INTERMEDIATE (IPC) COURSE
STUDY MATERIAL

PAPER : 3

COST ACCOUNTING AND FINANCIAL MANAGEMENT

Part – 1 : Cost Accounting

MODULE – 1

BOARD OF STUDIES
THE INSTITUTE OF CHARTERED ACCOUNTANTS OF INDIA

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A WORD ABOUT STUDY MATERIAL

The Study Material has been divided into two parts, namely, Study Material dealing with conceptual theoretical framework; and Practice Manual. The Study Material has been designed having regard to the needs of home study and distance learning students in mind. The students are expected to cover the entire syllabus and also do practice on their own while going through the Practice Manual.

The Study Material deals with the specific conceptual theoretical framework of cost accounting in detail. The main features of Study Material are as under:

- The entire syllabus has been divided into thirteen chapters.
- The chapters have been grouped into two modules
- **Module- 1 consisting of four chapters namely :**

  Chapter- 1: Basic Concepts

  Chapter- 2: Material

  Chapter- 3: Labour

  Chapter- 4: Overheads
- **Module- 2 consisting of nine chapters namely:**

  Chapter- 5: Non-integrated Accounts

  Chapter- 6: Job Costing and Batch Costing

  Chapter- 7: Contract Costing

  Chapter- 8: Operating Costing

  Chapter- 9: Process & Operation Costing

  Chapter- 10: Joint Products & By Products

  Chapter- 11: Standard Costing

  Chapter- 12: Marginal Costing

  Chapter- 13: Budgets and Budgetary Control
- In each chapter, learning objectives have been stated. The learning objectives would enable you to understand the sequence of various aspects dealt within the chapter before going into the details so that you know the direction of your studies.

- In each chapter, the topic has been covered in step by step approach. The text has been explained, where appropriate, through illustrations and practical problems. You should go through the chapter carefully ensuring that you understand the topic and then can tackle the exercises.

  Main features of Practice Manual are as under:

- Questions bunch with compilation of questions appearing during last examinations also.
- Important definitions, equations and formulae have been given before each topic for quick recapitulation. Students are expected to attempt the questions and then compare it with the actual answers.
- Aims to provide guidance as to the manner of writing an answer in the examination.
- Feedback form is given in the Module-1 of the Study Material wherein students are encouraged to give their feedback/ suggestions.

In this Study Material, formats of Financial Statements (i.e. Balance Sheet, Income Statements etc) and financial terms used are for illustrative purpose only. For appropriate format and applicability of various Standards, students are advised to refer the study material of appropriate subject (s).

Every effort has been made to make the Study Material error free, however if inadvertently any error is present and found by readers they may send it to us immediately so that it can be rectified at our end.

In case you need any further clarification/ guidance, you may send your queries at sanjit.sharma@icai.in; deepak.gupta@icai.in and nnsengupta@icai.in.

SYLLABUS

PAPER – 3 : COST ACCOUNTING AND FINANCIAL MANAGEMENT

(One paper — Three *hours – 100 Marks)*

Level of Knowledge: Working knowledge

PART – I : COST ACCOUNTING (50 MARKS)

Objectives:

(a) To understand the basic concepts and processes used to determine product costs,

(b) To be able to interpret cost accounting statements,

(c) To be able to analyse and evaluate information for cost ascertainment, planning, control and decision making, and

(d) To be able to solve simple cases.

Contents

1. Introduction to Cost Accounting

(a) Objectives and scope of Cost Accounting

(b) Cost centres and Cost units

(c) Cost classification for stock valuation, Profit measurement, Decision making and control

(d) Coding systems

(e) Elements of Cost

(f) Cost behaviour pattern, Separating the components of semi-variable costs

(g) Installation of a Costing system

(h) Relationship of Cost Accounting, Financial Accounting, Management Accounting and Financial Management.

2. Cost Ascertainment

(a) Material Cost

(i) Procurement procedures— Store procedures and documentation in respect of receipts and issue of stock, Stock verification (ii)Inventory control —

Techniques of fixing of minimum, maximum and reorder levels, Economic Order Quantity, ABC classification; Stocktaking and perpetual inventory

(iii) Inventory accounting

(iv) Consumption — Identification with products of cost centres, Basis for consumption entries in financial accounts, Monitoring consumption.

(b) Employee Cost

(i) Attendance and payroll procedures, Overview of statutory requirements, Overtime, Idle time and Incentives

(ii) Labour turnover

(iii) Utilisation of labour, Direct and indirect labour, Charging of labour cost, Identifying labour hours with work orders or batches or capital jobs

(iv) Efficiency rating procedures

(v) Remuneration systems and incentive schemes.

(c) Direct Expenses

Sub-contracting — Control on material movements, Identification with the main product or service.

(d) Overheads

(i) Functional analysis — Factory, Administration, Selling, Distribution, Research and Development Behavioural analysis — Fixed, Variable, Semi variable and Step cost

(ii) Factory Overheads — Primary distribution and secondary distribution, Criteria for choosing suitable basis for allotment, Capacity cost adjustments, Fixed absorption rates for absorbing overheads to products or services

(iii) Administration overheads — Method of allocation to cost centres or products

(iv) Selling and distribution overheads — Analysis and absorption of the expenses in products/customers, impact of marketing strategies, Cost effectiveness of various methods of sales promotion.

3. Cost Book-keeping

Cost Ledgers—Non-integrated accounts, Integrated accounts, Reconciliation of cost and financial accounts.

4. Costing Systems

(a) Job Costing

Job cost cards and databases, Collecting direct costs of each job, Attributing overhead costs to jobs, Applications of job costing.

(b) Batch Costing

(c) Contract Costing

Progress payments, Retention money, Escalation clause, Contract accounts, Accounting for material, Accounting for plant used in a contract, Contract profit and Balance sheet entries.

(d) Process Costing

Double entry book keeping, Process loss, Abnormal gains and losses, Equivalent units, Inter-process profit, Joint products and by products.

(e) Operating Costing System

5. Introduction to Marginal Costing

Marginal costing compared with absorption costing, Contribution, Breakeven analysis and profit volume graph.

6. Introduction to Standard Costing

Various types of standards, Setting of standards, Basic concepts of material and Labour standards and variance analysis.

7. Budget and Budgetary Control

The budget manual, preparation and monitoring procedures, budget variances, flexible budget, preparation of functional budget for operating and non operating functions, cash budget, master budget, principal budget factors.

STUDY PLAN – KEY TO EFFECTIVE LEARNING

Introduction

Cost Accounting and Financial Management is a subject which consists of two parts i.e. Cost accounting and Financial Management. The Cost Accounting part deals with basic concepts of Cost Accounting, elements of Cost, various methods of Costing and application of costing techniques. The basic objective of Cost Accounting part is as follows:

(a) To understand the basic concepts and processes used to determine product costs,

(b) To be able to interpret cost accounting statements,

(c) To be able to analyse and evaluate information for cost ascertainment, planning, control and decision making, and

(d) To be able to solve simple cases.

Outline of the Syllabus

The entire syllabus of the Cost Accounting part has been divided into thirteen chapters. The topics covered under these chapters are

1. Basic Concepts, 2.Material, 3.Labour, 4.Overheads, 5.Non Integrated Accounts, 6. Job Costing & Batch Costing 7. Contract Costing 8. Operating Costing 9. Process & Operation Costing 10. Joint products & By Products 11. Standard Costing 12. Marginal costing 13. Budgets and Budgetary Control.

Chapter Specific

- In the first chapter 'Basic Concepts', overview of all the concepts of Cost Accounting needs to be understood. The major parts which need to understand are definitions and different terminologies used in Cost Accounting and the context in which these are normally used. You are required to understand the objectives and importance of Cost Accounting system and its installation in industry, relation between Cost Accounting with other fields of study and its synchronisation with other related department/ stake holders to assist the management of the Organisation. Classification of cost, various elements and components of cost and various costing methods used in different industries need to be studied carefully. Theoretical questions are generally asked from this chapter almost in every examination. To answer these questions conceptual clarity and visualisation of practical life examples are necessary.
- The second chapter 'Material' is very important for the students. Students shall understand the concept, need and importance of materials in production system, various procedures involved in procuring, storing and issuing of material. You must know the

treatment of excess/ shortage of stores and valuation of store to be received, issued & stock at hand. Components which should form part of value of material should be understood; you may refer illustrations given in the Study Material. Generally problems on EOQ are solved using formula but some time instead of using formula answers to the questions is required to be done in tabular format as shown in the Study Material. You should also learn to draft format of Store Ledger under different valuation methods and accounting treatment. Treatment of normal and abnormal loss of materials, waste, scrap, spoilage and defectives in the Store ledger to be understood to arrive at correct stock position and its respective value. You should clearly know the differences between Simple average method and weighted average method of stock valuation. To avoid any confusion you should read the question carefully and understand the calculation under two methods of Valuation.

- In the third chapter 'Labour' students shall learn and understand the need of labour cost control, methods of attendance and payroll preparation procedures. Treatment of idle time and overtime both as normal and abnormal should be clearly understood by you. Students may also refer various illustrations given in the Study material for better and clear understanding. Labour Turnover is a term which can be heard in almost every Industry; you should understand what exactly, labour turnover is, reasons for labour turnover and its impact on an organisation's productivity directly and on image indirectly. Be conversed with various methods of computing labour turnover and Incentive plans to the workers. Students should be acquaintance with of different systems of wage payment and Incentives through practicing different types of problems. In examination generally questions are asked to compute Incentives based on a particular incentive plan or make comparison between two given plans. Students are advised to avoid selective study like only Rowan or Halsey method of bonus plan.
- The fourth chapter 'Overheads' in which students shall understand the meaning and difference between direct cost and indirect cost i.e. overheads. Overheads are generally associated with more than one department or product line. Overheads are distributed amongst the concerned departments/ product lines using a basis. Distribution of overheads is called allocation of overheads or apportionment of overheads or absorption of overheads. Understanding the meaning and differences among the terms such as allocation, apportionment and absorption of overhead is important for conceptual clarity. As stated above overheads are allocated/ apportioned/ absorbed using some basis e.g. primary distributions are done using labour hours, machine hours, floor area, capacity, number of staff etc. Students should be versed with treatment of under absorption and over absorption of overheads through application of supplementary rate while ascertaining the cost of a particular product or department. You should also learn different methods of secondary distribution and calculation involved therein. Students should do thorough practice to avoid computational errors. Some time questions are related with capacity determination, in this regard students should be familiar with terms such as Installed/ Rated capacity, normal capacity, practical capacity, actual capacity etc. Question may be asked to calculate idle capacity and/or cost.

- In the Fifth chapter 'Non-Integrated Accounts' students shall acquainted with both Integrated and Non-Integrated systems of accounting and different ledgers account to be opened under the two methods of cost accounting. You should know the reasons for the differences between profit as per the financial accounting and the cost accounting and ways to reconcile it. Accounting treatment of over absorption and under absorption of overheads should be understood.
- The sixth, seventh and eighth chapters consist of Job Costing and Batch Costing, Contract Costing, Operating Costing and Multiple Costing. Here students should understand the meaning and distinctive features of above mentioned methods of costing and the accounting procedures to be applied in the above mentioned different methods of costing. Students shall be conversed with the adjustment of opening and closing stock of raw material, work in process and finished goods while preparation of Job/ Batch cost sheet. In Contract Costing profit from the contract is recognised using percentage of completion method. To arrive at it various factors such as Value of contract, Cost of Work certified, work uncertified, retention money, cash received should be understood. Computation of notional profit and estimated profit shall be learned. You should understand effects of escalation clause both to contractor and contractee and revision of work certified.
- The ninth and tenth chapters consist of Process & Operation Costing and Joint Products and By Products. Area of application of the above costing methods and accounting difference among these should be understood. Process Costing method is followed in an industry where a product passing through various identifiable processes, where output of one process becomes the input of succeeding process and so on till it reaches its final shape. Students should be able to identify each process and related cost. Production being a continuous process where some incomplete (work in process) stock remains a possibility. To find out accurate cost incurred and output for a given period 'Statement of Equivalent Production' is prepared. Students should be able to calculate equivalent production for a given period with the use of any methods of inventory valuation. Students may refer illustrations given in the Study material for practice and clarity. One most important area of calculation is the treatment of normal loss, abnormal losses/ gains, adjustment for scrap in ascertainment of actual abnormal loss/gain.

  Some time more than one final products are obtained from a common process or input. Students shall know the treatment of joint cost to joint products for stock valuation purposes. Joint costs are apportioned using various methods such as based on sales value or based on volume etc. students may refer illustrations given in the Study Material for clear understanding. Some time questions may be asked on selling price at which a particular product can be sold or should be sold after further processing. Various illustrations have been given in the Study materials showing this type of calculations. Similarly all other methods such as operation costing and costing for By Products should be understood.

- The eleventh chapter is 'Standard Costing'. First of all students should understand the meaning of standard cost and what is actual cost. The difference between standard values with actual value is called variance; Variances are calculated using some rational and conventional formulas. Formulas and its logical interlinks for finding out variances should be understood. Mere mugging up of formulas without proper understanding of its relationship will not going to help, as this chapter is just an introduction, clear understanding will definitely help students at Final level where numerical are based on practical situations. Students should also understand the accounting procedures and disposition of variances. Classification of variances and interrelationship could be understood from the chart given in the study material. This chapter requires lots of practice.
- 'Marginal Costing' is the twelfth chapter of Cost Accounting at IPCC level and is one of the most vital chapter. Basic marginal equations and formulas should be understood. Students should be able to extract Profit Volume Ratio (P/V Ratio), Break Even Point/ sales, margin of safety, contribution, bifurcation of fixed cost from semi variable cost. Difference between marginal costing and absorption costing should be understood as some time you are required to reconcile figures from one method to another. Specimen Income Statement given in Study material is very helpful for clear understanding of the differences and treatment.
- In thirteenth chapter 'Budgets and Budgetary Control', objectives and importance of budgets and budgetary control, advantages and disadvantages of budgetary control should be understood. You are also required to learn the difference between various types of budgets and process of preparation of budgets. Generally preparation of flexible budget segregation of fixed cost and variable cost is required, so segregation techniques should be learnt (also discussed in Chapter-1). It is important for the students to understand inter linkage among different functional budget while answering question on functional budget. You may refer illustrations given in the Study Material.

Happy Reading and Best Wishes!

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1
Basic Concepts

Learning Objectives

After studying this chapter you will be able to:

- Understand the Cost Accounting System.
- Know about the objective and importance of Cost Accounting.
- Basic Cost Accounting terminology used in the subject.
- Difference and relation between Cost Accounting and Financial Accounting and Management Accounting will become clear.
- Understand the process of installation of Cost Accounting system with the key factors to be recognized for the process to take place.
- Classify costs into different categories.
- Identify different elements and components of costs and
- Understand and apply the various methods of costing used in the industry.
- The concept of Codes and the process of codification will become clear.

1.1 Introduction

In the seventeenth century in France, the Royal Wallpaper Manufactory had a Cost Accounting System. Some iron masters and potters in eighteenth century in England too began to produce Cost Accounting information before the Industrial Revolution. However, the period, 1880 AD – 1925 AD saw the development of complex product designs and the emergence of multi activity diversified corporations like Du Pont, General Motors etc. It was during this period that scientific management was developed which led accountants to convert physical standards into cost standards, the latter being used for variance analysis and control.

During World War I and II the social importance of cost accounting grew with the growth of each country's defence expenditure. In the absence of competitive markets for most of the material required to fight war, the Governments in several countries placed cost-plus contracts under which the price to be paid was the cost of production plus an agreed rate of profit. The reliance on cost information by the parties to defence contracts continued after World War II as well.

1.2 Meaning of Cost, Costing, Cost Accounting and Cost Accountancy

Term	*Meaning*
Cost	*As a noun*- The amount of expenditure (actual or notional) incurred on or attributable to a specified article, product or activity. *As a verb*- To ascertain the cost of a specified thing or activity.
Costing	*Costing* is defined as "the technique and process of ascertaining costs". According to CIMA "An organisation costing system is the foundation of the internal financial information system for managers. It provides the information that management needs to plan and control the organisation's activities and to make decisions about the future."
Cost Accounting	*Cost Accounting* is defined as "the process of accounting for cost which begins with the recording of income and expenditure or the bases on which they are calculated and ends with the preparation of periodical statements and reports for ascertaining and controlling costs."
Cost Accountancy	*Cost Accountancy* has been defined as "the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived there from for the purpose of managerial decision making."

1.3 Cost Units

It is a unit of product, service or time (or combination of these) in relation to which costs may be ascertained or expressed.

We may for instance determine the cost per tonne of steel, per tonne kilometre of a transport service or cost per machine hour. Sometime, a single order or a contract constitutes a cost unit. A batch which consists of a group of identical items and maintains its identity through one or more stages of production may also be considered as a cost unit.

Cost units are usually the units of physical measurement like number, weight, area, volume, length, time and value.

A few typical examples of cost units are given below:

Industry or Product	***Cost Unit Basis***
Automobile	*Number*
Cement	*Tonne/ per bag etc.*

Chemicals	*Litre, gallon, kilogram, tonne etc.*
Power	*Kilo-watt hour (KwH)*
Steel	*Tonne*
Transport	*Passenger kilometer*

Some examples from the CIMA terminology are as follows:

Industry Sector	***Cost unit***
Brewing	*Barrel*
Brick-making	*1,000 bricks*
Coal mining	*Tonne/ ton*
Electricity	*Kilowatt-hour (KwH)*
Engineering	*Contract, job*
Oil	*Barrel, tonne, litre*
Hotel/Catering	*Room/meal*
Professional services	*Chargeable hour, job, contract*
Education	*Course, enrolled student, successful student*
Hospitals	*Patient day*

Activity	***Cost unit***
Credit control	*Accounts maintained*
Selling	*Customer call, value of sales, orders taken*
Materials storage/ handling	*Requisition unit issued/received, material movement, value issued/received*
Personnel administration	*Personnel record*

1.4 Cost Centres

It is defined as a location, person or an item of equipment (or group of these) for which cost may be ascertained and used for the purpose of Cost Control.

Cost Centres are of two types,

- ***Personal Cost Centre:*** It consists of a person or group of persons e.g. Mr. X, supervisor, foreman, accountant, engineer, process staffs, mining staffs, doctors etc.

- ***Impersonal Cost Centre:*** It consists of a location or an item of equipment (or group of these) e.g. Ludhiana branch, boiler house, cooling tower, weighing machine, canteen, and generator set etc.

Cost Centre in a manufacturing concern:

Two main types of Cost Centres are indicated as below:

- ***Production Cost Centre:*** It is a cost centre where raw material is handled for conversion into finished product. Here both direct and indirect expenses are incurred. Machine shops, welding shops and assembly shops etc. are examples of production Cost Centres.
- ***Service Cost Centre:*** It is a cost centre which serves as an ancillary unit to a production cost centre. Payroll processing department, HRD, Power house, gas production shop, material service centres, plant maintenance centres etc. are examples of service cost centres.

1.5 Cost Objects

Cost object is anything for which a separate measurement of cost is required. Cost object may be a product, a service, a project, a customer, a brand category, an activity, a department or a programme etc.

Examples of Cost Object are:

• **Product**	*Smart phone, Tablet computer, SUV Car, Book etc.*
• **Services**	*An airline flight from Delhi to Mumbai, Concurrent audit assignment, Utility bill payment facility etc.*
• **Project**	*Metro Rail project of DMRC, Road projects of NHAI etc.*
• **Activity**	*Quality inspection of materials, Placing of orders etc.*
• **Process**	*Refinement of crudes in oil refineries, melting of billets or ingots in rolling mills etc.*
• **Department**	*Production department, Finance & Accounts, Safety etc*

1.6 Cost Drivers

A Cost driver is a factor or variable which effect level of cost. Generally it is an activity which is responsible for cost incurrence. Level of activity or volume of production is the example of a cost driver. An activity may be an event, task, or unit of work etc.

CIMA Official terminology defines cost driver as *"Factor influencing the level of cost. Often used in the context of ABC to denote the factor which links activity resource consumption to product outputs, for example the number of purchase orders would be a cost driver for procurement cost."*

Examples of cost drivers are number of machines setting ups, number of purchase orders, hours spent on product inspection, number of tests performed etc.

1.7 Scope of Cost Accounting

Scope of cost accounting consists of the following functions:

(i) ***Costing:*** Costing is the technique and process of ascertaining costs of products or services. The cost ascertainment procedure is governed by some cost accounting principles and rules. Generally cost is ascertained using some arithmetical process.

(ii) ***Cost Accounting:*** This is a process of accounting for cost which begins with the recording of expenditure and ends with the preparation of periodical statement and reports for ascertaining and controlling cost. Cost Accounting is a formal mechanism of cost ascertainment.

(iii) ***Cost Analysis:*** It involves the process of finding out the factors responsible for variance in actual costs from the budgeted costs and accordingly fixation of responsibility for cost differences. This also helps in better cost management and strategic decisions.

(iv) ***Cost Comparisons:*** Cost accounting also includes comparisons of cost from alternative courses of action such as use of different technology for production, cost of making different products and activities, and cost of same product/ service over a period of time.

(v) ***Cost Control:*** It involves a detailed examination of each cost in the light of advantage received from the incurrence of the cost. Thus, we can state that cost is analyzed to know whether cost is not exceeding its budgeted cost and whether further cost reduction is possible or not.

(vi) ***Cost Reports:*** This is the ultimate function of cost accounting. These reports are primarily prepared for use by the management at different levels. Cost Reports helps in planning and control, performance appraisal and managerial decision making.

(vii) ***Statutory Compliances:*** Maintaining cost accounting records as per the rules prescribed by the statute. As per the Companies (Cost Records and Audits) Rules, 2014, Companies governed by the Companies Act has to maintain cost records relating to utilization of materials, labour and other items of cost as applicable to the production of goods or provision of services as provided in the Act and these rules..

1.8 Objectives of Cost Accounting

The main objectives of Cost Accounting are explained as follows:

(i) Ascertainment of Cost: There are two methods of ascertaining costs:

Post Costing: It means analysis of actual information as recorded in financial books. It is accurate and is useful in the case of "Cost plus contracts" where price is to be determined finally on the basis of actual cost.

Continuous Costing: It aims at collecting information about cost as and when the activity takes place so that as soon as a job is completed the cost of completion would be known. This involves careful estimation of overheads. In order to be of any use, costing must be a continuous process.

Cost ascertained by the above two methods may be compared with the standard costs which are the target figures already compiled on the basis of experience and experiments.

(ii) Determination of Selling Price: Business enterprises run on a profit making basis. It is thus necessary that the revenue should be greater than the costs incurred. Cost accounting provides the information regarding the cost to make and sell the product or services produced. Though the selling price of a product is also influenced by market conditions, which are beyond the control of any business, it is still possible to determine the selling price within the market constraints; hence cost plays a dominating role.

(iii) Cost Control: To exercise cost control, broadly the following steps should be observed:

(a) Determine clearly the objective, i.e., pre-determine the desired results: The target cost and/ or targets of performance should be laid down in respect of each department or operation and these targets should be related to individuals who, by their action, control the actual and bring them into line with the targets

(b) Measure the actual performance: Actual cost of performance should be measured in the same manner in which the targets are set up, *i.e.* if the targets are set up operation-wise, and then the actual costs should also be collected operation-wise and not cost centre or department-wise as this would make comparison difficult.

(c) Investigate into the causes of failure to perform according to plan; and

(d) Institute corrective action.

(iv) Cost Reduction: It may be defined "as the achievement of real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended or diminution in the quality of the product."

Cost reduction implies the retention of the essential characteristics and quality of the product and thus it must be confined to permanent and genuine savings in the cost of manufacture, administration, distribution and selling, brought about by elimination of wasteful and inessential elements from the design of the product and from the techniques carried out in connection therewith.

The three-fold assumptions involved in the definition of cost reduction may be summarised as under :

(a) There is a saving in unit cost.

(b) Such saving is of permanent nature.

(c) The utility and quality of the goods and services remain unaffected, if not improved.

(v) Ascertaining the profit of each activity: The profit of any activity can be ascertained by matching cost with the revenue of that activity. The purpose under this step is to determine costing profit or loss of any activity on an objective basis.

(vi) Assisting management in decision making: Decision making is defined as a process of selecting a course of action out of two or more alternative courses. For making a choice between different courses of action, it is necessary to make a comparison of the outcomes, which may be arrived under different alternatives. Such a comparison has only been made possible with the help of Cost Accounting information. (e.g: Determination of Cost Volume Relationship, shutting down or operating at loss, making or buying from outside)

1.9 Difference between Cost Control and Cost Reduction

Cost Control	Cost Reduction
1. Cost control aims at maintaining the costs in accordance with the established standards.	1. Cost reduction is concerned with reducing costs. It challenges all standards and endeavours to better them continuously
2. Cost control seeks to attain lowest possible cost under existing conditions.	2. Cost reduction recognises no condition as permanent, since a change will result in lower cost.
3. In case of Cost Control, emphasis is on past and present	3. In case of cost reduction it is on present and future.
4. Cost Control is a preventive function	4. Cost reduction is a corrective function. It operates even when an efficient cost control system exists.
5. Cost control ends when targets are achieved	5. Cost reduction has no visible end.

1.10 Difference between Financial Accounting and Cost Accounting

Difference between financial accounting and cost accounting is as follows:

	Basis	Financial Accounting	Cost Accounting
(i)	Objective	It provides information about the financial performance.	It provides information of ascertainment of cost for the purpose of cost control and decision making.
(ii)	Nature	It classifies records, presents and interprets transactions in terms of money.	It classifies, records, presents, and interprets in a significant

			manner the material, labour and overheads cost.
(iii)	Recording of data	It records Historical data.	It makes use of both the historical costs and pre-determined costs.
(iv)	Users of information	The users of financial accounting statements are shareholders, creditors, financial analysts and government and its agencies, etc.	The cost accounting information is used by internal management.
(v)	Analysis of costs and profits	It shows the either Profit or loss of the organization.	It provides the details of cost and profit of each product, process, job, contracts, etc.
(vi)	Time period	Financial Statements are prepared usually for a year.	Its reports and statements are prepared as and when required.
(vii)	Presentation of information	A set format is used for presenting financial information.	There are no set formats for presenting cost information.

1.11 Difference between Cost Accounting and Management Accounting

	Basis	Cost Accounting	Management Accounting
(i)	Nature	It records the quantitative aspect only	It records both qualitative and quantitative aspect.
(ii)	Objective	It records the cost of producing a product and providing a service	It Provides information to management for planning and co-ordination
(iii)	Area	It only deals with cost Ascertainment.	It is wider in scope as it includes F.A., budgeting, Tax, Planning.
(iv)	Recording of data	It uses both past and present figures.	It is focused with the projection of figures for future.
(v)	Development	It's development is related to industrial revolution.	It develops in accordance to the need of modern business world.
(vi)	Rules and Regulation	It follows certain principles and procedures for recording costs of different products	It does not follow any specific rules and regulations.

1.12 Advantages of a Cost Accounting System

Important advantages of a Cost Accounting System may be listed as below:

1. Cost Determination	A good cost accounting system helps in identifying all expenses incurred to produce a product and determination of total cost of production.
2. Helping in Cost Reduction	The application of various cost accounting techniques helps in achieving the objective of economy in concern's operations and thereby helping the organisation to reduce cost. Continuous efforts are being made by the business organisation for finding new and improved methods for reducing costs.
3. Product Profitability Analysis	Cost Accounting is useful for identifying the exact causes for decrease or increase in the profit/loss of the business. It also helps in identifying unprofitable products or product lines so that these may be eliminated or alternative measures may be taken.
4. Provide information relevant for Decision Making	It provides information to the management to serve as guides in making decisions involving financial considerations. Guidance may also be given by the Cost Accountant on various issues such as, whether to purchase or manufacture a given component, whether to accept orders below cost, which machine to purchase when a number of choices are available.
5. Determination of selling price	Cost Accounting is quite useful for price fixation. The price determined may be useful for preparing estimates or filling tenders.
6. Cost Control and Variance Analysis	The use of cost accounting technique viz., variance analysis, points out the deviations from the pre-determined level and thus demands suitable action to eliminate such deviations in future.
7. Cost Comparison and Benchmarking	Cost comparison helps in cost control. Such a comparison may be made from period to period by using the figures in respect of the same unit of firms or of several units in an industry by employing uniform costing and inter-firm comparison methods. Comparison may be made in respect of costs of jobs, processes or cost centres.

8. Compliances with Statutory requirement	A system of costing provides figures for the use of Government, Wage Tribunals and other bodies for dealing with a variety of problems. Some such problems include price fixation, price control, tariff protection, wage level fixation, etc.
9. Identification of lacunae	The cost of idle capacity can be easily worked out, when a concern is not working to full capacity.
10. Helpful in Strategic Management Decision Making	The use of Marginal Costing technique may help the executives in taking various suitable decisions. This technique of costing is highly useful during the period of trade depression, as the orders may have to be accepted during this period at a price less than the total cost.
11. Helpful in solving Linear Programming Problems.	The marginal cost has linear relationship with production volume and hence in formulating and solving "Linear Programming Problems", marginal cost is useful.

1.13 Limitations of Cost Accounting

Like other branches of accounting, cost accounting is also having certain limitations. The limitations of cost accounting are as follows:

1. **Expensive:** It is expensive because analysis, allocation and absorption of overheads require considerable amount of additional work, and hence additional money.
2. **Requirement of Reconciliation:** The results shown by cost accounts differ from those shown by financial accounts. Thus Preparation of reconciliation statements is necessary to verify their accuracy.
3. **Duplication Work**: t involves duplication of work as organization has to maintain two sets of accounts i.e. Financial Account and Cost Account.
4. **Inefficiency:** Costing system itself does not control costs but its usage does.

1.14 Importance of Cost Accounting

Importance of Cost Accounting to Business Concerns:

Management of business concerns expects from Cost Accounting detailed cost information in respect of its operations to equip their executives with relevant information required for planning, scheduling, controlling and decision making. To be more specific, management expects from cost accounting - information and reports to help them in the discharge of the following functions:

(**a**) ***Control of Direct and Indirect cost:*** It includes the cost of material, cost of labour and overheads. Cost of material usually constitutes a substantial portion of the total cost of a

product. Therefore, it is necessary to control it as far as possible. Such a control may be exercised by ensuring un-interrupted supply of material and spares for production, by avoiding excessive locking up of funds/capital in stocks of materials and stores, also by the use of techniques like value analysis, standardisation etc. to control material cost, it can be controlled if workers complete their work within the standard time limit. Reduction of labour turnover and idle time too help us, to control labour cost. Overheads consist of indirect expenses which are incurred in the factory, office and sales department; they are part of production and sales cost. Such expenses may be controlled by keeping a strict check over them.

(b) ***Measuring efficiency and fixing responsibility:*** Cost Accounting department provides information about standard and actual performance of the concerned activity to measure efficiency of a particular cost centre and fix responsibility for any deviations from the set standards.

(c) ***Budgeting:*** Now–a–days detailed estimates in terms of quantities and amounts are drawn up before the start of each activity. This is done to ensure that a practicable course of action can be chalked out and the actual performance corresponds with the estimated or budgeted performance. The preparation of the budget is the function of Costing Department.

(**d**) ***Price determination:*** Cost accounts should provide information, which enables the management to fix remunerative selling prices for various items of products and services in different circumstances.

(e) ***Curtailment of loss during the off-season:*** Cost Accounting can also provide information, which may enable reduction of overhead, by utilising idle capacity during the off-season or by lengthening the season.

(f) ***Expansion:*** Cost Accounts may provide estimates of production of various levels on the basis of which the management may be able to formulate its approach to expansion.

(g) ***Arriving at decisions:*** Most of the decisions in a business undertaking involve correct statements of the likely effect on profits. Cost Accounts are of vital help in this respect. In fact, without proper cost accounting, decision would be like taking a jump in the dark, such as when production of a product is stopped.

1.15 Installation of a Costing System

As in the case of every other form of activity, it should be considered whether it would be profitable to have a cost accounting system. Management of an organisation needs complete and accurate information to make decisions. A well Costing system should provide all relevant information as and when required by various stakeholders.

Before setting up a system of cost accounting the under mentioned factors should be studied:

(a) **Objective:** The objective of costing system, for example whether it is being introduced for fixing prices or for insisting a system of cost control.

(b) **Nature of Business or Industry:** The Industry in which business is operating. Every business industry has its own peculiar feature and costing objectives. According to its cost

information requirement cost accounting methods are followed. For example Indian Oil Corporation Ltd. has to maintain process wise cost accounts to find out cost incurred on a particular process say in crude refinement process etc.

(c) Organisational Hierarchy: Costing system should fulfil the requirement of different level of management. Top management is concerned with the corporate strategy, strategic level management is concerned with marketing strategy, product diversification, product pricing etc. Operational level management needs the information on standard quantity to be consumed, report on idle time etc.

(d) Knowing the product: Nature of product determines the type of costing system to be implemented. The product which has by-products requires costing system which account for by-products as well. In case of perishable or short self- life, marginal costing method is required to know the contribution and minimum price at which it can be sold.

(e) Knowing the production process: A good costing system can never be established without the complete knowledge of the production process. Cost apportionment can be done on the most appropriate and scientific basis if a cost accountant can identify degree of effort or resources consumed in a particular process. This also includes some basic technical know-how and process peculiarity.

(f) Information synchronisation: Establishment of a department or a system requires substantial amount of organisational resources. While drafting a costing system, information needs of various other departments should be taken into account. For example in a typical business organisation accounts department needs to submit monthly stock statement to its lender bank, quantity wise stock details at the time filing returns to tax authorities etc.

(g) Method of maintenance of cost records: The manner in which Cost and Financial accounts could be inter-locked into a single integral accounting system and in which results of separate sets of accounts, cost and financial, could be reconciled by means of control accounts.

(h) Statutory compliances and audit: Records are to be maintained to comply with statutory requirements, standards to be followed (Cost Accounting Standards and Accounting Standards).

(i) Information Attributes: Information generated from the Costing system should be possess all the attributes of an information i.e. complete, accurate, timeliness, confidentiality etc. This also meets the requirements of management information system.

1.16 Essentials of a Good Cost Accounting System

The essential features, which a good Cost Accounting System should possess, are as follows:

(a) Informative and Simple: Cost Accounting System should be tailor-made, practical, simple and capable of meeting the requirements of a business concern. The system of costing should not sacrifice the utility by introducing meticulous and unnecessary details.

(b) Accuracy: The data to be used by the Cost Accounting System should be accurate; otherwise it may distort the output of the system and a wrong decision may be taken.

(c) Support from Management and subordinates: Necessary cooperation and participation of executives from various departments of the concern is essential for developing a good system of Cost Accounting.

(d) Cost-Benefit: The Cost of installing and operating the system should justify the results.

(e) Procedure: A carefully phased programme should be prepared by using network analysis for the introduction of the system.

(f) Trust: Management should have faith in the Costing System and should also provide a helping hand for its development and success.

1.17 Classification of Costs

It means the grouping of costs according to their common characteristics. The important ways of classification of costs are:

(1) By Nature or Element

(2) By Functions

(3) By Variability or Behaviour

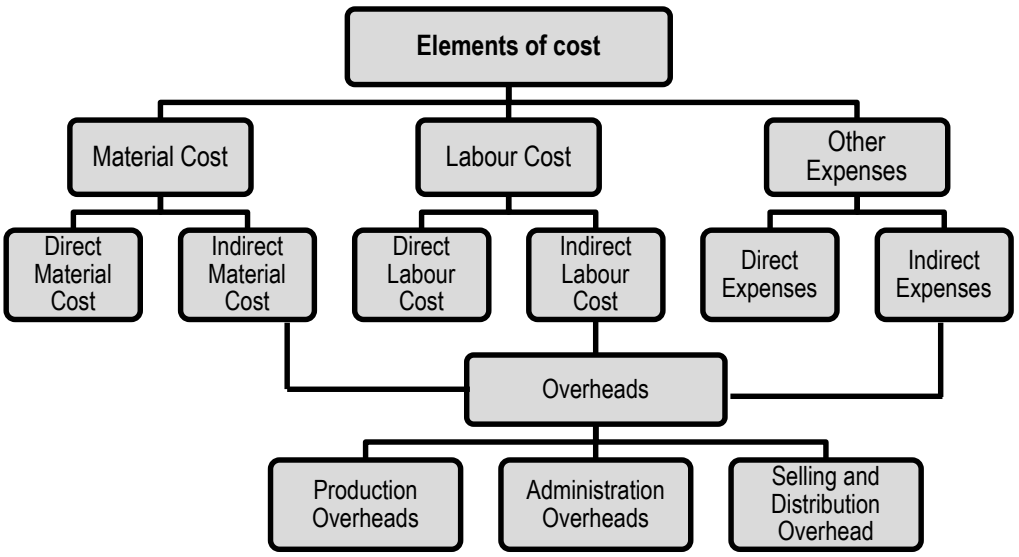
(4) By Controllability

(5) By Normality

(6) By Costs for Managerial Decision Making

1.17.1 By Nature or Element: This type of classification is useful to determine the total cost.

A diagram as given below shows the elements of cost described as under:



(i) **Direct Materials:** Materials which are present in the finished product (cost object) or can be economically identified in the product are called direct materials. For example, cloth in dress making; materials purchased for a specific job etc. However in some cases a material may be direct but it is treated as indirect, because it is used in small quantities, it is not economically feasible to identify that quantity and those materials which are used for purposes ancillary to the business.

(ii) **Direct Labour:** Labour which can be economically identified or attributed wholly to a cost object is called direct labour. For example, labour engaged on the actual production of the product or in carrying out the necessary operations for converting the raw materials into finished product.

(iii) **Direct Expenses:** It includes all expenses other than direct material or direct labour which are specially incurred for a particular cost object and can be identified in an economically feasible way. For example, hire charges for some special machinery, cost of defective work.

(iv) **Indirect Materials:** Materials which do not normally form part of the finished product (cost object) are known as indirect materials. These are —

- Stores used for maintaining machines and buildings (lubricants, cotton waste, bricks etc.)
- Stores used by service departments like power house, boiler house, canteen etc.

(v) **Indirect Labour :** Labour costs which cannot be allocated but can be apportioned to or absorbed by cost units or cost centres is known as indirect labour. Examples of indirect labour includes foreman and supervisors; maintenance workers; etc.

(vi) **Indirect Expenses:** Expenses other than direct expenses are known as indirect expenses, that cannot be directly, conveniently and wholly allocated to cost centres. Factory rent and rates, insurance of plant and machinery, power, light, heating, repairing, telephone etc., are some examples of indirect expenses.

(vii) **Overheads:** It is the aggregate of indirect material costs, indirect labour costs and indirect expenses. The main groups into which overheads may be subdivided are the following:

- **Production or Works Overheads**: Indirect expenses which are incurred in the factory and for the running of the factory. E.g.: rent, power etc.
- **Administration Overheads**: Indirect expenses related to management and administration of business. E.g.: office rent, lighting, telephone etc.
- **Selling Overheads: I**ndirect expenses incurred for marketing of a commodity. E.g.: Advertisement expenses, commission to sales persons etc.
- **Distribution Overheads**: Indirect expenses incurred in despatch of the goods E.g.: warehouse charges, packing and loading charges.

1.17.2 By Functions: Under this classification, costs are divided according to the function for which they have been incurred. It includes the following:

(i) **Prime Cost**

(ii) **Factory Cost or Works Cost**

(iii) **Cost of Production**

(iv) Cost of Goods Sold

(v) Cost of Sales

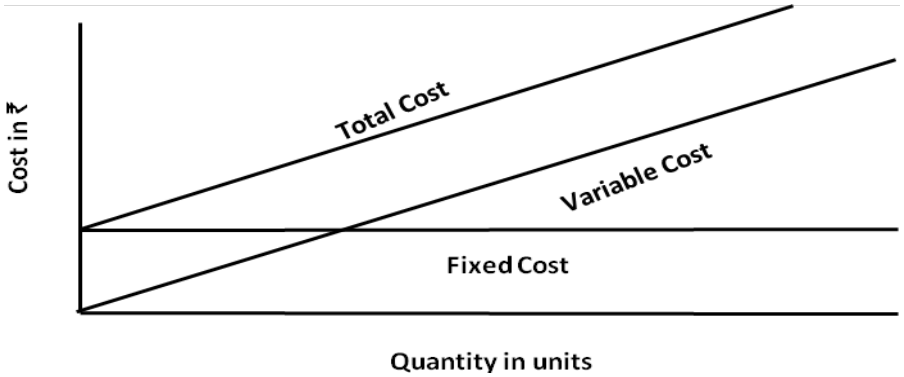
It can be understood with the help of the following diagram:

Direct Materials Direct Labours Direct Expenses		**Prime Cost**
Indirect Material	Factory Overheads	**Factory Cost or Works Cost**
Indirect Labour	Administration Overheads	**Cost of Goods Sold**
Indirect Expenses	Selling and Distribution Overheads	**Cost of Sales**

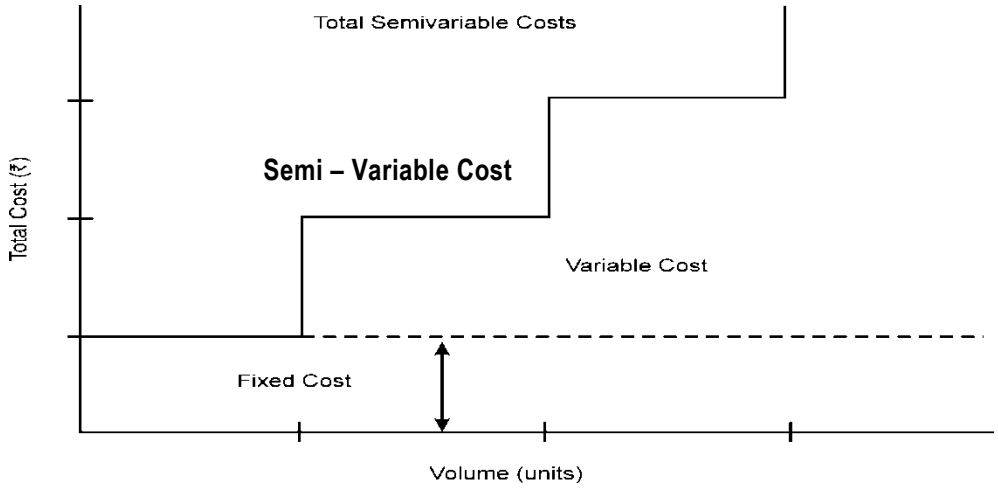
1.17.3 By Variability or Behaviour: According to this classification costs are classified into three group *viz.,* fixed, variable and semi-variable.

(a) **Fixed costs** – These are the costs which are incurred for a period, and which, within certain output and turnover limits, tend to be unaffected by fluctuations in the levels of activity (output or turnover). They do not tend to increase or decrease with the changes in output. For example, rent, insurance of factory building etc., remain the same for different levels of production.

(b) **Variable Costs** – These costs tend to vary with the volume of activity. Any increase in the activity results in an increase in the variable cost and **vice**-versa. For example, cost of direct labour, etc.



(c) **Semi-variable costs –** These costs contain both fixed and variable components and are thus partly affected by fluctuations in the level of activity. Examples of semi variable costs are telephone bills, gas and electricity etc. Such costs are depicted graphically as follows:



Semi – Variable overhead graph

1.17.4 Methods of segregating Semi-variable costs into fixed and variable costs - The segregation of semi-variable costs into fixed and variable costs can be carried out by using the following methods:

(a) Graphical method

(b) High points and low points method

(c) Analytical method

(d) Comparison by period or level of activity method

(e) Least squares method

(a) ***Graphical Method*****:** Under this method, the following steps are followed:

i. A large number of observations regarding the total costs at different levels of output are plotted on a graph with the output on the X-axis

ii. The total cost is plotted on the Y-axis.

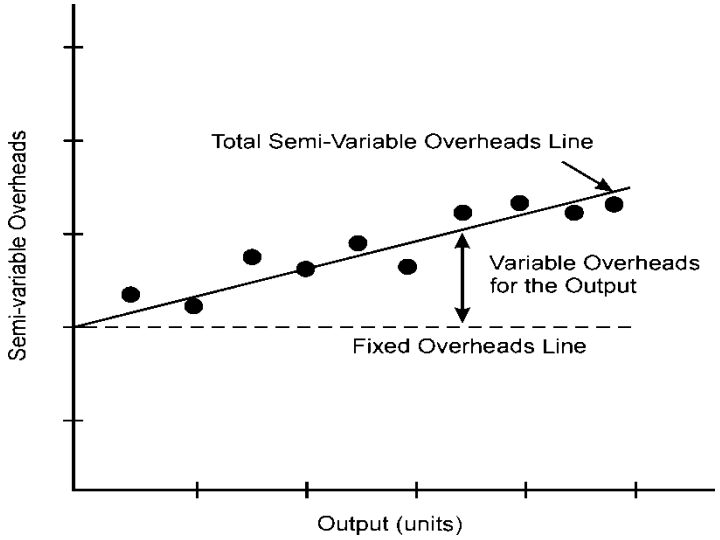
iii. Then, by judgment, a line of "best-fit", which passes through all or most of the points, is drawn.

iv. The point at which this line cuts the Y-axis indicates the total fixed cost component in the total cost.

v. If a line is drawn at this point parallel to the X-axis, this indicates the fixed cost.

vi The variable cost, at any level of output, is derived by deducting this fixed cost element from the total cost.

The following graph illustrates this:



(b) ***High points and Low points Method:*** - Under this method difference between the total cost at highest and lowest volume is divided by the difference between the sales value at the highest and lowest volume. The quotient thus obtained gives us the rate of variable cost in relation to sales value.

Illustration 1: (Segregation of fixed cost and variable cost)

	Sales value	***Total cost***
	(₹)	*(₹)*
At the Highest volume	*1,40,000*	*72,000*
At the Lowest volume	*80,000*	*60,000*
	60,000	*12,000*

Thus, Variable Cost (₹12,000/ ₹60,000) = 1/5 or 20% of sales value

= ₹28,000 (at highest volume)

Fixed Cost ₹72,000 – ₹28,000 i.e., (20% of ₹1,40,000) = ₹44,000.

Alternatively ₹60,000 – ₹16,000 (20% of ₹80,000) = ₹44,000.

(c) ***Analytical Method*****:** Under this method an experienced cost accountant tries to judge empirically what proportion of the semi-variable cost would be variable and what would be fixed. The degree of variability is ascertained for each item of semi-variable expenses. For example, some semi-variable expenses may vary to the extent of 20% while others may vary to the extent of 80%. Although it is very difficult to estimate the extent of variability of an expense, the method is easy to apply. (Go through the following illustration for clarity).

Illustration 2: (Segregation of fixed cost and variable cost)

Suppose, last month the total semi-variable expenses amounted to ₹ 3,000. If the degree of variability is assumed to be 70%, then variable cost = 70% of ₹ 3,000 = ₹ 2,100. Fixed cost = ₹ 3,000 – ₹ 2,100 = ₹ 900. Now in the future months, the fixed cost will remain constant, but the variable cost will vary according to the change in production volume. Thus, if in the next month production increases by 50%, the total semi-variable expenses will be: Fixed cost of ₹ 900, plus variable cost viz., ₹ 3,150 i.e., (₹ 2,100(V.C.) plus 50% increase of V.C. i.e., ₹ 1,050) i.e., ₹ 4,050.

(d) ***Comparison by period or level of activity method:*** - Under this method, the variable overhead may be determined by comparing two levels of output with the amount of expenses at those levels. Since the fixed element does not change, the variable element may be ascertained with the help of the following formula.

$$\frac{\text{Change in the amount of expense}}{\text{Change in the quantity of output}}$$

Suppose the following information is available:

	Production Units	***Semi-variable expenses***
		(₹)
January	100	260
February	140	300
Difference	40	40

The variable cost :

$$\frac{\text{Change in Semi – variable expenses}}{\text{Change in production volume}} = \frac{₹\ 40}{40\ \text{units}} = ₹\ 1/\ \text{unit}$$

Thus, in January, the variable cost will be 100 × ₹ 1 = ₹ 100 and the fixed cost element will be (₹ 260 – ₹ 100) or ₹ 160. In February, the variable cost will be 140 × ₹ 1 = ₹ 140 whereas the fixed cost element will remain the same, i.e., ₹ 160.

(e) ***Least Square Method:*** This is the best method to segregate semi-variable costs into its fixed and variable components. This is a statistical method and is based on finding out a line of best fit for a number of observations.

The method uses the linear equation **y = mx + c**, where

'm' represents the variable element of cost per unit, 'c' represents the total fixed cost, 'y' represents the total cost, 'x' represents the volume of output.

The total cost is thus split into its fixed and variable elements by solving this equation.

Illustration 3: (Segregation of fixed cost and variable cost)

	Level of activity	
Capacity %	60%	80%
Volume (Labour hours) or 'x'	150	200
Semi-variable expenses (maintenance of plant) or 'y'	₹ 1,200	₹ 1,275

Substituting the values of 'x' and 'y' in the equation, y = mx + c, at both the levels of activity, we get

$$1,200 = 150\ m + c$$
$$1,275 = 200\ m + c$$

On solving the above equations, we get the value of 'c'

Fixed cost or 'c' = ₹ 975 and Variable cost or 'm' = ₹ 1.50 per labour hour.

1.17.5 By Controllability: Costs here may be classified into controllable and uncontrollable costs.

(a) ***Controllable Costs***: - Cost that can be controlled, typically by a cost, profit or investment centre manager is called controllable cost. Controllable costs incurred in a particular responsibility centre can be influenced by the action of the executive heading that responsibility centre. For **example**, direct costs comprising direct labour, direct material, direct expenses and some of the overheads are generally controllable by the shop level management.

(b) ***Uncontrollable Costs*** - Costs which cannot be influenced by the action of a specified member of an undertaking are known as uncontrollable costs. For **example**, expenditure incurred by, say, the tool room is controllable by the foreman in-charge of that section but the share of the tool-room expenditure which is apportioned to a machine shop is not to be controlled by the machine shop foreman.

1.17.5. (i) Distinction between Controllable Cost and Uncontrollable Cost: The distinction between controllable and uncontrollable costs is not very sharp and is sometimes left to individual judgement. In fact no cost is uncontrollable; it is only in relation to a particular individual that we may specify a particular cost to be either controllable or uncontrollable.

1.17.6 By Normality: According to this basis cost may be categorised as follows:

(a) **Normal Cost** - It is the cost which is normally incurred at a given level of output under the conditions in which that level of output is normally attained.

(b) **Abnormal Cost** - It is the cost which is not normally incurred at a given level of output in the conditions in which that level of output is normally attained. It is charged to Costing Profit and loss Account.

1.17.7 By Costs for Managerial Decision Making: According to this basis cost may be categorised as follows:

(a) Pre-determined Cost - A cost which is computed in advance before production or operations start, on the basis of specification of all the factors affecting cost, is known as a pre-determined cost.

(b) Standard Cost - A pre-determined cost, which is calculated from managements 'expected standard of efficient operation' and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis.

(c) Marginal Cost - The amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit.

(d) Estimated Cost - Kohler defines estimated cost as "the expected cost of manufacture, or acquisition, often in terms of a unit of product computed on the basis of information available in advance of actual production or purchase". Estimated costs are prospective costs since they refer to prediction of costs.

(e) Differential Cost - (Incremental and decremental costs). It represents the change (increase or decrease) in total cost (variable as well as fixed) due to change in activity level, technology, process or method of production, etc. For example if any change is proposed in the existing level or in the existing method of production, the increase or decrease in total cost or in specific elements of cost as a result of this decision will be known as incremental cost or decremental cost.

(f) Imputed Costs - These costs are notional costs which do not involve any cash outlay. Interest on capital, the payment for which is not actually made, is an example of imputed cost. These costs are similar to opportunity costs.

(g) Capitalised Costs - These are costs which are initially recorded as assets and subsequently treated as expenses.

(h) Product Costs - These are the costs which are associated with the purchase and sale of goods (in the case of merchandise inventory). In the production scenario, such costs are associated with the acquisition and conversion of materials and all other manufacturing inputs into finished product for sale. Hence, under marginal costing, variable manufacturing costs and under absorption costing, total manufacturing costs (variable and fixed) constitute inventoriable or product costs.

(i) Opportunity Cost - This cost refers to the value of sacrifice made or benefit of opportunity foregone in accepting an alternative course of action. For example, a firm financing its expansion plan by withdrawing money from its bank deposits. In such a case the loss of interest on the bank deposit is the opportunity cost for carrying out the expansion plan.

(j) Out-of-pocket Cost - It is that portion of total cost, which involves cash outflow. This cost concept is a short-run concept and is used in decisions relating to fixation of selling price in recession, make or buy, etc. Out–of–pocket costs can be avoided or saved if a particular proposal under consideration is not accepted.

(k) Shut down Costs - Those costs, which continue to be, incurred even when a plant is temporarily shutdown *e.g.* rent, rates, depreciation, etc. These costs cannot be eliminated with the closure of the plant. In other words, all fixed costs, which cannot be avoided during the temporary closure of a plant, will be known as shut down costs.

(l) Sunk Costs - Historical costs incurred in the past are known as sunk costs. They play no role in decision making in the current period. For example, in the case of a decision relating to the replacement of a machine, the written down value of the existing machine is a sunk cost and therefore, not considered.

(m) Absolute Cost - These costs refer to the cost of any product, process or unit in its totality. When costs are presented in a statement form, various cost components may be shown in absolute amount or as a percentage of total cost or as per unit cost or all together. Here the costs depicted in absolute amount may be called absolute costs and are base costs on which further analysis and decisions are based.

(n) Discretionary Costs – Such costs are not tied to a clear cause and effect relationship between inputs and outputs. They usually arise from periodic decisions regarding the maximum outlay to be incurred. Examples include advertising, public relations, executive training etc.

(o) Period Costs - These are the costs, which are not assigned to the products but are charged as expenses against the revenue of the period in which they are incurred. All non-manufacturing costs such as general & administrative expenses, selling and distribution expenses are recognised as period costs.

(p) Engineered Costs - These are costs that result specifically from a clear cause and effect relationship between inputs and outputs. The relationship is usually personally observable. Examples of inputs are direct material costs, direct labour costs etc. Examples of output are cars, computers etc.

(q) Explicit Costs - These costs are also known as out of pocket costs and refer to costs involving immediate payment of cash. Salaries, wages, postage and telegram, printing and stationery, interest on loan etc. are some examples of explicit costs involving immediate cash payment.

(r) Implicit Costs - These costs do not involve any immediate cash payment. They are not recorded in the books of account. They are also known as economic costs.

1.18 Methods of Costing

Different industries follow different methods of costing because of the differences in the nature of their work. The various methods of costing are as follows:

Methods	Description
Job Costing	In this method of costing, cost of each job is ascertained separately. It is suitable in all cases where work is undertaken

	on receiving a customer's order like a printing press, motor workshop, etc.
Batch Costing	It is the extension of job costing. A batch may represent a number of small orders passed through the factory in batch. Each batch here is treated as a unit of cost and thus separately costed. Here cost per unit is determined by dividing the cost of the batch by the number of units produced in the batch.
Contract Costing	Here the cost of each contract is ascertained separately. It is suitable for firms engaged in the construction of bridges, roads, buildings etc.
Single or Output Costing	Here the cost of a product is ascertained, the product being the only one produce like bricks, coals, etc.
Process Costing	Here the cost of completing each stage of work is ascertained, like cost of making pulp and cost of making paper from pulp. In mechanical operations, the cost of each operation may be ascertained separately; the name given is operation costing.
Operating Costing	It is used in the case of concerns rendering services like transport, supply of water, retail trade etc.
Multiple Costing	It is a combination of two or more methods of costing outlined above. Suppose a firm manufactures bicycles including its components; the parts will be costed by the system of job or batch costing but the cost of assembling the bicycle will be computed by the Single or output costing method. The whole system of costing is known as multiple costing.

The following table summarises the various methods of costing applied in different industries:

Nature of Output	Method	Cost	Examples of Industries
A Series of Processes	Process costing or Operation Costing	For each process	Sugar
Construction of building	Contract Costing	For each contract	Real estate
Similar units of a Single Product, produced by Single Process	Unit or output or Single Costing	For the entire activity, but averaged for the output	Cold Drinks

Rendering of Services	Operating Costing	For all services	Hospitals
Customer Specifications: single Unit	Job Costing	For each order/ assignment/job	Advertising
Consisting of multiple varieties of activities and processes	Multiple Costing	Combination of any method	Car Assembly

1.19 Techniques of Costing

For ascertaining cost, following types of costing are usually used.

Techniques	Description
Uniform Costing	When a number of firms in an industry agree among themselves to follow the same system of costing in detail, adopting common terminology for various items and processes they are said to follow a system of uniform costing. Advantages of such a system are that i. A comparison of the performance of each of the firms can be made with that of another, or with the average performance in the industry. ii. Under such a system it is also possible to determine the cost of production of goods which is true for the industry as a whole. It is found useful when tax-relief or protection is sought from the Government.
Marginal Costing	It is defined as the ascertainment of marginal cost by differentiating between fixed and variable costs. It is used to ascertain effect of changes in volume or type of output on profit.
Standard Costing and Variance Analysis	It is the name given to the technique whereby standard costs are pre-determined and subsequently compared with the recorded actual costs. It is thus a technique of cost ascertainment and cost control. This technique may be used in conjunction with any method of costing. However, it is especially suitable where the manufacturing method involves production of standardised goods of repetitive nature.
Historical Costing	It is the ascertainment of costs after they have been incurred. This type of costing has limited utility. ➢ Post Costing: It means ascertainment of cost after production is completed.

	➢ Continuous costing: Cost is ascertained as soon as the job is completed or even when the job is in progress.
Direct Costing	It is the practice of charging all direct costs to operations, processes or products leaving all indirect costs to be written off against profits in which they arise.
Absorption Costing	It is the practice of charging all costs, both variable and fixed to operations, processes or products. This differs from marginal costing where fixed costs are excluded.

1.20 Coding System

1.20.1 Codes: The Chartered Institute of Management Accountants has defined a code as *"a system of symbols designed to be applied to a classified set of items to give a brief account reference, facilitating entry collation and analysis"*

Hence cost classification forms the basis of any cost coding. It helps us understand the characteristic of any cost through a short symbolised form.

1.20.2 Composite Codes (Example): A company has devised a system of codification in which the first three digits indicate the nature of the expenditure and the last three digits the cost centre or cost unit to be charged e.g. if the first digit is 1, the system implies that it refers to raw material and if the number is 2 it represents a labour cost. The second and third numbers relating to 1 i.e., raw material, provide details of the type e.g., whether the raw material is an electronic component (number 4), mechanical component (number 1) consumables(number 2) or packing (number 3) and the name respectively. Hence the description of a cost with a code 146.729 shall be understood as follows:

- Since the first number is 1 the cost refers to raw material cost
- The second number being 4 indicates that the raw material is an electronic component.
- The third number 6 refers to the description which according to the company's codification refers to Diodes.

The last three numbers provide details of the cost centre e.g. the first number provides details of the location of the plant, the second number gives detail of the department (machining or assembly or something else) and the third number indicates whether the cost is direct or indirect.

1.20.3 Advantages of a coding system: The following are some of the advantages of a well-designed coding system:

(a) Short and simple: Since the code is, most of the times, briefer than a description, it saves time when systems are worked upon manually and in case the system is computerised it reduces the data storage capacity. The illustration above demonstrates this advantage very clearly.

(b) Clarity: A code helps in reducing ambiguity. In case two professionals understand the same item differently a code will help them objectively.

(c) Computer friendly: Unlike detailed descriptions, a code facilitates data processing in computerised systems.

1.20.4 The requirements for an efficient coding system

(a) Unique: Every number used in the code should be unique and certain, i.e. it should be easily identified from the structure of the code.

(b) Flexibility: Elasticity and comprehensiveness is an absolute must for a well designed coding system. It should be possible to identify a code for every item and the coding system should be capable of expanding to accommodate new items.

(c) Brief: The code should be brief and meaningful.

(d) Centralised: The maintenance of the coding system should be centrally controlled. It should not be possible for individuals to independently add new codes to the existing coding system.

(e) Similarity: Codification systems should be of the same length. This makes errors easier to spot and it assists computerised data processing.

1.21 Summary

Classification of Costs

Nature of classification	*Classified Costs*	*Examples*
Nature of Element	***Material:*** *Cost of Material used in production*	*Cost of Raw Material*
	Labour: *Cost of Workers*	*Wages and Salary*
	Expenses: *Costs other than Material and Labour*	*Power, Office Maintenance*
Traceability to Object	***Direct Costs:*** *Which can be allocated directly to the product*	*Wood in case of Furniture*
	Indirect Costs*: Which cannot be directly allocated to the product*	*Nails used in Furniture*
Functions	***Production Costs*** *Cost of whole process of Production*	*Direct Materials and Conversion Cost.*
	Selling Costs: *Cost for creating demand of the product produced*	*Advertising Expenses*
	Distribution Costs: *Costs starting from packing of the product till reconditioning of empty products*	*Freight and Transportation Costs on Sales*

	Administrative Costs: *Cost of formulating policy, controlling the organisation, costs not directly related to production*	*Salary of Office Staff*
	Development Costs: *Development Costs for trial Run*	*Research Costs*
	Pre- Production Costs*: Costs starting with implementation of decisions and ending with the commencement of the production process*	*Direct Labour and Factory Overheads*
	Conversion Costs*: Cost of transforming direct material into Finished Products*	*Direct Labour and Overheads*
	Product Costs: *Costs necessary for production*	*Cost of purchase*
Variability	***Fixed Costs:*** *Cost which remains constant in total*	*Factory Rent*
	Variable Costs: *Costs which changes with production*	*Cost of Raw Material*
	Semi- Variable Costs: *Costs which are partly fixed and partly variable*	*Repair and Maintenance*
Controllability	***Controllable Costs:*** *Costs which can be influenced by the action of a specific member of an undertaking*	*Raw Material, Labour Costs, controlled by shop level management*
	Uncontrollable Costs: *Costs which cannot be influenced by the action of a specific member.*	*Fixed Costs- Rent*
Normality	*Normal Costs: Costs which are expected to be incurred in normal routine*	*Raw Material Costs*
	Abnormal Costs: Costs which are over and above normal costs	*Cost of Wastes*
Decision Making	***Relevant Costs (Marginal Costs, Differential Costs, Opportunity Costs, Out of Pocket):*** *Costs which are relevant and useful for decision making*	*Cost of Best Possible Use*
	Irrelevant Costs (Sunk costs, Committed costs, Fixed costs): *Costs which are not relevant or useful to decision making*	*Costs incurred in the past - Advance Payment*
Cash Outflow	***Explicit Costs:*** *Costs involving immediate payment of cash*	*Purchase of Raw material.*
	Implicit Costs: *Costs not involving immediate cash payment*	*Depreciation*

Types of Costing

Type	*Description*
Uniform Costing	*Standardised principles and practices of costing are used by a number of different industries.*
Marginal Costing	*Only Variable Costs or costs directly linked are charged to the product or process*
Standard Costing	*Standard Costs are compared with actual costs, to determine variances*
Historical Costing	*Where costs are recorded after they have incurred*
Direct Costing	*Direct Costs are charged to the product or process, Indirect Costs are charged to the profit from the product or process.*
Absorption Costing	*All costs (variable and Fixed) are charged to the product or process*

Methods of Costing

Method	*Description*
Job costing	*Where all costs can be directly charged to a specific job*
Batch Costing	*Where all costs can be directly charged to a group of products (batch)*
Contract Costing	*Similar to Job costing, but in this case the job is larger than job costing.*
Single or Output Costing	*Cost ascertainment for a single product.*
Process Costing	*The cost of production at each stage is ascertained separately*
Operating Costing	*Ascertainment of Costs in cases where services are rendered*
Multiple Costing	*Combination of two or more methods of costing, used where the nature of the product is complex and method cannot be ascertained*

2
Material

Learning Objectives

After studying this chapter you will be able to:

- Understand the concept of materials,
- Understand its need and importance.
- Describe the procedures involved in procuring, storing and issuing material.
- Differentiate amongst the various methods of valuing material.
- Evaluate different methods of pricing material issues, material received and material return.
- Understand the meaning and accounting treatment for normal and abnormal loss of 0material.
- Understand the meaning and the accounting treatment of waste, scrap, spoilage and defectives.

2.1 Introduction

We have acquired a basic knowledge about the concepts, objectives, advantages, methods and elements of cost. We shall now study each element of cost separately begin with material. The general meaning of material is all commodities/ physical objects supplied to an organization. It may be direct material or indirect material. Materials constitute a very significant portion of total cost of finished product. A proper recording and control over the material costs is very essential. Importance of proper recording and control of material are following:

(a) Dependence of the Quality of finished product: The exact quality of raw materials required should be determined according to the required quality of the finished product. Quality and cost both should be given equal consideration.

(b) Price of the product: The price paid should be the minimum possible otherwise the higher cost of the finished products would make the product uncompetitive in the market.

(c) Continuity in production: There should not be any interruption in the production process for want of materials and stores, including small inexpensive items like lubricating oil for a machine.

(d) Cost of holding material: There should not be over stocking of materials because this would result in loss of interest charges, higher warehouse charges, deterioration in quality and losses due to obsolescence

(e) Wastages: Wastage and losses while the materials are in store and during the process of manufacture should be avoided as far as possible; and

(f) Regular information about resources: It may also be added that information about availability of materials and stores should be continuously available so that production may be planned properly and the required materials purchased in time.

2.2 Material Control

The publication of the Chartered Institute of Management Accountants (CIMA) on Inventory Control defines it as *"The function of ensuring that sufficient goods are retained in stock to meet all requirements without carrying unnecessarily large stocks."*

2.2.1 Objectives of system of material control: The objectives of a system of material control are the following:

(i) ***Minimising interruption in production process:*** Ensuring that no activity, particularly production, suffers from interruption for want of materials and stores. It should be noted that this requires constant availability of every item that may be needed howsoever small its cost may be.

(ii) ***Cost of Material:*** Seeing to it that all the materials and stores are acquired at the lowest possible price considering the quality that is required and considering other relevant factors like reliability in respect of delivery, etc. Holding cost should also be tried to be minimized.

(iii) ***Reduction in Wastages*****:** Avoidance of unnecessary losses and wastages that may arise from deterioration in quality due to defective or long storage or from obsolescence. It may be noted that losses and wastages in the process of manufacture, concern the production department.

(iv) ***Adequate Information:*** Maintenance of proper records to ensure that reliable information is available for all items of materials and stores that not only helps in detecting losses and pilferages but also facilitates proper production planning.

(v) ***Completion of order in time:*** Proper material management is very necessary for fulfilling orders of the firm. This adds to the goodwill of the firm.

2.2.2 Requirements of material control: Material control requirements can be summarised as follows:—

1. Proper co-ordination of all departments involved *viz.,* finance, purchasing, receiving, inspection, storage, accounting and payment.

2. Determining purchase procedure to see that purchases are made, after making suitable enquiries, at the most favourable terms to the firm.
3. Use of standard forms for placing the order, noting receipt of goods, authorising issue of the materials etc.
4. Preparation of budgets concerning materials, supplies and equipment to ensure economy in purchasing and use of materials.
5. Operation of a system of internal check so that all transactions involving materials, supplies and equipment purchases are properly approved and automatically checked.
6. Storage of all materials and supplies in a well designated location with proper safeguards.
7. Operation of a system of perpetual inventory together with continuous stock checking so that it is possible to determine at any time the amount and value of each kind of material in stock.
8. Operation of a system of stores control and issue so that there will be delivery of materials upon requisition to departments in the right amount at the time they are needed.
9. Development of system of controlling accounts and subsidiary records which exhibit summary and detailed material costs at the stage of material receipt and consumption.
10. Regular reports of materials purchased, issue from stock, inventory balances, obsolete stock, goods returned to vendors, and spoiled or defective units.

2.2.3 Elements of Material Control: Material control is a systematic control over the procurement, storage and usage of material so as to maintain an even flow of material.

Material control involves efficient functioning of the following operations:

- Purchasing of materials
- Receiving of materials
- Inspection of materials
- Storage of materials
- Issuing materials
- Maintenance of inventory records
- Stock audit.

2.3 Materials Procurement Procedure

Material procurement procedure can be understood with help of the following diagram. Documents required and the departments who initiate these documents are shown sequentially.

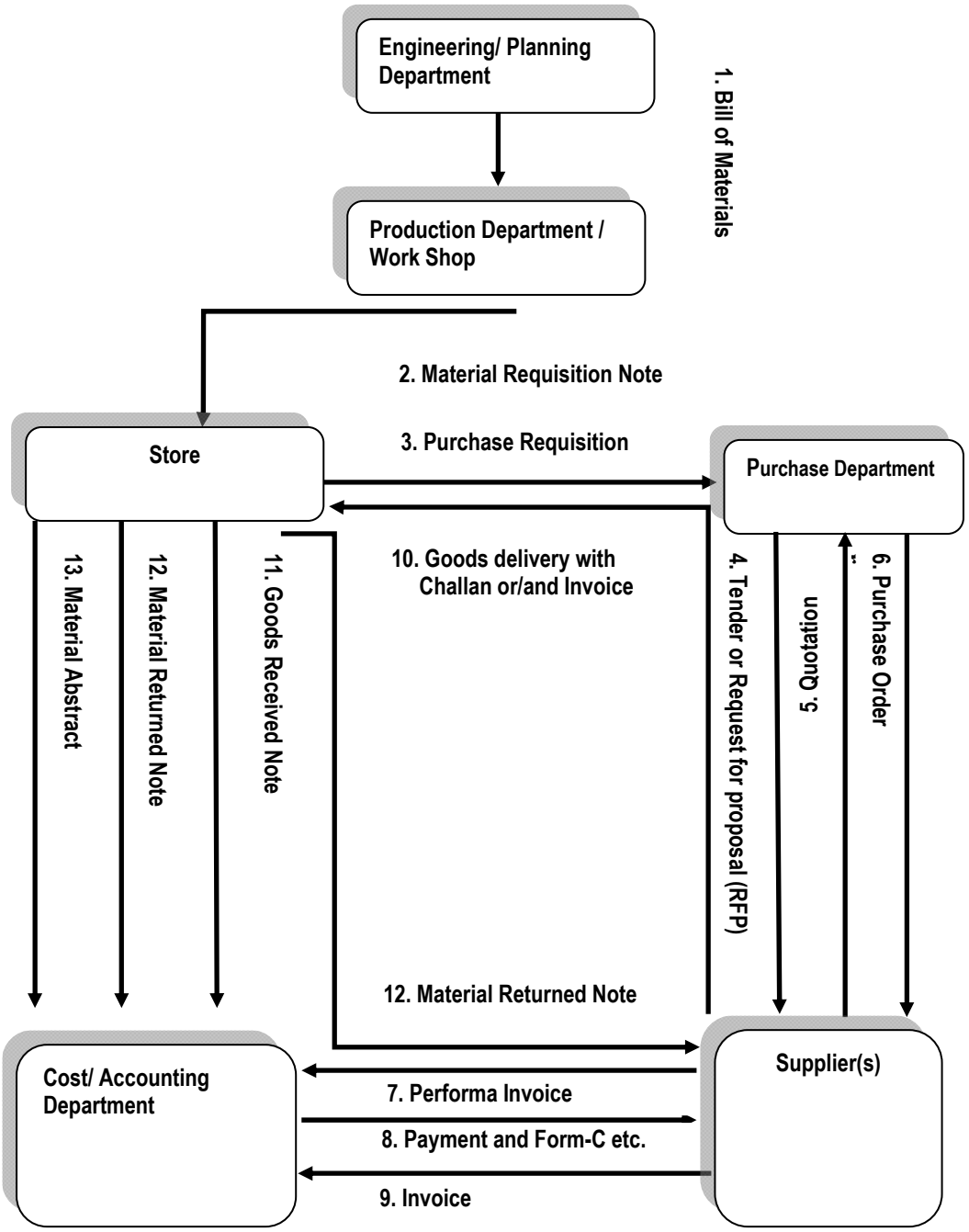


Diagram: Material Procurement Procedure

2.3.1 Bill of Materials: It is also known as Materials Specification List or simply Materials List. It is a schedule of standard quantities of materials required for any job or other unit of production. A comprehensive Materials List should rigidly lay down the exact description and specifications of all materials required for a job or other unit of production and also required quantities so that if there is any deviation from the standard list, it can easily be detected. The materials specification list is prepared by the Engineering or Planning Department in a standard form. The numbers of copies prepared vary according to the requirement of each business. Generally Bill of Material is sent to Production control department, Store department, Cost/ Accounting department and a copy retained with engineering or planning department. A proforma of Bill of Materials is as follows:

Bill of Materials

Job No.					No.	
Department authorised					Date	
Sl. No.	Code No.	Description	Qty. issued	Date of issue & Qty. Date Qty.	Rate ₹	Amount ₹
Authorised by					Received by	
					Checked by	
Store Keeper's signature					Cost clerk	

The advantages of using "bill of materials", by the concerned departments may be summed up as follows:—

Stores Department:

1. A bill of material serves as an important basis of preparing material purchase requisitions by stores department.
2. It acts as an authorisation for issuing total material requirement.
3. The clerical activity is reduced as the stores clerk issues the entire/part of the material requirement to the users if the details of material asked are present in the bill of materials.

Cost Accounts Department:

1. Bill of material, is used by Cost Accounts department for preparing an estimate/budget of material cost for the job/process/operation, it is meant.
2. It may be used as a device for controlling the excess cost of material used. This is done after determining material variances and ascertaining the reasons for their occurrence.

Production Control Department:

1. Bill of material may be used by this department for controlling usage of materials.
2. Its usage saves time which otherwise would have been wasted for preparing separate requisitions of material.

Engineering or Planning department: As stated earlier this department prepares the materials list in a standard form. A copy of list is sent to stores, cost accounts and production control department.

2.3.2 Material Requisition Note: It is also known as material requisition slip, It is the voucher of the authority regarding issue of materials for use in the factory or in any of its departments. Generally it is prepared by the production department and materials are withdrawn on the basis of material requisition list or bill of materials. If no material list has been prepared, it is desirable that the task of the preparation of material requisition notes be left to the planning department or by the department requires the materials. Usually, a foreman's authority is enough but, in the case of costly materials, it would be desirable to have such requisitions duly approved by some higher authority, like the superintendent or works manager before these are presented to Stores. Apart from sending a material requisition to store a copy is sent to cost accounting department and one copy is retained as office copy.

A specimen form of the Material Requisition is shown below:

Material Requisition Note

Work Order No. ..... *No. .....*

Department ..... *Date .....*

Item No.	*Particulars*	*Qnty.*	*Rate* ₹	*Amount* ₹
Store-keeper	*Workman receiving the material*		*Foreman*	*S.L. Clerk*

Difference between Bill of Materials and Material Requisition Note:

Bill of Materials	Material Requisition Note
1. It is the document prepared by the drawing office.	1. It is prepared by the Foreman of the consuming department.
2. It is a complete schedule of component parts and raw materials required for a particular job or work order.	2. It is a document authorizing Store-keeper to issue materials to the consuming department.
3. It often serves the purpose of a Stores Requisition as it shows the complete schedule of materials required for a particular job i.e. it can replace stores requisition.	3. It cannot replace a bill of materials.
4. It can be used for the purpose of quotations.	4. It is useful in arriving historical cost only.
5. It helps in keeping a quantitative control on materials drawn through stores Requisition.	5. It shows the material actually drawn from stores.

2.3.3 Purchase Requisition: Since the materials purchased will be used by the production departments, there should be constant co-ordination between the purchase and production departments. A purchase requisition is a form used for making a formal request to the purchasing department to purchase materials. This form is usually filled up by the store keeper for regular materials and by the departmental head for special materials (not stocked as regular items). The requisition form is duly signed by either works manager or plant superintendent, in addition to the one originating it. At the beginning a complete list of materials and stores required should be drawn up, the list should have weekly consumption figures. It should be gone through periodically so that necessary deletion and addition may be made. If there is any change in the rate of consumption per week (say, due to extra shift being worked), the purchase department should be informed about the new figures. Once an item has been included in the standard list, it becomes the duty of the purchase department to arrange for fresh supplies before existing stocks are exhausted. But if the production department requires some new material, it should make out an indent well in time and send it to the purchase department for necessary action.

For control over buying of regular store materials it is necessary to determine their maximum, minimum, reorder level and economic order quantities. The use of economic order quantities and various levels constitutes an adequate safeguard against improper indenting of regular materials. In respect of special materials, required for a special order or purpose, it is desirable that the technical department concerned should prepare materials specifications list specifying the quantity, size and order specifications of materials to be drawn from the store and those to be specially procured. It may originate either in the stores department in connection with regular stock of materials or in the production planning or in other technical

departments concerned in respect of special materials. Its purpose is to request and authorise the purchase department to order to procure the materials specified in stated quantities. It should be made out in triplicate and send to following.

Purchase Requisition (Regular/Special)

(Use a separate form for each item)

No..... Department.....
Date.....

Purchase..... Date by which material required.....

Description of Materials required	Quantity required	Exact specification

.....
Indentor

For use in purchase department

Firm 1. 2. 3. Order

Quotations No. & Date.....

.....

Price (including charges) With.....

.....

Price.....

Date of Delivery Date of dly.....

.....

Remarks Purchase Manager

2.3.4 Inviting Tender/ Requesting for proposal (RFP): After receipt of purchase requisition from the store department or other competent departments, role of purchasing department comes into play. If a concern can afford or the size of the concern is big enough, there should be a separate purchase department for all purchases to be made on behalf of all other departments. Such a department is bound to become expert in the various matters to be

attended to, for examples— units of materials to be purchased and licences to be obtained, transport, sources of supply, probable price etc.

Materials purchase department in a business house is confronted with the following issues:

(i) What to purchase?

(ii) When to purchase?

(iii) How much to purchase?

(iv) From where to purchase.

(v) At what price to purchase.

To overcome these questions, purchase department make an enquiry into the market for the required material. The process of gathering information about the rate, quantity, technology, services and support etc., purchase department sent RFP to selected vendors in case if purchase policy allows this practice. Some organizations follow the open and transparent purchase policy and invite quotationsS from the interested vendors. This process is called Tender Notification or Invitation of Tender.

2.3.5 Selection of Quotation/ Proposal: After invitation of tender from the vendors, interested vendors who are fulfilling all the criteria mentioned in the tender notice send their price quotations/ proposals to the purchase department. On the receipt of quotations a comparative statement is prepared. For selecting material suppliers the factors which the purchase department keeps in its mind are—price; quantity; quality offered; time of delivery; mode of transportation; terms of payment; reputation of supplier; etc. In addition to the above listed factors purchase manager obtains other necessary information from the statement of quotations; past records, buyer guides etc. for finally selecting material suppliers.

2.3.6 Preparation and execution of Purchase Orders: Having decided on the best quotation that should be accepted, the purchase manager or concerned officer proceeds to issue the formal purchase order. It is a written request to the supplier to supply certain specified materials at specified rates and within a specified period. Generally copies of purchase order are given to Store or order indenting department, receiving department and cost accounting department. A copy of the purchase order, alongwith relevant purchase requisitions, is held in the file of the department to facilitate the follow-up, of the delivery and also for approving the invoice for payment.

2.3.7 Receipt and inspection of materials: After execution of purchase order and advance payment (if terms of quotation so specified), necessary arrangement is made to receive the delivery of materials (in case of inter-state purchase way bill (e.g. Form-C) is get issued by the purchase or accounting department). After receipt of materials along with challan or/ and invoice, Receiving department arrange to inspect the materials for its conformity with purchase order. After satisfactory inspection materials are received and Goods Received Note is issued. If some materials are not found in good condition or not in conformity with the purchase order are returned back to the vendor alongwith a Material Returned Note.

2.3.7.1 Goods Received Note: If everything is in order and the supply is considered suitable for acceptance, the Receiving department prepares a Receiving Report or Material Inward Note or Goods Received Note. Generally it is prepared in quadruplicate, the copies being distributed to purchase department, store or order indenting department, receiving depart and accounting department.

A specimen form of the receiving report is given below:

Goods Received Note

Received from..... *No. .....*

Order No. ..... *Date.....*

			Amount			
Quantity	*Code*	*Description*	*Amount due to supplier* ₹	*Charges* ₹	*Total* ₹	*Remarks*

Inspector..... *Store Keeper.....*

Receiver..... *Store Ledger Clerk.....*

2.3.7.2 Material Returned Note : Sometimes materials have to be returned to suppliers after these have been received in the factory. Such returns may occur before or after the preparation of the receiving report. If the return takes place before the preparation of the receiving report, such material obviously would not be included in the report and hence not debited in the stores books and ledgers. In that case, no adjustment in the account books would be necessary. But if the material is returned after its entry in the receiving report, a suitable document must be drawn up in support of the credit entry so as to exclude from the Stores of Material Account the value of the materials returned back. This document usually takes the form of a Material Returned Note or Material outward return note.

The Material outward return note is drawn up by the Stores or the Despatch Department. Five copies of it are usually prepared; two for the supplier (one of which is to be sent back by the supplier after he has signed the same), one for Store, one for Cost (stores) Ledger and one copy to be retained in the Material outward return book.

2.3.8 Checking and passing of bills for payment: The invoice received from the supplier is sent to the stores accounting section to check authenticity and mathematical accuracy. The quantity and price are also checked with reference to goods received note and the purchase order respectively. The stores accounting section after checking its accuracy finally certifies and passes the invoice for payment. In this way the payment is made to supplier.

2.4 Valuation of Material Receipts

After the procurement of materials from the supplier actual material cost is calculated. Ascertainment of cost of material purchased is called valuation of materials. Cost of material includes cost of purchase net of trade discounts, rebates, duty draw-back, Cenvat credit availed, etc. and other costs incurred in bringing the inventories to their present location and condition. The invoice of material purchased from the market sometime contain items such as trade discount, quantity discount, freight, duty, insurance, cost of containers, sales tax, excise duty, cash discount etc.

Treatment of items associated with purchase of materials is tabulated as below

Sl no.	Items	Treatment
Discounts and Subsidy		
(i)	Trade Discount	Trade discount **is deducted** from the purchase price if it is not shown as deduction in the invoice.
(ii)	Quantity Discount	Like trade discount quantity discount is also shown as deduction from the invoice. It **is deducted** from the purchase price if not shown as deduction.
(iii)	Cash Discount	Cash discount **is not deducted** from the purchase price. It is treated as interest and finance charges.
(iv)	Subsidy/ Grant/ Incentives	Any subsidy/ grant/ incentive received from the Government or from other sources **deducted** from the cost of purchase.
Duties and Taxes		
(v)	Road Tax/ Toll Tax	Road tax/ Toll tax if paid by the buyer then it **is included** with the cost of purchase.
(vi)	Octroi/ Entry Tax	Octroi/ Entry tax is collected by the Panchayats/ local authorities. It **is added** with cost of purchase if it is borne by the buyer.
(vii)	Central Sales Tax (CST)	Central Sales Tax (CST) is paid on inter-state sale and collected from the buyers. The buyer is not getting any credit for tax paid hence it **is added** with cost of purchase.
(viii)	State Sales tax or Value Added Tax (VAT)	State Sales Tax/ VAT is paid on intra-state sale and collected from the buyers. It **is excluded** from the cost of purchase if credit for the same is available. Unless mentioned specifically it should not form part of cost of purchase.

(ix)	Excise Duty	Excise duty is paid on manufacture of goods and collected from the buyer. It **is excluded** from the cost of purchase if credit (CENVAT) is available for the same. Unless mentioned specifically excise duty is not added with the cost of purchase.
(x)	Custom Duty	Custom duty is paid on import of goods from outside India. It **is added** with the purchase cost.
(xi)	Purchase Tax	It is a tax paid on purchase of goods from unregistered supplier. Credit on purchase tax is available hence unless specifically mentioned it **is not added** with the cost of purchase.
Penalty and Charges		
(xii)	Demurrage	Demurrage is a penalty imposed by the transporter for delay in uploading or offloading of materials. It is an abnormal cost and **not included** with cost of purchase
(xiii)	Detention charges/ Fine	Detention charges/ fines are imposed for non compliance of rule or law by any statutory authority. It is an abnormal cost and **not included** with cost of purchase
(xiv)	Penalty	Penalty of any type is **not included** with the cost of purchase
Other expenditures		
(xv)	Insurance charges	Insurance charges are paid for protecting goods during transit. It **is added** with the cost of purchase.
(xvi)	Commission or brokerage paid.	Commission or brokerage paid **is added** with the cost of purchase.
(xvii)	Freight inwards	It **is added** with the cost of purchase as it is directly attributable to procurement of material.
(xviii)	Cost of containers	Treatment of cost of containers are as follows: Non-returnable containers: The cost of containers **is added** with the cost of purchase of materials. Returnable Containers: If on return of containers cost of containers is returned back then in this case cost of containers **is not added** with the cost of purchase. If the amount of refund on returning the container is less than the amount paid then **only short fall is added** with the cost of purchase.
(xix)	Shortage	Shortage in materials are treated as follows: **Shortage due to normal reasons:** Good units absorb

		the cost of shortage due to normal reasons. Losses due to breaking of bulk, evaporation, due to unavoidable conditions etc. are the reasons of normal loss. **Shortage due to abnormal reasons:** shortage arises due to abnormal reasons such as material mishandling, pilferage, due to avoidable reasons are not absorbed by the good units. Losses due to abnormal reasons are debited to costing profit and loss account.

Illustration 1: (Valuation of material)

An invoice in respect of a consignment of chemicals A and B provides the following information:

	(₹)
Chemical A: 10,000 kgs. at ₹10 per kg.	*1,00,000*
Chemical B: 8,000 kgs. at ₹13 per kg.	*1,04,000*
Central Sales tax @ 2%	*4,080*
Railway freight	*3,840*
Total cost	*2,11,920*

A shortage of 500 kgs. in chemical A and 320 kgs. in chemical B is noticed due to normal breakages. You are required to determine the rate per kg. of each chemical, assuming a provision of 2% for further deterioration.

Solution

Working:

Computation of effective quantity of each chemical available for use

	Chemical A (kg.)	Chemical B (kg.)
Quantity purchased	10,000	8,000
Less : Shortage due to normal breakages	500	320
	9,500	7,680
Less : Provision for deterioration 2%	190	153.6
Quantity available	9,310	7,526.4

Statement showing the computation of rate per kg. of each chemical

	Chemical A (₹)	Chemical B (₹)
Purchase price	1,00,000	1,04,000
Add : Central Sales tax @2%	2,000	2,080
Add: Railway freight		

(in the ratio of quantity purchased i.e., 5:4)	2,133	1,707
Total cost (A)	1,04,133	1,07,787
Effective Quantity (see working) (B)	9,310 kg.	7,526.4 kg.
Rate per kg. (A ÷ B)	11.19	14.32

Illustration 2: (Valuation of material)

At what price per unit would Part No. A 32 be entered in the Stores Ledger, if the following invoice was received from a supplier:

Invoice	***(₹)***
200 units Part No. A 32 @ ₹ 5	*1,000.00*
Less : 20% discount	*(200.00)*
	800.00
Add : Excise duty @ 15%	*120.00*
	920.00
Add : Packing charges (5 non-returnable boxes)	*50.00*
	970.00

(i) A 2 per cent cash discount will be given if payment is made in 30 days.

(ii) Documents substantiating payment of excise duty is enclosed for claiming CENVAT credit.

Solution

Computation of cost per unit

	(₹)
Net purchase Price	800.00
Add : Packing charges (5 non-returnable boxes)	50.00
	850.00
No. of units purchased	200 units
Cost per unit	4.25

Note: (i) Cash discount is treated as interest and finance charges hence, it is not considered for valuation of material.

(ii) Excise duty is refundable; hence it will not be added to purchase cost.

2.5 Material Storage & Records

Proper storing of materials is of primary importance. It is not enough only to purchase material of the required quality. If the purchased material subsequently deteriorates in quality because of bad storage, the loss is even more than what might arise from purchase of bad quality

materials. Apart from preservation of quality, the store-keeper also must ensure safe custody of the material. It should be the function of store-keeper that the right quantity of materials always should be available in stock.

2.5.1 Duties of store keeper: These can be briefly set out as follows:

(i) General control over store: Store keeper should keep control over all activities in Stores department. He should check the quantities as mentioned in Goods received note and with the purchased materials forwarded by the receiving department and to arrange for the storage in appropriate places.

(ii) Safe custody of materials: Store keeper should ensure that all the materials are stored in a safe condition and environment required to preserve the quality of the materials.

(iii) Maintaining records: Store keeper should maintain proper record of quantity received, issued, balance in hand and transferred to/ from other stores.

(iv) Initiate purchase requisition: Store keeper should initiate purchase requisitions for the replacement of stock of all regular stores items whenever the stock level of any item of store approaches the re-order level fixed.

(v) Maintaining adequate level of stock: Store keeper should maintain adequate level of stock at all time. He/ she should take all necessary action so that production could not be interrupted due to lack of stock. Further he/ she should take immediate action for stoppage of further purchasing when the stock level approaches the maximum limit. To reserve a particular material for a specific job when so required.

(vi) Issue of materials: Store keeper should issue materials only against the material requisition slip approved by the appropriate authority. He/ she should also refer to bill of materials while issuing materials to requisitioning department.

(vii) Stock verification and reconciliation: Store keeper should verify the book balances with the actual physical stock at frequent intervals by way of internal control and check the any irregular or abnormal issues, pilferage, etc.

2.5.2 Store Records: The record of stores may be maintained in three forms:

- Bin Cards
- Stock Control Cards
- Store Ledger

Bin Cards: Bin refers to a box/ container/ space where materials are kept. Card is placed with each of the bin (space) to record the details of material like receipt, issue and return. The first two forms are records of quantities received, issued and those in balance, but in the third record i.e. store ledger, value of receipts, issues and closing balance is also maintained. Usually, records of quantities i.e. Bin cards and Store Control Cards are kept by the store keeper in store department while record of both quantity and value is maintained by cost accounting department.

Stock Control Cards: It is a record keeping document maintained by stores department for

every item of material. Recording includes receipt, issue, return, in hand and order given.

Advantages and Disadvantages of Bin Cards:

Advantages	Disadvantages
(i) There would be fewer chances of mistakes being made as entries will be made at the same time as goods are received or issued by the person actually handling the materials.	(i) Store records are dispersed over a wide area.
(ii) Control over stock can be more effective, in as much as comparison of the actual quantity in hand at any time with the book balance is possible.	(ii) The cards are liable to be smeared with dirt and grease because of proximity to material and also because of handling materials.
(iii) Identification of the different items of materials is facilitated by reference to the Bin Card the bin or storage receptacle.	(iii) People handling materials are not ordinarily suitable for the clerical work involved in writing Bin Cards.

Advantages and disadvantages of Stock Control Cards

Advantages	Disadvantages
(i) Records are kept in a more compact manner so that reference to them is facilitated.	(i) On the spot comparison of the physical stock of an item with its book balance is not facilitated.
(ii) Records can be kept in a neat and clean way by men solely engaged in clerical work so that a division of labour between record keeping and actual material handling is possible.	(ii) Physical identification of materials in stock may not be as easy as in the case of bin cards, as the Stock Control Cards are housed in cabinets or trays.
(iii) As the records are at one place, it is possible to get an overall idea of the stock position without the necessity of going round the stores.	

Stores Ledger: A Stores Ledger is a collection of cards or loose leaves specially ruled for maintaining a record of both quantity and cost of stores received, issued and those in stock. It being a subsidiary ledger to the main cost ledger, it is maintained by the Cost Accounting Department. It is posted from Goods Received Notes and Materials requisition.

The advantages of writing up Stores Ledger mechanically are:

(i) Distribution of work: It enables distribution of work among a number of clerks due to which receipts and issues are posted quickly and regularly.

(ii) **Centralised record:** It enables stock records to be centralised in case of an organisation having a number of depots.

(iii) **Testing of accuracy:** The accuracy of posting can be mechanically tested more conveniently.

(iv) **Cost effective:** The records are clearer and neater. Also the recurring cost of maintaining them is much less than those kept manually.

(v) **Control over stock:** If up-to-date records are available, the management will be able to exercise greater control over quantities held in stock from time to time which may result in a great deal of saving in both the amount of investment in stock and their cost.

Difference between Bin Card & Stores Ledger

Bin Card	Stores Ledger
It is maintained by the storekeeper in the store.	It is maintained in costing department.
It contains only quantitative details of material received, issued and returned to stores.	It contains information both in quantity and value.
Entries are made when transactions take place.	It is always posted after the transaction.
Each transaction is individually posted.	Transactions may be summarized and then posted.
Inter-department transfers do not appear in Bin Card.	Material transfers from one job to another job are recorded for costing purposes.

2.6 Inventory Control

The main objective of inventory control is to achieve maximum efficiency in production and sales with the minimum investment in inventory. Inventory comprises of stocks of raw materials, stores & consumables, work-in-progress, and finished products. The techniques commonly applied for inventory control are as follows:

Techniques of Inventory control:

(i) Setting of various stock levels.

(ii) ABC analysis.

(iii) Two bin system.

(iv) Establishment of system of budgets.

(v) Use of perpetual inventory records and continuous stock verification.

(vi) Determination of economic order quantity.

(vii) Review of slow and non-moving items.

(viii) Use of control ratios.

2.6.1 Setting of Various Stock Levels:

(i) Re-Order Quantity: Re-order quantity is the quantity of materials for which purchase requisition is made by the store department. While setting quantity to be re-ordered consideration is given to the maintenance of minimum level of stock, re-order level, minimum delivery time and the most important cost.

Economic Order Quantity (EOQ)

Meaning	Factors	Formula
The size of the order for which both ordering and carrying cost are minimum is known as economic order quantity or EOQ.	**Ordering Cost:** The costs which are associated with the purchasing or ordering of material. It includes costs of tender invitation, preparation of purchase orders, staff posted for ordering of goods, expenses incurred on transportation of goods purchased, inspection cost of incoming material etc. **Carrying Cost:** The costs for holding the inventories. It includes the cost of capital invested in inventories, cost of storage, insurance cost etc.	$EOQ = \sqrt{\frac{2AO}{C}}$ where, A = Annual usage units O = Ordering cost per order C = Annual carrying cost of one unit, i.e., carrying cost percentage × cost of one unit.

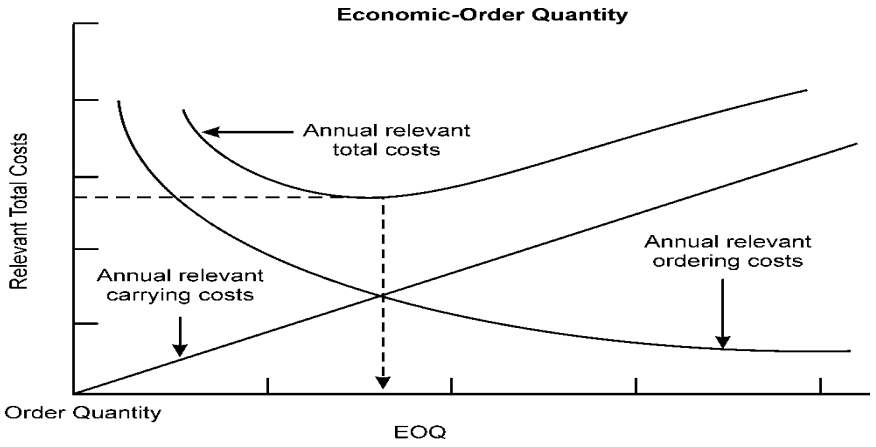
Assumptions underlying E.O.Q.: The calculation of economic order of material to be purchased is subject to the following assumptions:

(i) Ordering cost per order and carrying cost per unit per annum are known and they are fixed.

(ii) Anticipated usage of material in units is known.

(iii) Cost per unit of the material is constant and is known as well.

(iv) The quantity of material ordered is received immediately *i.e.* the lead time is zero.



(ii) Re-order level

Meaning	Factors	Formula
This level lies between minimum and the maximum levels in such a way that before the material ordered is received into the stores, there is sufficient quantity on hand to cover both normal and abnormal consumption situations. In other words, it is the level at which fresh order should be placed for replenishment of stock.	Maximum rate of Consumption Maximum Re-order period	Re-order level = Maximum re-order period × Maximum Usage (or) = Minimum level + (Average rate of consumption × Average time to obtain fresh supplies).

(Re-order period or lead time: Time gap between placing an order and receiving the stock is known as lead time.)

(iii) Minimum level

Meaning	Factors	Formula
The lowest figure of inventory balance, which must be maintained in hand at all times, so that there is no stoppage of production due to non-availability of inventory.	1. Information about maximum consumption and maximum delivery period in respect of each item to determine its re-order level. 2. Average rate of consumption for each	Minimum level of inventory = Re-order level – (Average rate of consumption × average time of inventory delivery)

	inventory item. 3. Average delivery period for each item. This period can be calculated by averaging the maximum and minimum period.	

(iv) Maximum level

Meaning	Factors	Formula
It indicates the maximum figure of inventory quantity held in stock at any time.	1. The fixation of maximum level of an inventory item requires information about its re-order level. The re-order level itself depends upon its maximum rate of consumption and maximum delivery period. It in fact is the product of maximum consumption of inventory item and its maximum delivery period. 2. Knowledge about minimum consumption and minimum delivery period for each inventory item should also be known. 3. The determination of maximum level also requires the figure of economic order quantity. 4. Availability of funds, storage space, nature of items and their price per unit are also	Maximum level of inventory = Re-order-level + Re-order quantity – (Minimum consumption × Minimum re-order period)

	important for the fixation of maximum level. 5. In the case of imported materials due to their irregular supply, the maximum level should be high.	

(v) Average Inventory Level

Meaning	Factors	Formula
Average inventory level is the average stock held by an organisation	Minimum level of inventory Maximum level of inventory Re-order quantity	Average inventory level = Minimum level + 1/2 Re-order quantity or $\frac{\text{Maximum level + Minimum level}}{2}$

(vi) Danger level

Meaning	Factors	Formula
It is the level at which normal issues of the raw material inventory are stopped and emergency issues are only made.	Normal or Average consumption Lead time (re-order period) for emergency purchase	Danger level = Average consumption × Lead time for emergency purchases

(vii) Buffer Stock: Some quantity of stock may be kept for contingency to be used in case of sudden order, such stock is known as buffer stock.

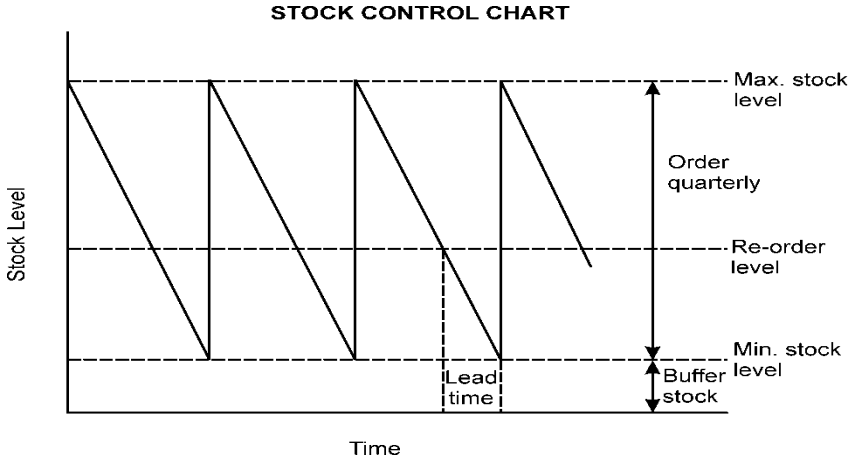


Illustration 3: (Calculation of EOQ)

Calculate the Economic Order Quantity from the following information. Also state the number of orders to be placed in a year.

Consumption of materials per annum	:	*10,000 kg.*
Order placing cost per order	:	*₹ 50*
Cost per kg. of raw materials	:	*₹ 2*
Storage costs	:	*8% on average inventory*

Solution

$$EOQ = \sqrt{\frac{2A \times O}{C}}$$

A = Units consumed during year

O = Ordering cost per order

C = Inventory carrying cost per unit per annum.

$$EOQ = \sqrt{\frac{2 \times 10,000 \times 50}{\frac{2 \times 8}{100}}} = \sqrt{\frac{2 \times 10,000 \times 50 \times 25}{4}}$$

= 2,500 kg.

$$\textit{No. of orders to be placed in a year} = \frac{\text{Total consumption of materials per annum}}{EOQ}$$

$$= \frac{10,000\,\text{kg.}}{2,500\,\text{kg.}} = 4 \text{ Orders per year}$$

Illustration 4: (Calculation of EOQ and Total variable cost)

(i) Compute E.O.Q. and the total variable cost for the following:

Annual Demand	=	*5,000 units*
Unit price	=	*₹ 20.00*
Order cost	=	*₹16.00*
Storage rate	=	*2% per annum*
Interest rate	=	*12% per annum*
Obsolescence rate	=	*6% per annum*

(ii) Determine the total variable cost that would result for the items if an incorrect price of ₹ 12.80 is used.

Solution

(i) Carrying cost = Storage rate = 2%

Interest Rate = 12%

Obsolescence Rate = 6 %

Total 20% per annum

C = 20% of ₹ 20 = ₹ 4 per unit per annum.

$$E.O.Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2\times 5000\times 16}{4}} = \sqrt{40,000} = 200 \text{ units}$$

Total variable cost:

Purchase price of 5,000 units @ ₹ 20.00 per unit		=	₹ 1,00,000
Ordering cost	$= \frac{5000}{200}$ = 25 orders @ ₹ 16	=	₹ 400
Carrying cost of average Inventory	$= \frac{200}{2}$ = 100 units @ ₹ 4	=	₹ 400
Total variable cost			₹ 1,00,800

(ii) If an incorrect price of ₹ 12.80 is used:

C = 20% of 12.80 = ₹ 2.56 per unit per annum.

$$E.O.Q. = \sqrt{\frac{2\times 5,000\times 16}{2.56}} = 250 \text{ units}$$

Total variable cost:

Purchase price of 5,000 units @ ₹ 12.80 per unit		=	₹ 64,000
Ordering cost	$= \frac{5,000}{250}$ = 20 orders @ ₹ 16	=	₹ 320
Carrying cost (of average inventory)	$= \frac{250}{2}$ = 125 units @ ₹ 2.56	=	₹ 320
Total variable cost			₹ 64,640

Illustration 5: (Evaluation of existing policy and EOQ)

Anil & Company buys its annual requirement of 36,000 units in 6 installments. Each unit costs ₹ 1 and the ordering cost is ₹ 25. The inventory carrying cost is estimated at 20% of unit value. Find the total annual cost of the existing inventory policy. How much money can be

saved by Economic Order Quantity.

Solution:

(a) Total Annual Cost in Existing Inventory Policy

		(₹)
Ordering cost (6 orders @ ₹ 25)		150
Carrying cost of average inventory (36,000 ÷ 6) = 6,000 units per order		
Average inventory = 3,000 units		
Carrying cost = 20% of ₹1 × 3,000 = 3,000 × 0.20		600
Total cost	A	750

(b) Total Annual Cost in E.O.Q

$$EOQ = \sqrt{\frac{2 \times 36{,}000 \times 25}{₹1 \times 20\%}} = 3000 \text{ units}$$

			(₹)
No. of orders = 36,000 ÷3,000 units = 12 orders			
Ordering cost (12 × ₹ 25) =			300
Carrying cost of average inventory (3,000 × 0.20) ÷ 2 =			300
Total Cost		B	600
Savings due to E.O.Q ₹ (750 – 600)	(A – B)		150

Note : As the units purchase cost of ₹ 1 does not change in both the computation, the same has not been considered to arrive at total cost of inventory for the purpose of savings.

Illustration 6: (Evaluation of discount offer and EOQ)

A Company manufactures a special product which requires a component 'Alpha'. The following particulars are collected for the year 20X1:

(i)	*Annual demand of Alpha*	*8,000 units*
(ii)	*Cost of placing an order*	*₹ 200 per order*
(iii)	*Cost per unit of Alpha*	*₹ 400*
(iv)	*Carrying cost p.a.*	*20%*

The company has been offered a quantity discount of 4 % on the purchase of 'Alpha' provided the order size is 4,000 components at a time.

Required :

(i) Compute the economic order quantity

(ii) Advise whether the quantity discount offer can be accepted.

Solution

(i) Calculation of Economic Order Quantity

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 8,000 \text{ units} \times ₹\ 200}{₹\ 400 \times 20/100}} = 200 \text{ units}$$

(ii) Evaluation of Profitability of Different Options of Order Quantity

(a) When EOQ is ordered

		(₹)
Purchase Cost	(8,000 units × ₹ 400)	32,00,000
Ordering Cost	[(8,000 units/200 units) × ₹ 200]	8,000
Carrying Cost	(200 units × ₹400 × ½ × 20/100)	8,000
Total Cost		32,16,000

(b) When Quantity Discount is accepted

		(₹)
Purchase Cost	(8,000 units × ₹384)	30,72,000
Ordering Cost	[(8,000 units/4000 units) × ₹200]	400
Carrying Cost	(4000 units × ₹384 × ½ × 20/100)	1,53,600
Total Cost		32,26,000

Advise – The total cost of inventory is lower if EOQ is adopted. Hence, the company is advised not to accept the quantity discount.

Illustration 7: (Calculation of EOQ)

The complete Gardener is deciding on the economic order quantity for two brands of lawn fertilizer. Super Grow and Nature's Own. The following information is collected:

	Fertilizer	
	Super Grow	***Nature's Own***
Annual demand	*2,000 bags*	*1,280 bags*
Relevant ordering cost per purchase order	*₹1,200*	*₹1,400*
Annual relevant carrying cost per bag	*₹480*	*₹560*

Required:

(i) Compute EOQ for Super Grow and Nature's own.

(ii) For the EOQ, what is the sum of the total annual relevant ordering costs and total annual relevant carrying costs for Super Grow and Nature's own?

(iii) For the EOQ, compute the number of deliveries per year for Super Grow and Nature's own.

Solution

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where,

A = Annual Demand

O = Ordering cost per order

C = Inventory carrying cost per unit per annum

(i) Calculation of EOQ

Super Grow	Nature's own
$EOQ = \sqrt{\frac{2 \times 2,000 \times 1,200}{480}}$ $= \sqrt{10,000}$ or 100 bags	$EOQ = \sqrt{\frac{2 \times 1,280 \times 1,400}{560}}$ $= \sqrt{6,400 \text{ or }}$ or 80 bags

(ii) Total annual relevant cost = Total annual relevant ordering costs + Total annual relevant carrying cost

Super Grow	Nature's own
= (2,000/100 × ₹1,200) + (½ × 100 bags × ₹480) = ₹ 24,000 + ₹ 24,000 = ₹ 48,000	= (1,280/80 × ₹1,400) + (½ × 80 bags × ₹ 560) = ₹ 22,400 + ₹ 22,400 = ₹ 44,800

(iii) Number of deliveries for Super Grow and Nature's own fertilizer per year

$$= \frac{\text{Annual demand for fertilizer bags}}{EOQ}$$

Super Grow	Nature's own
$= \frac{2,000 \text{ bags}}{100 \text{ bags}} = 20$ orders	$= \frac{1,280 \text{ bags}}{80 \text{ bags}} = 16$ orders.

Illustration 8: (Calculation of Stock Levels)

Two components, A and B are used as follows :

Normal usage	*50 per week each*
Maximum usage	*75 per week each*

Minimum usage	*25 per week each*
Re-order quantity	*A : 300; B : 500*
Re-order period	*A : 4 to 6 weeks*
	B : 2 to 4 weeks

Calculate for each component (a) Re-ordering level, (b) Minimum level, (c) Maximum level, (d) Average stock level.

Solution

(a) Re-ordering level:

Maximum usage per week × Maximum delivery period.

Re-ordering level for component A = 75 units× 6 weeks = 450 units

Re-ordering level for component B = 75 units× 4 weeks = 300 units

(b) Minimum level:

Re-order level – (Normal usage × Average period)

Minimum level for component A = 450 units – (50 units × 5 weeks) = 200 units

Minimum level for component B = 300 units – (50 units × 3 weeks) = 150 units

(c) Maximum level:

Re-order level + Re-order quantity – (Min. usage × Minimum period)

Maximum level for component A = (450 units + 300 units) – (25 units × 4 weeks) = 650 units

Maximum level for component B = (300 units + 500 units) – (25 units × 2 weeks) = 750 units

(d) Average stock level:

½ (Minimum + Maximum) stock level

Average stock level for component A = ½ (200 units + 650 units) = 425 units.

Average stock level for component B = ½ (150 units + 750 units) = 450 units.

Illustration 9: (Calculation of Stock Levels)

A Company uses three raw materials A, B and C for a particular product for which the following data apply:

Raw Material	*Usage per unit of Product (Kgs.)*	*Re-order quantity (Kgs.)*	*Price per Kg.*	*Delivery period (in weeks)*			*Re-order level (Kgs)*	*Minimum level (Kgs.)*
				Minimum	*Average*	*Maximum*		
A	*10*	*10,000*	*10*	*1*	*2*	*3*	*8,000*	*?*

B	*4*	*5,000*	*30*	*3*	*4*	*5*	*4,750*	*?*
C	*6*	*10,000*	*15*	*2*	*3*	*4*	*?*	*2,000*

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities:

(i) Minimum stock of A,

(ii) Maximum stock of B,

(iii) Re-order level of C,

(iv) Average stock level of A.

Solution

(i) Minimum stock of A

Re-order level – (Average rate of consumption × Average time required to obtain fresh delivery)

= 8,000 – (200 × 10 × 2) = 4,000 kgs.

(ii) Maximum stock of B

Re-order level + Re-order quantity – (Minimum consumption × Minimum delivery period)

= 4,750 + 5,000 – (175 × 4 × 3)

= 9,750 – 2,100 = 7,650 kgs.

(iii) Re-order level of C

Maximum delivery period × Maximum usage

= 4 × 225 × 6 = 5,400 kgs.

OR

Re-order level of C

= Minimum stock of C + [Average rate of consumption × Average time required to obtain fresh delivery]

= 2,000 + [(200 × 6) × 3] kgs.

= 5,600 kgs.

(iv) Average stock level of A

= Minimum stock level of A + ½ Re-order quantity of A

= 4,000 + ½ × 10,000 = 4,000 + 5,000 = 9,000 kgs.

OR

Average Stock level of A

$$\frac{\text{Minimum stock level of A} + \text{Maximum stock level of A}}{2}$$ (Refer to working note)

$$\frac{4,000 + 16,250}{2} = 10,125 \text{ kgs.}$$

Working note:

Maximum stock of A = ROL+ ROQ – (Minimum consumption × Minimum re-order period)

= 8,000 + 10,000 – [(175 × 10) × 1]

= 16,250 kgs.

Illustration 10: (Evaluation of discount offer and EOQ)

(a) EXE Limited has received an offer of quantity discounts on its order of materials as under:

Price per tonne (₹)	*Tonnes (Nos.)*
1,200	*Less than 500*
1,180	*500 and less than 1,000*
1,160	*1,000 and less than 2,000*
1,140	*2,000 and less than 3,000*
1,120	*3,000 and above.*

The annual requirement for the material is 5,000 tonnes. The ordering cost per order is ₹ 1,200 and the stock holding cost is estimated at 20% of material cost per annum. You are required to compute the most economical purchase level.

(b) What will be your answer to the above question if there are no discounts offered and the price per tonne is ₹ 1,500?

Solution

(a)

Total annual requirement (A)	Order size (Tonne) (q)	No. of orders A/q	Cost of inventory A × Per tonne cost (₹)	Ordering cost A/q × ₹1200 (₹)	Carrying cost p.t.p.a 1/2× q × 20% of cost p.t.(₹)	Total Cost (4+5+6) (₹)
1	2	3	4	5	6	7
5,000 tonne	400	12.5	60,00,000 (5,000×₹1200)	15,000	48,000 (200 × ₹ 240)	60,63,000
	500	10	59,00,000 (5,000×₹ 1180)	12,000	59,000 (250 × ₹ 236)	59,71000

	1,000	5	58,00,000 (5,000×₹ 1160)	6,000	1,16,000 (500 × ₹ 232)	59,22,000
	2,000	2.5	57,00,000 (5,000×₹ 1140)	3,000	2,28,000 (1,000×₹228)	59,31,000
	3,000	1.666	56,00,000 (5,000×₹ 1120)	2,000	3,36,000 (1,500×₹224)	59,38,000

The above table shows that the total cost of 5,000 units including ordering and carrying cost is minimum (₹ 59,22,000) when the order size is 1,000 units. Hence the most economical purchase level is 1,000 units.

(b) If there will are no discount offer then the purchase quantity should be equal to EOQ. The EOQ is as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

where A is the annual inventory requirement,

O is the ordering cost per order and

C is the carrying cost per unit per annum.

$$= \sqrt{\frac{2 \times 5{,}000 \text{ units} \times ₹\ 1{,}200}{20\% \times ₹\ 1{,}500}} = 200 \text{ units}$$

Illustration 11: (Calculation of Stock Levels and Danger level)

From the details given below, calculate:

(i) Re-ordering level

(ii) Maximum level

(iii) Minimum level

(iv) Danger level.

Re-ordering quantity is to be calculated on the basis of following information:

Cost of placing a purchase order is ₹ 20

Number of units to be purchased during the year is 5,000

Purchase price per unit inclusive of transportation cost is ₹ 50

Annual cost of storage per units is ₹ 5.

Details of lead time : Average- 10 days, Maximum- 15 days, Minimum- 5 days.

For emergency purchases- 4 days.

Rate of consumption : Average: 15 units per day,
Maximum: 20 units per day.

Solution

Basic Data:

A	(Number of units to be purchased annually)	=	5,000 units
O	(Ordering cost per order)	=	₹ 20
C	(Annual cost of storage per unit)	=	₹ 5
Purchase price per unit inclusive of transportation cost		=	₹ 50.

Computations:

(i) Re-ordering level = Maximum usage per period × Maximum lead time
(ROL) = 20 units per day × 15 days = 300 units

(ii) Maximum level = ROL + ROQ – [Min. rate of consumption × Min. lead time] *(Refer to working notes1 and 2)*
= 300 units + 200 units – [10 units per day × 5 days] = 450 units

(iii) Minimum level = ROL – Average rate of consumption × Average re-order-period
= 300 units – (15 units per day × 10 days) =150 units

(iv) Danger level = Average consumption × Lead time for emergency purchases
= 15 units per day × 4 days = 60 units

Working Notes:

1. Minimum rate of consumption per day

$$\text{Av. rate of consumption} = \frac{\text{Minimum rate of consumption} + \text{Maximum rate of consumption}}{2}$$

$$15 \text{ units per day} = \frac{X \text{ units/day} + 20 \text{ units per day}}{2} \quad \text{or} \quad X = 10 \text{ units per day.}$$

2. Re-order Quantity (ROQ)

$$= \sqrt{\frac{2 \times 5{,}000 \text{ units} \times ₹ 20}{5}} = 200 \text{ units}$$

Illustration 12: (EOQ and calculation of minimum carrying cost)

G. Ltd. produces a product which has a monthly demand of 4,000 units. The product requires a component X which is purchased at ₹ 20. For every finished product, one unit of component

is required. The ordering cost is ₹ 120 per order and the holding cost is 10% p.a.

You are required to calculate:

(i) Economic order quantity.

(ii) If the minimum lot size to be supplied is 4,000 units, what is the extra cost, the company has to incur?

(iii) What is the minimum carrying cost, the company has to incur?

Solution

(a) (i) Economic order quantity:

A (Annual requirement or Component 'X') = 4,000 units per month × 12 months
= 48,000 units

C (Purchase cost p.u.) = ₹ 20

O (Ordering cost per order) = ₹ 120

i (Holding cost) = 10% per annum

$$E.O.Q. = \sqrt{\frac{2AO}{C_i}} = \sqrt{\frac{2 \times 48{,}000 \text{ units} \times ₹120}{10\% \text{ of } ₹20}} = 2{,}400 \text{ units}$$

(ii) Extra cost incurred by the company:

A. Total cost when order size is equal 4,000 units:

Total cost = Total ordering cost + Total carrying cost

$$= \frac{A}{Q} \times O + \frac{1}{2} Q (C_i)$$

$$= \left(\frac{48{,}000 \text{ units}}{4{,}000 \text{ units}} \times ₹ 120\right) + \left(\frac{1}{2} \times 4{,}000 \text{ units} \times 10\% \times ₹ 20\right)$$

= ₹ 1,440 + ₹ 4,000 = ₹ 5,440

B. Total cost when order size is equal EOQ i.e. 2,400 units:

$$\text{Total cost} = \left(\frac{48{,}000 \text{ units}}{2{,}400 \text{ units}} \times ₹ 120\right) + \left(\frac{1}{2} \times 2{,}400 \text{ units} \times 10\% \times ₹ 20\right)$$

= ₹ 2,400 + ₹ 2,400 = ₹ 4,800

Extra cost that the company has to incur = (A) – (B) = ₹ 5,440 – ₹ 4,800 = ₹ 640

(iii) Minimum carrying cost :

Carrying cost depends upon the size of the order. It will be minimum on the least order size. (In this part of the question the two order sizes are 2,400 units and 4,000

units. Here 2,400 units is the least of the two order sizes. At this order size carrying cost will be minimum.)

The minimum carrying cost in this case can be computed as under :

Minimum carrying cost = $\frac{1}{2}$ × 2,400 units × 10% × ₹ 20 = ₹ 2,400.

Illustration 13: (Calculation of Stock out Cost)

M/s Tyrotubes trades in four wheeler tyres and tubes. It stocks sufficient quantity of tyres of almost every vehicle. In year end 20X1-X2, the report of sales manager revealed that M/s Tyrotubes experienced stock-out of tyres.

The stock-out data is as follows:

*Stock-out of Tyres**	*No. of times*
100	*2*
80	*5*
50	*10*
20	*20*
10	*30*
0	*33*

M/s Tyrotubes loses ₹150 per unit due to stock-out and spends ₹ 50 per unit on carrying of inventory.

Determine optimum safest stock level.

**Demand that could not be fulfilled due to insufficient stock of tyres.*

Solution:

Computation of Stock-out and Inventory carrying cost

Safety Stock Level (units) (1)	Stock-out (units) (2)	Probability (3)	Stock-out cost(₹) (4)=(2) x ₹150	Expected stock-out cost(₹) (5)=(3)x(4)	Inventory carrying cost (₹) (6)=(1)x₹50	Total cost (₹) (7)=(5)+(6)
100	0	0.00	0	0	5,000	5,000
80	20	0.02	3,000	60	4,000	4,060
50	50	0.02	7,500	150		
	30	0.05	4,500	225		
			12,000	375	2,500	2,875
20	80	0.02	12,000	240		
	60	0.05	9,000	450		
	30	0.10	4,500	450		

			25,500	1,140	1,000	2,140
10	90	0.02	13,500	270		
	70	0.05	10,500	525		
	40	0.10	6,000	600		
	10	0.20	1,500	300		
			31,500	1,695	500	2,195
0	100	0.02	15,000	300		2,700
	80	0.05	12,000	600		
	50	0.10	7,500	750		
	20	0.20	3,000	600		
	10	0.30	1,500	450		
			39,000	2,700	0	2,700

At safety stock level of 20 units, total cost is least i.e. ₹ 2,140.

Working Note:

Computation of Probability of Stock-out

Stock-out (units)	100	80	50	20	10	0	Total
Nos. of times	2	5	10	20	30	33	100
Probability	0.02	0.05	0.10	0.20	0.30	0.33	1.00

Explanation:

Stock-out means the demand of an item that could not be fulfilled because of insufficient stock level.

Safety stock is the level of stock of any item which is maintained in excess of lead time consumption. It is kept as cushion against any unexpected demand for that item.

Safety stock level	**Impact**
100 units	Any unexpected demand upto 100 units can be met.
80 units	Stock out will only arise if unexpected demand will be for 100 units. In this case 20 units will remain unsatisfied. The probability of any unexpected demand for 100 units is 0.02.
50 units	Any unexpected demand beyond 50 units will be remain unsatisfied. If unexpected demand for 100 units arises (probability is 0.02) 50 units will be unsatisfied. Similarly if unexpected demand for 80 units arises (probability is 0.05), 30 units will be unsatisfied.
20 units	Any unexpected demand beyond 20 units will be remain unsatisfied. If unexpected demand for 100 units arises (probability is 0.02), 80 units will remain unsatisfied. If unexpected demand for 80 units arises (probability is 0.05), 60 units will remain unsatisfied. Similarly, when unexpected demand for 50 units arises (probability is 0.10), 30 units will remain unsatisfied.
10 units	Any unexpected demand beyond 10 units will be remain unsatisfied. If unexpected demand for 100 units arises (probability is 0.02), 90 units will remain unsatisfied. If unexpected demand for 80 units arises (probability is

	0.05), 70 units will remain unsatisfied. If unexpected demand for 50 units arises (probability is 0.10), 40 units will remain unsatisfied. Similarly, when unexpected demand for 20 units arises (probability is 0.20), 10 units will remain unsatisfied.
0 unit	When no safety stock level is maintained, any unexpected demand cannot be satisfied. If unexpected demand for 100 units arises (probability is 0.02), 100 units will remain unsatisfied. If unexpected demand for 80 units arises (probability is 0.05), 80 units will remain unsatisfied. If unexpected demand for 50 units arises (probability is 0.10), 50 units will remain unsatisfied. If unexpected demand for 20 units arises (probability is 0.20), 20 units will remain unsatisfied. Similarly, unexpected demand for 10 units (probability is 0.30), 10 units will remain unsatisfied.

2.6.2 Techniques of Inventory Control: Depending on the type of organization and type of inventory specific inventory control techniques are adopted. Some of these are:

(1) ABC Analysis: This system exercises discriminating control over different items of stores classified on the basis of the investment involved. Usually the items are divided into three categories according to their importance, namely, their value and frequency of replenishment during a period.

(i) 'A' Category of items consists of only a small percentage i.e., about 10% of the total items handled by the stores but require heavy investment about 70% of inventory value, because of their high prices or heavy requirement or both. Items under this category can be controlled effectively by using a regular system which ensures neither over-stocking nor shortage of materials for production. Such a system plans its total material requirements by making budgets. The stocks of materials are controlled by fixing certain levels like maximum level, minimum level and re-order level.

(ii) 'B' Category of items are relatively less important; they may be 20% of the total items of material handled by stores. The percentage of investment required is about 20% of the total investment in inventories. In the case these items, as the sum involved is moderate, the same degree of control as applied in 'A' category of items is not warranted. The orders for the items, belonging to this category may be placed after reviewing their situation periodically.

(iii) 'C' Category of items do not require much investment; it may be about 10% of total inventory value but they are nearly 70% of the total items handled by store. For these category of items, there is no need of exercising constant control. Orders for items in this group may be placed either after six months or once in a year, after ascertaining consumption requirements. In this case the objective is to economies on ordering and handling costs.

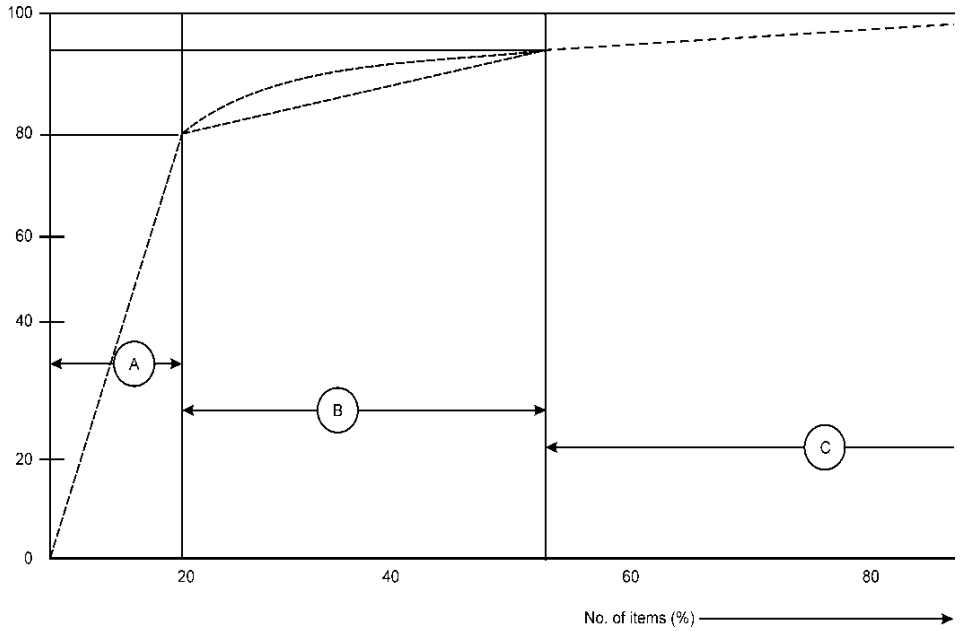


Illustration 14: (Application of ABC inventory control system)

A factory uses 4,000 varieties of inventory. In terms of inventory holding and inventory usage, the following information is compiled:

No. of varieties of inventory	*%*	*% value of inventory holding (average)*	*% of inventory usage (in end-product)*
3,875	*96.875*	*20*	*5*
110	*2.750*	*30*	*10*
15	*0.375*	*50*	*85*
4,000	*100.000*	*100*	*100*

Classify the items of inventory as per ABC analysis with reasons.

Solution

Classification of the items of inventory as per ABC analysis

1. 15 number of varieties of inventory items should be classified as 'A' category items because of the following reasons:

   (i) Constitute 0.375% of total number of varieties of inventory handled by stores of factory, which is minimum as per given classification in the table.

   (ii) 50% of total use value of inventory holding (average) which is maximum according to the given table.

   (iii) Highest in consumption about 85% of inventory usage (in end-product).

2. 110 number of varieties of inventory items should be classified as 'B' category items because of the following reasons:
   (i) Constitute 2.750% of total number of varieties of inventory items handled by stores of factory.
   (ii) Requires moderate investment of about 30% of total use value of inventory holding (average).
   (iii) Moderate in consumption about 10% of inventory usage (in end–product).
3. 3,875 number of varieties of inventory items should be classified as 'C' category items because of the following reasons:
   (i) Constitute 96.875% of total varieties of inventory items handled by stores of factory.
   (ii) Requires about 20% of total use value of inventory holding (average).
   (iii) Minimum inventory consumption *i.e.* about 5% of inventory usage (in end-product).

Illustration 15: (Application of ABC in inventory control system)

From the following details, draw a plan of ABC selective control:

Item	*Units*	*Unit cost (₹)*
1	*7,000*	*5.00*
2	*24,000*	*3.00*
3	*1,500*	*10.00*
4	*600*	*22.00*
5	*38,000*	*1.50*
6	*40,000*	*0.50*
7	*60,000*	*0.20*
8	*3,000*	*3.50*
9	*300*	*8.00*
10	*29,000*	*0.40*
11	*11,500*	*7.10*
12	*4,100*	*6.20*

Solution

Statement of Total Cost and Ranking

Item	Units	%of Total units	Unit cost (₹)	Total cost (₹)	%of Total cost	Ranking
1	7,000	3.1963	5.00	35,000	9.8378	4
2	24,000	10.9589	3.00	72,000	20.2378	2
3	1,500	0.6849	10.00	15,000	4.2162	7

4	600	0.2740	22.00	13,200	3.7103	8
5	38,000	17.3516	1.50	57,000	16.0216	3
6	40,000	18.2648	0.50	20,000	5.6216	6
7	60,000	27.3973	0.20	12,000	3.3730	9
8	3,000	1.3699	3.50	10,500	2.9513	11
9	300	0.1370	8.00	2,400	0.6746	12
10	29,000	13.2420	0.40	11,600	3.2605	10
11	11,500	5.2512	7.10	81,650	22.9502	1
12	4,100	1.8721	6.20	25,420	7.1451	5
	2,19,000	100		3,55,770	100	

Basis for selective control (Assumed)

₹ 50,000 & above	--	'A' items
₹ 15,000 to 50000	--	'B' items
Below ₹ 15,000	--	'C' items

On this basis, a plan of A B C selective control is given below:

Ranking	Item Nos.	% of Total units	Cost (₹)	% of Total Cost	Category
1	11	5.2512	81,650	22.9502	
2	2	10.9589	72,000	20.2378	
3	5	17.3516	57,000	16.0216	
Total	**3**	**33.5617**	**2,10,650**	**59.2096**	**A**
4	1	3.1963	35,000	9.8378	
5	12	1.8721	25,420	7.1451	
6	6	18.2648	20,000	5.6216	
7	3	0.6849	15,000	4.2162	
Total	**4**	**24.0181**	**95,420**	**26.8207**	**B**
8	4	0.2740	13,200	3.7103	
9	7	27.3973	12,000	3.3730	
10	10	13.2420	11,600	3.2605	
11	8	1.3699	10,500	2.9513	
12	9	0.1370	2,400	0.6746	
Total	**5**	**42.4202**	**49,700**	**13.9697**	**C**
Grand Total	12	100	3,55,770	100	

(1) Advantages of ABC analysis: The advantages of ABC analysis are the following :

(i) *Continuity in production:* It ensures that, without there being any danger of interruption of production for want of materials or stores, minimum investment will be made in inventories of stocks of materials or stocks to be carried.

(ii) *Lower cost:* The cost of placing orders, receiving goods and maintaining stocks is minimised specially if the system is coupled with the determination of proper economic order quantities.

(iii) *Less attention required:* Management time is saved since attention need be paid only to some of the items rather than all the items as would be the case if the ABC system was not in operation.

(iv) *Systematic working:* With the introduction of the ABC system, much of the work connected with purchases can be systematized on a routine basis to be handled by subordinate staff.

(2) HML: In this system inventory items are classified as high price, medium price and low cost items.

(3) VED: Items are classified as vital, essential and desirable items under this system. This system is used particularly in spare parts inventory.

(4) FSN: Items are classified as fast moving, slow moving and non-moving items.

(5) GOLF: This system is based on sources of items. These are classified as Government supply, ordinary supply, local and foreign supply.

(6) SOS: Items are classified as seasonal and off seasonal items.

2.6.3 Two Bin System: Under this system each bin is divided into two parts - one, smaller part, should stock the quantity equal to the minimum stock or even the re-ordering level, and the other to keep the remaining quantity. Issues are made out of the larger part; but as soon as it becomes necessary to use quantity out of the smaller part of the bin, fresh order is placed. "Two Bin System" is supplemental to the record of respective quantities on the bin card and the stores ledger card.

2.6.4 Establishment of system of budgets: To control investment in the inventories, it is necessary to know in advance about the inventories requirement during a specific period usually a year. The exact quantity of various types of inventories and the time when they would be required can be known by studying carefully production plans and production schedules. Based on this, inventories requirement budget can be prepared. Such a budget will discourage the unnecessary investment in inventories.

2.6.5 Use of perpetual inventory records and continuous stock verification: Perpetual inventory represents a system of records maintained by the stores department. It in fact comprises: (*i*) Bin Cards, and (*ii*) Stores Ledger.

The success of perpetual inventory depends upon the following:

(a) The Stores Ledger–(showing quantities and amount of each item).

(b) Stock Control cards (or Bin Cards).

(c) Reconciling the quantity balances shown by (*a*) & (*b*) above.

(d) Checking the physical balances of a number of items every day systematically and by rotation.

(e) Explaining promptly the causes of discrepancies, if any, between physical balances and book figures.

(f) Making corrective entries where called for after step (*e*) and

(g) Removing the causes of the discrepancies referred to in step (*e*)

Advantages of perpetual inventory: The main advantages of perpetual inventory are as follows:

(1) Physical stocks can be counted and book balances adjusted as and when desired without waiting for the entire stock-taking to be done.

(2) Quick compilation of Profit and Loss Account (for interim period) due to prompt availability of stock figures.

(3) Discrepancies are easily located and thus corrective action can be promptly taken to avoid their recurrence.

(4) A systematic review of the perpetual inventory reveals the existence of surplus, dormant, obsolete and slow-moving materials, so that remedial measures may be taken in time.

(5) Fixation of the various stock levels and checking of actual balances in hand with these levels assist the Store keeper in maintaining stocks within limits and in initiating purchase requisitions for correct quantity at the proper time.

Continuous Stock Verification – The checking of physical inventory is an essential feature of every sound system of material control. Such a checking may be periodical or continuous. Moreover, in the case of periodical checking there is the problem of finding an adequately trained contingent. It is likely to be drawn from different departments where stock-taking is not the normal work and they are apt to discharge such temporary duties somewhat perfunctorily. The element of surprise, that is essential for effective control is wholly absent in the system. Then if there are stock discrepancies, they remain undetected until the end of the period. Often, the discrepancies are not corrected.

The system of continuous stock-taking consists of counting and verifying the number of items daily throughout the year so that during the year all items of stores are covered three or four times. The stock verifiers are independent of the stores, and the stores staffs have no foreknowledge as to the particular items that would be checked on any particular day. But it must be seen that each item is checked a number of times in a year.

Advantages of continuous stock-taking: The advantages of continuous stock-taking are:

1. Closure of normal functioning is not necessary.

2. Stock discrepancies are likely to be brought to the notice and corrected much earlier than under the annual stock-taking system.
3. The system generally has a sobering influence on the stores staff because of the element of surprise present therein.
4. The movement of stores items can be watched more closely by the stores auditor so that chances of obsolescence buying are reduced.
5. Final Accounts can be ready quickly. Interim accounts are possible quite conveniently.

Disadvantages: Annual stock-taking, however, has certain inherent shortcomings which tend to detract from the usefulness of such physical verification. For instance, since all the items have to be covered in a given number of days, either the production department has to be shut down during those days to enable thorough checking of stock or else the verification must be of limited character.

2.6.7 Review of slow and non-moving items: Sometimes, due to high value of slow moving and non-moving raw materials, it appears that the concern has blocked huge sum of money unnecessarily in raw materials. To overcome this problem, it is necessary to dispose-off these as early as possible or make arrangements for their exchange with the inventories required by the concern. Besides this no new requisition should be made for the purchase of slow moving items, till the existing stock is exhausted. Computation of inventory turnover ratio may help in identifying slow moving items.

2.6.8 Use of control ratios

(i) ***Input Output Ratio:*** Inventory control can also be exercised by the use of input output ratio analysis. Input-output ratio is the ratio of the quantity of input of material to production and the standard material content of the actual output.

This type of ratio analysis enables comparison of actual consumption and standard consumption, thus indicating whether the usage of material is favourable or adverse.

(ii) ***Inventory Turnover Ratio****:* Computation of inventory turnover ratios for different items of material and comparison of the turnover rates provides a useful guidance for measuring inventory performance. High inventory turnover ratio indicates that the material in the question is a fast moving one. A low turnover ratio indicates over-investment and locking up of the working capital in inventories. Inventory turnover ratio may be calculated by using the following formulae:-

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of materials consumed during the period}}{\text{Cost of average stock held during the period}}$$

$$\text{Average stock} = 1/2 \text{ (opening stock + closing stock)}$$

$$\textit{Average no. of days of Inventory holding} = \frac{\textit{360 days/ 12 months}}{\textit{Inventory Turnover Ratio}}$$

By comparing the number of days in the case of two different materials, it is possible to know which is fast moving and which is slow moving. On this basis, attempt should be made to reduce the amount of capital locked up, and prevent over-stocking of the slow moving items.

Illustration 16: (Calculation of inventory turnover ratio)

The following data are available in respect of material X for the year ended 31st March, 20X1.

	(₹)
Opening stock	*90,000*
Purchases during the year	*2,70,000*
Closing stock	*1,10,000*

Calculate:

(i) Inventory turnover ratio, and

(ii) The number of days for which the average inventory is held.

Solution

Inventory turnover ratio

(Refer to working note) $= \frac{\text{Cost of stock of raw material consumed}}{\text{Average stock of raw material}}$

$= \frac{₹\ 2,50,000}{₹\ 1,00,000} = 2.5$

Average number of days for which

the average inventory is held $= \frac{365}{\text{Inventory turnover ratio}} = \frac{365\text{days}}{2.5} = 146$ days

Working Note:

	(₹)
Opening stock of raw material	90,000
Add: Material purchases during the year	2,70,000
Less: Closing stock of raw material	1,10,000
Cost of stock of raw material consumed	2,50,000

Illustration 17: (Calculation of inventory turnover ratio)

From the following data for the year ended 31st December, 20X1, calculate the inventory turnover ratio of the two items and put forward your comments on them.

	Material A (₹)	***Material B(₹)***
Opening stock 1.1.20X1	*10,000*	*9,000*
Purchase during the year	*52,000*	*27,000*
Closing stock 31.12.20X1	*6,000*	*11,000*

Solution

First of all it is necessary to find out the material consumed:

Cost of materials consumed	Material A (₹)	Material B (₹)
Opening stock	10,000	9,000
Add: Purchases	52,000	27,000
	62,000	36,000
Less: Closing stock	6,000	11,000
Materials consumed	56,000	25,000
Average inventory: (Opening Stock + Closing Stock) ÷ 2	8,000	10,000
Inventory Turnover ratio: (Consumption ÷ Average inventory)	7 times	2.5 times
Inventory Turnover (Number of Days in a year/IT ratio)	52 days	146 days

Comments: Material A is moving faster than Material B.

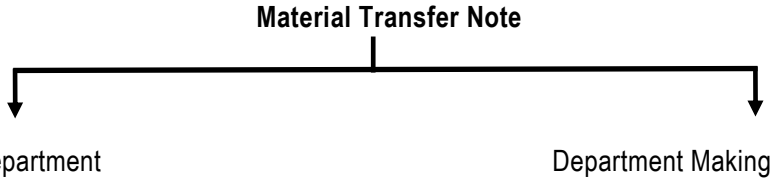
2.7 Material Issue Procedure

Issue of material must not be made except under properly authorised requisition slip; usually it is the foreman of a department who has the authority to draw materials from the store. Issue of material must be made on the basis of first in first out, that is, out of the earliest lot on hand. If care is not exercised in this regard, quality of earliest lot of material may deteriorate for having been kept for a long period.

Material Requisition Note: It is the voucher of the authority as regards issue of materials for use in the factory or in any of its departments. After receipt of material requisition slip store keeper ensures that requisition is properly authorized and requisitioned quantity is within the quantity specified in bill of materials. After satisfied with the documents, store keeper issue materials and keep one copy of based materials and record the transaction in the records maintained by the stores department.

Transfer of Material: The surplus material arising on a job or other units of production may sometime be unsuitable for transfer to Stores because of its bulk, heavy weight, brittleness or some such reason. It may, however, be possible to find some alternative use for such materials by transferring it to some other job instead of returning it to the Store Room.

It must be stressed that generally transfer of material from one job to another is irregular, if not improper, in so far it is not conducive to correct allocation and control of material cost of jobs or other units of production. It is only in the circumstances envisaged above that such direct transfer should be made, at the time of material transfer a material transfer note should be made in duplicate, the disposition of the copies of this note being are as follows :



No copy is required for the Store as no entry in the stores records would be called for. The Cost Department would use its copy for the purpose of making the necessary entries in the cost ledger accounts for the jobs affected.

The form of the Material Transfer Note is shown below:

Material Transfer Note

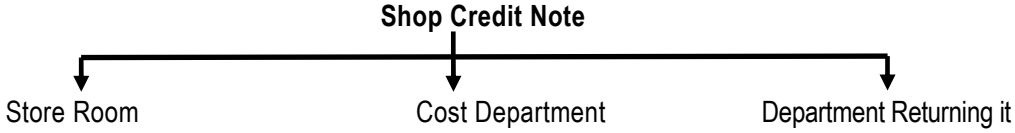
From Job No. ..... No. .....
To Job No. ..... Date .....

Item No.	Particulars	Rate ₹	Amount ₹
Transferred by		*Received by* ..... *Job Ledger Clerk*	

Return of Material: Sometimes, it is not possible before hand to make any precise estimate of the material requirements or units of production. Besides, at times due to some technical or other difficulty, it is not practicable to measure exactly the quantity of material required by a department. In either case, material may have to be issued from stores in bulk, often in excess of the actual quantity required. Where such a condition exists, it is of the utmost importance from the point of view of materials control that any surplus material left over on the completion of a job should be promptly hand over to the storekeeper for safe and proper custody.

Unless this is done, the surplus material may be misappropriated or misapplied to some purpose, other than that for which it was intended. The material cost of the job against which the excess material was originally drawn in that case, would be overstated unless the job is given credit for the surplus arising thereon.

The surplus material, when it is returned to the storeroom, should be accompanied by a document known either as a Shop Credit Note or alternatively as a Stores Debit Note. This document should be made out, by the department returning the surplus material and it should be in triplicate to be used as follows:



The form of Shop Credit Note is given below:

Shop Credit Note

Job No.				No. .....
Department				Date .....
Item No.	Particulars	Qnty.	Rate	Amount
Store-keeper	S.L. Clerk			Foreman of the Returning Department

2.8 Valuation of Material Issues

Materials issued from stores should be priced at the value at which they are carried in stock. But there can be a situation where the material may have been purchased at different times and at different prices with varying discounts, taxes etc. Because of this the problem arises as to how the material issues to production are to be valued. There are several methods for tackling this situation. The cost accountant should select the proper method based on following factors:

1. The frequency of purchases, price fluctuations and its range.
2. The frequency of issue of materials, relative quantity etc.
3. Nature of cost accounting system.
4. The nature of business and type of production process.
5. Management policy relating to valuation of closing stock.

Several methods of pricing material issues have been evolved in an attempt to satisfactorily answer the problem. These methods may be grouped and explained as follows:

2.8.1 Cost Price Methods:

(a) Specific price method.

(b) First-in First-out method.

(c) Last-in-First-out method.

(d) Base stock method.

2.8.2 Average Price Methods:

(e) Simple average price method.

(f) Weighted average price method.

(g) Periodic simple average price method.

(h) Periodic weighted average price method.

(i) Moving simple average price method.

(j) Moving weighted average price method.

2.8.3 Market Price Methods:

(k) Replacement price method.

(l) Realisable price method.

2.8.4 Notional Price Methods:

(m) Standard price method.

(n) Inflated price methods.

(o) Re-use Price Method.

We may now briefly discuss all the above methods:

(a) Specific Price Method

Meaning	Suitability
This method is useful, specially when materials are purchased for a specific job or work order, and as such these materials are issued subsequently to that specific job or work order at the price at which they were purchased.	To use this method, it is necessary to store each lot of material separately and maintain its separate account.

Advantages and disadvantages

Advantages	Disadvantages
• The cost of materials issued for production purposes to specific jobs represent actual and correct costs.	• This method is difficult to operate, specially when purchases and issues are numerous.
• This method is best suited for non-standard and specific products.	

(b) First-in-First out Method (FIFO)

Meaning	Suitability
It is a method of pricing the issues of materials, in the order in which they are purchased. In other words, the materials are issued in the order in which they arrive in the store or the items longest in stock are issued first. Thus each issue of material only recovers the purchase price which does not reflect the current market price.	This method is considered suitable in times of falling price because the material cost charged to production will be high while the replacement cost of materials will be low. But, in the case of rising prices, if this method is adopted, the charge to production will be low as compared to the replacement cost of materials. Consequently, it would be difficult to purchase the same volume of material (as in the current period) in future without having additional capital resources.

Advantages and disadvantages

Advantages	Disadvantages
• It is simple to understand and easy to operate.	• If the prices fluctuate frequently, this method may lead to clerical error.
• Material cost charged to production represents actual cost with which the cost of production should have been charged.	• Since each issue of material to production is related to a specific purchase price, the costs charged to the same job are likely to show a variation from period to period.
• In the case of falling prices, the use of this method gives better results.	• In the case of rising prices, the real profits of the concern being low, they may be inadequate to meet the concern's demand to purchase raw materials at the ruling price.
• Closing stock of material will be represented very closely at current market price.	

The application of FIFO method is illustrated below:

Material Received and Issued

Lot No.	Date	Quantity Kg.	Lot No.	Rate (₹)	Amount (₹)
1.	July 3	600		1.00	600.00
2.	July 13	800		1.20	960.00
3.	July 23	600		0.90	540.00
4.	August 5	400		1.10	440.00
5.	August 6	1200		0.80	960.00
	July 8		400 Kgs. out of (1)	1.00	400.00
	July 12		200 Kgs. out of (1)	1.00	200.00
	July 22		600 Kgs. out of (2)	1.20	720.00
	July 25		200 Kgs. out of (2)	1.20	240.00
			200 Kgs. out of (3)	0.90	180.00
	August 8		400 Kgs. out of (3)	0.90	360.00
			400 Kgs. out of (4)	1.10	440.00
			200 Kgs. out of (5)	0.80	160.00

The stock in hand after 8th August will be 1,000 Kgs. This will be out of lot number (5) and its value will be ₹ 800, *i.e.,* @ ₹ 0.80 per Kg.

(c) Last-in-First out method (LIFO)

Meaning	Suitability
It is a method of pricing the issues of materials. This method is based on the assumption that the items of the last batch (lot) purchased are the first to be issued. Therefore, under this method the prices of the last batch (lot) are used for pricing the issues, until it is exhausted, and so on. If however, the quantity of issue is more than the quantity of the latest lot than earlier (lot) and its price will also be taken into consideration.	During inflationary period or period of rising prices, the use of LIFO would help to ensure that the cost of production determined on the above basis is approximately the current one. This method is also useful specially when there is a feeling that due to the use of FIFO or average methods, the profits shown and tax paid are too high.

Advantages and Disadvantages

Advantages	Disadvantages
• The cost of materials issued will be either nearer to and or will reflect the current market price. Thus, the cost of goods produced will be related to the trend of the market price of materials. Such a trend in price of materials enables the matching of cost of production with current sales revenues.	• Calculation under LIFO system becomes complicated and cumbersome when frequent purchases are made at highly fluctuating rates.
• The use of the method during the period of rising prices does not reflect undue high profit in the income statement as it was under the first-in-first-out or average method. In fact, the profit shown here is relatively lower because the cost of production takes into account the rising trend of material prices.	• Costs of different similar batches of production carried on at the same time may differ a great deal.
• In the case of falling prices profit tends to rise due to lower material cost, yet the finished products appear to be more competitive and are at market price.	• In time of falling prices, there will be need for writing off stock value considerably to stick to the principle of stock valuation, i.e., the cost or the market price whichever is lower.
• Over a period, the use of LIFO helps to iron out the fluctuations in profits.	• This method of valuation of material is not acceptable to the income tax authorities.

• In the period of inflation LIFO will tend to show the correct profit and thus avoid paying undue taxes to some extent.	

It may be noted that Last in First out (LIFO) is not permitted under Accounting Standard (AS)-2: Valuation of Inventories. However for the purpose of academic knowledge LIFO method is included in this Study Material.

(d) Base Stock Method

Meaning	Suitability
Minimum quantity of stock under this method is always held at a fixed price as reserve in the stock, to meet a state of emergency, if it arises. This minimum stock is known as base stock and is valued at a price at which the first lot of materials is received and remains unaffected by subsequent price fluctuations.	This method of valuing inventory than a method of valuing issues because, with the base of stock valued at the original cost some other method of valuing issues should be adopted. The quantity in excess of the base stock may be valued either on the FIFO or LIFO basis. This method is not an independent method as it uses FIFO or LIFO. Its advantages and disadvantages therefore will depend upon the use of the other method viz., FIFO or LIFO.

Illustration 18: (Treatment of shortage in stock taking)

'AT' Ltd. furnishes the following store transactions for September, 2011 :

1-9-11	*Opening balance*	*25 units value ₹162.50*
4-9-11	*Issues Req. No. 85*	*8 units*
6-9-11	*Receipts from B & Co. GRN No. 26*	*50 units @ ₹5.75 per unit*
7-9-11	*Issues Req. No. 97*	*12 units*
10-9-11	*Return to B & Co.*	*10 units*
12-9-11	*Issues Req. No. 108*	*15 units*
13-9-11	*Issues Req. No. 110*	*20 units*
15-9-11	*Receipts from M & Co. GRN. No. 33*	*25 units @ ₹6.10 per unit*
17-9-11	*Issues Req. No. 121*	*10 units*
19-9-11	*Received replacement from B & Co. GRN No. 38*	*10 units*
20-9-11	*Returned from department, material of M & Co. MRR No. 4*	*5 units*
22-9-11	*Transfer from Job 182 to Job 187 in the*	

	dept. MTR 6	*5 units*
26-9-11	*Issues Req. No. 146*	*10 units*
29-9-11	*Transfer from Dept. "A" to Dept. "B" MTR 10*	*5 units*
30-9-11	*Shortage in stock taking*	*2 units*

Write up the priced stores ledger on FIFO method and discuss how would you treat the shortage in stock taking.

Solution

Working Notes:

1. The material received as replacement from vendor is treated as fresh supply.
2. In the absence of information the price of the material received from within on 20-9-11 has been taken as the price of the earlier issue made on 17-9-11. In FIFO method physical flow of the material is irrelevant for pricing the issues.
3. The issue of material on 26-9-11 is made out of the material received from within.
4. The entries for transfer of material from one job and department to other on 22-9-11 and 29-9-11 are book entries for adjusting the cost of respective jobs and as such they have not been shown in the stores ledger account.
5. The material found short as a result of stock taking has been written off.

Solution :

Stores Ledger of AT Ltd. for the month of September, 2011 (FIFO Method)

	RECEIPT					ISSUE			BALANCE		
Date	GRN No. MRR No.	Qty. Units	Rate (₹)	Amount (₹)	Requisition No.	Qty. Units	Rate (₹)	Amount (₹)	Qty. Units	Rate (₹)	Amount (₹)
1	2	3	4	5	6	7	8	9	10	11	12
1-9-11	—	—	—	—	—	—	—	—	25	6.50	162.50
4-9-11	—	—	—	—	85	8	6.50	52	17	6.50	110.50
6-9-11	26	50	5.75	287.50	—	—	—	—	17 50	6.50 5.75	398.00
7-9-11	—	—	—	—	97	12	6.50	78	5 50	6.50 5.75	320.00
10-9-11	—	—	—	—	*Nil*	10	5.75	57.50	5 40	6.50 5.75	262.00
12-9-11	—	—	—	—	108	5 10	6.50 5.75	90	30	5.75	172.50
13-9-11	—	—	—	—	110	20	5.75	115	10	5.75	57.50
15-9-11	33	25	6.10	152.50	—	—	—	—	10 25	5.75 6.10	210.00
17-9-11	—	—	—	—	121	10	5.75	57.50	25	6.10	152.50
19-9-11	38	10	5.75	57.50	—	—	—	—	25 10	6.10 5.75	210.00
20-9-11	4	5	5.75	28.75	—	—	—	—	5 25 10	5.75 6.10 7.75	258.75
26-9-11	—	—	—	—	146	5 5	5.75 6.10	59.25	20 10	6.10 5.75	179.50
30-9-11	—	—	—	—	Shortage	2	6.10	12.20	18 10	6.10 5.75	167.30

Illustration 19: (Calculation of value of materials consumed and stock)

The following information is provided by Sunrise Industries for the fortnight of April, 2011:

Material Exe :

Stock on 1-4-2011 100 units at ₹ 5 per unit.

Purchases

5-4-11	*300*	*units*	*at ₹ 6*
8-4-11	*500*	*units*	*at ₹ 7*
12-4-11	*600*	*units*	*at ₹ 8*

Issues

6-4-11	*250*	*units*
10-4-11	*400*	*units*
14-4-11	*500*	*units*

Required :

(A) Calculate using FIFO and LIFO methods of pricing issues :

(a) the value of materials consumed during the period
(b) the value of stock of materials on 15-4-11.

(B) Explain why the figures in (a) and (b) in part A of this question are different under the two methods of pricing of material issues used. You need not draw up the Stores Ledgers.

Solution

(A) (a) Value of Material Exe consumed during the period

1-4-11 to 15-4-11 by using FIFO method.

Date	Description Units	Qty. (Units)	Rate (₹)	Amount (₹)
1-4-11	Opening balance	100	5	500
5-4-11	Purchased	300	6	1,800
6-4-11	Issued	100	5	
		150	6	1,400
8-4-11	Purchased	500	7	3,500
10-4-11	Issued	150	6	
		250	7	2,650
12-4-11	Purchased	600	8	4,800
14-4-11	Issued	250	7	
		250	8	3,750
15-4-11	Balance	350	8	2,800

Total value of material Exe consumed during the period under FIFO method comes to (₹ 1,400 + ₹ 2,650 + ₹ 3,750) ₹ 7,800 and balance on 15-4-11 is of ₹ 2,800.

Value of Material Exe consumed during the period 1-4-11 to 15-4-11 by using LIFO method

Date	Description	Qty. (Units)	Rate (₹)	Amount (₹)
1-4-11	Opening balance	100	5	500
5-4-11	Purchased	300	6	1,800
6-4-11	Issued	250	6	1,500
8-4-11	Purchased	500	7	3,500
10-4-11	Issued	400	7	2,800
12-4-11	Purchased	600	8	4,800
14-4-11	Issued	500	8	4,000
15-4-11	Balance	350	—	2,300*

Total value of material Exe issued under LIFO method comes to (₹ 1,500 + ₹ 2,800 + ₹ 4,000) ₹ 8,300.

*The balance 350 units on 15-4-11 of ₹ 2,300, relates to opening balance on 1-4-11 and purchases made on 5-4-11, 8-4-11 and 12-4-11. (100 units @ ₹ 5, 50 units @ ₹ 6, 100 units @ ₹ 7 and 100 units @ ₹ 8).

(b) As shown in (*a*) above, the value of stock of materials on 15-4-11:

Under FIFO method ₹ 2,800
Under LIFO method ₹ 2,300

(B) Total value of material Exe issued to production under FIFO and LIFO methods comes to ₹ 7,800 and ₹ 8,300 respectively. The value of closing stock of material Exe on 15-4-11 under FIFO and LIFO methods comes to ₹ 2,800 and ₹ 2,300 respectively.

The reasons for the difference of ₹ 500 (₹ 8,300 – ₹ 7,800) as shown by the following table in the value of material Exe, issued to production under FIFO and LIFO are as follows:

Date	Quantity Issued	Value FIFO	Total	Value LIFO	Total
	(Units)	*(₹)*	*(₹)*	*(₹)*	*(₹)*
6-4-11	250	1,400		1,500	
10-4-11	400	2,650		2,800	
14-4-11	500	3,750	7,800	4,000	8,300

1. On 6-4-11, 250 units were issued to production. Under FIFO their value comes to ₹ 1,400 (100 units × ₹ 5 + 150 units × ₹ 6) and under LIFO ₹ 1,500 (250 × ₹ 6). Hence, ₹ 100 was more charged to production under LIFO.

2. On 10-4-11, 400 units were issued to production. Under FIFO their value comes to ₹ 2,650 (150 × ₹ 6 + 250 × ₹ 7) and under LIFO ₹ 2,800 (400 × ₹ 7). Hence, ₹ 150 was more charged to production under LIFO.
3. On 14-4-11, 500 units were issued to production. Under FIFO their value comes to ₹ 3,750 (250 × ₹ 7 + 250 × ₹ 8) and under LIFO ₹ 4,000 (500 × ₹ 8). Hence, ₹ 250 was more charged to production under LIFO.

Thus the total excess amount charged to production under LIFO comes to ₹ 500.

The reasons for the difference of ₹ 500 (₹ 2,800 – ₹ 2,300) in the value of 350 units of Closing Stock of material Exe under FIFO and LIFO are as follows :

1. In the case of FIFO, all the 350 units of the closing stock belongs to the purchase of material made on 12-4-11, whereas under LIFO these units were from opening balance and purchases made on 5-4-11, 8-4-11 and 12-4-11.
2. Due to different purchase price paid by the concern on different days of purchase, the value of closing stock differed under FIFO and LIFO. Under FIFO 350 units of closing stock were valued @ ₹ 8 p.u. Whereas under LIFO first 100 units were valued @ ₹ 5 p.u., next 50 units @ ₹ 6 p.u., next 100 units @ ₹ 7 p.u. and last 100 units @ ₹ 8 p.u.

Thus under FIFO, the value of closing stock increased by ₹ 500.

Illustration 20: (Methods of pricing of materials)

The following transactions in respect of material Y occurred during the six months ended 30th June, 2011:

Month	*Purchase (units)*	*Price per unit (₹)*	*Issued units*
January	*200*	*25*	*Nil*
February	*300*	*24*	*250*
March	*425*	*26*	*300*
April	*475*	*23*	*550*
May	*500*	*25*	*800*
June	*600*	*20*	*400*

Required :

(a) The Chief Accountant argues that the value of closing stock remains the same no matter which method of pricing of material issues is used. Do you agree? Why or why not? Detailed stores ledgers are not required.

(b) When and why would you recommend the LIFO method of pricing material issues?

Solution

(a) The Closing Stock at the end of six months period *i.e.,* on 30th June, 2011 will be 200 units, whereas up to the end of May 2011, total purchases coincide with the total issues *i.e.,* 1,900 units. It means that at the end of May 2011, there was no closing stock. In the month of June 2011, 600 units were purchased out of which 400 units were issued. Since there was only one purchase and one issue in the month of June, 2011 and there was no opening stock on 1st June 2011, the Closing Stock of 200 units is to be valued at ₹ 20 per unit.

In view of this, the argument of the Chief Accountant appears to be correct. Where there is only one purchase and one issue in a month with no opening stock, the method of pricing of material issues becomes irrelevant. Therefore, in the given case one should agree with the argument of the Chief Accountant that the value of Closing Stock remains the same no matter which method of pricing the issue is used.

It may, however, be noted that the argument of Chief Accountant would not stand if one finds the value of the Closing Stock at the end of each month.

(b) LIFO method has an edge over FIFO or any other method of pricing material issues due to the following advantages:

(i) The cost of the materials issued will be either nearer or will reflect the current market price. Thus, the cost of goods produced will be related to the trend of the market price of materials. Such a trend in price of materials enables the matching of cost of production with current sales revenues.

(ii) The use of the method during the period of rising prices does not reflect undue high profit in the income statement, as it was under the first-in-first-out or average method. In fact, the profit shown here is relatively lower because the cost of production takes into account the rising trend of material prices.

(iii) In the case of falling prices, profit tends to rise due to lower material cost, yet the finished products appear to be more competitive and are at market price.

(iv) During the period of inflation, LIFO will tend to show the correct profit and thus, avoid paying undue taxes to some extent.

(e) Simple Average Price Method

Meaning	Suitability
Under this method, materials issued are valued at average price, which is calculated by dividing the total of all units rate by the number of unit rate.	1. When the materials are received in uniform lots of similar quantity, otherwise, it will give wrong results. 2. When purchase prices do not fluctuate considerably.

$$\text{Material issue price} = \frac{\text{Total of unit prices of each purchase}}{\text{Total number of purchases}}$$

Advantage:

1. It is simple to understand and easy to operate.

Disadvantages:

1. Materials issue cost does not represent actual cost price. Since the materials are issued at a price obtained by averaging cost prices, a profit or loss may arise from such type of pricing.
2. In case the prices of material fluctuate considerably, this method will give incorrect results.
3. The prices of materials issues used are determined by averaging prices of purchases without giving consideration to the quantity. Such a price determination is unscientific.

(f) Weighted Average Price Method

Meaning	Suitability
This method gives due weights to quantities purchased and the purchase price, while, determining the issue price. The average issue price here is calculated by dividing the total cost of materials in the stock by total quantity of materials prior to each issue.	This method is useful in case where quality of material purchased under different lot varies

Advantages and Disadvantages:

Advantages	Disadvantages
• It smoothens the price fluctuations if at all it is there due to material purchases.	• Material cost does not represent actual cost price and therefore, a profit or loss will arise out of such a pricing method.
• Issue prices need not be calculated for each issue unless new lot of materials is received.	• It may be difficult to compute since every men lot received would require re-computation of issue prices.

(g) Periodic Simple Average Price Method

Meaning	Suitability
This method is similar to Simple Average Price Method except that the average price	When both quality and rate are different in different lot.

is calculated at the end of the concerned period. In other words, the price paid during the period for different lots of materials purchased are added up and the total is divided by the number of purchases made during the period. The rate so computed is then used to price all the issues made during the period, and also for valuing the closing inventory of the period.	

Advantages and Disadvantages:

Advantages	Disadvantages
• It is simple to operate, as it avoids calculation of issue price after every receipt.	• This method cannot be applied in jobbing industry where each individual job order is to be priced at each stage of its completion.
• This method can usefully be employed in costing continuous processes where each individual order is absorbed into the general cost of producing large quantities of articles.	• This method is unscientific as it does not take into consideration the quantities purchased at different prices.
	• This method also suffers from all those disadvantages of simple average cost method.

(h) Periodic Weighted Average Price Method

Meaning: This method is like weighted average price method, except that the calculations of issue prices are made periodically (say, a month). The rate so arrived is used for the issues made during that period and also for valuing the inventory at the end of the period.

Advantage:

1. This method is superior to the periodic simple average price method as it takes into account the quantities also.
2. It overcomes or evens out the effect of fluctuations.
3. In addition to above, the method also possesses all the advantages of the simple weighted average price method.

Disadvantage:

This method is not suitable for job costing because each job is to be priced at each stage of completion.

(i) Moving Simple Average Price Method

Meaning: Under this method, the rate for material issues is determined by dividing the total of the periodic simple average prices of a given number of periods by the numbers of periods. For determining the moving simple average price, it is necessary to fix up first period to be taken for determining the average.

Advantage: *This method evens out price fluctuations over a longer period, thus* stabilising the charges to work-in-progress. Thus the cost of production will be stable to a significant extent.

***Disadvantage*:** A profit or loss arises by the use of moving simple average cost.

(j) Moving Weighted Average Price Method

Meaning: Under this method, the issue, rate is calculated by dividing the total of the periodic weighted average price of a given number of periods by the number of periods.

(k) Replacement Price Method

Meaning	Suitability
Replacement price is defined as the price at which it is possible to purchase an item, identical to that which is being replaced or revalued. Under this method, materials issued are valued at the replacement cost of the items. This method pre-supposes the determination of the replacement cost of materials at the time of each issue; *viz.,* the cost at which identical materials could be currently purchased. The product cost under this method is at current market price, which is the main objective of the replacement price method.	This method is useful to determine true cost of production and to value material issues in periods of rising prices, because the cost of material considered in cost of production would be able to replace the materials at the increased price.

Advantage: Product cost reflects the current market prices and it can be compared with the selling price.

***Disadvantage*:** The use of the method requires the determination of market price of material before each issue of material. Such a requirement creates problems.

(l) Realisable Price Method

Meaning: Realisable price means a price at which the material to be issued can be sold in the market. This price may be more or may be less than the cost price at which it was originally purchased. Like replacement price method, the stores ledger would show profit or loss in this method too.

(m) Standard Price Method: Under this method, materials are priced at some predetermined rate or standard price irrespective of the actual purchase cost of the materials. Standard cost is usually fixed after taking into consideration the following factors:

(i) Current prices,

(ii) Anticipated market trends, and

(iii) Discount available and transport charges etc.

Standard prices are fixed for each material and the requisitions are priced at the standard price. This method is useful for controlling material cost and determining the efficiency of purchase department. In the case of highly fluctuating prices of materials, it is difficult to fix their standard cost on long-term basis.

Advantages	Disadvantages
• The use of the standard price method simplifies the task of valuing issues of materials.	• The use of standard price does not reflect the market price and thus results in a profit or loss.
• It facilitates the control of material cost and the task of judging the efficiency of purchase department.	• The fixation of standard price becomes difficult when prices fluctuate frequently
• It reduces the clerical work.	

Illustration 21: (Evaluation of different methods)

The following information is extracted from the Stores Ledger:

Material X	
Opening Stock	*Nil*
Purchases :	
Jan. 1	*100 @ ₹ 1 per unit*
Jan. 20	*100 @ ₹ 2 per unit*
Issues :	
Jan. 22	*60 for Job W 16*
Jan. 23	*60 for Job W 17*

Complete the receipts and issues valuation by adopting the First-In-First-Out, Last-In-First-Out and the Weighted Average Method. Tabulate the values allocated to Job W 16, Job W 17 and the closing stock under the methods aforesaid and discuss from different points of view which method you would prefer.

Solution

From the point of view of cost of material charged to each job, it is minimum under FIFO and maximum under LIFO (Refer to Tables). During the period of rising prices, the use of FIFO give rise to high profits and that of LIFO low profits. In the case of weighted average there is no significant adverse or favourable effect on the cost of material as well as on profits.

From the point of view of valuation of closing stock it is apparent from the above statement that it is maximum under FIFO, moderate under weighted average and minimum under LIFO.

It is clear from the Tables that the use of weighted average evens out the fluctuations in the prices. Under this method, the cost of materials issued to the jobs and the cost of material in hands reflects greater uniformity than under FIFO and LIFO. Thus from different points of view, weighted average method is preferred over LIFO and FIFO.

Statement of receipts and issues by adopting First-in-First-Out Method

Date	Particulars	Receipts			Issues			Balance		
		Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)
Jan. 1	Purchase	100	1	100	—	—	—	100	1	100
Jan. 20	Purchase	100	2	200	—	—	—	100 100	1 2	100 200
Jan. 22	Issue to Job W 16	—	—	—	60	1	60	40 100	1 2	40 200
Jan. 23	Issue to Job W 17	—	—	—	40 20	1 2	40 40	80	2	160

Statement of receipts and issues by adopting Last-In-First-Out method

Date	Particulars	Receipts			Issues			Balance		
		Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)
Jan. 1	Purchase	100	1	100	—	—	—	100	1	100
Jan. 20	Purchase	100	2	200	—	—	—	100 100	1 2	100 200
Jan. 22	Issue to Job W 16	—	—	—	60	2	120	100 40	1 2	100 80
Jan. 23	Issue to Job W 17	—	—	—	40 20	2 1	80 20	80	1	80

Statement of Receipt and Issues by adopting Weighted Average method

Date	Particulars	Receipts			Issues			Balance		
		Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)	Units No.	Rate (₹)	Value (₹)
Jan. 1	Purchase	100	1	100	—	—	—	100	1	100
Jan. 20	Purchase	100	2	200	—	—	—	200	1.50	300
Jan. 22	Issue to Job W 16	—	—	—	60	1.50	90	140	1.50	210
Jan. 23	Issue to Job W 17	—	—	—	60	1.50	90	80	1.50	120

Statement of Material Values allocated to Job W 16, Job 17 and Closing Stock, under aforesaid methods

	FIFO (₹)	LIFO (₹)	Weighted Average (₹)
Material for Job W 16	60	120	90
Material for Job W 17	80	100	90
Closing Stock	160	80	120
	300	300	300

(n) Inflated Price Method: In case material suffers loss in weight due to natural or climatic factors, *e.g.,* evaporation, the issue price of the material is inflated to cover up the losses.

(o) Re-use Price Method: When materials are rejected and returned to the stores or a processed material is put to some other use, then for the purpose it is meant, then such materials are priced at a rate quite different from the price paid for them originally. There is no final procedure for valuing use of material.

2.9 Valuation of Returns & Shortages

2.9.1 Valuation of Materials Returned to the Vendor: Materials which do not meet quantity, dimensional and other specifications and are considered to be unfit for production are usually returned to the vendor. These materials can be returned to the vendor before they are sent to the stores. In case materials reach store and are noticed to be of sub-standard quality, then also they can be returned to vendor. The price of the materials to be returned to vendor should include its invoice price plus freight, receiving and handling charges etc. *Strictly speaking, the materials returned to vendor should be returned at the stores ledger price and not at invoice price.* But in practice invoice price is only considered, the gap between the invoice price and stores ledger price is charged as overhead. In Stores ledger the defective or sub-standard materials are shown in the issue column at the rate shown in the ledger, and the difference between issue price and invoice cost is debited to an inventory adjustment account.

2.9.2 Valuation of Materials Returned to Stores: When materials requisitioned for a specific job or work-in progress are found to be in excess of the requirement or are unsuitable for the purpose, they are returned to the stores. There are two ways of treating such returns.

(1) Such returns are entered in the receipt column at the price at which they were originally issued, and the materials are kept in suspense, to be issued at the same price against the next requisition.

(2) Include the materials in stock as if they were fresh purchases at the original issue price.

2.9.3 Valuation of Shortages during Physical Verification: Materials found short during physical verification should be entered in the issue column and valued at the rate as per the method adopted, *i.e.,* FIFO or any other.

2.10 Selection of Pricing Method

No hard and fast rule or procedure has been laid down to select a method of pricing issues of material. However, the ultimate choice of a method of selection may be based on the following considerations.

(a) The method of costing used and the policy of management.
(b) The frequency of purchases and issues.
(c) The extent of price fluctuations.
(d) The extent of work involved in recording, issuing and pricing materials.
(e) Whether cost of materials used should reflect current or historical conditions?

2.11. Treatment of Normal and Abnormal Loss of Materials

Whichever method may be adopted for pricing materials, certain differences between the book balance and the value of physical stock are bound to occur. These differences, which may be a gain or loss, should be transferred to Inventory Adjustment Account pending investigation. If, upon investigation, they are regarded as normal, they should be transferred to Overhead Control Account; if abnormal, they should be written off to the Costing Profit and Loss Account.

2.12. Accounting and control of waste, scrap, spoilage and defectives

2.12.1 Waste

Meaning	Treatment	Control
The portion of basic raw materials lost in processing having no recoverable value. Waste may be visible - remnants of basic raw materials - or invisible; *e.g.,* disappearance of basic raw materials through evaporation, smoke etc. Shrinkage of material due to natural causes may also be a form of a material wastage.	***In Case of Normal Wastage:*** Normal waste is absorbed in the cost of net output. ***In Case of Abnormal Wastage:*** The abnormal waste is transferred to the Costing Profit and Loss Account.	For effective control of waste, normal allowances for yield and waste should be made from past experience, technical factors and special features of the material process and product. Actual yield and waste should be compared with anticipated figures and appropriate actions should be taken where necessary. Responsibility should be fixed on purchasing, storage, maintenance, production and inspection staff to maintain standards. A systematic procedure for feedback of achievement against laid down standards should be established.

2.12.2 Scrap

Meaning	Treatment	Control
It has been defined as the incidental residue from cer-	Scrap may be treated in cost accounts in the following	Control of scrap really means the maximum

tain types of manufacture, usually of small amount and low value, recoverable without further processing.	ways:- **(i) When the scrap value is negligible:** It may be excluded from costs. In other words, the cost of scrap is borne by good units and income from scrap is treated as other income. **(ii) When the scrap value is not identifiable to a particular process or job:** The sales value of scrap net of selling and distribution cost, is deducted from overhead to reduce the overhead rate. A variation of this method is to deduct the net realisable value from material cost. **(iii) When scrap is identifiable with a particular job or process and its value is significant:** The scrap account should be charged with full cost. The credit is given to the job or process concerned. The profit or loss in the scrap account, on realisation, will be transferred to the Costing Profit and Loss Account.	effective utilisation of raw material. Scrap control does not, therefore, start in the production department; it starts from the stage of product de-signing. Thus the most suitable type of materials, the right type of equipment and personnel would help in getting maximum quantity of finished product from a given raw material. A standard allowance for scrap should be fixed and actual scrap should be collected, recorded and reported indicating the cost centre responsible for it. A periodical scrap report would serve the purpose where two or more departments or cost centres are responsible for the scrap; the reports should be routed through the departments concerned.

2.12.3 Spoilage

Meaning	Treatment	Control
It is the term used for materials which are badly damaged in manufacturing operations, and they cannot be rectified economically and hence taken out of process to be disposed of in some manner without further	***In case of normal spoilage*** Normal spoilage (i.e., which is inherent in the operation) costs are included in costs either charging the loss due to spoilage to the production order or by charging it to	To control spoilage, allowance for normal spoilage should be fixed and actual spoilage should be compared with standard set. A systematic procedure of reporting would help

processing.	production overhead so that it is spread over all products. Any value realised from spoilage is credited to production order or production overhead account, as the case may be. ***In case of abnormal spoilage*** The cost of abnormal spoilage (i.e., arising out of causes not inherent in manufacturing process) is charged to the Costing Profit and Loss Account. When spoiled work is the result of rigid specification, the cost of spoiled work is absorbed by good production while the cost of disposal is charged to production overhead.	control over spoilage. A spoilage report should highlight the normal and abnormal spoilage, the department responsible, the causes of spoilage and the corrective action taken, if any.

2.12.4 Defectives

Meaning	Treatment	Control
It signifies those units or portions of production which can be rectified and turned out as good units by the application of additional material, labour or other service. Defectives arise due to sub-standard materials, bad-supervision, bad-planning, poor workmanship, inadequate-equipment and careless inspection. To some extent, defectives may be unavoidable but usually,	The possible ways of treatment are as below: (i) Defectives that are considered inherent in the process and are identified as normal can be recovered by using the following methods: (a) *Charged to good products* - The loss is absorbed by good units. This method is used when 'seconds' have a normal value and defectives rectified into 'seconds' or 'first' are normal;	When defectives are found, the Inspector will make out the Defective Work Report, giving particulars of the department, process or job, defective units, normal and abnormal defectives, cost of rectification etc. On receipt of the defective Work Report, it may be decided to rectify the defective work; all costs of rectification are collected against the rectification

with proper care it should be possible to avoid defect in the goods produced.	(b) *Charged to general overheads* - When the defectives caused in one department are reflected only on further processing, the rework costs are charged to general overheads; (c) *Charged to the department overheads* - If the department responsible for defectives can be identified then the rectification costs should be charged to that department; (d) *Charged to Costing Profit and Loss Account* - If defectives are abnormal and are due to causes beyond the control of organisation, the rework cost should be charged to Costing Profit and Loss Accounts. (ii) Where defectives are easily identifiable with specific jobs, the work costs are debited to the job.	work order, precaution will be taken to see that number of defectives is within normal limits.

Reclamation of loss from defective units - In the case of articles that have been spoiled, it is necessary to take steps to reclaim as much of the loss as possible. For this purpose:

(i) All defective units should be sent to a place fixed for the purpose;

(ii) These should be dismantled;

(iii) Goods and serviceable parts should be separated and taken into stock;

(iv) Parts which can be made serviceable by further work should be separated and sent to the workshop for the purpose and taken into stock after the defects have been removed; and

(v) Parts which cannot be made serviceable should be collected in one place for being melted or sold.

Printed forms should be used to record quantities for all purposes aforementioned.

Difference between Waste and Scrap

Waste	Scrap
1. It is connected with raw material or inputs to the production process.	1. It is connected with output
2. Waste of materials may be visible or invisible.	2. Scraps are generally identifiable and has physical substance.
3. Generally waste has no recoverable value.	3. Scraps are termed as by-products and has small recoverable value.

Difference between Scrap and Defectives

Scrap	Defectives
1. It is loss connected with output	1. This type of loss connected with the output but it can be in the input as well.
2. Scraps are not intended but cannot be eliminated due to nature of material or process itself.	2. Defectives also are not intended but can be eliminated through proper control.
3. Generally scraps are not used or rectified.	3. Defectives can be used after rectification.
4. Scraps have insignificant recoverable value.	4. Defectives are sold at lower value from that of good one.

Distinction between spoilage and defectives: The difference between spoilage and defectives is that while spoilage cannot be repaired or reconditioned, defectives can be rectified and transferred, either back to standard production or to seconds.

The problem of accounting for defective work is the problem of accounting of the costs of rectification or rework.

2.12.5 Obsolescence

Meaning	Treatment	Control
Obsolescence is defined as "the loss in the intrinsic value of an asset due to its supersession".	Materials may become obsolete under any of the following circumstances: (i) where it is a spare part or a component of a	Losses due to obsolescence can be minimised through careful forethought and reduced stocking of spares, etc. Stores records should be

	machinery used in manufacture and that machinery becomes obsolete ; (ii) where it is used in the manufacture of a product which has become obsolete ; (iii) where the material itself is replaced by another material due to either improved quality or fall in price. In all three cases, the value of the obsolete material held in stock is a total loss and immediate steps should be taken to dispose it off at the best available price. The loss arising out of obsolete materials on abnormal loss does not form part of the cost of manufacture.	continuously gone through to see whether any item is likely to become obsolete. There will be such likelihood if an item has not been used for a long time. (This does not apply to spare parts of machines still in use).

2.13 Consumption of Materials

Any product that is manufactured in a firm entails consumption of resources like material, labour etc. The management for planning and control must know the cost of using these resources in manufacturing. The consumption of materials takes place say when the material is used in the manufacture of the product.

It is important to note that the amount of materials consumed in a period by a cost object need not be equal to the amount of material available with the concern. For example, during any period the total of raw material stock available for use in production may not be equal to the amount of materials actually consumed and assigned to the cost object of the production. The difference between the material available and material consumed represents the stock of material at the end of the period.

2.13.1 Identification of Materials: For the identification of consumption of materials with products of cost centres the followings points should be noted:

1. It is required that the concern should follow coding system for all materials so that each material is identified by unique code number.

2. It is required that each product of a cost centre should be given a unique code number so that the direct material issued for production of particular product of a cost centre can be collected against the code number of that product.

   However, it may not be possible to allocate all materials directly to individual product of a cost centre e.g. maintenance materials, inspection and testing materials etc. The consumption of these materials are collected for cost centre and then charged to individual product by adopting suitable overhead absorption rate of cost centre.

   $$\text{Overhead absorption rate of cost centre} = \frac{\text{Cost for cost centre}}{\text{Base relating to cost centre (e.g.labou r hrs. or machine hrs.)}}$$

3. Each issue of materials should be recorded. One way of doing this is to use a material requisition note. This note shows the details of materials issued for product of cost centre and the cost centre which is to be charged with cost of materials.
4. A material return note is required for recording the excess materials returned to the store. This note is required to ensure that original product of cost centre is credited with the cost of material which was not used and that the stock records are updated.
5. A material transfer note is required for recording the transfer of materials from one product of cost centre to other or from one cost centre to other cost centre.
6. The cost of materials issued would be determined according to stock valuation method used.

2.13.2 Monitoring Consumption of Materials: For monitoring consumption of materials a storekeeper should periodically analyse the various material requisitions, material return notes and material transfer notes. Based on this analysis, a material abstract or material issue analysis sheet is prepared, which shows at a glance the value of material consumed in manufacturing each product. This statement is also useful for ascertaining the cost of material issued for each product.

Format of Material Abstract

Week Ending.....

Material requisition or Transfer Note or Returned Note No.	Amount	Product Nos.						Total for Product	Overheads (Indirect Material charged)
		101	102	103	104	105	106		
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)		(₹)
	—	—	—	—	—	—	—	—	—
Total									

The material abstract statement serves a useful purpose. It in fact shows the amount of

material to be debited to various products & overheads. The total amount of stores debited to various products & overheads should be the same as the total value of stores issued in any period.

2.13.3. Basis for consumption entries in Financial Accounts: Every manufacturing organisation assigns material costs to products for two purposes.

Firstly, for external financial accounting requirements, in order to allocate the material costs incurred during the period between cost of goods produced and inventories; secondly to provide useful information for managerial decision making requirements. In order to meet external financial accounting requirements, it may not be necessary to accurately trace material costs to individual products.

Some products costs may be overstated and others may be understated but this may not matter for financial accounting purposes as long as total of individual materials costs

transactions are recorded i.e., transactions between cost centre within the firm are recorded in a manner that facilitates analysis of costs for assigning them to cost units.

The consumption entries in financial accounts are made on the basis of total cost of purchases of materials after adjustment for opening and closing stock of materials. The stock of materials is taken at cost or net realisable value whichever is less.

2.14 Summary

- **Material Control:** *It is the systematic control over the procurement, storage and usage of materials to maintain even flow of materials and avoiding at the same time excessive investment in inventories.*
- **Material Requisition Note:** *Document used to authorize and record the issue of materials from store.*
- **Purchase Requisition Note:** *Document is prepared by the storekeeper to initiate the process of purchases.*
- **Purchase Order:** *It is a written request to the supplier to supply certain specified materials at specified rates and within a specified period.*
- **Material received note:** *This document is prepared by receiving department which unpacks the goods received and verify the quantities and other details.*
- **Material Transfer Note***: This document is prepared when the material is transferred from one department to another.*
- **Material Return Note:** *It is a document given with the goods being returned from Factory back to the stores.*
- **Bin Card**: *A prime entry record of the quantity of stocks, kept on in/out/balance, held in designated storage areas.*

- **Stores Ledger:** *A ledger containing a separate account for each item of material and component stocked in store giving details of the receipts, issues and balance both in terms of quantity and value.*

- **Techniques of Inventory control:**

Techniques	*Description*
Setting of various stock levels.	***Minimum Level:*** *It is the minimum quantity, which must be retained in stock* *ROL- (Avg. consumption × Avg. Lead time)* ***Maximum Level:*** *It is the maximum limit upon which stock can be stored at any time* *ROL + ROQ – (Min consumption × Min Lead Time)* ***Re order Level:*** *It is the level, when reached the order needs to be placed* *Maximum lead time × Maximum Usage* *Or* *Minimum level + (Average rate of consumption × Average time to obtain fresh supplies).* ***Average Inventory Level*** *= Minimum level + 1/2 Re-order quantity* *Or* $= \frac{Maximum\ level + Minimum\ level}{2}$ ***Danger Level:*** *level where normal issue of materials is stopped, and only emergency materials are issued.* *Danger level = Average consumption × Lead time for emergency purchases*
ABC analysis	*Items are classified into the following categories:* ***A Category:*** *Quantity less than 10 % but value more than 70 %* ***B Category;*** *Quantity less than 20 % but value about 20 %* ***C Category:*** *Quantity about 70 % but value less than 10%*
Two bin system.	*If one bin items exhausts, new order is placed and till the mean time quantity from the other bin is purchased.*
Establishment of system of budgets.	*The exact quantity of various types of inventories and the time when they would be required can be ascertained in advance by preparing budgets.*
Use of perpetual inventory records and continuous stock verification.	*Continuous stock checking is done by taking different sections of the store in rotation*
Determination of economic order quantity	*It is the calculation of optimum level quantity which minimizes the total cost of Ordering and Delivery Cost and Carrying Cost*

	$EOQ = \sqrt{\frac{2AO}{C}}$ Carrying Cost: $\frac{EOQ \times \text{Carrying cost per unit}}{2}$ Ordering Cost: $\frac{A \times \text{Cost per order}}{EOQ}$ No. of Orders: $\frac{\text{Annual Usage}}{EOQ}$
Review of slow and non-moving items.	*Disposing of as early as possible slow moving items, in return with items needed for production to avoid unnecessary blockage of resources.*
Use of control ratios	*Input output ratio: It is the ratio of the quantity of input of material to production and the standard material content of the actual output.* *Inventory turnover ratio:* $\frac{\text{Cost of materials consumed during the period}}{\text{Cost of average stock held during the period}}$ *Average stock= 1/2 (opening stock + closing stock)*

- ***Valuation of Material Issues***

  First-in First-out method*: The materials received first are to be issued first when material requisition is received. Materials left as closing stock will be at the price of latest purchases.*

  Last-in First-out method*: The materials purchased last are to be issued first when material requisition is received. Closing stock is valued at the oldest stock price.*

  Simple Average Method: *Material Issue Price=* $\frac{\text{Total of unit price of each purchase}}{\text{Total Nos of Purchases}}$

  Weighted Average Price Method*: This method gives due weightage to quantities purchased and the purchase price to determine the issue price.*

  Weighted Average Price = $\frac{\text{Total cost of materials in stock}}{\text{Total quantity of materials}}$

- ***Various Material Losses***

  (a) Wastage: *Portion of basic raw material lost in processing having no recoverable value*

  (b) Scrap: *The incidental material residue coming out of certain manufacturing operations having low recoverable value.*

  (c) Spoilage: *Goods damaged beyond rectification to be sold without further processing.*

  (d) Defectives: *Goods which can be rectified and turned out as good units by the application of additional labour or other services.*

3

Labour

Learning Objectives

When you have finished studying this chapter, you should be able to:

- Understand the need of labour cost control,
- Understand the attendance and the payroll procedure
- Describe the meaning and accounting treatment of idle time and overtime
- Understand the concept of labour turnover and the various methods of computing the same
- Understand various types of systems of wage payment and incentives
- Describe the efficiency rating procedures.

3.1 Introduction

Labour cost after material cost is another significant element of cost not only because the wages bill in a modern organisation is generally substantial but also because it has certain peculiar characteristics which other elements of cost do not have. A good cost accountant must understand the special features of labour cost, the most important of which is that there is almost no limit to the increase of output of this most important and wonderful factor of production.

3.2 Classification of Labour Cost

Labour cost may be broadly classified as direct labour cost and indirect labour cost.

3.2.1 Direct Labour Cost: Wages paid to the employees which can be attributed to a cost object in an economically feasible manner. This can be easily identified and allocated to an activity, contract, cost centre, customer, process, product etc.

3.2.2 Indirect Labour Cost: Wages paid to the employees which cannot be directly attributed to a particular cost object.

Distinction between Direct and Indirect Labour Cost:

Direct labour cost	Indirect labour cost
1. It is the cost incurred in payment of labour who are directly engaged in the production process.	1. Cost incurred for payment of labour who are not directly engaged in the production process.
2. Direct labour cost can be easily identified and allocated to cost unit.	2. Indirect labour cost is apportioned on some appropriate basis.
3. Direct labour cost varies with the volume of production and has positive relationship with the volume.	3. Indirect labour cost may not vary with the volume of production.

3.3 Labour Cost Control

Labour costs are associated with human beings. To control labour costs one has to understand human behavior. Labour cost control means control over the cost incurred on labour. Control over labour costs does not imply control over the size of the wage bill; it also does not imply that wages of each worker should be kept as low as possible.

The aim should be to keep the wages per unit of output as low as possible. This can only be achieved by giving workers appropriate compensation to encourage efficiency so that optimum output can be achieved in effective manner.

A well motivated team of workers can bring about wonders. Each concern should, therefore, constantly strive to raise the productivity of labour. The efforts for the control of labour costs should begin from the very beginning. There has to be a concerted effort by all the concerned departments. In a large organisation, generally the following departments are involved in the control of labour costs:

Department	Functions
1. Personnel Department	i) On receipt of labour requisition from the various departments it searches for the required skills and qualification. ii) It ensures that the persons recruited posses the requisite qualification and skills required for the job. iii) Arranges proper training for the newly recruited workers and workshops for existing workers. iv) Maintains all personal and job related records of the employees. v) Evaluation of performance from time to time
2. Engineering and Work Study Department	i) Prepares plans and specifications for each job ii) Providing training and guidance to the employees iii) Supervises production activities

	iv) Conducts time and motion studies v) Undertakes job analysis. vi) Conducts job evaluation.
3.Time-keeping Department	This Department is primarily concerned with the maintenance of attendance records of the employees and the time spent by them on various jobs, etc.
4. Payroll Department	i) The preparation of payroll of the employees. ii) It disburses salary and wage payments.
5. Cost Accounting Department	This department is responsible for the accumulation and classification etc. of all type of costs. All such data pertaining to labour costs are also collected, analysed and allocated to various jobs, processes, departments, etc., by this department.

3.3.1 Important Factors for the Control of Labour Cost: To exercise an effective control over the labour costs, the essential requisite is efficient utilisation of labour and allied factors. The main points which need consideration for controlling labour costs are the following:

(i) Assessment of manpower requirements.

(ii) Control over time-keeping and time-booking.

(iii) Time & Motion Study.

(iv) Control over idle time and overtime.

(v) Control over labour turnover.

(vi) Wage systems.

(vii) Incentive systems.

(viii) Systems of wage payment and incentives.

(ix) Control over casual, contract and other workers.

(x) Job Evaluation and Merit Rating.

(xi) Labour productivity.

3.3.2 Collection of Labour Costs: The task of collecting labour costs is performed by the Cost Accounting Department which record separately wages paid to direct and indirect labour. It is the duty of this department to ascertain the effective wages per hour in each department and to analyse the total payment of wages of each department into:

(i) the amount included in the direct cost of goods produced or jobs completed;

(ii) the amount treated as indirect labour and thus included in overheads; and

(iii) the amount treated as the cost of idle time and hence loss.

(iv) the amount treated as abnormal loss/ gain and to be transferred to profit and loss account.

Through this process costs of various jobs are ascertained. Naturally, in this the proper recording of time spent by the workers is essential. Labour cost per hour may be collected through the use of the form given below:

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Department				*Labour Cost Report*					*Week ended*			
			Productive Time					*Wages Paid*				
Name of the employee	*Section*	*Day Work Hrs.*	*O/Time Hours*	*Total Hours*	*Paid Idle Time Hrs.*	*Total Time Hrs.*	*Time Hrs.*	*O/Time Premium*	*Bonus*	*Total*	*Cost per Production Hours*	
							(₹)	*(₹)*	*(₹)*	*(₹)*	*(₹)*	

3.4 Attendance & Payroll Procedures

3.4.1 Attendance Procedure / Time-keeping: It refers to correct recording of the employees' attendance time. Students may note the difference between "time keeping" and "time booking". The latter refers to break up of time on various jobs while the former implies a record of total time spent by the workers in a factory.

Objectives of Time-keeping: Correct recording of employees' attendance time is of utmost importance where payment is made on the basis of time worked.

Where payment is made by results *viz;* straight piece work, it would still be necessary to correctly record attendance for the purpose of ensuring that proper discipline and adequate rate of production are maintained. In fact the various objectives of time-keeping are as follows:

(i) For the preparation of payrolls.

(ii) For calculating overtime.

(iii) For ascertaining and controlling labour cost.

(iv) For ascertaining idle time.

(v) For disciplinary purposes.

(vi) For overhead distribution.

Methods of Time-keeping: There are two methods of time-keeping. They are the manual methods and the mechanical methods. The choice of a particular method depends upon the requirements and policy of a firm. But whichever method is followed, it should make a correct record of the time incurring the minimum possible expenditure and should minimise the risk of fraudulent payments of wages.

Methods	Descriptions
Manual	
(a) Attendance Register Method	It is the oldest method of recording time. Under this method, an attendance register is kept in the time office adjacent to the factory gate or in each department for workers employed therein. The time of a arrival and departure, may be noted down by an employee know as time-keeper. This method is simple and inexpensive and can be used in small firms where the number of workers is not large. This method may lead to dishonest practice of recording wrong time because there is possibility of collusion between some of the workers and the time-keeper. However, for recording the time of workers who work at customers' premises and places which are situated at a distance from the factory, this may be the only suitable method.
(b) Metal Disc Method	Under this method, each worker is allotted a metal disc or a token with a hole bearing his identification number. As the workers enter the factory gate, they remove their respective discs or tokens and place them in a box or tray kept near the board. Immediately after the scheduled time for entering the factory, the box is removed and the late comers will have to give their tokens to the time-keeper personally so that the exact time of their arrival could be recorded. It has certain disadvantages as given below: 1. There are chances that a worker may try to remove his companion's token from the board in order to get his presence marked when he is absent. 2. There are chances of disputes regarding the exact time of arrival of a worker because the time-keeper marking the attendance can commit mistakes deliberately or through carelessness. There is no authentic proof of the presence or absence of the workers. 3. There are chances of inclusion of dummy or ghost workers by the time-keeper.
Mechanical	
(a) Time Recording Clocks	The time recording clock is a mechanical device which automatically records the time of the workers. Under this method, each worker is given a Time Card and are serially arranged in a tray near the factory gate and as the worker enters the gate, he picks up his card from the tray, puts it in the time recording clock which prints the exact time of arrival in the proper space against the particular day. This process is repeated for recording time of departure for lunch, return from lunch and time of leaving the factory in the evening. Late arrivals, early leavings and

	overtime are printed in red to attract the attention of the management. ***Advantages:*** i There are no chances of disputes arising in connection with recording of time of workers because time is recorded by the time recording clock and not by the time-keeper. ii There is no scope for partiality or carelessness of the time-keeper as it is in case of manual methods. ***Disadvantages:*** i There are chances that a worker may try to get his friend's time card from the tray in order to get him marked present in time when he is actually late or get his presence marked when he is absent. This drawback can be removed if the time-keeper does not show carelessness. ii Sometimes, the time recording clock goes out of order and the work of recording of time is dislocated.
(b) Dial Time Records.	The dial time recorder is a machine which has a dial around the clock. This dial has a number of holes (usually about 150) and each hole bears a number corresponding to the identification number of the worker concerned. There is one radial arm at the centre of the dial. As a worker enters the factory gate, he is to press the radial arm after placing it at the hole of his number and his time will automatically be recorded on roll of a paper inside the dial time recorder against the number. The sheet on which the time is recorded provides a running account of the worker's time. ***Advantages:*** 1. This machine allows greater accuracy and can itself transcribe the number of hours to the wages sheets. 2. This machine can also calculate the wages of the workers and thus avoids much loss of time. ***Disadvantages:*** The high installation cost of the dial time recorder and its use for only a limited of workers are the drawbacks of this method.
(c) Punch Card attendance system	One of the most popular time clock attendance systems is punch card attendance system. A punch card is a flat and stiff paper with notches cut in it and contains digital information. In punch card attendance system, employees use this punch or proximity card for in and/or out. To use a punch card, employees just need to wave the card near a reader, which then ensures whether the correct person is logging in and/or out. ***Advantages:*** 1. Punch card attendance system prevents the proxy attendance and records the accurate in and/or out time of each employee.

	2. Employees just need to punch their cards and their attendance along with the time gets recorded so in short manual intervention is not there which avoids any kind of misconception. 3. There is no scope of editing and manipulation in records so it keeps utmost transparency in the organization. ***Disadvantages:*** Like all good things come along with bad things, punch card attendance system also has a few disadvantages, it has a complex software and hardware and needs expensive machines to install.
(d) Bio Metric Attendance system	Biometrics has unique recognizing features which are based on physical or behavioral traits of an individual. Recognizing an individual on the basis of physical traits include identification based on his fingerprint, face, DNA, eyes, iris, palm, etc while behavioral traits identification refers to voice or rhythm recognition. Based on this technology different recognition systems have been designed depending on different traits. **Fingerprint recognition system** - An automated method of verifying a match between human fingerprints. As fingerprint of every person is unique, it offers a very secure and reliable attendance monitoring. No buddy punching/ proxy attendance is possible. **Face recognition**- Based on automatic identification and verification of face by digital image or video frame and matching it with facial database present in it software. Mainly used in security systems. **Time and attendance Tracking technology –** Time and attendance technology helps the companies to keep a track on the attendance and working hours of the employee in order to make their payment. This technology has proved to be a real time and money saver for all types of business. This technology has replaced all the paper sheets and other manual systems at rapid speed. It has two types of systems. One is web-based and the other is PC-based. It depends on the type of business whether which system suits it.

Requisites of a Good Time-keeping System: A good time-keeping system should have following requisites:

1. System of time-keeping should be such which should not allow proxy for another worker under any circumstances.
2. There should also be a provision of recording of time of piece workers so that regular attendance and discipline may be maintained. This is necessary to maintain uniformity of flow of production.
3. Time of arrival as well as time of departure of workers should be recorded so that total time of workers may be recorded and wages may be calculated accordingly.

4. As far as possible, method of recording of time should be mechanical so that chances of disputes regarding time may not arise between workers and the time-keeper.
5. Late-comers should record late arrivals. Any relaxation by the time-keeper in this regard will encourage indiscipline.
6. The system should be simple, smooth and quick. Unnecessary queuing at the factory gate should be avoided. Sufficient clocks should be installed keeping in view the number of workers so that workers may not have to wait for a long period for recording their time of arrivals and departures.
7. A responsible officer should pay frequent visits at the factory gate to see that proper method of recording of time is being followed.

Time-Booking - The clock card is required, essentially, for the correct determination of the amount of wages due to a worker on the basis of time he has put in the factory.

It merely records day by day and period by period the total time spent by each individual worker in the factory. But it does not show how that time was put to use in the factory—how an individual worker utilised his time in completing jobs entrusted to him and how long he was kept waiting for one reason or another due to lack of work, lack of material and supplies, lack of instructions, machine breakdowns, power failures and the like. These are all vital pieces of information necessary for the proper collection of cost data and for effective controlling of costs. For the collection of all such information, a separate record, generally known as Time (or Job) card, is kept.

The time (or job) card can be of two types—

- ***One containing analysis of time with reference to each job:*** A separate job card is employed in respect of a job undertaken; where a job involves several operations, a separate entry is made in respect of each operation.

  Thus the job card would record the total time spent on a particular job or operation. If a number of people are engaged on the same job or operation, the time of all those workers would be booked on the same card.

  One advantage of this method is that it provides complete data on the labour content of job or operation collectively so that the computation of labour cost is greatly facilitated.

  But this method has drawbacks as well. Since a worker's job timing is scattered over a number of job cards the time spent on all these jobs and idle time must be abstracted periodically for finding each worker's total time spent on different jobs and the time for which he remained idle during the period. The total of these two times (job and idle) must obviously equal his total attendance time, as shown by his clock card or attendance register.

  Thus, it would be seen that if the job cards are made out according to job or operation a separate summary has to be prepared for reconciling each worker's job and idle time with his gate time. It would be quite obvious that such a reconciliation is of great importance from the point of view of labour costs.
- ***The other with reference to each worker****:* In this case, it would greatly facilitate reconciliation of the worker's job time with his gate time.

Under this system, a card would be issued to each worker for each day or for each week and the time which he spends on different jobs (and also any idle time) would be recorded in the same card so that the card would have a complete history on it as to how his time had been spent during the period. Since all the details would be on one card the total time accounted for in the job card would be readily tallied with the total time put in the Gate Card or attendance register. In this case however, a Labour Abstract for different jobs would have to be prepared from the card of individual worker so that total hours (and/or their value) put in by different workers on different jobs during the period could be ascertained and aggregated. It would thus be seen that according to either of the method a process of abstraction and reconciliation is necessary

Specimens of two types of job cards are given below:

JOB CARD (1st type)

Description of ..... Job No. .....

Department ..... Date.....

Worker's No.	Start	Stop	Elapsed time	Actual time taken	Rate	Amount

Supervisor's initial

JOB (OR TIME) CARD (2nd type)

No..... Date.....

Name of the worker ..... Ticket No.....

Department.....

Operation.....

Job No.	Start	Stop	Time Elapsed	Time	Rate	Amount

Supervisor's initial

Reconciliation of gate and job cards - An advantage of the introduction of job card is that:-

i It enables a reconciliation to be made of the time spent by the worker in each department with the time paid for as per the attendance record.

ii Reconciliation not only helps in locating wastage of time, but also in preventing dummy workers being put on the payroll of workers paid for time not worked by them.

The two sets of records serve separate purposes.

Where payment to labour is on the time rate basis, the Gate Card is a record of the hours of work that should be paid for. Since the Gate Card merely records the hours during which the worker has been within the premises of the factory and it does not contain any details as to how those hours have been put to use by the worker in his department, a job card must be prepared to provide the necessary information. As we have already seen, the job card may be prepared either worker-wise or job-wise.

Objectives of Time-Booking - Objectives of time-booking are as follows:

1. To ensure that time paid for, according to time keeping, has been properly utilised on different jobs or work orders.
2. To ascertain the cost of each job or work order.
3. To provide a basis for the apportionment of overhead expenses over various jobs/work orders when the method for the allocation of overhead depends upon time spent on different jobs.
4. To calculate the amount of wages and bonus payable under the wage incentive system.
5. To ascertain the labour hours spent on each job and the idle labour hours.

3.4.2 Payroll procedure: Steps included in this process are as under:

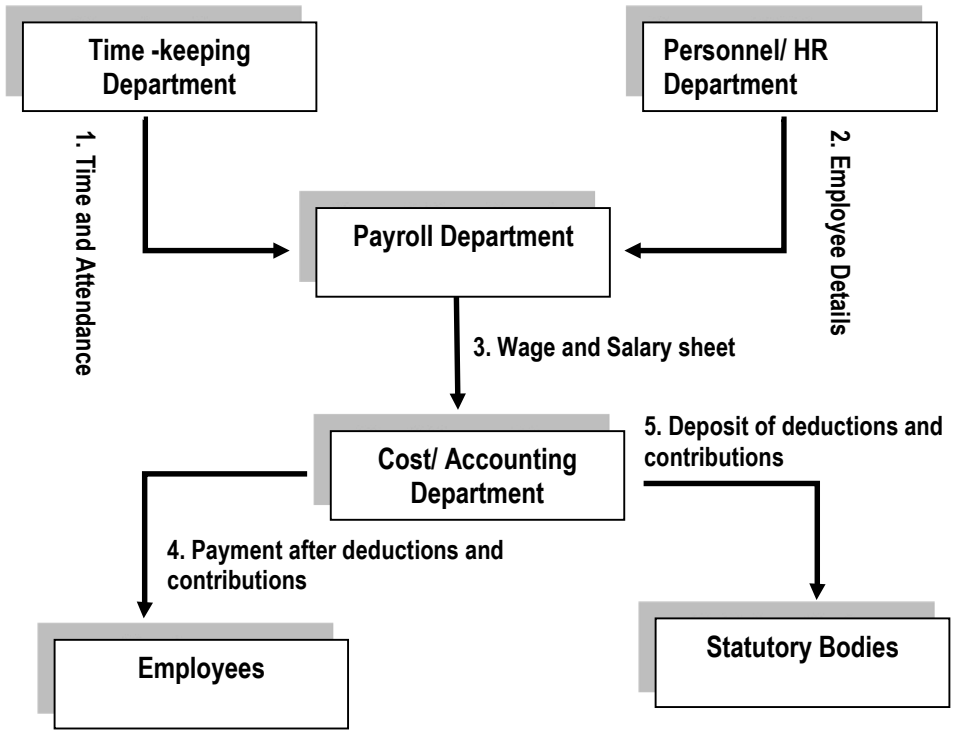


Diagram: Payroll Procedures

1. **Attendance and Time details:** A detailed sheet of number of days or hours worked by each employee (in case of time based payment) and units or percentage of work (in case of piece rate) as reflected by the time keeping methods are sent to the payroll department by the time keeping department. Further, payroll department with the help of time booking records calculate any further incentives such as overtime payment, bonus to be paid to the employees.
2. **List of employees and other details:** A list of employees on roll and the rate at which they will be paid is sent by the personnel/ HR department. Payroll department should ensure that no unauthorised person can paid.
3. **Computation of wages and other incentives:** Payroll department based on the details provided by the time keeping department and personnel department calculate wages/ salary to be paid to the employees. Payroll department prepares pay slip for all employees authorized by the personnel department and forward the same to the cost/ accounting department for further deductions and payment.
4. **Payment to the employees:** Cost/ accounting department deduct all statutory deduction such as employee's contribution to provident fund and employee state insurance (ESI) scheme, TDS on salary etc. After all deductions wages/ salary is paid to the employees.
5. **Deposit of all statutory liabilities:** All statutory deduction made from the employees alongwith employer's contributions such as provident fund and employee state insurance scheme are paid to the respective statutory bodies.
6. **Investigation:** Should a clock card (attendance sheet) for an employee not listed on the payroll sheet be found, investigation of its propriety is required. Likewise, there should be an explanation for any missing clock cards deductions: After the gross earnings (that is, the total amount earned by an employee before any deductions are taken into consideration) have been calculated for every employee, deductions are entered on the payroll sheet, and the net pay of each employee is determined.

The followings are generally deducted from the payroll

Type of deductions	Description
Statutory Deductions	
1. Provident fund	Employee's contribution to the Provident fund is deducted from the salary/ wages of the concerned employee. Employee's contribution to the fund shall be equal to contribution payable by the employer.
2. Employee State Insurance Scheme (ESI)	Employee's contribution to the ESI is deducted from the salary/ wages. Currently, the employee's contribution rate (w.e.f. 1.1.97) is 1.75% of the wages
3. Tax Deduction at Source (TDS)	Employer is obliged to deduct tax at source if it will be paying to the employee net salary exceeding maximum exemption limit

	in equal installments.
4. Professional Tax	In India, the professional tax is imposed at the state level. Business owners, working individuals, merchants and people carrying out various occupations comes under the purview of this tax. Professional tax is deducted based on predetermined slabs.
Other Deductions	
1. Voluntary contribution to Provident fund	If any employee so desires may contribute over and above the contribution payable by the employer.
2. Contribution to any benevolent fund.	An employee may contribute to any benevolent fund voluntarily by a putting a request to the payroll department.
3. Loan deductions	Installments of any loan taken by the employee.
4. Other advances and dues	Other advances like festival advance and unadjusted advances taken.

3.5 Idle Time

It is a time during which no production is carried out because the worker remains idle even though they are paid. Idle time can be normal idle or abnormal idle time.

Normal idle time: It is the time which cannot be avoided or reduced in the normal course of business.

Causes	Treatment
1. The time lost between factory gate and the place of work 2. The interval between one job and another 3. The setting up time for the machine 4. Normal fatigue etc.	It is treated as a part of the cost of production. Thus, in the case of direct workers an allowance for normal idle time is built into the labour cost rates. In the case of indirect workers, normal idle time is spread over all the products or jobs through the process of absorption of factory overheads

Abnormal idle time: Apart from normal idle time, there may be factors which give rise to abnormal idle time.

Causes	Treatment
1. Idle time may also arise due to abnormal factors like lack of coordination 2. Power failure, Breakdown of machines 3. Non-availability of raw materials, strikes, lockouts, poor supervision, fire,	*Abnormal idle time* cost is not included as a part of production cost and is shown as a separate item in the Costing Profit and Loss Account. The cost of abnormal idle time should be further categorised into controllable and

flood etc. 4. The causes for abnormal idle time should be further analysed into controllable and uncontrollable. i) *Controllable abnormal idle time* refers to that time which could have been put to productive use had the management been more alert and efficient. All such time which could have been avoided is controllable idle time. ii) *Uncontrollable abnormal idle time* refers to time lost due to abnormal causes, over which management does not have any control *e.g.*, breakdown of machines, flood etc. may be characterised as uncontrollable idle time.	uncontrollable. For each category, the break-up of cost due to various factors should be separately shown. This would help the management in fixing responsibility for controlling idle time. Management should aim at eliminating controllable idle time and on a long-term basis reducing even the normal idle time. This would require a detailed analysis of the causes leading to such idle time.

Illustration 1: (Calculation of effective hourly cost)

'X' an employee of ABC Co. gets the following emoluments and benefits:

(a)	*Basic pay*	*₹ 1,000 p.m.*
(b)	*Dearness allowance*	*₹ 200 p.m.*
(c)	*Bonus*	*20% of salary and D.A.*
(d)	*Other allowances*	*₹ 250 p.m.*
(e)	*Employer's contribution to P.F.*	*10% of salary and D.A.*

'X' works for 2,400 hours per annum, out of which 400 hours are non-productive and treated as normal idle time. You are required to find out the effective hourly cost of employee 'X'.

Solution

Statement showing computation of effective hourly cost of employee 'X'

(i) Earning of Employee 'X':

	Per month (₹)	*Per annum* (₹)
Basic pay	1,000	12,000
Dearness Allowance	200	2,400
Bonus	240	2,880
Employer's contribution to provident fund	120	1,440

	Other allowance	250	3,000
		1,810	21,720
(ii)	Effective working hours :		
	Annual working hours		2,400
	Less : Normal idle time		400
	Effective working hours		2,000
	Effective hourly cost of 'X' : ₹ 21,720/2,000		10.86

3.6 Overtime

Overtime premium: Work done beyond normal working hours is known as 'overtime work'. Overtime payment is the amount of wages paid for working beyond normal working hours. The rate for overtime work is higher than the normal time rate; usually it is at double the normal rates. The extra amount so paid over the normal rate is called overtime premium.

As per the Factories Act 1948 " Where a worker works in a factory for more than nine hours in any day or for more than fortyeight hours in any week, he shall, in respect of overtime work, be entitled to wages at the rate of twice his ordinary rate of wages."
Where any workers in a factory are paid on a piece-rate basis, the time rate shall be deemed to be equivalent to the daily average of their full-time earnings for the days on which they actually worked on the same or identical job during the month immediately preceding the calendar month during which the overtime work was done, and such time rates shall be deemed to be the ordinary rates of wages of those workers
Ordinary rate of wages means the basic wages plus such allowances, including the cash equivalent of the advantage accruing through the concessional sale to workers of food grains and other articles, as the worker is for the time being entitled to, but does not include a bonus and wages for overtime work.

Occasional overtime is a healthy sign since it indicates that the firm has the optimum capacity and that the capacity is being fully utilised. But persistent overtime is rather a bad sign because it may indicate either (*a*) that the firm needs larger capacity in men and machines, or (*b*) that men have got into the habit of postponing their ordinary work towards the evening so that they can earn extra money in the form of overtime wages.

Causes of Overtime and Treatment of Overtime premium in cost accounting

Causes	*Treatment*
(1) The customer may agree to bear the entire charge of overtime because of urgency of work.	(1) If overtime is resorted to at the desire of the customer, then overtime premium may be charged to the job directly.
(2) Overtime may be called for to make up	(2) If overtime is required to cope with

any shortfall in production due to some unexpected development.	general production programmes or for meeting urgent orders, the overtime premium should be treated as overhead cost of the particular department or cost centre which works overtime.
(3) Overtime work may be necessary to make up a shortfall in production due to some fault of management.	(3) If overtime is worked in a department due to the fault of another department, the overtime premium should be charged to the latter department.
(4) Overtime work may be resorted to, to secure an out-turn in excess of the normal output to take advantage of an expanding market or of rising demand	(4) Overtime worked on account of abnormal conditions such as flood, earthquake etc., should not be charged to cost, but to Costing Profit and Loss Account.

Effect of overtime payment on productivity: Overtime work should be resorted to only when it is extremely essential because it involves extra cost. The overtime payment increases the cost of production in the following ways:

1. The overtime premium paid is an extra payment in addition to the normal rate.
2. The efficiency of operators during overtime work may fall and thus output may be less than normal output.
3. In order to earn more the workers may not concentrate on work during normal time and thus the output during normal hours may also fall.
4. Reduced output and increased premium of overtime will bring about an increase in costs of production.
5. Gives rise to associated costs. (wear and tear of machinery, power etc.)

Steps for controlling overtime: To keep overtime to its minimum, it is necessary to exercise proper control over the overtime work. The suitable procedure which may be adopted for controlling overtime comprises the following steps:

1. Watch on the output during normal hours should be maintained to ensure that overtime is not granted when normal output is not obtained during the normal hours, without any special reasons.
2. Statement concerning overtime work be prepared along with justifications, at appropriate places for putting up before the competent authority.
3. Prior sanction about overtime should be obtained from competent authority.

4. Actual rate of output produced during the overtime period should be compared with normal rate of output.
5. Periodical reports on overtime wages should be sent to top management for taking corrective action.
6. If possible an upper limit may be fixed for each category of workers in respect of overtime.

Illustration 2: (Calculation of earnings)

Calculate the earnings of A and B from the following particulars for a month and allocate the labour cost to each job X, Y and Z:

	A	*B*
(i) Basic Wages (₹)	*100*	*160*
(ii) Dearness Allowance	*50%*	*50%*
(iii) Contribution to provident Fund (on basic wages)	*8%*	*8%*
(iv) Contribution to Employee's State Insurance (on basic wages)	*2%*	*2%*
(v) Overtime (Hours)	*10*	*--*

The normal working hours for the month are 200. Overtime is paid at double the total of normal wages and dearness allowance. Employer's contribution to state Insurance and Provident Fund are at equal rates with employees contributions. The two workers were employed on jobs X, Y and Z in the following proportions:

Jobs	*X*	*Y*	*Z*
Worker A	*40%*	*30%*	*30%*
Worker B	*50%*	*20%*	*30%*

Overtime was done on job Y.

Answer

Statement showing Earnings of Workers A and B

	A (₹)	B (₹)
Basic wages	100.00	160.00
Dearness Allowance (50% of Basic Wages)	50.00	80.00
Overtime wages (Refer to Working Note 1)	15.00	--
Gross wages earned	165.00	240.00
Less: Contribution to Provident fund	(8.00)	(12.80)
Less: Contribution to ESI	(2.00)	(3.20)
Net wages earned	155.00	224.00

Statement of Labour Cost

	A (₹)	B (₹)
Gross Wages (excluding overtime)	150.00	240.00
Add: Employer's contribution to PF	8.00	12.80
Add: Employer's contribution to ESI	2.00	3.20
Gross wages earned	160.00	256.00
Normal working hours	200	200
Ordinary wages arte per hour	0.80	1.28

Statement Showing Allocation of Wages to Jobs

	Total Wages (₹)	Jobs		
		X (₹)	Y (₹)	Z (₹)
Worker A:				
- Ordinary Wages (4: 3 : 3)	160.00	64.00	48.00	48.00
- Overtime	15.00	--	15.00	--
Worker B:				
- Ordinary Wages (5 : 2 : 3)	256.00	128.00	51.20	76.80
	431.00	192.00	114.20	124.80

Working Notes

1. Normal Wages are considered as basic wages

$$\text{Over time} = \frac{2 \times (\text{Basic wage + DA}) \times 10 \text{ hours}}{200}$$

$$= 2 \times \left(\frac{₹150}{200}\right) \times 10 \text{ hours} = 1.50 \times 10 \text{ hours} = ₹ 15$$

Illustration 3: (Calculation of overtime premium)

It is seen from the job card for repair of the customer's equipment that a total of 154 labour hours have been put in as detailed below:

	Worker 'A' paid at ₹ 200 per day of 8 hours	*Worker 'B' paid at ₹ 100 per day of 8 hours*	*Worker 'C' paid at ₹ 300 per day of 8 hours*
Monday (hours)	*10.5*	*8.0*	*10.5*
Tuesday (hours)	*8.0*	*8.0*	*8.0*

Wednesday (hours)	*10.5*	*8.0*	*10.5*
Thursday (hours)	*9.5*	*8.0*	*9.5*
Friday (hours)	*10.5*	*8.0*	*10.5*
Saturday (hours)	*--*	*8.0*	*8.0*
Total (hours)	*49.0*	*48.0*	*57.0*

In terms of an award in a labour conciliation, the workers are to be paid dearness allowance on the basis of cost of living index figures relating to each month which works out @ ₹ 968 for the relevant month. The dearness allowance is payable to all workers irrespective of wages rate if they are present or are on leave with wages on all working days.

Sunday is a weekly holiday and each worker has to work for 8 hours on all week days and 4 hours on Saturdays; the workers are however paid full wages for Saturday (8 hours for 4 hours worked).

Workers are paid overtime according to the Factories Act, 1948. Excluding holidays the total number of hours works out to 176 in the relevant month. The company's contribution to Provident Fund and Employees State Insurance Premium are absorbed into overheads.

Work out the wages payable to each worker.

Solution

(1) Calculation of hours to be paid for worker A :

	Normal hours	Extra hours	Overtime hours	Equivalent normal hours for overtime worked	Total normal hours
Monday	8	1	1½	3	12
Tuesday	8	--	--	--	8
Wednesday	8	1	1½	3	12
Thursday	8	1	½	1	10
Friday	8	1	1½	3	12
Saturday	--	--	--	--	--
Total	40	4	5	10	54

Calculation of hours to be paid for worker B :

	Normal hours	Extra hours	Overtime hours	Equivalent normal hours for overtime worked	Total normal hours
Monday	8	---	---	---	8
Tuesday	8	---	---	---	8
Wednesday	8	---	---	---	8

Thursday	8	---	---	---	8
Friday	8	---	---	---	8
Saturday	4	4*	---	---	8
Total	44	4	---	---	48

(*Worker-B has neither worked more than 9 hours in any day nor more than 48 hours in the week)

Calculation of hours to be paid for worker C :

	Normal hours	Extra hours	Overtime hours	Equivalent normal hours for overtime worked	Total normal hours
Monday	8	1	1½	3	12
Tuesday	8	---	---	---	8
Wednesday	8	1	1½	3	12
Thursday	8	1	½	1	10
Friday	8	1	1½	3	12
Saturday	4	---	4*	8	12
Total	44	4	9	18	66

(*Worker-C has worked more than 48 hours in the week)

Wages payable:

	A	B	C
Basic Wages per hour (₹)	25.00	12.50	37.50
Dearness allowance per hour (₹)	5.50	5.50	5.50
Hourly rate (₹)	30.50	18.00	43.00
Total normal hours	54.00	48.00	66.00
Total Wages payable (₹)	1,647.00	864.00	2,838.00

Illustration 4: (Calculation of labour cost chargeable to a job)

In a factory, the basic wage rate is ₹ 10 per hour and overtime rates are as follows :

Before and after normal working hours	:	*175% of basic wage rate*
Sundays and holidays	:	*225% of basic wage rate*
During the previous year, the following hours were worked	:	
Normal time	:	*1,00,000 hours*
Overtime before and after working hours	:	*20,000 hours*

Overtime on Sundays and holidays	:	*5,000 hours*
Total	:	*1,25,000 hours*
The following hours have been worked on job 'Z'	:	
Normal	:	*1,000 hours.*
Overtime before and after working hrs.	:	*100 hours.*
Sundays and holidays	:	*25 hours.*
Total	:	*1,125 hours.*

You are required to calculate the labour cost chargeable to job 'Z' and overhead in each of the following instances:

(a) Where overtime is worked regularly throughout the year as a policy due to the labour shortage.

(b) Where overtime is worked irregularly to meet the requirements of production.

(c) Where overtime is worked at the request of the customer to expedite the job.

Solution

Workings

Computation of average inflated wage rate (including overtime premium) :

Basic wage rate	:	₹ 10 per hour
Overtime wage rate before and after working hours	:	₹ 10 × 175% = ₹ 17.50 per hour
Overtime wage rate for Sundays and holidays	:	₹ 10 × 225% = ₹ 22.50 per hour
Annual wages for the previous year for normal time	:	1,00,000 hrs. × ₹ 10 = ₹ 10,00,000
Wages for overtime before and after working hours	:	20,000 hrs. × ₹ 17.50=₹ 3,50,000
Wages for overtime on Sundays and holidays	:	5,000 hrs. × ₹ 22.50 = ₹ 1,12,500
Total wages for 1,25,000 hrs.		= ₹14,62,500
Average inflated wage rate	:	$\frac{₹14,62,500}{1,25,000 \text{ hours}}$ = ₹11.70

(a) ***Where overtime is worked regularly as a policy due to labour shortage,*** the overtime premium is treated as a part of labour cost and job is charged at an inflated wage rate.

Hence,

Labour cost chargeable to job Z = Total hours × Inflated wage rate
= 1,125 hrs. × ₹ 11.70 = ₹ 13,162.50

(b) ***Where overtime is worked irregularly to meet the requirements of production***, basic wage rate is charged to the job and overtime premium is charged to factory overheads as under :

Labour cost chargeable to			
Job Z : 1,125 hours @ ₹ 10 per hour	=	₹	11,250.00
Factory overhead : 100 hrs. × ₹ (17.50 – 10)	=	₹	750.00
25 hrs. × ₹ (22.50 – 10)	=	₹	312.50
Total factory overhead		₹	1,062.50

(c) ***Where overtime is worked at the request of the customer***, overtime premium is also charged to the job as under :

			(₹)
Job Z labour cost	1,125 hrs. @ ₹ 10	=	11,250.00
Overtime premium	100 hrs. @ ₹ (17.50 – 10)	=	750.00
	25 hrs. @ ₹ (22.50 – 10)	=	312.50
Total			12,312.50

3.7 Labour Turnover

Labour turnover in an organisation is the rate of change in the composition of labour force during a specified period measured against a suitable index.

The standard of usual labour turnover in the industry or locality or the labour turnover rate for a past period may be taken as the index or norm against which actual turnover rate is compared.

There are three methods of calculating labour turnover which are given below :

(i) **Replacement method** : This method takes into consideration actual replacement of labour irrespective of number of persons leaving

$$= \frac{\text{Number of employees replaced}}{\text{Average number of employees on roll}} \times 100$$

New labour appointed on account of expansion not to be included in number of replacements

(ii) **Separation method:** In this method labour turnover is measured by dividing the total number of separations during the period by the average total number of workers on payroll during the same period

$$= \frac{\text{Number of employees separated during the year}}{\text{Average number of employees on roll during the period}} \times 100$$

(iii) **Flux method:** This method takes into account both the number of replacements as well as the number of separations during the period

$$= \frac{\text{Number of employees separated} + \text{Number of employees replaced}}{\text{Average number of employees on roll during the period}} \times 100$$

Labour turnover due to new recruitment: Workers joining a business concern on account of its expansion do not account for labour turnover. But these newly recruited workers are certainly responsible for a change in the composition of labour force, due to this feature, some cost accountants measure workers to the extent of new (excluding replacements) joining the labour force as follows :

$$\Rightarrow \frac{\text{No. of new workers joining in a period (excluding replacements)}}{\text{Average number of workers on the roll in a period}} \times 100$$

The total number of workers joining, including replacements, is called accessions. The labour turnover rate, in such a case, may also be computed in respect of total number of workers joining (accessions) the business concern, during a given period both on account of replacements and because of expansion is as under:

$$\Rightarrow \frac{\text{No.of accessions in a period}}{\text{Average number of workers in a period}} \times 100$$

When number of accessions are considered for measuring labour turnover, the labour turnover rate by flux method may be computed by using any one of the following expressions:

Labour turnover rate (Flux method) =

$$\frac{\text{No. of separations} + \text{No. of replacements} + \text{No. of new recruitments}}{\text{Average number of workers}} \times 100$$

OR

$$\frac{\text{No. of separations} + \text{No. of accessions}}{\text{Average number of workers}} \times 100$$

The above rate of labour turnover indicates the total effect of number of workers separated, number of workers replaced and number of new workers recruited and joined the concern on account of its expansion, etc.

If in the above computations, the data given is for a period other than a year, the labour turnover rate so computed may be converted into equivalent annual labour turnover rate by the following formula:

$$\text{Equivalent annual labour turnover rate} = \frac{\text{Turnover rate for the period}}{\text{Number of days in the period}} \times 365$$

Causes of Labour Turnover : The main causes of labour turnover in an organization/ industry can be broadly classified under the following three heads :

(a) Personal Causes;

(b) Unavoidable Causes; and

(c) Avoidable Causes.

Personal causes are those which induce or compel workers to leave their jobs; such causes include the following:

(i) Change of jobs for betterment.

(ii) Premature retirement due to ill health or old age.

(iii) Domestic problems and family responsibilities.

(iv) Discontent over the jobs and working environment.

In all the above cases the employee leaves the organisation at his will and, therefore, it is difficult to suggest any possible remedy in the first three cases.

But the last one can be overcome by creating conditions leading to a healthy working environment. For this, officers should play a positive role and make sure that their subordinates work under healthy working conditions.

Unavoidable causes are those under which it becomes obligatory on the part of management to ask one or more of their employees to leave the organisation; such causes are summed up as listed below:

(i) Seasonal nature of the business;

(ii) Shortage of raw material, power, slack market for the product etc.;

(iii) Change in the plant location;

(iv) Disability, making a worker unfit for work;

(v) Disciplinary measures;

(vi) Marriage (generally in the case of women).

Avoidable causes are those which require the attention of management on a continuous basis so as to keep the labour turnover ratio as low as possible. The main causes under this case are indicated below :

(1) Dissatisfaction with job, remuneration, hours of work, working conditions, etc.,

(2) Strained relationship with management, supervisors or fellow workers;

(3) Lack of training facilities and promotional avenues;

(4) Lack of recreational and medical facilities;

(5) Low wages and allowances.

Proper and timely management action can reduce the labour turnover appreciably so far as avoidable causes are concerned.

Effects of Labour Turnover: High labour turnover increases the cost of production in the following ways:

(i) Even flow of production is disturbed;

(ii) Efficiency of new workers is low; productivity of new but experienced workers is low in the beginning;

(iii) There is increased cost of training and induction;

(iv) New workers cause increased breakage of tools, wastage of materials, etc.

In some companies, the labour turnover rates are as high as 100%; it means that on the average, all the work is being done by new and inexperienced workers. This is bound to reduce efficiency and production and increases the cost of production.

(v) Cost of recruitment and training increases.

Two types of costs which are associated with labour turnover are :

(a) Preventive costs: These include costs incurred to keep the labour turnover at a low level, *i.e.* cost of medical services, welfare schemes and pension schemes. If a company incurs high preventive costs, the rate of labour turnover is usually low.

(b) Replacement costs: These are the costs which arise due to high labour turnover. If men leave soon after they acquire the necessary training and experience of good work, additional costs will have to be incurred on new workers, *i.e.,* cost of employment, training and induction, abnormal breakage and scrap and extra wages and overheads due to the inefficiency of new workers.

It is obvious that a company will incur very high replacement costs if the rate of labour turnover is high. Similarly, only adequate preventive costs can keep labour turnover at a low level. Each company must, therefore, work out the optimum level of labour turnover keeping in view its personnel policies and the behaviour of replacement cost and preventive costs at various levels of labour turnover rates.

Remedial Steps To Minimise Labour Turnover - The following steps are useful for minimising labour turnover.

1. ***Exit interview*:** An interview be arranged with each outgoing employee to ascertain the reasons of his leaving the organisation.
2. ***Job analysis and evaluation*:** Before recruiting workers, job analysis and evaluation may be carried out to ascertain the requirements of each job.
3. ***Scientific system of recruitment, placement and promotion*:** The organisation should make use of a scientific system of recruitment, selection, placement and promotion for employees.
4. ***Enlightened attitude of management*:** The management should introduce the following steps for creating a healthy working atmosphere:
   (i) Service rules should be framed, discussed and approved among management and workers, before their implementation.

(ii) Provide facilities for education and training of workers.

(iii) Introduce a procedure for settling worker's grievances.

5. ***Use of committee*:** Issues like control over workers, handling their grievances etc., may be dealt by a committee, comprising of members from management and workers.

Illustration 5: (Calculation of cost of labour turnover)

The management of Bina and Rina Ltd. are worried about their increasing labour turnover in the factory and before analyzing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to ₹ 83,03,300 and P/V ratio was 20 per cent. The total number of actual hours worked by the Direct Labour force was 4.45 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive.

The costs incurred consequent on labour turnover revealed, on analysis, the following:

Settlement cost due to leaving	*₹ 43,820*
Recruitment costs	*₹ 26,740*
Selection costs	*₹ 12,750*
Training costs	*₹ 30,490*

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit foregone last year on account of labour turnover.

Solution

Determination of contribution foregone

Actual hours worked (given)	4,45,000
Less : Unproductive training hours	15,000
Actual productive hours	4,30,000

The potentially productive hours lost are 1,00,000

$$\text{Sales lost for 1,00,000 hours} = \frac{₹83,03,300}{4,30,000 \text{ hrs}} \times 1,00,000 \text{ hrs} = ₹\ 19,31,000$$

Contribution lost for 1,00,000 hrs.

$$= \frac{₹19,31,000}{100} \times 20 = ₹\ 3,86,200$$

Statement showing profit foregone last year on account of labour turnover of Bina and Rina Ltd.

	(₹)
Contribution foregone (as calculated above)	3,86,200
Settlement cost due to leaving	43,820
Recruitment cost	26,740
Selection cost	12,750
Training costs	30,490
Profit foregone	5,00,000

Illustration 6: (Calculation of workers recruited, joined and discharged)

The Cost Accountant of Y Ltd. has computed labour turnover rates for the quarter ended 31st March, 20X1 as 10%, 5% and 3% respectively under 'Flux method', 'Replacement method' and 'Separation method' respectively. If the number of workers replaced during that quarter is 30, find out the number of:

(1) workers recruited and joined and (2) workers left and discharged.

Solution

Working Note:

Average number of workers on roll:

$$\text{Labour turnover rate under replacement method} = \frac{\text{No. of replacements}}{\text{Average number of workers on roll}} \times 100$$

$$\text{Or,} \quad \frac{5}{100} = \frac{30}{\text{Average number of workers on roll}}$$

$$\text{Or Average number of workers on roll} = \frac{30 \times 100}{5} = 600$$

(1) *Number of workers recruited and joined :*

$$\text{Labour turnover rate (Flux method)} = \frac{\text{No. of separations * (S)} + \text{No. of accessions(A)}}{\text{Average number of workers on roll}} \times 100$$

$$\text{Or} \quad \frac{10}{100} = \frac{18^* + A}{600}$$

$$\text{Or} \quad A = \left[\frac{6000}{100} - 18\right] = 42$$

No. of workers recruited and joined 42.

(2) *Number of workers left and discharged :*

$$\text{Labour turnover rate (}\textit{Separation method}\text{)} = \frac{\text{No. of separations(S)}}{\text{Average number of workers on roll}} \times 100$$

$$\frac{3}{100} = \frac{S}{600}$$

Or $S^* = 18$

Hence, number of workers left and discharged comes to 18.

3.8 Incentive System

3.8.1 Important factors necessary for introducing of an incentive system: An incentive can be defined as the stimulation for effort and effectiveness by offering monetary inducement or enhanced facilities. It may be provided individually or collectively.

It may be monetary in the form of a bonus where the employee gets a reward for his efforts directly or non-monetary tending to improve living and working conditions where a group of employees or individuals share the reward arising out of their combined effort in equitable production.

The main factors that should be taken into account before introducing a scheme of incentives are stated below:

(i) ***System of Quality Control:*** The need for producing goods of high quality or those having very good workmanship or finish and the manner this can be ensured. Only if a system of quality control can be relied upon to maintain the quality of goods of the standard required, an incentive scheme should be introduced; otherwise, workers should be paid on time basis.

(ii) ***Maximise production:*** The need to maximise production—thus required incentives to be given to workers. But sometimes workmanship is more important than quantity of output; in such cases, incentive schemes of wage payment are not suitable.

(iii) ***Precision in measuring quantity of Work:*** Where the quantity of work done cannot be measured precisely, incentive schemes cannot be offered.

(iv) ***Role of Management in Incentive Schemes*****:** The role of management and workers in achieving greater efficiency, if it is unnecessary for the management to constantly plan work, for example, when the work is repetitive, workers should be offered good incentives to achieve high efficiency; but in case management is constantly required to plan the work, as in the case of job work, the management should share the fruits of extra efficiency achieved. This factor determines the choice of a particular incentive scheme.

(v) ***Effort of Workers:*** Whether the quantity of output is within the control of the worker and if so, to what extent. Sometimes, as in the case of chain assembly work the output is not dependent on the effort put in by workers; incentive schemes in such cases are not suitable.

(vi) ***Standards of Performance:*** The exactitude with which standards of performance can be laid down. Fixation of standard is necessary for the introduction of a scheme of incentives. When this requires heavy expenditure, incentive schemes may be rather costly.

(vii) ***No Discrimination:*** The effect of an incentive scheme for one set of workers on other workers. If for instance, an incentive scheme makes it possible for unskilled workers to earn high wages, the wage rates for skilled workers must also be raised (if they are paid on time basis) to avoid dissatisfaction among them. In that event, the incentive scheme may raise labour cost instead of lowering it.

(viii) ***Comparative Study:*** The system of wage payment prevailing in other areas and industries or similar occupations. If possible, there should be uniformity.

(ix) ***Attitude of Workers:*** The attitude of labour and trade unions towards incentive schemes. Workers usually like to have a certain guaranteed time-basis wage but also like to earn extra through an incentive scheme.

On the whole, the system of wage payment should be such as would increase production without lowering quality. This will increase the surplus and will enable the employer to pay higher wages which, in turn, will lead to higher output.

3.8.2 Main principles for a sound system of wage incentive: The objective of wage incentives is to improve productivity and increase production so as to bring down the unit cost of production.

In order to make the incentive scheme effective and useful, the following general principles have to be considered while designing a sound system of wage incentives.

(i) ***Just and Fair:*** The reward for a job should be linked with the effort involved in that job and the scheme should be just and fair to both employees and employers. This involves the following:

(a) The standard required of the workers should be carefully set, if possible through proper time and motion studies.

(b) If the work is of repetitive type, the entire benefit of the time saved should be available to the worker but, in the case of non-standardised work or where precise standards cannot be set, the benefit of the time saved, if any, should be shared by the employer, the supervisor and the worker.

(ii) ***Well defined*** **scheme:** The scheme should be clearly defined and be capable of being understood by the employees easily. The standards set should be such that they can be achieved even by average employees. While standards are being set, the workers concerned should be consulted.

(**iii**) ***Worker's Expectations:*** As far as possible, no limit should be placed on the amount of additional earnings; otherwise it will dampen the initiative of the workers. In this regard, what is important is not what actually prevails but what the workers think—if they think, even wrongly, that the employer will stop wages from rising beyond a certain limit, the incentive scheme may not be really effective.

(iv) ***Stability:*** The scheme should be reasonable and stable, and should not be changed or modified too often without consulting the employees.

(v) ***Charge on employees:*** The scheme should take care that the employees are not penalised for reasons beyond their control.

(vi) ***Incentive based on quality*****:** The scheme should provide for inspection of output so that only good pieces qualify for incentives. It would even be better not to introduce any incentive scheme if workmanship is of vital importance in sales.

(vii) ***Adequate Resources:*** The management should ensure that there is no cause for complaint by the workers that they are sitting idle, say for want of tools or materials. Management has to see that there is, as far as practicable, no interruption of production.

(viii) ***Limited Costs:*** The operation of the scheme should not entail heavy clerical costs. In fact the scheme should facilitate the introduction of budgetary control and standard costing.

(ix) ***Morale booster*****:** It should be capable of improving the morale of the employees and it should be in conformity with the local trade union agreements and other government regulations.

(x) ***Guaranteed wages*****:** There should be a guaranteed wage on time basis which generally works as a good psychological boost to incentive scheme.

(xi) ***Equality in payment:*** the effect of incentive scheme on those who cannot be covered should be gauged and taken note of. Sometimes, highly skilled workers have perforce to be paid on time basis whereas semiskilled or unskilled workers may be put on incentive scheme. If the latter earn more than former, the incentive schemes on the whole prove harmful.

Essential characteristics of a good incentive system: to recapitulate

(i) It should be just both to the employer and to the employee. It should be positive and not unnecessarily punitive and so operated as to promote confidence.

(ii) It should be strong both ways i.e. it should have a standard task and a generous return. The latter should be in direct proportion to employee's efforts. It should reflect the employer's contribution to the success of the company.

(iii) It should be unrestricted as to the amount of the earning.

(iv) It should be reasonable, apart from being simple, for employee to figure out his incentive in relation to his individual performance, as far as practicable.

(v) It should be flexible and intimately related to other management controls.

(vi) It should automatically assist supervision and, when necessary, aid team work.

(vii) It should have employee's support and in no way should it be paternalistic.

(viii) It should have managerial support in so far as production material, quality control, maintenance and non-financial incentives are concerned.

(ix) It should not be used temporarily and dropped in recession times as means of wage reduction.

(x) There should be correct measurement of the effort made for incentive purpose. Measurement of effort is made by time and motion study and based on job evaluation; the rates of wages are fixed for different operations.

3.9 Labour Utilisation

For identifying utilisation of labour a statement is prepared (generally weekly) for each department / cost centre. This statement should show the actual time paid for, the standard time (including normal idle time) allowed for production and the abnormal idle time analysed for causes thereof.

3.9.1 Identification of utilisation of labour with cost centres : For the identification of utilisation of labour with the cost centre a wage analysis sheet is prepared.

Wage analysis sheet is a columnar statement in which total wages paid are analysed according to cost centre, jobs, work orders etc. The data for analysis is provided by wage sheet, time card, piece work cards and job cards.

The preparation of such sheet serves the following purposes:

(i) It analyse the labour time into direct and indirect labour by cost centres, jobs, work orders.

(ii) It provides details of direct labour cost comprises of wages, overtime to be charged as production cost of cost centre, jobs or work orders.

(iii) It provides information for treatment of indirect labour cost as overhead expenses.

Wage Analysis Sheet

No. week-ending	Department/ cost centre	Total	Work in progress	Factory Overhead control A/c	Administration Overhead control A/c	Selling & Distribution overhead control A/c

3.9.2 Identification of labour hours with work order or batches or capital job: For identification of labour hours with work order or batches or capital jobs or overhead work orders the following points are to be noted :

(i) The direct labour hours can be identified with the particular work order or batches or capital job or overhead work orders on the basis of details recorded on source document such as time sheet or job cards.

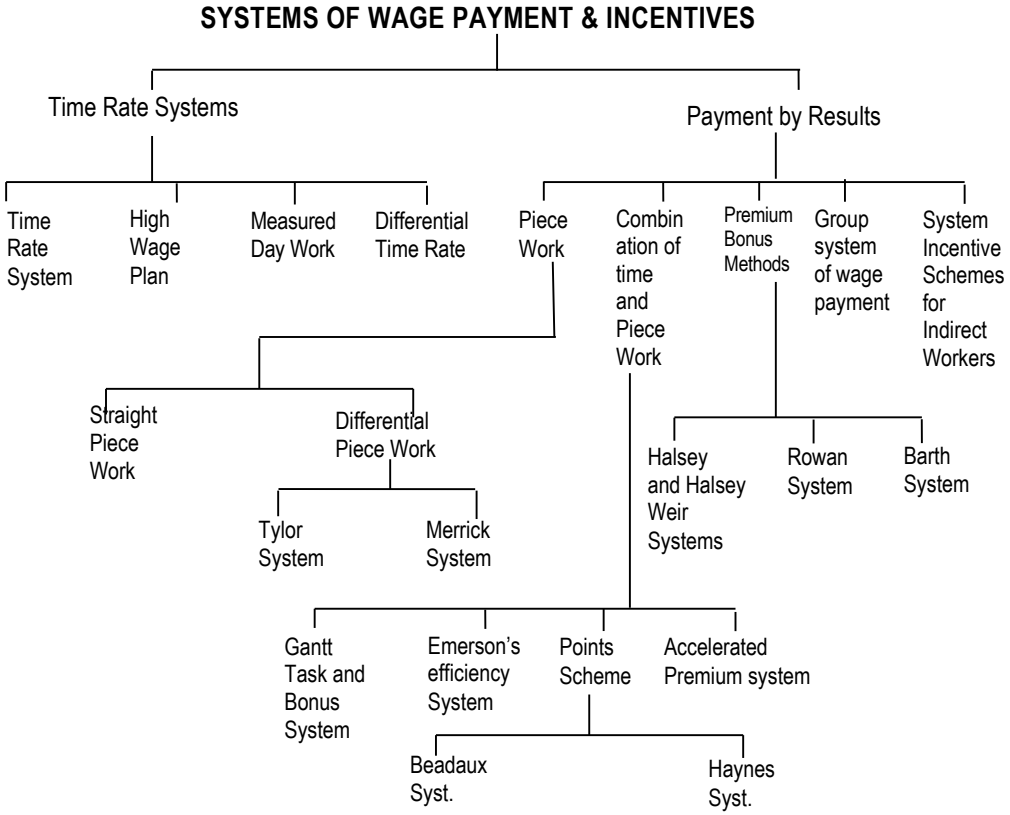
(ii) The indirect labour hours cannot be directly identified with the particular work order or batches or capital jobs or overhead work orders. Therefore, they are traced to cost centre

and then assigned to work order or batches or capital jobs or overhead work orders by using overhead absorption rate.

3.10 Systems of Wage Payment and Incentives

There exist several systems of employee wage payment and incentives, which can be classified under the following heads:

The formulas for different wage payment and incentive systems are given below:



1 ***Time Rate System***

Earnings = Hours worked × Rate per hour

2 ***Straight Piece Rate System***

Earnings = Number of units × Piece rate per unit

3 ***Differential piece Rate System***

3.1 **F.W. Taylor's System**

Efficiency	Payment
Less than 100%	83% of the normal piece rate or 80% of piece rate when below standard

		Either 100% or	125% of the normal piece rate or 120% of piece rate more than 100% when at or above standard
	3.2	**Merrick Differential Piece Rate System**	
		Efficiency	Payment
		Up to 83 %	Ordinary piece rate
		83% to 100%	110% of ordinary piece rate (10% above the ordinary piece rate)
		Above 100%	120% or 130% of ordinary piece rate (20% to 30% of ordinary piece rate)
4	***Combination of Time and Piece Rate***		
	4.1	**Gantt Task and Bonus System**	
		Output	Payment
		Output below standard	Guaranteed time rate
		Output at standard	120% of time rate
		Output above standard	120% of piece rate
	4.2	**Emerson Efficiency System**	
		Earning is calculated as follows :	
		Efficiency	Payment
		Below 66-2/3%	No bonus, only guaranteed time rate is paid.
		66-2/3% to 100%	Worker is paid by hourly rate for the time he actually worked plus an increase in bonus according to degree of efficiency on the basis of step bonus rates. Bonus rate can be up to 20%.
		Above 100%	120% of time wage rate plus additional bonus of 1% for each 1% increase in efficiency.
	4.3	**Bedaux Point System**	
		Earnings = Hours worked × Rate per hour + $\left(\frac{75}{100}\times\frac{\text{Bedaux points saved}}{60}\times\text{Rate per hour}\right)$	
	4.4	**Haynes Manit Systems**	
		This system is similar to Bedaux Point system. Instead of Bedaux points saved, 'MANIT' (Man-minutes) saved are measured for payment of bonus. Bonus is distributed as follows :	
		50% bonus to the workers	
		10% bonus to the supervisors	
		40% bonus to the employer	

4.5 **Accelerated Premium System**

In this system individual employer makes his own formula. The following formula may be used for a general idea of the scheme:

$Y = 0.8 \times x^2$

Where

y= wages

x= efficiency

5 ***Premium Bonus Plan***

5.1 **Halsey Premium Plan**

$$\text{Earnings} = \text{Hours worked} \times \text{Rate per hour} + \left(\frac{50}{100} \times \text{Time saved} \times \text{Rate per hour}\right)$$

5.2 **Halsey-Weir Premium Plan**

$$\text{Earnings} = \text{Hours worked} \times \text{Rate per hour} + \left(\frac{30}{100} \times \text{Time saved} \times \text{Rate per hour}\right)$$

5.3 **Rowan System**

$$\text{Earnings} = \text{Hours worked} \times \text{Rate per hour} + \left(\frac{\text{Time saved}}{\text{Time allowed}} \times \text{Hours worked} \times \text{Rate per hour}\right)$$

5.4 **Barth Sharing Plan**

$$\text{Earnings} = \text{Rate per hour} \times \sqrt{\text{Standard hours} \times \text{Hours worked}}$$

5.5 **Scanlon Plan**

$$\text{Bonus Percentage} = \frac{\text{Average Annual Salaries and Wages}}{\text{Average Annual Sales Revenue}}$$

One should remember that Provident Fund, Employees State Insurance Scheme Premium and bonus are payable on the basic wages, dearness allowance and value of food concession.

3.10.1 Time Rate System

Meaning	Suitability
Under this system, the worker is paid by the hour, day, week, or month. The amount of wages due to a worker are arrived at by multiplying the time worked (as shown by the gate card) by the appropriate time rate.	(1) Persons whose services cannot be directly or tangibly measured, *e.g.*, general helpers, supervisory and clerical staff etc. (2) Workers engaged on highly skilled

	jobs or rendering skilled services, *e.g.*, tool making, inspection and testing. (3) Where the pace of output is independent of the operator, *e.g.*, automatic chemical plants.

Merits	Demerits
(i) Simple to understand and to calculate wages. (ii) Reduces temptation on the part of workers to increase the output at the cost of quality. (iii) Unity in labour, no distinction between efficient and inefficient labour due to quality of production. (iv) Stability in wages	(i) No monetary incentive to raise the level of production. (ii) No distinction between the slow and the efficient worker. (iii) The tendency is for the fall in output; this raises the cost per unit (because both labour and fixed expenses will be spread over a smaller number of units). (iv) A firm cannot be sure of labour costs per unit under this method and, hence, may suffer a loss on quotations if already submitted.

3.10.1.1 High wage plan: This plan was first introduced by Ford Motor Company (in USA) in order to induce workers to exercise extra effort in their work.

Under this plan a worker is paid a wage rate which is substantially higher than the rate prevailing in the area or in the industry. In return, he is expected to maintain a very high level of performance, both quantitative and qualitative. As a result, high rate men are not as costly or expensive as they might appear at first sight.

High wage plan is suitable where high quality of work and also increased productivity are required.

The advantage which may accrue from the implementation of this plan are :

(1) It is simple and inexpensive to operate.

(2) It helps in attracting highly skilled and efficient workers by providing suitable incentive.

(3) It reduces the extent of supervision.

(4) Increased productivity may result in reduction of unit labour cost.

3.10.1.2 Measured day work: According to this method the hourly rate of the time worker consists of two parts *viz,* fixed and variable. The fixed element is based on the nature of the job *i.e.* the rate for this part is fixed on the basis of job requirements. The variable portion varies for

each worker depending upon his merit rating and the cost of living index. The aggregate of fixed and variable part for a day is termed as Measured day's work rate of a worker.

As the rate is based on two different elements, there are separate time rates not only for each worker but also for each job. This method does not find much favour with workers due to the following:

1. The rates fixed are not easily understood by the workers.
2. Merit rating tends to be arbitrary and unless changed at rapid intervals, the ratings will not reflect the correct ranking of the qualities of a worker.

3.10.1.3 Differential time rate: According to this method, different hourly rates are fixed for different levels of efficiency. Up to a certain level of efficiency the normal time or day rate is paid. Based on efficiency level the hourly rate increases gradually. The following table shows different differential rates :

Up to, say 75% efficiency	Normal (say ₹ N per hr.)
From 76% to 80% efficiency	1.10 × N
From 81% to 90% efficiency	1.20 × N
From 91% to 100% efficiency	1.30 × N
From 101% to 120% efficiency	1.40 × N

As this method is linked with the output and efficiency of workers, therefore, it cannot be strictly called as a time rate method of wage payment. This method in fact is similar to differential piece work system.

3.10.2 Payment by result: Under this system the payment made has a direct relationship with the output given by a worker. The attendance of the worker or the time taken by him for doing a job has no bearing on the payment. The system of payment by results may be classified into the following four categories:

(a) Systems in which the payment of wages is directly proportionate to the output given by workers.

(b) Systems in which the proportion of the wage payment to the worker increases progressively with increase in production.

(c) Systems in which payment rate decreases with the increase in output.

(d) Systems with earnings varying in proportions which differ at different levels of production.

3.10.2.1 Straight piece work system

Under this system of wage payment, each operation, job or unit of production is termed a piece. A rate of payment, known as the piece rate or piece work rate is fixed for each piece. The wages of the worker depend upon his output and rate of each unit of output; it is in fact independent of the time taken by him. The wages paid to a worker are calculated as :

Wages = Number of units produced × Piece rate per unit.

Considerable care and judgment are called for fixing the piece rate. If the rate fixed is too high or too low, it would operate to the disadvantage of either the employer or the employee. Any attempt on the part of the management to revise a piece rate, erroneously set too high, is likely to lead to friction and conflict with labour. If on the other hand, it is too low, it would fail in its objective. The only way all this may be avoided is by employing scientific methods of job evaluation and time and motion study for the purpose of setting the rates.

Advantages	Disadvantages
1. The system is simple to operate and also easy to understand.	1. The quality of output usually suffers.
2. The incentive provided is quite effective as the workers get the full benefit of any increase in production and the employer also gains by saving on overhead costs.	2. Maintenance of detailed statistics as regards production of individual workers is necessary.
3. Labour cost per unit being constant, these can be calculated in advance and quotations can be confidently submitted.	3. Maintenance of satisfactory discipline in the matter of arrival and departure of workers becomes somewhat difficult.
	4. In the anxiety to produce as large a quantity as possible, workers may damage the machines and may also increase wastage of materials.
	5. Skilled workers and supervisors (who are often paid on time basis) may resent higher wages to unskilled workers paid on the piece basis.

3.10.2.2 Differential piece work system: This system provide for higher rewards to more efficient workers. The main feature of all differential piece-work systems is that several piece rates on a slab scale are fixed for a job or operation which is put on piece-work. For different levels of output below and above the standard, different piece rates are applicable. Taylor Differential Piece Work System and Merrick Differential Piece Rate System are two important differential piece work systems discussed briefly as below:

(a) Taylor's differential piece work system - The Taylor's Differential Piece Rate System aims at rewarding efficient workers by providing increased piece rate beyond certain level of output.

Under this system two widely differing piece-rates are prescribed for each job. The lower rate is 83% of the normal piece rate and the higher rate is 125% of the normal piece rate. In other words the higher rate is 150% of the lower rate. The lower rate is given to a worker when his efficiency level is less than 100%. The higher rate is offered at efficiency level of either 100%

or more. Due to the existence of the two piece rates, the system is known as differential piece rate system.

Note: Some authors also use 80% and 120% of the piece rates as lower and higher rates respectively at the efficiency levels, as indicated in the above paragraph.

Advantages	Disadvantages
1. It is simple to understand and operate. 2. The incentive is very good and attractive for efficient workers. 3. It has a beneficial effect where overheads are high as increased production has the effect of reducing their incidence per unit of production.	This system is quite harsh to workers, as a slight reduction in output may result in a large reduction in the wages earned by them. This system is no longer in use in its original form, though the main idea behind it is used in many wage schemes.

Illustration 7: (Calculation of earnings under Taylor's differential piece rate system)

Using Taylor's differential piece rate system, find the earnings of the Amar, Akbar and Ali from the following particulars:

Standard time per piece	:	*20 minutes*
Normal rate per hour (in an 8 hours day)	:	*₹ 9.00*
Amar produced	:	*23 units*
Akbar produced	:	*24 units*
Ali produced	:	*30 units*

Solution

Earnings under Differential piece rate system

Workers	Amar	Akbar	Ali
Standard output per day (units) (8 hours x 60 minutes)/ 20 minutes	24	24	24
Actual output per day (units)	23	24	30
Efficiency (%) $\left[\frac{\text{Actual output}}{\text{Standarad output}} \times 100\right]$	95.83% $\left[\frac{23 \text{ unit}}{24 \text{ unit}} \times 100\right]$	100% $\left[\frac{24 \text{ unit}}{24 \text{ unit}} \times 100\right]$	125% $\left[\frac{30 \text{ unit}}{24 \text{ unit}} \times 100\right]$
* Earning rate per unit	83% of the piece rate	125% of the piece rate	125% of the piece rate
Earning rate per unit (₹) (*Refer to working note*)	2.49 *(83% of ₹3)*	3.75 *(125% of ₹3)*	3.75 *(125% of ₹3)*

Earnings (₹)	57.27	90.00	112.50
	(23 units × ₹ 2.49)	(24 units × ₹ 3.75)	(30 units × ₹ 3.75)

* Under Taylor's Differential price rate system, two widely differing price rates are prescribed for each job. The lower rate is 83% of the normal piece rate and is applicable if efficiency of the worker is below 100%. The higher piece rate is 125% of the normal piece rate and is applicable if work completed is at efficiency level of 100% and above.

Working Note:

Normal rate per hour = ₹ 9.00

$$\text{Normal rate per unit} = \frac{₹\ 9.00}{\text{Standard production per hour}} = \frac{₹\ 9.00}{3 \text{ units}} = ₹\ 3$$

(b) Merrick Differential Piece Rate System - Under this system three piece rates for a job are fixed. None of the fixed rates is below the normal. These three piece rates are as below:

Efficiency	*Piece rate applicable*
Upto 83%	Normal rate,
Above 83% and upto 100%	10% above normal rate.
Above 100%	20% or 30% above normal rate.

This system is an improvement over Taylor's Differential Piece Rate System.

Illustration 8 (Calculation of earnings under Merrick differential piece rate system)

Refer to the statement of previous Illustration and compute the earnings of workers under Merrick Differential Piece Rate System

Solution

Workers	Amar	Akbar	Ali
** Earning rate per unit (Refer to previous illustration)*	*10% above the normal rate*	*10% above the normal rate*	*20% above the normal rate or 30% above the normal*
Earning rate per unit (₹)	*3.30*	*3.30*	*3.60 or 3.90*
Earnings (₹)	*75.90*	*79.20*	*108 or 117*
	(23 units × ₹ 3.30)	*(24 units × ₹ 3.30)*	*(30 units × ₹ 3.60) or (30 units × ₹ 3.90)*

Illustration 9: (Calculation of earnings under Taylor's differential piece rate system)

Using Taylor's differential piece rate system, find the earning of A from the following particulars:

Standard time per piece	12 minutes
Normal rate per hour (in a 8 hours day)	₹20
A produced	37 units

Solution:

Actual output = 37 units

Standard output = $\frac{8 \text{ hrs.} \times 60 \text{ minutes}}{12 \text{ minutes per piece}}$ = 40 units

Efficiency = $\frac{37 \text{ units}}{40 \text{ units}} \times 100$ = 92.5%

Under Taylor's differential piece rate system, a worker is paid lower piece rate of 83%, since his efficiency is less than 100%.

Standard production per hour	=	60 minutes/12 minutes	=	5 units
Normal Rate per hour			=	₹20
Normal piece rate per unit	=	₹20/5 units	=	₹4
Lower piece rate per unit	=	₹4 × 83/100	=	₹3.32
Total earnings	=	37 units × ₹3.32	=	₹122.84

Illustration 10: (Calculation of earnings under Merrick differential piece rate system)

Calculate the earnings of workers A, B and C under Straight Piece Rate System and Merrick's Piece Rate System from the following particulars:

Normal Rate per Hour	*₹ 5.40*
Standard Time per Unit	*1 Minute*

Output per day is as follows:

Worker A – 390 Units

Worker B – 450 Units

Worker C – 600 Units

Working hours per day are 8.

Solution

Earnings of Workers under Straight Piece Rate System:

Worker A = 390 units × ₹ 0.09 = ₹ 35.10

Worker B = 450 units × ₹ 0.09 = ₹ 40.50

Worker C = 600 units × ₹ 0.09 = ₹ 54.00

Earnings of Workers under Merrick's Multiple Piece Rate System

Particulars	A	B	C
Efficiency level (Refer to working note ii)	81.25%	93.75%	125%
Applicable wage rate per unit	0.09	0.099	0.108*
Earnings (₹)	35.10 (390 units × 0.09)	44.55 (450 units × 0.099)	64.80 (600 units × 0.108)

Note : *Some author suggests an increase of 30% over normal piece rate at an efficiency level of 120% or more. In such a case the rate per unit would be ₹ 0.117 and total earnings would come to ₹70.20.

Working Notes :

(i) Normal wage rate per unit = Normal Rate per Hour/Standard output per hour
= ₹ 5.40/60 = 9 Paise

(ii) Efficiency level

Workers	A	B	C
Actual output per day (units)	390	450	600
Standard output per day (units)	480	480	480

Efficiency level achieved

$$= \frac{\text{Actual output units}}{\text{Standard output units}} \times 100$$

$\frac{390}{480} \times 100$ = 81.25%

$\frac{450}{480} \times 100$ = 93.75%

$\frac{600}{480} \times 100$ = 125%

3.10.3 Gantt Task and Bonus system: This system is a combination of time and piece work system. According to this system a high standard or task is set and payment is made at time rate to a worker for production below the set standard.

If the standards are achieved or exceeded, the payment to the concerned worker is made at a higher piece rate. The piece rate fixed under this system also includes an element of bonus the extent of 20%. The figure of bonus to such workers is calculated over the time rate of the workers.

Thus in its essence, the system consists of paying a worker on time basis if he does not attain the standard and on piece basis if he does. Wages payable to workers under this plan are calculated as under:

	Output	*Payment*
(i)	Output below standard	Guaranteed time rate.
(ii)	Output at standard	Time rate *plus* bonus of 20% (usually) of time rate.
(iii)	Output above standard	High piece rate on worker's whole output.

It is so fixed, so as to include a bonus of 20% of the piece rate.

Advantages	Disadvantages
1. It provides good incentive for efficient workers and at the same time protects the less efficient by guaranteeing the time rate. 2. It is simple to understand and operate. 3. It encourages better supervision and planning.	The guaranteed time rate may have the effect of weakening the urge of slower worker to increase his output.

Illustration 11: (Calculation of wages under the Gantt system)

In a factory the standard time allowed for completing a given task (50 units), is 8 hours. The guaranteed time wages are ₹ 20 per hour. If a task is completed in less than the standard time, the high rate of ₹ 4 per unit is payable. Calculate the wages of a worker, under the Gantt system, if he completes the task in

(i) 10 hours; (ii) 8 hours, and (iii) in 6 hours. Also ascertain the comparative rate of earnings per hour under the three situations.

Solution

(i) When the worker performs the task in 10 hours, his earnings will be at the time wage rate i.e. 10 hours × ₹ 20 per hour = ₹ 200.

(ii) When the worker performs the task is standard time i.e. in 8 hours, his earning will be:

8 hours × ₹ 20	=	₹ 160
Bonus @ 20% of time wages	=	₹ 32
Total earnings		₹ 192

(iii) When the worker performs the task in less than the standard time his earning will be at piece rate *i.e.*

50 units × ₹ 4 per unit = ₹ 200

The comparative rate of earnings per hour under the above three situations is:

(i) ₹ 200/10 hrs. = ₹ 20 per hour

(ii) ₹ 192/8 hrs. = ₹ 24 per hour

(iii) ₹ 200/6 hrs. = ₹ 33.33 per hour

3.10.4 Emerson's Efficiency System: Under this system minimum time wages are guaranteed. But beyond a certain efficiency level, bonus in addition to minimum day wages is given.

A worker who is able to attain efficiency, measured by his output equal to 2/3rd of the standard efficiency, or above, is deemed to be an efficient worker deserving encouragement. The scheme

thus provides for payment of bonus at a rising scale at various levels of efficiency, ranging from 66.67% to 150%.

The levels are as mentioned below:

(i) For a performance below 66.67% only time rate wages without any bonus are paid.

(ii) 66⅔% to 100% efficiency, bonus varies between 0.01% and 20%.

(iii) Above 100% efficiency bonus of 20% of basic wages plus 1% for each 1% increase in efficiency is admissible.

This system is superior to one to the differential piece rate in so far as it encourages the slow worker to do a little better than before. Also it does not pre-suppose a high degree of average performance. Wages on time basis are guaranteed.

Illustration 12: ***(Earnings under Emerson Efficiency System)***

From the following information you are required to calculate the bonus and earnings under Emerson Efficiency System. The relevant information is as under:

Standard working hours	:	*8 hours a day*
Standard output per hour in units	:	*5*
Daily wage rate	:	*₹ 50*

Actual output in units

Worker A	*25 units*
Worker B	*40 units*
Worker C	*45 units*

Solution

Statement showing bonus and earnings under Emerson Efficiency System

Workers	A	B	C
Actual output in units	25	40	45
Standard output in units	40	40	40
Efficiency level (%) $\left[\frac{\text{Actual output}}{\text{Standarad output}} \times 100\right]$	62.5%	100%	112.50%
Rate of bonus	No bonus	20%	32.50% (20% + 12.5%)
Time wages (₹)	50	50	50
Bonus (₹)	Nil	10 (20% of ₹ 50)	16.25 (32.5% of ₹ 50)

Total earnings (₹)	50	60	66.25

3.10.5 Points Scheme or Bedeaux System: Under this scheme, firstly the quantum of work that a worker can perform is expressed in Bedeaux points or B's. These points represent the standard time in terms of minutes required to perform the job. The standard numbers of points in terms of minutes are ascertained after a careful and detailed analysis of each operation or job. Each such minute consists of the time required to complete a fraction of the operation or the job, and also an allowance for rest due to fatigue.

Workers who are not able to complete tasks allotted to them within the standard time are paid at the normal daily rate.

Those who are able to improve upon the efficiency rate are paid a bonus, equal to the wages for time saved as indicated by excess of B's earned (standard minutes for work done) over actual time. Workers are paid 75% of the time saved.

Illustration 13: (Calculation of earnings under Bedeaux system)

Calculate the earnings of worker from the following information under Bedeaux system :

Standard time for a product A-30 seconds plus relaxation allowance of 50%.

Standard time for a product B-20 second plus relaxation allowance of 50%.

During 8 hour day for

Actual output of product for A — *500 units.*

Actual output of product B — *300 units*

Wage rate — *₹ 10 per hour*

Solution

Bedeaux point per unit of product A :

$$\frac{30 \text{ seconds} + 15 \text{ seconds}}{60} = \frac{45}{60} = 0.75 \text{ B's}$$

Bedeaux point per unit of product B:

$$\frac{20 \text{ seconds} + 10 \text{ seconds}}{60} = \frac{30}{60} = 0.50 \text{ B's}$$

Total production in terms of B's:

500 × 0.75 + 300 × 0.50 = 525 B's

Standard B's (8 hours × 60) = 480 B's

No. of B's saved (525 B's – 480 B's) = 45 B's

Earnings = Hrs. worked × rate per hour + 75/100 × $\frac{45}{60}$ × ₹ 10

$$= 8 \text{ hours} \times ₹10 + 75/100 \times \frac{45}{60} \times ₹\ 10$$

$$= ₹\ 80 + ₹\ 5.63 = ₹\ 85.63$$

3.10.6 Hayne's System: Under this system also the standard is set in minutes. The standard time for the job is expressed in terms of the standard man-minutes called as ***"MANIT***". Manit stands for man-minute. In the case of repetitive work the time saved is shared between the worker and the foreman in the ratio 5 : 1. If the work is of non-repetitive nature, the worker, the employer and the foreman share the value of time saved in the ratio of 5 : 4 : 1. Each worker is paid according to hourly rate for the time spent by him on the job.

3.10.7 Accelerated Premium System: Under this system earnings increase with output; the rate of increase of earnings itself increases progressively with output; in fact the earnings increase in greater proportion than the increase in production. This system acts as a strong incentive for skilled workers to earn high wages by increasing output and for production beyond standard.

3.10.8 Premium Bonus Methods : Under these methods, standard time is established for performing a job. The worker is guaranteed his daily wages (except in Barth System), if his output is below and upto standard. In case the task is completed in less than the standard time, the saved time is shared between the employee and the employer.

There are two types of time-sharing plans in use *viz.,* constant sharing plans and variable sharing plans.

3.10.9 Halsey and Halsey Weir Systems :

Under *Halsey system* a standard time is fixed for each job or process.

If there is no saving on this standard time allowance, the worker is paid only his day rate.

He gets his time rate even if he exceeds the standard time limit, since his day rate is guaranteed.

If, however, he does the job in less than the standard time, he gets a bonus equal to 50 percent of the wages of time saved; the employer benefits by the other 50 percent. The scheme also is sometimes referred to as the Halsey fifty percent plan.

Formula for calculating ***wages under Halsey system***

= Time taken × Time rate + 50% of time saved × Time rate.

The ***Halsey Weir System*** is the same as the Halsey System except that the bonus paid to workers is 30% of the time saved i.e.

= Time taken × Time rate + 30% of time saved × Time rate.

Advantages	Disadvantages
1. Time rate is guaranteed while there is opportunity for increasing earnings by	1. Incentive is not so strong as with piece rate system. In fact the harder the

increasing production. 2. The system is equitable in as much as the employer gets a direct return for his efforts in improving production methods and providing better equipment.	worker works, the lesser he gets per piece. 2. The sharing principle may not be liked by employees.

Illustration 14: (Calculation of earning under Halsey System)

Calculate the earnings of a worker under Halsey System. The relevant data is as below :

Time Rate (p.h.)	*₹ 6*
Time allowed	*8 hours*
Time taken	*6 hours*
Time saved	*2 hours*

Solution

Calculation of total earnings :

6 hrs. × ₹6 + 1/2 × (2 hrs. × ₹ 6) or ₹ 36 + ₹6 = ₹ 42

Of his total earnings, ₹ 36 is on account of the time worked and ₹6 is on account of his share of the premium bonus.

3.10.10 Rowan system: According to this system a standard time allowance is fixed for the performance of a job and bonus is paid if time is saved.

Under Rowan System the bonus is that proportion of the time wages as time saved bears to the standard time.

Formula for calculating wages under Rowan system

$$= \text{Time taken} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

Advantages	Disadvantages
1. It is claimed to be a fool-proof system in as much as a worker can never double his earnings even if there is bad rate setting.	1. The system is a bit complicated.
2. It is admirably suitable for encouraging moderately efficient workers as it provides a better return for moderate efficiency than under the Halsey Plan.	2. The incentive is weak at a high production level where the time saved is more than 50% of the time allowed.

3. The sharing principle appeals to the employer as being equitable.	3. The sharing principle is not generally welcomed by employees.

Illustration 15: (Calculation of earnings under Rowan System)

Calculate the earnings of a worker under Rowan System. The relevant data is given as below:

Time rate (per Hour)	*₹6*
Time allowed	*8 hours.*
Time taken	*6 hours.*
Time saved	*2 hours.*

Solution

Calculation of total earnings:

$$= \text{Time taken} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

$$= 6 \text{ hours} \times ₹6 + \frac{2 \text{ hours}}{8 \text{ hours}} \times 6 \text{ hours} \times ₹6 = ₹\ 36 + ₹9 = ₹\ 45$$

Illustration 16: (Calculation of earnings and effective hourly rate under Halsey scheme)

A skilled worker in XYZ Ltd. is paid a guaranteed wage rate of ₹ 30 per hour. The standard time per unit for a particular product is 4 hours. P, a machineman, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of ₹ 37.50 on the manufacture of that particular product.

Required: What could have been his total earnings and effective hourly rate, had he been put on Halsey Incentive Scheme (50%)?

Solution

Total earnings (under 50% Halsey Scheme) = Hours worked × Rate per hour + ½ × time saved × Rate per hour

= 3 hours × ₹ 30 + ½ × 1 hour × ₹30 = ₹ 105

Effective hourly rate $= \frac{\text{Total earnings}}{\text{Hours taken}} = \frac{₹\ 105}{3 \text{ hours}} = ₹\ 35$

Working Note :

Let T hours be the total time worked in hours by the skilled workers (machine man P), ₹ 30 is the rate per hour; standard time is 4 hours per unit and effective hourly earnings rate is ₹ 37.50 then

Earning (under Rowan plan) = Hours worked × Rate per hr + $\frac{\text{Time saved}}{\text{Time allowed}}$ × Time taken × Rate per hr

₹ 37.5 T = T × ₹30 + $\frac{(4 - T)}{4}$ × T × ₹ 30

₹ 37.5 = ₹ 30 + (4 – T) × ₹ 7.5

or, ₹ 7.5 T = ₹ 22.5

or, T = 3 hours.

Illustration 17: (Comparison of earnings between Halsey plan and Rowan plan)

(a) Bonus paid under the Halsey Plan with bonus at 50% for the time saved equals the bonus paid under the Rowan System. When will this statement hold good? (Your answer should contain the proof).

(b) The time allowed for a job is 8 hours. The hourly rate is ₹8. Prepare a statement showing :

i. The bonus earned

ii. The total earnings of labour and

iii. Hourly earnings.

Under the Halsey System with 50% bonus for time saved and Rowan System for each hour saved progressively.

Solution:

(a) Bonus under Halsey Plan = $\frac{50}{100}$ × (SH - AH) × R (i)

Bonus under Rowan Plan : = $\frac{AH}{SH}$ × (SH - AH) × R (ii)

Bonus under Halsey Plan will be equal to the bonus under Rowan Plan when the following condition holds good :

$\frac{50}{100}$ × (SH - AH) × R = $\frac{AH}{SH}$ × (SH - AH) × R

$\frac{50}{100} = \frac{AH}{SH}$

Hence, when the actual time taken (AH) is 50% of the time allowed (SH), the bonus under Halsey and Rowan Plans is equal.

(b) Statement of Bonus, total earnings of labour and hourly earnings under Halsey and Rowan Systems.

SH	*AH*	*Time saved*	*Basic wages (AH × ₹8) (B × ₹8)*	*Bonus under Halsey System* $\left[\frac{50}{100}\times C\times 8\right]$	*Bonus under Rowan system* $\left[\frac{B}{A}\times C\times 8\right]$	*Total Earnings under Halsey System D+E*	*Total Earnings under Rowan System D+F*	*Hourly Earnings under Halsey System G/B*	*Hourly Earnings under Rowan System H/B*
A hours	B hours	C = (A-B) hours	D ₹	E ₹	F ₹	G ₹	H ₹	I ₹	J ₹
8	8	-	64	-	-	64	64	8.00	8.00
8	7	1	56	4	7	60	63	8.57	9.00
8	6	2	48	8	12	56	60	9.33	10.00
8	5	3	40	12	15	52	55	10.40	11.00
8	4	4	32	16	16	48	48	12.00	12.00
8	3	5	24	20	15	44	39	14.67	13.00
8	2	6	16	24	12	40	28	20.00	14.00
8	1	7	8	28	7	36	15	36.00	15.00

Illustration 18: (Preparation of Comparison statement of earnings)

Two workmen, 'A' and 'B', produce the same product using the same material. Their normal wage rate is also the same. 'A' is paid bonus according to the Rowan system, while 'B' is paid bonus according to the Halsey system. The time allowed to make the product is 50 hours. 'A' takes 30 hours while 'B' takes 40 hours to complete the product. The factory overhead rate is ₹ 5 per man-hour actually worked. The factory cost for the product for 'A' is ₹ 3,490 and for 'B' it is ₹ 3,600.

Required :

(a) Compute the normal rate of wages;

(b) Compute the cost of materials cost;

(c) Prepare a statement comparing the factory cost of the products as made by the two workmen.

Solution:

Step 1 : Let X be the cost of material and Y be the normal rate of wages per hour.

Step 2 : Factory Cost of Workman 'A'

	(₹)
A. Material Cost	X
B. Wages	30 Y
C. Bonus = $\frac{AH}{SH}\times(SH - AH)\times R$	12 Y
Bonus = $\frac{30}{50}\times(50 - 30)\times Y$	
D. Overheads (30 × ₹5)	150
E. Factory Cost	X + 30Y + 12 Y + ₹150
	or, X + 42 Y = ₹3,490 (Given) – ₹150 = ₹3,340 Equation (I)

Step 3 : Factory Cost of Workman 'B'

	(₹)
A. Material Cost	X
B. Wages	40 Y
C. Bonus = 50% of (SH - AH) × R = 50% of (50 - 40) × R	5 Y
D. Overheads (40 × ₹5)	200
E. Factory Cost	X + 40Y + 5 Y + ₹200 or, X + 45 Y = ₹3,600 (Given) – ₹200 = ₹3,400 Equation (II)

Step 4 : Subtracting Eq. (I) from Eq. (II)

3Y = ₹60

Y = ₹ 60/3 = ₹ 20 per hour.

(a) The normal rate of wages : ₹ 20 per hour

(b) The cost of material : X + 45 × ₹ 20 = ₹ 3,400

X : = ₹ 3,400 – ₹ 900 = ₹ 2,500

(c) **Comparative Statement of the Factory Cost of the product made by the two workmen.**

	'A' (₹)	*'B'* (₹)
Material cost	2,500	2,500
Direct Wages	(30 × ₹ 20) 600	(40 × ₹ 20) 800
Bonus	(12 × ₹ 20) 240	(5 × ₹ 20) 100
Factory Overhead	150	200
Factory Cost	3,490	3,600

Illustration 19: (Appropriate incentive scheme)

A factory having the latest sophisticated machines wants to introduce an incentive scheme for its workers, keeping in view the following:

(i) The entire gains of improved production should not go to the workers.

(ii) In the name of speed, quality should not suffer.

(iii) The rate setting department being newly established are liable to commit mistakes.

You are required to devise a suitable incentive scheme and demonstrate by an illustrative numerical example how your scheme answers to all the requirements of the management.

Solution

Rowan Scheme of premium bonus (variable sharing plan) is a suitable incentive scheme for the workers of the factory. If this scheme is adopted, the entire gains due to time saved by a worker will not pass to him.

Another feature of this scheme is that a worker cannot increase his earnings or bonus by merely increasing its work speed. The reason for this is that the bonus under Rowan Scheme is maximum when the time taken by a worker on a job is half of the time allowed. As this fact is known to the workers, therefore, they work at such a speed which helps them to maintain the quality of output too.

Lastly, Rowan System provides a safeguard in the case of any loose fixation of the standards by the rate-setting department. It may be observed from the following illustration that in the Rowan Scheme the bonus paid will be low due to any loose fixation of standards. Workers cannot take undue advantage of such a situation. The above three features of Rowan Plan can be discussed with the help of the following illustration:

(i) Time allowed = 4 hours
Time taken = 3 hours
Time saved = 1 hour
Rate = ₹ 5 per hour

$$\text{Bonus} = \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{Rate}$$

$$= \frac{3 \text{ hours}}{4 \text{ hours}} \times 1 \text{ hour} \times ₹\ 5 = ₹\ 3.75$$

In the above illustration time saved is 1 hour and, therefore, total gain is ₹ 5. Out of ₹ 5 according to Rowan Plan only ₹ 3.75 is given to the worker in the form of bonus and the remaining ₹ 1.25 remains with the management. In other words a worker is entitled for 75 percent of the time saved in the form of bonus.

(ii) The figures of bonus in the above illustration when the time taken is 2 hours and 1 hour respectively are as below:

$$\text{Bonus} = \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{Rate}$$

$$= \frac{2 \text{ hours}}{4 \text{ hours}} \times 2 \text{ hours} \times ₹\ 5 = ₹\ 5$$

$$= \frac{1 \text{ hours}}{4 \text{ hours}} \times 3 \text{ hours} \times ₹\ 5 = ₹\ 3.75$$

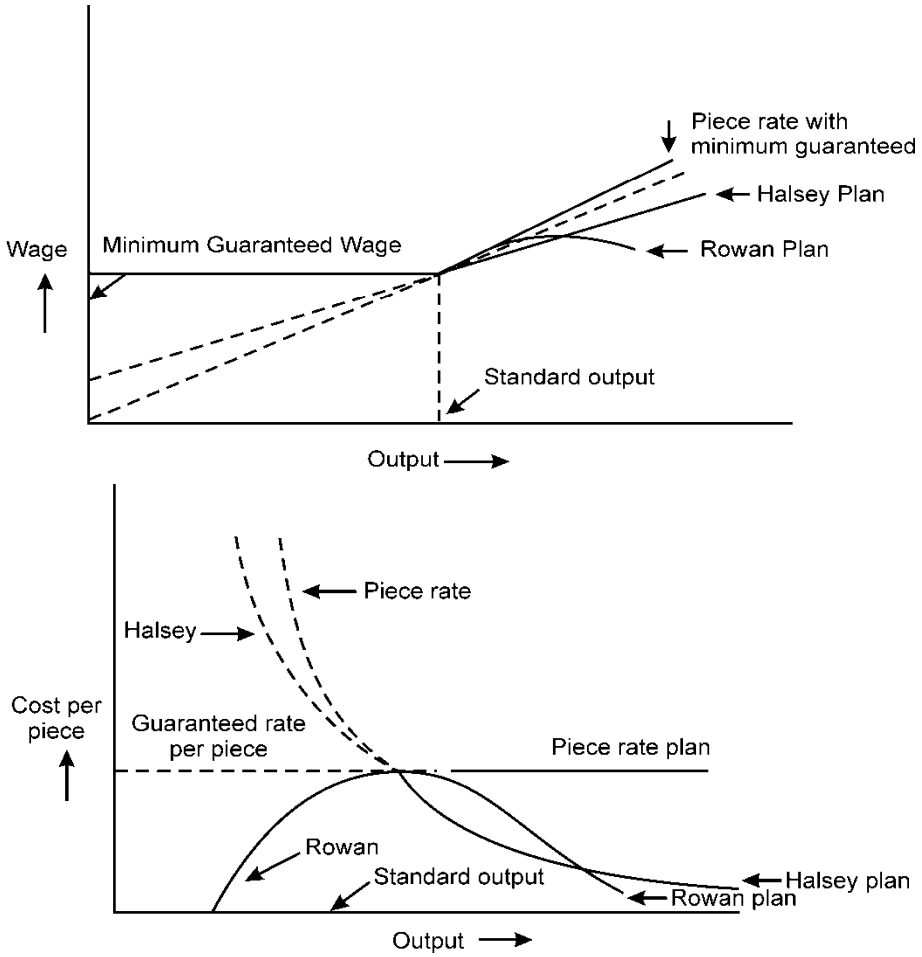
The above figures of bonus clearly show that when time taken is half of the time allowed, the bonus is maximum. When the time taken is reduced from 2 to 1 hour, the bonus figure

fell by ₹ 1.25. Hence, it is quite apparent to workers that it is of no use to increase speed of work. This feature of Rowan Plan thus protects the quality of output.

(iii) If the rate-setting department erroneously sets the time allowed as 10 hours instead of 4 hours, in the above illustration; then the bonus paid will be as follows:

$$\text{Bonus} = \frac{3\text{ hours}}{10\text{ hours}} \times 7\text{ hours} \times ₹\ 5 = ₹\ 10.50$$

The bonus paid for saving 7 hours thus is ₹ 10.50 which is approximately equal to the wages of 2 hours. In other words the bonus paid to the workers is low. Hence workers cannot take undue advantage of any mistake committed by the time setting department of the concern.



3.10.11 Barth System The formula used for calculating the remuneration under this system is as follows :

$$\text{Earnings} = \text{Hourly rate} \times \sqrt{\text{Standard hours} \times \text{Hours worked}}$$

The system is particularly suitable for trainees and beginners and also for unskilled workers. The reason is that for low production efficiency, the earnings are higher than in the piece-work system but as the efficiency increases, the rate of increase in the earnings falls.

This system is not suitable for workers having more than 100% efficiency as it does not provide incentive on working at more than 100% efficiency.

Illustration 20: (Selection of appropriate incentive scheme)

Mr. A. is working by employing 10 skilled workers. He is considering the introduction of some incentive scheme - either Halsey Scheme (with 50% bonus) or Rowan Scheme - of wage payment for increasing the labour productivity to cope with the increased demand for the product by 25%. He feels that if the proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers, it could act as sufficient incentive for them to produce more and he has accordingly given this assurance to the workers.

As a result of the assurance, the increase in productivity has been observed as revealed by the following figures for the current month :

Hourly rate of wages (guaranteed)	*₹ 2.00*
Average time for producing 1 piece	
by one worker at the previous performance	*2 hours*
(This may be taken as time allowed)	
No. of working days in the month	*25*
No. of working hours per day for each worker	*8*
Actual production during the month	*1,250 units*

Required:

1. *Calculate effective rate of earnings per hour under Halsey Scheme and Rowan Scheme.*
2. *Calculate the savings to Mr. A in terms of direct labour cost per piece under the schemes.*
3. *Advise Mr. A about the selection of the scheme to fulfill his assurance.*

Solution

Working Notes:

1. *Total time wages of 10 workers per month:*

   = No. of working days in the month × No. of working hours per day of each worker × Hourly rate of wages × No. of workers

   = 25 days × 8 hrs. × ₹ 2 × 10 workers= ₹ 4,000

2. *Time saved per month :*

Time allowed per piece to a worker	2 hours
No. of units produced during the month by 10 workers	1,250 pieces
Total time allowed to produce 1,250 pieces (1,250 × 2 hours)	2,500 hours
Actual time taken to produce 1,250 pieces	2,000 hours
Time saved (2,500 hours – 2,000 hours)	500 hours

3. *Bonus under Halsey scheme to be paid to 10 workers :*

Bonus = (50% of time saved) × hourly rate of wages

= 50/100 × 500 hours × ₹ 2 = ₹ 500

Total wages to be paid to 10 workers are (₹ 4,000 + ₹ 500) ₹ 4,500, if Mr. A considers the introduction of Halsey Incentive Scheme to increase the labour productivity.

4. Bonus under Rowan Scheme to be paid to 10 workers:

$$\text{Bonus} = \frac{\text{Time taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{hourly rate}$$

$$= \frac{2{,}000 \text{ hours}}{2{,}500 \text{ hours}} \times 500 \text{ hours} \times ₹ 2 = ₹ 800$$

Total wages to be paid to 10 workers are (₹ 4,000 + ₹ 800) ₹ 4,800, if Mr. A considers the introduction of Rowan Incentive Scheme to increase the labour productivity.

1. (i) Effective hourly rate of earnings under Halsey scheme :

(Refer to Working Notes 1, 2 and 3)

$$= \frac{\text{Total time wages of 10 workers+Total bonus under Halsey scheme}}{\text{Total hours worked}}$$

$$= \frac{₹4{,}000 + ₹ 500}{2{,}000 \text{ hours}} = ₹ 2.25$$

(ii) Effective hourly rate of earnings under Rowan scheme :

(Refer to Working Notes 1, 2 and 4)

$$= \frac{\text{Total time wages of 10 workers+Total bonus under Rowan scheme}}{\text{Total hours worked}}$$

$$= \frac{₹ 4{,}000 + ₹800}{2{,}000 \text{ hours}} = ₹ 2.40$$

2. (i) Saving in terms of direct labour cost per piece under Halsey scheme :

(Refer to Working Note 3)

Labour cost per piece (under time wage scheme) = 2 hours × ₹ 2 = ₹ 4.

Labour cost per piece (under Halsey scheme)

$$= \frac{\text{Total wages paid under the scheme}}{\text{Total number of units produced}} = \frac{₹\ 4,500}{1,250} = ₹\ 3.60$$

Saving per piece : (₹ 4 – ₹ 3.60) = ₹ 0.40.

(ii) Saving in terms of direct labour cost per piece under Rowan Scheme:

(Refer to Working Note 4)

Labour cost per piece under Rowan scheme = ₹ 4,800/1,250 units = ₹ 3.84

Saving per piece = ₹ 4 – ₹ 3.84 = ₹ 0.16.

3. From the labour cost per piece under Halsey scheme (₹ 3.60) and Rowan scheme (₹ 3.84), it is quite clear that Halsey scheme brings about more saving than Rowan scheme to the concern. But Halsey scheme does not fulfill the assurance given to the workers about 20% increase in their earnings as it secures only 12.5% [500/4,000 × 100] increase.

On the other hand, Rowan scheme secures 20% [800/4,000 × 100] increase in the earnings and it fulfills the assurance. Therefore, Rowan scheme may be adopted.

Illustration 21: (Calculation of earnings under different schemes)

Wage negotiations are going on with the recognised labour union and the Management wants you as the Cost Accountant of the Company to formulate an incentive scheme with a view to increase productivity.

The case of three typical workers Achyuta, Ananta and Govida who produce respectively 180, 120 and 100 units of the company's product in a normal day of 8 hours is taken up for study.

Assuming that day wages would be guaranteed at 75 paise per hour and the piece rate would be based on a standard hourly output of 10 units, calculate the earnings of each of the three workers and the labour cost per 100 pieces under (i) Day wages, (ii) Piece rate, (iii) Halsey scheme, and (iv) The Rowan scheme.

Also calculate under the above schemes the average cost of labour for the company to produce 100 pieces.

Solution

Calculation of earnings of each of the three workers and the labour cost per 100 pieces under different wage schemes.

(i) Day wages

Name of workers	Day wages	Actual output (units)	Labour cost per 100 pieces
	(₹)		(₹)
Achyuta	6.00	180	3.33
Ananta	6.00	120	5.00
Govinda	6.00	100	6.00
Total	18.00	400	

Average cost of labour for the company to produce 100 pieces:

$$\frac{\text{Total wages paid}}{\text{Total output}} \times 100 = \frac{₹18}{400} \times 100 = ₹\ 4.50$$

(ii) Piece rate

Name of workers	*Actual output (units)*	*Piece rate (₹)*	*Wages earned (₹)*	*Labour cost per 100 pieces (₹)*
Achyuta	180	0.075	13.50	7.50
Ananta	120	0.075	9.00	7.50
Govinda	100	0.075	7.50	7.50
Total	400		30.00	

Average cost of labour for the company to produce 100 pieces : $= \frac{₹\ 30}{400} \times 100 = ₹\ 7.50$

(iii) Halsey Scheme

Name of workers	*Acutal output (units)*	*Std. time for actual output Hrs.*	*Actual time for actual output Hrs.*	*Time saved Hrs.*	*Bonus Hrs. (50% of time saved Hrs.)*	*Total wages including Bonus** (₹)	*Labour cost per 100 pieces* (₹)
Achyuta	180	18	8	10	5	9.75	5.42
Ananta	120	12	8	4	2	7.50	6.25

Govinda	100	10	8	2	1	6.75	6.75
						24.00	

Average cost of labour for the company to produce 100 pieces = $\frac{₹\ 24}{400} \times 100 = ₹6.00$

*Total wages = (Actual hours worked + bonus hours) × Rate per hour
Hence total wages of Achyuta are: (8 + 5) × ₹ 0.75 = ₹ 9.75

Similarly, the total wages of Ananta and Govinda are ₹ 7.50 and ₹ 6.75 respectively.

(iv) Rowan Scheme:

Name of workers	*Actual output (units)*	*Std. time for actual output (hrs.)*	*Actual time taken hours*	*Time saved (hours)*	*Bonus* hrs.*	*Wages for actual hrs. @ 75 P per hr. (₹)*	*Bonus @ 75 P per Bonus hour (₹)*	*Total earnings (₹)*	*Labour cost per 100 pieces (₹)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(7)+(8)=(9)*	*(10)*
Achyuta	180	18	8	10	4.44	6.00	3.33	9.33	5.18
Ananta	120	12	8	4	2.67	6.00	2.00	8.00	6.67
Govinda	100	10	8	2	1.6	6.00	1.20	7.20	7.20
								24.53	

Average cost of labour to the company for 100 pieces $= \frac{₹\ 24.53}{400} \times 100 = ₹\ 6.13$

*Bonus hours = Time taken $\times \frac{\text{Time saved}}{\text{Time allowed}}$

Bonus hours of Achyuta = $\frac{8\ \text{hours} \times 10\ \text{hours}}{18\ \text{hours}} = 4.44$

Similarly, bonus hours of Ananta and Govinda are ₹2.67 hours and ₹1.6 hours respectively.

3.10.12 Group System of wage payment: Certain jobs or operations are required to be performed collectively by a number of workers. Under such cases each man's work depends on the work performed by one or more of his colleagues and as such it is not possible to measure separately the output of each worker.

The workers constituting a group or a team here are considered as a composite unit and the combined output of such a unit is measured for the purpose of wage calculation. The methods usually used for distributing wages to each worker are the following:

1. Equally, if all the workers of the group are of the same grade and skill, same rate of pay

and has worked for same duration.

2. Pro-rata to the time-rate of each worker where the time spent by the individual worker is the same.
3. On the basis of the time rates and attendance of each worker.
4. On a specified percentage basis; the percentage applicable to a worker is pre-determined on the basis of the skill, rate of pay etc.
5. In a group of unskilled and skilled workers, a method of distribution is to pay the unskilled workers at their time rates. The balance amount remaining out of the total earnings after payment to the unskilled workers is distributed among the skilled workers by any of the methods discussed above.

Group Bonus - Group Bonus refers to the bonus paid for the collective efforts made by a group of workers. The amount of bonus is distributed among the individual members of the group on some agreed basis.

Group Bonus Schemes - Under a group bonus scheme, bonus is paid to a team/group of employees working together.

Such a scheme is introduced generally where individual efficiency cannot be established for the payment of bonus.

For example, in the construction work, it is the team work of masons and labourers which produces results. If any incentive is to be offered, it should be offered to the team as a whole and not to an individual. Group bonus is based on the combined output of the team as a whole. The quantum of bonus is determined on the basis of the productivity of the team and the bonus is shared by individual workers in specified proportions, often in the proportion of wages on time basis.

Objectives of Group Bonus Schemes: The objectives of a group bonus scheme are the following :-

(i) To create collective interest and team spirit among workers.

(ii) To create interest among supervisors to improve performance.

(iii) To reduce wastage in materials and idle time.

(iv) To achieve optimum output at minimum cost.

(v) To encourage individual members of the group, team where only the output of the team as a whole can be measured.

Advantages of Group Bonus Schemes:

1. They create a sense of team spirit since all the workers in a group realise that their personal incentives are dependent upon group effort.
2. A spirit of healthy competition amongst various groups doing identical jobs is also created. This results is the elimination of excessive waste of materials.

3. The operators and supervisors also feel interested in raising the production to higher levels.
4. The scheme is usually easier to understand and entails less costing and accounting work. It is easier to set up group activity targets, since the performance unit is large.

Schemes of group bonus - There are five schemes of group bonus as discussed below :

(1) **Priestman's Production Bonus**: This method was adopted by Priestman Bros. Ltd., in 1917.

According to this method when the actual production in units or points exceeds the standard fixed, a bonus is paid to the workers as additional wages equivalent to the percentage of actual output over the standard output.

(2) **Cost Efficiency Bonus:** Under this scheme, the amount of bonus is calculated when the cost is reduced below the normal established targets. Targets of cost, for example, material cost, labour cost and overhead cost etc., per unit are fixed. If the measurement of actual performance shows a saving in the total labour and material cost or a reduction in the total cost per unit, a fair percentage of the saving is distributed among the staff.

Three popular schemes usually used for calculating the amount to be distributed to workers as Bonus are as below:

(i) ***Nunn-Bush Plan*:** According to this plan a norm of direct labour cost is fixed and expressed as a percentage of the sales value.

The amount calculated at this percentage is credited to a fund. The actual labour cost is debited to this fund and the balance remaining to the credit of this fund is distributed as bonus to all the workers and employees.

(ii) ***Scanlon Plan*:** Here also a fund is created for the normal cost of wages and salaries. This fund is debited with the actual labour costs. Two-thirds to three-fourths of the credit balance, if any, is distributed as bonus, the balance is kept as reserve for future set-backs.

(iii) ***Rucker Plan*:** This plan is quite similar to Nunn-Bush Plan except that the percentage for crediting the fund is based on the total value added by manufacturer (*i.e.* the total cost less the value of the material) and not on total sales value.

(3) ***Town Gain Sharing Plan*:** Under this plan bonus is dependent upon a saving in the labour cost as compared to standard. The bonus is calculated at 50% of the saving achieved.

(4) ***Budgeted Expense Bonus*:** Bonus is determined in advance and paid as a percentage of savings effected in the actual total expenses as compared to the budgeted expense. It is payable to indirect workers also.

(5) ***Waste Reduction Bonus*:** Bonus becomes payable under this scheme if the team of workers brings about a reduction in the percentage of material wastages as compared to the standard set. It is applicable to industries where the material cost assumes a greater proportion of the total cost.

Many times group bonus schemes do not enjoy the approval of workers. Some workers tend to feel that their personal incentives are low merely because some members of the group are lazy or inefficient. Such workers believe that it is better to provide incentives on individual basis, if it is possible.

3.10.13 System of Incentive schemes for Indirect Workers: Since the setting of work standards and measurement of output in the case of indirect workers is not an easy task in respect of maintenance, internal transport, inspection, packing and cleaning, therefore the introduction of a system of payment by results for indirect workers is difficult.

In spite of the aforesaid difficulty, it has been felt necessary to provide for incentives to indirect workers, due to the following reasons:

1. *Dissatisfaction:* Payment of incentive bonus to direct workers and time rate to indirect workers leads to dissatisfaction and labour unrest.
2. *Entitlement:* Indirect workers are as much entitled to bonus as direct workers.
3. *Team Spirit:* Bonus payment to indirect workers creates team spirit.
4. *Increase in efficiency***:** An incentive system for indirect workers assists in maintaining the efficiency of services such as plant repairs, stores maintenance, material handling etc.
5. *Dependence on indirect labour:* The efficiency of direct workers is reduced where their work is dependent upon the service rendered by the indirect workers.

A few examples of incentive schemes to indirect workers are as below :

(i) Incentive to supervisors and foremen: Supervisors and foremen are an important link between the management and the workers. Incentive payment to these persons would assist in maintaining all round efficiency. Incentive to supervisors and foremen may be provided in the form of non-financial benefits.

Incentive can also be provided to these workers in the form of Bonus. The extent of bonus which will be distributed as incentive will depend on the savings effected over the standards.

(ii) Incentive to maintenance and repairs staff: Under mass production work, repair and maintenance duties can be considered as routine and repetitive for which percentage of efficiency can be evaluated. In case such an evaluation is not possible or practicable, a group bonus system may be established, on the basis of reduction in breakdown or on the number of complaints.

Illustration 22: (Calculation of earnings of each worker under group task)

A, B and C were engaged on a group task for which a payment of ₹ 725 was to be made. A's time basis wages are ₹ 8 per day, B's ₹ 6 per day and C's ₹ 5 per day. A worked for 25 days; B worked for 30 days; and C for 40 days. Distribute the amount of ₹ 725 among the three workers.

Solution

Total wages on time basis:		*(₹)*
A	25 @ ₹ 8	200
B	30 @ ₹ 6	180
C	40 @ ₹ 5	200
		580
Payment for the task		
Bonus : (₹ 725 – ₹ 580)		145
or, 25% of the time-basis wages.		725

Earnings of each worker

Worker	*Wages on time basis* *(₹)*	*Group task Bonus 25%* *(₹)*	*Total* *(₹)*
A	200	50	250
B	180	45	225
C	200	50	250
	580	145	725

Illustration 23: (Calculation of bonus earned by direct and indirect labour)

Both direct and indirect labours of a department in a factory are entitled to production bonus in accordance with a group incentive scheme, the outline of which is as follows:

(a) For any production in excess of the standard rate fixed at 16,800 tonnes per month (of 28 days) a general incentive of ₹ 15 per tonne is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely @ 65% by direct labour, @ 15% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.

(b) Moreover, if the excess production is more than 20% above the standard, direct labour also get a special bonus @ ₹ 5 per tonne for all production in excess of 120% of standard.

(c) Inspection staff are penalized @ ₹ 20 per tonne for rejection by customer in excess of 2% of production.

(d) Maintenance staff are also penalized @ ₹ 20 per hour for breakdown.

From the following particulars for a month, work out production bonus earned by each group :

(a) Actual working days : 25

(b) Production : 21,000 tonnes

(c) Rejection by customer : 500 tonnes

(d) Machine breakdown : 40 hours

Solution

1. Standard output per day $= \frac{\text{Standard output per month}}{\text{Budgeted number of days in a month}}$

$= \frac{16{,}800 \text{ tonnes}}{28 \text{ days}} = 600 \text{ tonnes}$

2. Standard output for 25 days = 600 tonnes × 25 days = 15,000 tonnes

(a) General Incentive

(*i*)	Standard output	:	15,000 tonnes
(*ii*)	Actual output	:	21,000 tonnes
(*iii*)	Excess output over standard	:	21,000 – 15,000 = 6,000 tonnes
(*iv*)	Percentage of excess production to standard output	:	$\frac{6{,}000 \text{ tonnes}}{15{,}000 \text{ tonnes}} \times 100$
(*v*)	Aggregate general incentive	:	= Excess output × ₹ 15
		:	= 6,000 tonnes × ₹15 = ₹ 90,000

(vi) Allocation of general incentive

Direct labour	:	65% of ₹ 90,000	₹ 58,500
Inspection staff	:	15% of ₹ 90,000	₹ 13,500
Maintenance staff	:	12% of ₹ 90,000	₹ 10,800
Supervisory staff	:	8% of ₹ 90,000	₹ 7,200
Total			₹ 90,000

(b) Special bonus to direct workers

(*i*) 20% is the excess output over 120% of standard output or 3,000 tonnes (15,000 tonnes × 20%)

(*ii*) Special incentive = 3,000 tonnes × ₹ 5 = ₹ 15,000

(c) Penalty imposed on inspection staff

(*i*) Normal rejection = 2% of production = 2% of 21,000 tonnes
= 420 tonnes

(*ii*) Actual rejection = 500 tonnes

(*iii*) Excess rejection over normal rejection = 500 – 420 = 80 tonnes

(*iv*) Penalty = 80 tonnes × ₹ 20 per tonne = ₹ 1,600

(d) Penalty imposed on maintenance staff

(*i*) Breakdown hours = 40 hours

(*ii*) Penalty = 40 hours × ₹ 20 per hour = ₹ 800

Statement of production bonus earned by each group

Particulars	*Direct labour (₹) 1*	*Inspection staff (₹) 2*	*Maintenance staff (₹) 3*	*Supervisory staff (₹) 4*	*Total (₹) 5*
Aggregate general incentive	58,500	13,500	10,800	7,200	90,000
Special bonus	15,000	-	-	-	15,000
Penalty	-	(1,600)	(800)	-	(2,400)
Production bonus	73,500	11,900	10,000	7,200	1,02,600

3.10.14 Profit-sharing and Co-partnership schemes: *A profit-sharing scheme* implies that the net profit of business would be shared between the workers and the shareholders or the partners in a pre-determined ratio.

Co-partnership, on the other hand, implies that the workers shall own the business jointly with the shareholders. In this case, usually the workers share of profits is given in the form of shares.

Some employers in our country originally introduced profit-sharing schemes with a view of stimulating interest among workers for increasing production. But the schemes have not been successful on account of unwillingness on the part of the management to consult workers. Even a demand for copies of final accounts of the business to be shown to them has been considered by some employers to be an unwarranted interference. The question of bonus has thus been one of the major causes of industrial disputes in recent years. (Payment of compulsory bonus is now governed by the payment of Bonus Act.)

Though profit sharing has become a normal feature of the industrial life in this country, co-partnership is comparatively unknown. Nevertheless it must be pointed out that in England and other Western countries, a number of successful concerns have been allotting shares to their workers in proportion to their shares of bonus. Some of them have advanced loans to them to purchase shares. Both these forms of benefit have been quite popular with labour.

Advantages	Disadvantages
(i) Employees are made to feel that they too have a stake in the well-being of the undertaking and have a contribution to make in earning of profits by improving production, efficiency and operations.	(i) Profit may fluctuate from year to year; there is thus an element of uncertainty in such schemes. (ii) Profit depends upon many factors of which labour efficiency is only one.

(ii) Labour turnover may be reduced, particularly if a minimum period of service is laid down as a condition for participating in such schemes. (iii) Better team work and better co-operation.	Insufficiency of bonus may lead to dissatisfaction instead of promoting good relations, if the good work done by labour is nullified by other factors. (iii) The reward may be too remote to sustain continued interest in and zeal for work. (iv) There may be doubt and suspicion about the profit disclosed. (v) Since all are entitled to participate in such schemes, there is no recognition of individual merit. (vi) The individual share of profit may be too meagre to be appealing. (vii) Since in practice bonus has to be fought in India, so it has become an important cause of labour disputes.

Workers share in the net profits of the firm can be calculated by any of the following ways:

(i) A fixed percentage may be allowed to the worker as bonus at the end of the financial year.

(ii) The profit earned, can be department wise and hence a fixed percentage of the department's profit can be allowed as profit sharing.

(iii) Profits may be computed per unit of output and a part of profit may be allowed to workers on this basis.

Treatment in Costing: In foreign countries bonus is an ex-gratia payment and hence it is regarded as an appropriation of profit not to be included in costs. In fact trade unions there do not look upon bonus with favour.

In India however, payment of bonus is compulsory under the Payment of Bonus Act under which 8.33% of wages earned or ₹ 100 whichever is higher, is the minimum bonus payable, the maximum being 20%. Hence bonus must be treated as part of costs in India.

There can be two methods of dealing with bonus:

(i) It may be treated as part of overheads; in any case, this must be so for bonus paid to indirect workers.

(ii) In the case of direct workers the bonus payable may be estimated beforehand and wage rates for costing purposes suitably inflated by including the bonus that would be paid.

Example: A worker gets ₹ 800 p.m. as wages and it is expected that he will be paid two months' wages as bonus. His total earning will be ₹ 11,200 (₹ 9,600 + ₹ 1,600). If the worker works for 2,400 hours in a year the wage rate for costing purposes will be: ₹ 4.67, *i.e.,* ₹ 11,200/2,400 hours.

Illustration 24: (Calculation and verification of wages paid to the worker)

During audit of account of G Company, your assistant found errors in the calculation of the wages of factory workers and he wants you to verify his work.

He has extracted the following information:

(i) The contract provides that the minimum wage for a worker is his base rate. It is also paid for downtimes i.e., the machine is under repair or the worker is without work. The standard work week is 40 hours. For overtime production, workers are paid 150 percent of base rates.

(ii) Straight Piece Work – The worker is paid at the rate of 20 paise per piece.

(iii) Percentage Bonus Plan – Standard quantities of production per hour are established by the engineering department. The workers' average hourly production, determined from his total hours worked and his production, is divided by the standard quantity of production to determine his efficiency ratio. The efficiency ratio is then applied to his base rate to determine his hourly earnings for the period.

(iv) Emerson Efficiency Plan – A minimum wages is paid for production upto 66-2/3% of standard output or efficiency. When the workers production exceeds 66-2/3% of the standard output, he is paid bonus as per the following table:

Efficiency Level	*Bonus*
Upto $66\frac{2}{3}$ *%*	*Nil*
$66\frac{2}{3}$ *% to 79 %*	*10%*
80% – 99%	*20%*
100% – 125%	*45%*

Your assistant has produced the following schedule pertaining to certain workers of a weekly pay roll:

Workers	Wage Incentive Plan	Total Hours	Down Time Hours	Units Produced	Standard Units	Base Rate	Gross Wages as per Book
						₹	₹
Rajesh	Straight piece work	40	5	400	—	1.80	85
Mohan*	Straight piece work	46	—	455	—	1.80	95
John	Straight piece work	44	—	425	—	1.80	85
Harish	Percentage bonus plan	40	4	250	200	2.20	120

Mahesh	*Emerson*	*40*	*—*	*240*	*300*	*2.10*	*93*
Anil	*Emerson*	*40*	*—*	*600*	*500*	*2.00*	*126*
(40 hours production)							

** Total hours of Mohan include 6 overtime hours.*

Prepare a schedule showing whether the above computation of workers' wages are correct or not. Give details.

Solution

Schedule showing the correct figure of minimum wages, gross wages and wages to be paid

Workers	*Wage incentive plan*	*Minimum wages* (₹)	*Gross wages computed as per Incentive plan* (₹)	*Gross wage as per book* (₹)	*Wages to be paid are Maximum of : minimum and gross computed wages* (₹)
Rajesh (*Refer to W. Note 1*)	Straight piece work	72.00	80.00	85	80.00
Mohan (*Refer to W. Note 2*)	Straight piece work	88.20	91.00	95	91.00
John (*Refer to W. Note 3*)	Straight piece work	82.80	85.00	85	85.00
Harish (*Refer to W. Note 4*)	Percentage bonus plan	88.00	122.00	120	122.00
Mahesh (Refer to W. Note 5)	Emerson	84.00	100.80	93	100.80
Anil (*Refer to W. Note 6*)	Emerson	80.00	116.00	126	116.00

Working notes :

1. Minimum wages = Total normal hours × rate per hour
   = 40 hours × ₹ 1.80 = ₹ 72
   Gross wages (computed) as per incentive plan = No. of units × rate per unit
   = 400 units × ₹ 0.20 = ₹ 80
2. Minimum wages = Total normal hours × Rate per hour + Overtime hours × Overtime rate per hour
   = 40 hours × ₹ 1.80 + 6 hours × ₹ 2.70
   = ₹ 72 + ₹ 16.20 = ₹ 88.20
   Gross wages (computed) as per incentive plan = 455 units × ₹ 0.20 = ₹ 91.00

3.	Minimum wages	= 40 hours × ₹ 1.80 + 4 hours × ₹ 2.70
		= ₹ 72 + ₹ 10.80 = ₹ 82.80
	Gross wages (computed) as per incentive plan	= 425 units × ₹ 0.20 = ₹ 85
4.	Minimum wages	= 40 hours × ₹ 2.20 = ₹ 88
	Efficiency of worker	$= \frac{\text{Actual production per hour}}{\text{Standard production per hour}} \times 100$
		$= \frac{(250 \text{ units}/36 \text{ hours})}{(200 \text{ units}/40 \text{ hours})} \times 100 = 138.89\%$
	Hourly rate	= Rate per hour × Efficiency of worker
		= ₹ 2.20 × 138.89% = ₹ 3.05
	Gross wages (computed) as percentage of bonus plan	= 40 hours × ₹ 3.05 = ₹ 122/-
5.	Minimum wages	= 40 hours × ₹ 2.10 = ₹ 84
	Efficiency of worker	$= \frac{(240 \text{ units}/40 \text{ hours})}{(300 \text{ units}/40 \text{ hours})} \times 100 = 80\%$
	Bonus (as per Emerson's plan)	= Total minimum wages × Bonus percentage
		= ₹ 84 × 20% = ₹ 16.80
	Gross wages (computed) as per Emerson's Efficiency plan	= Minimum wages + Bonus
		= ₹ 84 + ₹ 16.80 = ₹ 100.80
6.	Minimum wages	= 40 hours × ₹ 2 = ₹ 80
	Efficiency of worker	$= \frac{600}{500} \times 100 = 120\%$
	Bonus (as per Emerson's plan)	= ₹ 80 × 45% = ₹ 36
	Gross wages (computed) as per Emerson's Efficiency plan	= ₹ 80 + ₹ 36 = ₹ 116

Illustration 25: (Evaluation of proposal)

The present output details of a manufacturing department are as follows:

Average output per week	*48,000 units from 160 employees*
Saleable value of output	*₹ 6,00,000*

Contribution made by output

towards fixed expenses and profit *₹ 2,40,000*

The Board of Directors plans to introduce more mechanisation into the department at a capital cost of ₹ 1,60,000. The effect of this will be to reduce the number of employees to 120, and increasing the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output, the Board intends to offer a 1% increase on the piece work rate of ₹ 1 per unit for every 2% increase in average individual output achieved.

To sell the increased output, it will be necessary to decrease the selling price by 4%.

Calculate the extra weekly contribution resulting from the proposed change and evaluate for the Board's information, the desirability of introducing the change.

Solution

1. Present average output per employee and total future expected output per week

Present average output per employees per week $= \frac{\text{Total present output}}{\text{Total number of present employees}}$

$= \frac{48{,}000 \text{ units}}{160 \text{ employees}} = 300 \text{ units}$

Total Future expected output per week = Total number of future employees (present output + 60% of present output per employee)

= 120 employees (300 units + 60% × 300 units)

= 57,600 units

2. Present and proposed piece work rate

Present piece work rate = ₹ 1.00 per unit

Proposed piece work rate = Present piece work rate + 30% × ₹ 1

= ₹ 1.00 + 0.30 P

= ₹ 1.30 per unit

3. Present and proposed sale price per unit

Present sales price per unit = ₹ 12.50

(*₹ 6,00,000/48,000 units*)

Proposed sale price per unit = ₹ 12

(*₹ 12.50 – 4% × ₹ 12.50*)

4. Present marginal cost (excluding wages) per unit :

$$= \frac{\text{Present sales value} - \text{Fixed expenses \& profit} - \text{Contribution towards present wages}}{\text{Present output (units)}}$$

$$= \frac{₹\ 6,00,000 - ₹\ 2,40,000 - ₹\ 48,000}{48,000 \text{ units}} = ₹\ 6.50 \text{ per unit}$$

Statement of extra weekly contribution
(Information resulting from the proposed change of mechanisation meant for Board's evaluation)

Expected sales units (*Refer to Working note 1*)		57,600
	(₹)	*(₹)*
Sales value : (A) (*57,600 units* × *₹ 12*) (*Refer to Working note 3*)		6,91,200
Marginal costs (excluding wages) : (B) (*57,600 units* × *₹ 6.50*) (*Refer to Working note 4*)	3,74,400	
Wages : (C) (*57,600 units* × *₹ 1.30*) (*Refer to Working note 2*)	74,880	
Total marginal cost : (D) = {(B) – (C)}		4,49,280
Marginal contribution : {(A) – (D)}		2,41,920
Less : Present contribution		2,40,000
Increase in contribution (per week)		1,920

Evaluation: Since the mechanisation has resulted in the increase of contribution to the extent of ₹ 1,920 per week, therefore the proposed change should be accepted.

We have examined the advantages and disadvantages of various methods of remunerating labour, so we can summarise below that the best method of remuneration can be adjudged through the following points:

1. A minimum wage should be guaranteed to all workers.
2. Efficient workers are given incentives in the form of bonus so that they can work harder and produce more.

A share in profits of the firm is given to workers in addition to the minimum wages and bonus

3.11 Absorption of Wages

3.11.1 Elements of wages: In common parlance, the term 'wages' represents monetary payment which an employee receives at regular intervals for the services rendered. Strictly speaking, however, from the point of view of the employer and the cost to the industry, wages

should be taken to include *also non-monetary benefits* which an employee receives by virtue of employment. Such non-monetary benefits may include:

(i) Medical facilities;

(ii) Educational and training facilities;

(iii) Recreational and sports facilities;

(iv) Housing and social welfare; and

(v) Cost of subsidised canteen and co-operative societies.

Such benefits are generally given in an industrial establishment. In some cases the provision of benefits is compulsory. Therefore, while computing the wage cost per worker, the monetary value of such non-monetary benefits should also be taken into account.

The monetary part of a worker's remuneration includes the basic wages, dearness allowance, overtime wages, other special allowance, if any, production bonus, employer's contribution to the provident fund, Employees State Insurance scheme premium, contribution to pension fund, leave pay, etc.

The basic wage is the payment for work done, measured in terms of hours attended or the units produced, as the case may be. The basic wage rate is not normally altered unless there is a fundamental change in the working conditions or methods of manufacture.

Dearness allowance is an allowance provided to cover the increase in cost of living from one period to another. This allowance is calculated either as percentage of the basic wage or as a fixed amount for the days worked. In either case, the percentage or the fixed amount is subject to revision whenever the cost of living index or consumer price Index rises or falls by a certain figure as agreed to by the employer with the labour union. When permanent rise in the cost of living index occurs, a part of the dearness allowance is often absorbed in the basic wage.

Overtime allowance is an allowance paid for the extra hours worked at the rates laid down in the Factories Act. In certain industries, where special allowance for the working conditions, tool maintenance, etc., are paid they are also considered as part of wages.

Production Bonus is an incentive payment made to workers for efficiency that results in production above the standard. There are different methods of computing incentives. Under the Payment of Bonus Act, a worker is entitled to compulsory bonus of 8.33% wages earned in the relevant year or ₹ 100 (whichever is greater). The bonus may be upto 20% of wages depending upon the quantum of profits calculated as per the Act.

3.11.2. Component of wages cost or wages for costing purposes: In addition to wages (including allowances, such as D.A.) that are paid to workers, a firm may have to spend on many other items (such as premium to the ESI or provident fund or bonus).

Further, the worker does not spend all the time for which he is paid on productive work.

This is because he is entitled to weekly holiday and various type of leave. There is also a certain amount of unavoidable idle time. The question is to what extent such additional payment or cost

in respect of labour can be charged directly to unit of cost as part of direct labour cost? Of course, in the case of indirect labour, all such payments as also the wages paid to them, must be treated as part of overheads.

But in the case of direct workers, two alternatives are possible. The additional charges may be treated as overheads. Alternatively, the wage rates being charged to job may be computed by including such payments; automatically then, such payments will be charged to the work done alongwith wages of the worker. (It should be remembered that such wage rate will be only for costing purposes and not for payment to workers). The total of wages and additional payment should be divided by effective hours of work to get such wage rates for costing purposes.

Illustration 26: (Calculation of wage rate per hour)

A worker is paid ₹1000 per month and a dearness allowance of ₹ 200 p.m. Worker contribution to provident fund is @ 10% and employer also contributes the same amount as the employee. The Employees State Insurance Corporation premium is 6.5% of wages of which 1.75% is paid by the employees. It is the firm's practice to pay 2 months' wages as bonus each year.

The number of working days in a year are 300 of 8 hours each. Out of these the worker is entitled to 15 days leave on full pay. Calculate the wage rate per hour for costing purposes.

Solution *(₹)*

Wages paid to worker during the year (₹ 1,000 +200) x 12	14,400
Add: Employer Contribution to:	
Provident Fund @ 10%	1,440
E.S.I. Premium 4.75% (6.5 – 1.75)	684
Bonus at 2 months' wages (Basic + DA)	2,400
Total	18,924

Effective hours per year: 285 × 8 = 2,280

Wage-rate per hour (for costing purpose): ₹ 18,924/2,280 hours = ₹8.30

Illustration 27: (Treatment of abnormal idle time)

In a factory working six days in a week and eight hours each day, a worker is paid at the rate of ₹ 100 per day basic plus D.A. @ 120% of basic. He is allowed to take 30 minutes off during his hours shift for meals-break and a 10 minutes recess for rest. During a week, his card showed that his time was chargeable to :

Job X	*15 hrs.*
Job Y	*12 hrs.*
Job Z	*13 hrs.*

The time not booked was wasted while waiting for a job. In Cost Accounting, how would you allocate the wages of the workers for the week?

Solution

Working notes:

(i) *Total effective hours in a week :*
[(8 hrs. – (30 mts. + 10 mts.)] × 6 days = 44 hours

(ii) *Total wages for a week :*
(₹ 100 + 120% of ₹ 100) × 6 days = ₹ 1,320

(iii) Wage rate per hour : = ₹ 30

(iv) Time wasted waiting for job (Abnormal idle time): = 44 hrs. – (15 hrs. + 12 hrs. + 13 hrs.)
= 4 hrs.

Allocation of wages in Cost Accounting

		(₹)
Allocated to Job X	: 15 hours × ₹ 30 =	450
Allocated to Job Y	: 12 hours × ₹ 30 =	360
Allocated to Job Z	: 13 hours × ₹ 30 =	390
Charged to Costing Profit & Loss A/c	: 4 hours × ₹ 30 =	120
Total		1,320

3.11.3 Holiday and leave wages: One alternative to account for wages paid on account of paid holiday and leave can be to include them as departmental overheads. In such a case, it is necessary to record such wages separately from "worked for wages". Such a segregation can be made possible by providing a separate column in the payroll for holiday and leave wages in the same way as there are columns for dearness allowance, provident fund deductions, etc. If, however, a separate or additional column cannot be provided for this purpose it would be necessary to analyse the payroll periodically to ascertain how much of the total payment pertains to "worked for wages" and how much is attributed to leave and holiday wages.

Another way could be to inflate the wage rate for costing purposes to include holiday and leave wages. This can be done only in the case of direct workers.

Illustration 28: (Calculation of leave wages)

Calculate the labour hour rate of a worker X from the following data :

Basic pay	*₹ 1,000 p.m.*
D.A.	*₹ 300 p.m.*
Fringe benefits	*₹ 100 p.m.*

Number of working days in a year 300. 20 days are availed off as holidays on full pay in a year. Assume a day of 8 hours.

Solution

(a)	(i)	Effective working days in a year	300
		Less : Leave days on full pay	20
		Effective working days	280 days
		Total effective working hours (280 days × 8 hours)	2,240
	(ii)	*Total wages paid in a year*	*(₹)*
		Basic pay	12,000
		D.A.	3,600
		Fringe benefits	1,200
			16,800
	(iii)	*Hourly rate* : ₹ 16,800/2,240 hours	₹ 7.50

3.11.4 Night shift allowance: In some cases, workers get extra payment if they work at night. Since the extra payment is not for any particular job, therefore such a payment should be treated as part of overheads.

3.11.5 Principles of remuneration: The term 'remuneration' has been defined as the reward for labour and service. It is the result of the agreement between the employer and the employee, whereby for a specified work or service rendered by the employee the employer agrees to pay a specified sum of money. Apart from this an employee by virtue of the fact that he is an employee becomes entitled to certain non-monetary benefits.

The method of remuneration adopted varies from industry to industry and, in certain cases, even among different units in the same industry. Whatever be the variation, the method of fixing remuneration payable to the various categories of employees has to be based on certain accepted principles. These are:

(i) **Geographical Area Based:** Wage-rates in an industry should be fixed in conformity with the general wage-levels in the geographical area i.e. the rate should be more or less the same for similar efforts and skill. The wage-level in an area would in turn depend upon demand for labour, the availability of labour, the cost of living in the area, the wage levels in neighbouring industrial area, and the capacity of the particular industry to pay.

(ii) **Performance\Job Based:** Wage-rates should be related to the degree of skill, effort, initiative and responsibility that the employee is expected to assume in respect of the various jobs he may be called upon to perform. There should be generally equal pay for equal work.

(iii) **Minimum Wages:** Wage-rates should guarantee a minimum wage regardless of the existence of factors listed under (ii) above, particularly when the working conditions are difficult and dangerous.

(iv) **Maintain Standard of living:** Wage-rates are considered satisfactory only if they enable the workers to maintain a reasonable standard of living.

(v) **Separate wage rates for different classes of employees:** Separate wage rates should be fixed for different classes of employees since each class expects to maintain a different standard of living; also the education, physical and mental efforts and responsibility required for performing different jobs are not the same.

(vi) **Incentive as per output:** It should be possible for worker to increase his earnings through extra effort and by increasing output. If he alone is responsible, he should have the full benefit of the increased productivity. Otherwise, if increased output has resulted from co-operation between management and workers both should share the benefit.

It is important that these basic principles should be recognised in fixing the wage rate of workers; otherwise, there will be dissatisfaction among the employees and, consequently, there will be higher labour turnover. Satisfactory employer-employee relationship is a primary necessity for industrial development and this has to be ensured to a very great degree, by satisfactory schemes of remunerating labour.

The aim should be to keep labour cost per unit of output (or service) as low as possible. It is not the same as keeping wages at low levels.

There is a definite correlation between wages and productivity; high wages often lead to such an increase in productivity that wages per unit of output fall. However, this rule is also subject to diminishing returns—a point is reached at which any further increase in wage rates does not bring about a corresponding increase in efficiency. But generally, higher wages result in lower cost per unit.

Wages affect the national economy through cost of goods produced. If an increase in wages outpaces the corresponding increase in productivity, goods become costlier and cannot compete with those of other countries in the world markets.

From the point of view of an expert it is necessary to keep wages in check like other costs. The safe rule is to link up wages with productivity.

3.11.6 Absorption rates of labour cost: Labour cost as stated above include monetary compensation and non-monetary benefits to workers.

Monetary benefits include, basic wages, D.A., overtime pay, incentive or production bonus contribution to employee provident fund, House Rent Allowance, Holiday and vacation pay etc.

The non-monetary benefits include medical facilities, subsidized canteen services, subsidized housing, education and training facilities.

Accounting of monetary and non-monetary benefits to indirect workers does not pose any problems because the total of monetary and non-monetary benefits are treated as overhead and absorbed on the basis of rate per direct labour hour, if overheads are predominantly labour oriented.

For direct workers, the ideal method is to charge jobs or units produced by supplying per hour rate calculated as below :

$$\text{Rate per hour} = \frac{\text{Total of estimated monetary benefits and cost of non-monetary benefits}}{\text{Budgeted direct labour hours - Normal idle time}}$$

Another alternative method is to treat the monetary benefits other than basic wages and dearness allowance as well as cost of non-monetary benefits as overheads.

3.12 Efficiency Rating Procedures

Efficiency is usually related with performance and may be computed by comparing the time taken with the standard time allotted to perform the given job/task.

If the time taken by a worker on a job equals or less than the standard time, then he is rated efficient.

In case he takes more time than the standard time he is rated as inefficient.

$$\text{Efficiency in \%} = \frac{\text{Time allowed as per std.}}{\text{Time taken}} \times 100$$

For efficiency rating of employees the following procedures may be followed:

1. Determining standard time/performance standards: The first step is to determine the standard time taken by a worker for performing a particular job/task. The standard time can be determined by using Time & Motion study or Work study techniques. While determining the standard time for a job/task a heterogeneous group of workers is taken and contingency allowances are added for determining standard time.

2. Measuring Actual Performance of workers: For computing efficiency rating it is necessary to develop a procedure for recording the actual performance of workers. The system developed should record the output of each worker along with the time taken by him.

3. Computation of efficiency rating: The efficiency rating of each worker can be computed by using the above mentioned Formula.

3.12.1 Need for efficiency rating

1. As discussed earlier when a firm follows a system of payment by results, the payment has a direct relationship with the output given by a worker. The firm for making payment to worker is required to ascertain his efficiency level. For instance, under Taylor's differential piece work system the lower rate i.e. 83% of piece rate is given to a worker when his efficiency rating is less than 100% and higher rate viz., 125% of piece rate is offered at efficiency level of either 100% or more. Similarly under Emersion efficiency plans bonus is paid at rising scale at various level of efficiency, ranging from 66.67% to 150%.
2. The efficiency rating also helps the management in preparing labour requirement budget or for preparing manpower requirements. For example, let P Ltd. manufactures two products by using one grade of labour. The following estimates are available :

	Product A	*Product B*
Budgeted production (units)	3,480	4,000
Std. hrs. allowed per product	5	4

It is further worked out that the efficiency rating (efficiency ratio) for productive hours worked by direct workers in actually manufacturing the production is 80% then the exact standard labour requirement can be worked out as follows:

	Product A	*Product B*	*Total*
Budgeted production (in units)	3,480	4,000	
Std. hours allowed for budgeted production	17,400 (3,480 units × 5 hours)	16,000 (4,000 units × 4 hours)	33,400

Since efficiency ratio is given as 80% therefore Std. labour hours required for 100% efficiency level are $\left(33{,}400\,\text{hours} \times \frac{100}{80}\right)$ = 41,750 hours.

Labour productivity : Productivity is generally determined by the input/output ratio. In the case of labour it is calculated as below:

$$\frac{\text{Standard time for doing actual amount of work}}{\text{Actual time taken to do work}}$$

Labour productivity is an important measure for measuring the efficiency of individual workers. It is an index of efficiency and a sign of effectiveness in the utilisation of resources-men, materials, capital, power and all kinds of services and facilities.

It is measured by the output in relation to input. Productivity can be improved by reducing the input for a certain quantity or value of output or by increasing the output from the same given quantity or value of input.

Factors for increasing labour productivity: The important factors which must be taken into consideration for increasing labour productivity are as follows:

1. Employing only those workers who possess the right type of skill.
2. Placing a right type of man on the right job.
3. Training young and old workers by providing them the right types of opportunities.
4. Taking appropriate measures to avoid the situation of excess or shortage of labour at the shop floor.
5. Carrying out work study for the fixation of wage rate, and for the simplification and standardisation of work.

3.13 Summary

- ***Labour Cost:*** *Cost incurred for hiring of human resource of employees*
- ***Direct Labour:*** *Any Labour Cost that is specifically incurred for or can be readily charged to or identified with a specific job, contract, work order or any other unit of cost.*
- ***Idle Time:*** *The time for which the employer pays but obtains no direct benefit or for no productive purpose.*
- ***Normal Idle Time:*** *Time which cannot be avoided or reduced in the normal course of business. The cost of normal idle time should be charged to the cost of production.*
- ***Abnormal Idle Time:*** *It arises on account of abnormal causes and should be charged to Costing Profit and Loss account.*
- ***Time Keeping:*** *It refers to correct recording of the employees attendance time*
- ***Time Booking:*** *It is basically recording the details of work done and the time spent by workers on each job or process.*
- ***Overtime:*** *Payment to workers, when a worker works beyond the normal working hours. Usually overtime has to be paid at double the rate of normal hours.*
- ***Overtime Premium:*** *It's the amount of extra payment paid to a worker under overtime.*
- ***Labour Turnover:*** *It is the rate of change in labour force during a specified period due to resignation, retirement and retrenchment. If the labour turnover is high, it's a sign of instability and may affect the profitability of the firm.*
- *Labour turnover can be measured through the following methods:*

(i) Replacement Method: $\frac{\text{Number of employees replaced}}{\text{Average number of employees on roll}} \times 100$

(ii) Separation Method: $\frac{\text{Number of employees separated during the year}}{\text{Average number of employees on rolls during the period}} \times 100$

(iii) Flux Method: $\frac{\text{Number of employees separated + number of employees replaced}}{\text{Average number of employees on rolls during the period}} \times 100$

(iv) Labour turnover due to new recruitment:

$$\frac{\text{No. of new workers joining in a period (excluding replacements)}}{\text{Average number of workers on the roll in a period}}$$

(v) Labour turnover including accessions:

$$\frac{\text{No. of new workers joining in a period (excluding replacements)}}{\text{Average number of workers on the roll in a period}}$$

OR

$$\frac{\text{No. of separations + No. of accessions}}{\text{Average number of workers}} \times 100$$

- ***Incentives:*** *It is the simulation for effort and effectiveness by offering monetary inducement or enhanced facilities.*
- ***Time Rate System:*** *The amount of wages due to a worker are arrived at by multiplying the time worked by the appropriate time rate.*
- ***Differential Time Rate:*** *Different hourly rates are fixed for different levels of efficiency. Upto a certain level a fixed rate is paid and based on the efficiency level the hourly rate increases gradually.*
- ***Straight Piece Work:*** *Payment is made on the basis of a fixed amount per unit of output irrespective of time taken. It is the number of units produced by the worker multiplied by rate per unit.*
- ***Differential Piece Rate:*** *For different level of output below and above the standard, different piece rates are applicable.*

(i) *Taylor's Differentials Piece Work system:*

Output/ Efficiency	*Rate*
< 100%	*83% of normal rate*
≥ 100%	*125% of normal rate or 150% of lower rate*

(ii) *Merrick Differential Piece Work System:*

Efficiency	*Piece rate applicable*
Upto 83%	*Normal rate,*
Above 83% and upto 100%	*10% above normal rate.*
Above 100%	*20% or 30% above normal rate.*

- ***Gantt Task and bonus system***

Output	*Payment*
Output below standard	*guaranteed time rate.*

Output at standard	*Time rate plus bonus of 20% (usually) of time rate.*
Output above standard	*High piece rate on worker's whole output.*

It is so fixed, so as to include a bonus of 20% of the time rate

- ***Emerson's Efficiency system:***

Efficiency	*Payment*
<66.67%	*Hourly Rate*
66.67%-100%	*Bonus varies from 1% to 20%*
≥ 100%	*Bonus of 20% of basic + 1% of every 1% increase in efficiency.*

- ***Halsey System:*** *Time taken × Time rate + 50% of time saved × Time rate.*
- ***Halsey Weir Plan:*** *same as Halsey system but bonus is paid at 30%.*
- ***Rowan System:*** $\text{Time taken} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$
- ***Barth System:*** $\text{Earnings} = \text{Hourly rate} \times \sqrt{\text{Standard hours} \times \text{Hours worked}}$
- ***Job Analysis:*** *A study of job in all phases for the purpose of laying down job description and job specifications.*
- ***Labour Productivity:*** *It is the index of labour efficiency and indicates the effectiveness in utilization of labour.*

$$\frac{\text{Standard time for doing actual amount of work}}{\text{Actual time taken to do work}}$$

- ***Efficiency Rating:*** $\frac{\text{Time allowed as per std.}}{\text{Time taken}} \times 100$
- ***Rate of Absorption of Wages:***

$$\frac{\text{Total of estimated monetary benefits and cost of non-monetary benefits}}{\text{Budgeted direct labour hours - Normal idle time}}$$

- ***Wage Abstract:*** *A summary giving details of wages to be charged to individual jobs, work orders or processes for a specific period.*

4

Overheads

Learning Objectives

After studying this chapter you will be able to:

- Know the meaning of overheads
- Differentiate between direct costs and overheads.
- Understand the meaning of allocation, apportionment and absorption of overheads
- Identify, whether overheads are under-absorbed or over- absorbed.
- Understand of the accounting and control of administrative, selling and distribution of overheads.

4.1 Introduction

Overheads are the expenditure which cannot be conveniently traced to or identified with any particular cost unit. Such expenses are incurred for output generally and not for a particular work order e.g., wages paid to watch and ward staff, heating and lighting expenses of factory etc. Overheads are also very important cost element alongwith direct materials and direct labour. Often in a manufacturing concern, overheads exceed direct wages or direct materials and at times even both put together. On this account, it would be a grave mistake to ignore overheads either for the purpose of arriving at the cost of a job or a product or for controlling total expenditure.

Overheads also represent expenses that have been incurred in providing certain ancillary facilities or services which facilitate or make possible the carrying out of the production process; by themselves these services are not of any use. For instance, a boiler house produces steam so that machines may run and, without the generation of steam, production would be seriously hampered. But if machines do not run or do not require steam, the boiler house would be useless and the expenses incurred would be a waste.

Overheads are incurred not only in the factory of production but also on administration, selling and distribution.

4.2 Classification of Overheads

	Description	Example
By Function:		
Factory or Manufacturing or Production Overhead	Manufacturing overhead is the indirect cost incurred for manufacturing or production activity in a factory. Manufacturing overhead includes all expenditures incurred from the procurement of materials to the completion of finished product.	(i) Stock keeping expenses, (ii) Repairs and maintenance of plant, (iii) Depreciation of factory building, (iv) Indirect labour, (v) cost of primary packing (vi) Insurance of plant and machinery etc. Production overhead include administration costs relating to production, factory, works or manufacturing.
Office and Administrative Overheads	Office and Administrative overheads are expenditures incurred on all activities relating to general management and administration of an organisation. It includes formulating the policy, directing the organisation and controlling the operations of an undertaking which is not related directly to production, selling, distribution, research or development activity or function.	(i) Salary paid to office staffs, (ii) Repairs and maintenance of office building, (iii) Depreciation of office building (iv) postage and stationery, (v) Lease rental in case of operating lease (in case of finance lease lease rental excluding finance cost) (vi) accounts and audit expenses etc.
Selling and Distribution Overheads	(i) Selling overhead: expenses related to sale of products and include all indirect expenses in sales management for the organisation. (ii) Distribution overhead: cost incurred on making product available for sale in the market.	(i) Salesmen commission, (ii) Advertisement cost, (iii) Sales office expenses etc. (i) Delivery van expenses, (ii) Transit insurance, (iii) warehouse and cold storage expenses, (iv) secondary packing expenses etc.
By Nature		
Fixed Overhead	These are the costs which are incurred for a period, and which, within certain output and	(i) Salary paid to permanent employees,

	turnover limits, tend to be unaffected by fluctuations in the levels of activity (output or turnover). They do not tend to increase or decrease with the changes in output.	(ii) Depreciation of building and plant and equipment, (iii) Interest on capital, (iv) Insurance
Variable Overhead	These costs tend to vary with the volume of activity. Any increase in the activity results in an increase in the variable cost and vice-versa.	(i) Indirect materials, (ii) Power and fuel, (iii) lubricants, (iv) tools and spares etc.
Semi-Variable Overheads	These costs contain both fixed and variable components and are thus partly affected by fluctuations in the level of activity.	(i) Electricity cost, (ii) water cost, (iii) telephone and internet expenses etc.
By Element		
Indirect materials	Materials which do not normally form part of the finished product (cost object) are known as indirect materials.	(i) Stores used for maintaining machines and buildings (lubricants, cotton waste, bricks etc.) (ii) Stores used by service departments like power house, boiler house, canteen etc.
Indirect labour	Labour costs which cannot be allocated but can be apportioned to or absorbed by cost units or cost centres is known as indirect labour.	(i) Salary paid to foreman and supervisor (ii) Salary paid to administration staff etc.
Indirect expenses	Expenses other than direct expenses are known as indirect expenses, that cannot be directly, conveniently and wholly allocated to cost centres.	(i) Rates & taxes, (ii) insurance, (iii) depreciation, (iv) advertisement expenses etc.
Controllability		
Controllable costs	These are those costs which can be controlled by the implementation of appropriate managerial influence and proper	(i) Materials cost, (ii) wages and salary, (iii) power and fuel etc.

	policies.	
Uncontrollable costs	Overhead costs which cannot be controlled by the management even after the implementation of appropriate managerial influence and proper polices are known as uncontrollable costs.	(i) Rates and taxes, (ii) Depreciation, (iii) Interest on borrowings

4.2.1 Advantages of Classification of Overheads into Fixed and Variable: The primary objective of segregating semi-variable expenses into fixed and variable is to ascertain marginal costs. Besides this, it has the following advantages also.

(a) ***Controlling Expenses*:** The classification of expenses into fixed and variable components helps in controlling expenses. Fixed costs are generally policy costs, which cannot be easily reduced. They are incurred irrespective of the output and hence are more or less non controllable. Variable expenses vary with the volume of activity and the responsibility for incurring such expenditure is determined in relation to the output. The management can control these costs by giving proper allowances in accordance with the output achieved.

(b) ***Preparation of Budget Estimates*:** The segregation of overheads into fixed and variable part helps in the preparation of flexible budget. It enables a firm to estimate costs at different levels of activity and make comparison with the actual expenses incurred.

Suppose in October, 2011 the output of a factory was 1,000 units and the expenses were:

	(₹)
Fixed	5,000
Variable	4,000
Semi-variable (40% fixed)	6,000
	15,000

In November, 2011 the output was likely to increase to 1,200 units. In that case the budget or estimate of expenses will be:

	(₹)
Fixed	5,000
Variable $\left(\frac{₹\ 4,000 \times 1,200}{1,000}\right)$	4,800
Semi-variable	
Fixed, 40% of ₹ 6,000	2,400

Variable : $\left[\frac{₹\ 3,600 \times 1,200}{1,000}\right]$	4,320
	16,520

It would be a mistake to think that with the output going up from 1,000 units to 1,200 units the expenses would increase proportionately to ₹18,000. This would be wrong budgeting.

(*c*) ***Decision Making*:** The segregation of semi variable cost between fixed and variable overhead also helps the management to take many important decisions. For example, decisions regarding the price to be charged during depression or recession or for export market. Likewise, decisions on make or buy, shut down or continue, etc., are also taken after separating fixed costs from variable costs.

In fact, when any change is contemplated, say, increase or decrease in production, change in the process of manufacture or distribution, it is necessary to know the total effect on cost (or revenue) and that would be impossible without a correct segregation of fixed and variable costs. The technique of marginal costing, cost volume profit relationship and break-even analysis are all based on such segregation.

4.3 Accounting and Control of Manufacturing Overheads

We have already seen that overheads are by nature those costs which cannot be directly related to a product or to any other cost unit. Yet for working out the total cost of a product or a unit of service, the overheads must be included. Thus we have to find out a way by which the overheads can be distributed over the various units of production.

One method of working out the distribution of overheads over the various products could be to ascertain the amount of actual overheads and distribute them over the products. This however, creates a problem since the actual amount of overheads can be known only after the financial accounts are closed. If we wait that long, the cost sheets lose their main advantages and utility to the management. All the decisions for which cost sheets are prepared are immediate decisions and cannot be postponed till the actual overheads are known. Therefore, some method has to be found by which overheads can be included in the cost of the products, as soon as prime cost, the cost of raw materials, labour and other direct expenses, is ascertained.

One method is to work out pre-determined rates for absorbing overheads. These rates are worked out before an accounting period begins by estimating the amount of overheads and the level of activity in the ensuing period. Thus, as soon as the prime cost of a product or a job is available, the various overheads are charged by these rates. Of course, this implies that the overheads are charged on an estimated basis. Later, when the actual overheads are known, the difference between the overheads charged to the products and actual overheads is worked out and adjusted.

Manufacturing Overheads: Generally manufacturing overheads form a substantial portion of the total overheads. It is important, that such overheads should be properly absorbed over the cost of production. The following procedure may be adopted in this regard. The steps given below shows how factory overhead rates are estimated and overheads absorbed on that basis and the last one shows how actual are compared with the absorbed amount.

(Students should carefully note the distinction between the various terms used).

1. Estimation and collection of manufacturing overheads: The first stage is to estimate the amount of overheads, keeping in view the past figures and adjusting them for known future changes. The sources available for the collection of factory overheads may include (a) Invoices, (b) Stores requisition, (c) Wage analysis book (d) Journal entries. etc.

2. Assignment of Manufacturing Overheads: The guiding principle for assignment of manufacturing overheads to a cost object is the traceability of the overheads in an economically feasible manner.

Assignment of the manufacturing overhead is done on the basis of either of the following two principles:

(i) Cause and Effect: Cause is the process or operation or activity and effect is the incurrence of cost.

(ii) Benefit received: Manufacturing overheads are to be apportioned to various cost objects in proportion to the benefits received by them.

(a) Cost Allocation: The term 'allocation' refers to the direct assignment of cost to a cost object which can be traced directly. It implies relating overheads directly to the various departments. The estimated amount of various items of manufacturing overheads should be allocated to various cost centres or departments. For example- if a separate power meter has been installed for a department, the entire power cost ascertained from the meter is allocated to that department. The salary of the works manager cannot be directly allocated to any one department since he looks after the whole factory. It is, therefore, obvious that many overhead items will remain unallocated after this step.

(b) Cost Apportionment: There are some items of estimated overheads (like the salary of the works manager) which cannot be directly allocated to the various departments and cost centres. Such unallocable expenses are to be spread over the various departments or cost centres on the basis of two principles. This is called apportionment. Thus apportionment implies "*the allotment of proportions of items of cost to cost centres or departments*". After this stage, all the overhead costs would have been either allocated to or apportioned over the various departments.

(c) Re-apportionment: Upto the last stage all overheads are allocated and apportioned to all the departments- both production and service departments. Service departments are those departments which do not directly take part in the production of goods or providing services. Such departments provide auxiliary services across the entity and renders services to other

cost centres and in some cases to outside parties. Examples of such departments are engineering, quality control and assurance, laboratory, canteen, stores, time office, dispensary etc. The overheads of these departments are to be shared by the production departments since service departments operate primarily for the purpose of providing services to production departments. The process of assigning service department overheads to production departments is called reassignment or re-apportionment. At this stage, all the factory overheads are collected under production departments.

3. Absorption: After completing the distribution as stated above the overheads charged to department are to be recovered from the output produced in respective departments. This process of recovering overheads of a department or any other cost center from its output is called recovery or absorption.

Absorption of manufacturing overheads shall be as follows:

(i) Variable Manufacturing overheads: The variable manufacturing overheads shall be absorbed on the basis of actual production.

(ii) Fixed Manufacturing overheads: The fixed manufacturing overhead shall be absorbed on the basis of normal capacity.

The overhead expenses can be absorbed by estimating the overhead (as assigned above) and then working out an absorption rate. When overheads are estimated, their absorption is carried out by adopting a pre-determined overhead absorption rate. This rate can be calculated by using any one method as discussed in this chapter at the end.

As the actual accounting period begins, each unit of production automatically absorbs a certain amount of factory overheads through pre-determined rates. During the year a certain amount will be absorbed over the various products. This is known as the total amount of absorbed overheads.

4. Treatment of over and under absorption of overheads: After the year end the total amount of actual factory overheads is known. There is bound to be some difference between the actual amount of overheads and the absorbed amount of overheads. So the overheads are generally either under-absorbed or over-absorbed. The difference has to be adjusted keeping in view of such differences and the reasons therefore.

Students will thus see that the whole discussion as above is meant to serve the following two purposes:

(a) to charge various products and services with an equitable portion of the total amount of factory overheads ; and

(b) to charge factory overheads immediately as the product or the job is completed without waiting for the figures of actual factory overheads.

4.4 Steps for the Distribution of Overheads

The various steps for the distribution of overheads have been discussed in detail as below:

4.4.1 Estimation and Collection of Manufacturing Overheads: The amount of factory overheads is required to be estimated. The estimation is usually done with reference to past data adjusted for known future changes. The overhead expenses are usually collected through a system of standing orders.

Standing Orders: In every manufacturing business, expenses are incurred on direct materials and direct labour in respect of several jobs or other units of production, manufacture of which is undertaken. The incurring of these expenses is authorised by production orders or work orders. The work order numbers are not ordinarily fixed or permanent. They are generally allotted in a serial order according to the number of manufacturing jobs undertaken by the business. In addition, indirect expenses are incurred in connection with the rendering of services to the production departments, or to the manufacturing process. The term "Standing Order" *denotes sanction for indirect expenses under various heads of expenditure.*

In large factories, usually the classification of indirect expenditures is combined with a system of Standing Orders (sometimes also referred as Service "Orders"). It is a system under which a number is allotted to each item of expense for the purpose of identification, and the same is continued from year to year. All the indirect expenditure in such a case, is charged to one or the other of the Standing Orders and periodical summaries, giving total of each Standing Order, are prepared for comparison with budgets, as well as for apportioning them among the various departments. The extent of such analysis and the nomenclature adopted are settled by the management according to the needs of the industry.

4.4.2 Allocation of Overheads over various Departments or Departmentalisation of Overheads: Most of the manufacturing processes functionally are different and are performed by different departments in the factory. Where such a division of functions had been made, some of the departments should be engaged in actual production of goods, and others in providing services ancillary thereto. At this stage, the factory overheads which can be directly related to the various production or service departments are allocated in this manner.

It may, sometime, become necessary to sub-divide a manufacturing organisation into several cost centres, so that a closer distribution of expenses and a more detailed control is practicable.

It is thus obvious that the principal object of setting up cost centres is to collect data, in respect of similar activities more conveniently. This avoids a great deal of cost analysis. When costs are collected by setting up cost centres, several items can be ascertained definitely and the element of estimation is reduced considerably. For instance, the allowance of the normal idle time or the amount to be spent on consumable stores, etc. There are two main types of cost centres - machine or personal - depending on whether the process of manufacture is carried on at a centre by man or machine. For the convenience of recording of expenditure,

cost centres are sometimes allotted a code number.

Advantages of Departmentalisation: The collection of overheads department wise gives rise to the following advantages:

(a) *Better Estimation of Expenses:* Some expenses which relate to the departments will be estimated almost on an exact basis and, to that extent, the accuracy of estimation of overheads will be higher.

(b) *Better Control:* For the purpose of controlling expenses in a department, it is obviously necessary that the figures in relation to each department should be separately available. It is one of the main principles of control that one should know for each activity how much should have been spent and how much is actually spent. If information about expenses is available only for factory as a whole, it will not be possible to know which department has been over spending.

(c) *Ascertainment of Cost for each department:* From the point of view of ascertaining the cost of each job, the expenses incurred in the departments through which the job or the product has passed should be known. It is only then that the cost of the job or the product can be charged with the appropriate share of indirect expenses. It is not necessary that a job must pass through all the departments or that the work required in each department should be the same for all jobs. It is, therefore, necessary that only appropriate charge in respect of the work done in the department is made. This can be done only if overheads for each department are known separately.

(d) *Suitable Method of Costing:* A suitable method of costing can be followed differently for each department *e.g.,* batch costing when a part is manufactured, but single or output costing when the product is assembled.

4.4.3 Apportioning overhead expenses over various departments: After the allocable overheads are related to the departments, expenses incurred for several departments have to be apportioned over each department, *e.g.* rent, power, lighting, insurance and depreciation. For distributing these overheads over different departments benefiting thereby, it is necessary at first to determine the proportion of benefit received by each department and then distribute the total expenditure proportionately on that basis. But the same basis of apportionment cannot be followed for different items of overheads since the benefit of service to a department in each case has to be measured differently. Some of the bases that may be adopted for the apportionment of expenses are stated below:

Overhead Cost	Bases of Apportionment
1. (i) Rent and other building expenses (ii) Lighting and heating (conditioning) (iii) Fire precaution service (iv) Air- conditioning	Floor area, or volume of department
2. (i) Perquisites	Number of workers

	(ii) Labour welfare expenses (iii) Time keeping (iv) Personnel office (v) Supervision	
3.	(i) Compensation to workers (ii) Holiday pay (iii) ESI and PF contribution (iv) Perquisites	Direct wages
4.	General overhead	Direct labour hour, or Direct wages, or Machine hours.
5.	(i) Depreciation of plant and machinery (ii) Repairs and maintenance of plant and machinery (iii) Insurance of stock	Capital values
6.	(i) Power/steam consumption (ii) Internal transport (iii) Managerial salaries	Technical estimates
7.	Lighting expenses (light)	No. of light points, or Area or Metered units
8.	Electric power (machine operation)	Horse power of machines, or Number of machine hour, or value of machines or units consumed.
9.	(i) Material handling (ii) Stores overhead	Weight of materials, or volume of materials, or value of materials or unit of materials.

Some other basis of apportioning overhead costs: We have considered already that the benefit received by the department generally is the principal criterion on which the costs of service departments or common expenses are apportioned. But other bases of apportionments which may be used are mentioned below:

(a) Analysis or survey of existing conditions.

(b) Ability to pay.

(c) Efficiency or incentive.

A single concern may have only one criterion under consideration predominantly or may use all (including the service or benefit criterion) for different phases of its activity.

Analysis or Survey of existing conditions : At times it may not be possible to determine the advantage of an item of expenses without undertaking an analysis of expenditure. For example, lighting expenses can be distributed over departments only on the basis of the number of light points fixed in each department.

Ability to pay: It is a principle of taxation which has been applied in cost accounting as well for distributing the expenditure on the basis of income of the paying department, on a proportionate basis. For example, if a company is selling three different products in a territory, it may decide to distribute the expenses of the sales organisation to the amount of sales of different articles in these territories. This basis, though simple to apply, may be inequitable since the expenditure charged to an article may have no relation to the actual effort involved in selling it. Easy selling lines thus may have to bear the largest proportion of expenses while, on the other hand, these should bear the lowest charge.

Efficiency or Incentives: Under this method, the distribution of overheads is made on the basis of pre-determined levels of production or sales. When distribution of overhead cost is made on this basis and if the level of production exceeds the pre-determined level of production the incidence of overhead cost gets reduced and the total cost per unit of production or of sales, lowered. The opposite is the effect if the assumed levels are not reached.

Thus the department whose sales are increasing is able to show a greater profit and thereby is able to earn greater goodwill and appreciation of the management than it would have if the distribution of overheads was made otherwise.

Difference between Allocation and Apportionment

The difference between the allocation and apportionment is important to understand because the purpose of these two methods is the identification of the items of cost to cost units or centers. However, the main difference between the above methods is given below.

(1) Allocation deals with the whole items of cost, which are identifiable with any one department. For example, indirect wages of three departments are separately obtained and hence each department will be charged by the respective amount of wages individually.

On the other hand apportionment deals with the proportions of an item of cost for example; the cost of the benefit of a service department will be divided between those departments which has availed those benefits.

(2) Allocation is a direct process of charging expenses to different cost centres whereas apportionment is an indirect process because there is a need for the identification of the appropriate portion of an expense to be borne by the different departments benefited.

(3) The allocation or apportionment of an expense is not dependent on its nature, but the relationship between the expense and the cost centre decides that whether it is to be allocated or apportioned.

(4) Allocation is a much wider term than apportionment.

4.4.4 Re-apportioning service department overheads over production department: The re-apportionment of the service department cost to the production

department is known as secondary distribution. The suggestive bases that may be adopted for re-apportionment are given below:

Cost of the Service Departments:	Basis
1. Maintenance and Repair shop 2. Planning and progress 3 Tool room	Direct labour hours, Machine hours, Direct labour wages, Asset value × Hours worked.
4. Canteen and Welfare 5. Hospital and Dispensary 6. Personnel Department	No. of direct workers No. of employees etc.
7. Time-keeping	No. of card punched, No. of employees
8. Computer Section	Computer hours, Specific allocation to departments
9. Power House (electric lighting cost)	Floor area, Cubic content, No. of electric Points, Wattage.
10. Power House (electric power cost)	Horse power, Kwh, Horse power × Machine hours, Kwh × Machine hours
11. Stores Department	No. of requisitions, Weight or value of Materials issued.
12. Transport Department	Crane hours, Truck hours, Truck mileage, Truck tonnage, Truck ton- hours, Tonnage handled. No. of packages of Standard size
13. Fire Protection	Capital values
14. Inspection	Inspection hours

Notes:

(1) Repairs included in repairs shop cost, building maintenance cost included in maintenance shop cost etc. should be apportioned on the basis of capital values.

(2) Economy, practicability, equitability and reliability are the matters of consideration for selection of the base.

Methods for Re-apportionment: The re-apportionment of service department expenses over the production departments may be carried out by using any one of the following methods:

(i) Direct re-distribution method.

(ii) Step method of secondary distribution or non-reciprocal method.

(iii) Reciprocal Service method.

(i) Direct Re-distribution Method: Service department costs under this method are apportioned over the production departments only, ignoring the services rendered by one service department to the other. To understand the applications of this method go through the illustration which follows.

Illustration 1: (Re-apportionment of costs under Direct re-distribution method)

XL Ltd., has three production departments and four service departments. The expenses for these departments as per Primary Distribution Summary are as follows :

Production Departments :	*(₹)*	*(₹)*
A	*30,000*	
B	*26,000*	
C	*24,000*	*80,000*
Service Departments :	*(₹)*	*(₹)*
Stores	*4,000*	
Time-keeping and Accounts	*3,000*	
Power	*1,600*	
Canteen	*1,000*	*9,600*

The following information is also available in respect of the production departments:

	Dept. A	*Dept. B*	*Dept. C*
Horse power of Machine	*300*	*300*	*200*
Number of workers	*20*	*15*	*15*
Value of stores requisition in (₹)	*2,500*	*1,500*	*1,000*

Apportion the costs of service departments over the production departments.

Solution

Secondary Overhead Distribution Statement

Item of cost (as per primary distribution summary)	***Basis of apportionment***	***Total***	***Production Depts***		
			A	***B***	***C***
		(₹)	***(₹)***	***(₹)***	***(₹)***
Cost as per primary distribution summary		80,000	30,000	26,000	24,000
Stores (5:3:2)	Value of Store requisition	4,000	2,000	1,200	800

Time-keeping and Accounts (4:3:3)	No. of workers	3,000	1,200	900	900
Power (3:3:2)	H.P. of Machine	1,600	600	600	400
Canteen (4:3:3)	No. of workers	1,000	400	300	300
		89,600	34,200	29,000	26,400

(ii) *Step Method or Non-reciprocal method:*

This method gives cognizance to the services rendered by service department to another service department. Therefore, as compared to previous method, this method is more complicated because a sequence of apportionments has to be selected here. The sequence here begins with the department that renders maximum number of services to the other service department(s). In other words the cost of the service department that serves the largest number of services to the other service department(s) and production department(s) is distributed first. After this, the cost of service department serving the next largest number of departments is apportioned.

This process continues till the cost of last service department is apportioned. The cost of last service department is apportioned among production departments only.

Some authors are of the view that the cost of service department with largest amount of cost should be distributed first.

Illustration 2: (Re-apportionment of costs under non-reciprocal method)

Suppose the expenses of two production departments A and B and two service departments X and Y are as under :

Amount	***(₹)***	***Apportionment Basis***		
		Y	*A*	*B*
X	*2,000*	*25%*	*40%*	*35%*
Y	*1,500*	*—*	*40%*	*60%*
A	*3,000*			
B	*3,200*			

Solution

Summary of Overhead Distribution

Departments	X (₹)	Y (₹)	A (₹)	B (₹)
Amount as given above	2,000	1,500	3,000	3,200
Expenses of X Dept. apportioned over Y,A and B Dept. in the ratio (5:8:7)	—2,000	500	800	700
Expenses of Y Dept. apportioned over A and B Dept. in the ratio (2:3)	-	—2,000	800	1,200
Total	*Nil*	*Nil*	4,600	5,100

(iii) ***Reciprocal Service Method:*** This method recognises the fact that where there are two or more service departments they may render services to each other and, therefore, these inter-departmental services are to be given due weight while re-distributing the expenses of the service departments.

The methods available for dealing with reciprocal services are:

(a) Simultaneous equation method;

(b) Trial and error method;

(c) Repeated distribution method.

(a) ***Simultaneous Equation Method:*** According to this method firstly, the costs of service departments are ascertained. These costs are then re-distributed to production departments on the basis of given percentages. (Refer to the following illustration to understand the method)

Illustration 3: (Re-apportionment of costs under Simultaneous equation method)

Service departments' expenses

	(₹)
Boiler House	*3,000*
Pump Room	*600*
	3,600

The allocation is :

	Production Departments		*Boiler House*	*Pump Room*
	A	*B*		
Boiler House	*60%*	*35%*	*–*	*5%*
Pump Room	*10%*	*40%*	*50%*	*–*

Solution

The total expenses of the two service departments will be determined as follows:

Let B stand for Boiler House expenses and P for Pump Room expenses.

Then

B = 3,000 + 1/2 P

P = 600 + 1/20 B

Substituting the value of B,

P = 600 + 1/20 (3,000 + 1/2 P)

= 600 + 150 + 1/40 P

= 750 + 1/40 P

40 P = 30,000 + P

39 P = 30,000

P = ₹ 769 (approx.)

The total of expenses of the Pump Room are ₹ 769 and that of the Boiler House is ₹ 3,385 *i.e.,* ₹ 3,000 + 1/2 × ₹ 769.

The expenses will be allocated to the production departments as under:

Production departments:	*A* *(₹)*	*B* *(₹)*
Boiler House (60% and 35% of ₹ 3,385)	2,031	1,185
Pump Room (10% and 40% of ₹ 769)	77	307
Total	2,108	1,492

The total of expenses apportioned to A and B is ₹ 3,600.

(b) ***Trial and Error Method*****:** According to this method the cost of one service cost centre is apportioned to another service cost centre. The cost of another service centre *plus* the share received from the first cost centre is again apportioned to the first cost centre. This process is repeated till the amount to be apportioned becomes negligible, that means repeated distribution method is followed to the extent of service departments only. All apportioned amounts for each service cost centre are added to get the total apportioned cost. These total

service cost centre costs are redistributed to the production departments. Trial and error method and Simultaneous equation method gives the same result. *(Refer to the following illustration to understand this method.)*

Illustration 4: (Re-apportionment of costs under Trial and error method)

Sanz Ltd., is a manufacturing company having three production departments, 'A', 'B' and 'C' and two service departments 'X' and 'Y'. The following is the budget for December 2013:

	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct material		1,000	2,000	4,000	2,000	1,000
Direct wages		5,000	2,000	8,000	1,000	2,000
Factory rent	4,000					
Power	2,500					
Depreciation	1,000					
Other overheads	9,000					
Additional information:						
Area (Sq. ft.)		500	250	500	250	500
Capital value of assets (₹ lacs)		20	40	20	10	10
Machine hours		1,000	2,000	4,000	1,000	1,000
Horse power of machines		50	40	20	15	25

A technical assessment of the apportionment of expenses of service departments is as under:

	A	B	C	X	Y
Service Dept. 'X' (%)	45	15	30	–	10
Service Dept. 'Y' (%)	60	35	–	5	–

Required:

(i) A statement showing distribution of overheads to various departments.

(ii) A statement showing re-distribution of service departments expenses to production departments using Trial and error method.

Solution

(i) Overhead Distribution Summary

	Basis	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct materials	Direct	–	–	–	–	2,000	1,000
Direct wages	Direct	–	–	–	–	1,000	2,000

Factory rent	*Area*	4,000	1,000	500	1,000	500	1,000
Power	*H.P. × M/c Hrs.*	2,500	500	800	800	150	250
Depreciation	*Cap. value*	1,000	200	400	200	100	100
Other overheads	*M/c hrs.*	9,000	1,000	2,000	4,000	1,000	1,000
		16,500	2,700	3,700	6,000	4,750	5,350

(ii) Redistribution of Service Department's expenses:

	Service Departments	
	X (₹)	Y (₹)
Overheads as per primary distribution	4,750	5,350
(i) Apportionment of Dept-X expenses to Dept-Y (10% of ₹ 4,750)	---	475
(ii) Apportionment of Dept-Y expenses to Dept-X [5% of (₹ 5,350 + ₹ 475)]	291	---
(i) Apportionment of Dept-X expenses to Dept-Y (10% of ₹ 291)	---	29
(ii) Apportionment of Dept-Y expenses to Dept-X (5% of ₹ 29)	2	---
Total	5,043	5,854

Distribution of Service departments' overheads to Production departments

	Production Departments		
	A (₹)	B (₹)	C (₹)
Overhead as per primary distribution	2,700	3,700	6,000
Dept- X (90% of ₹ 5,043)	2,269	756	1,513
Dept- Y (95% of ₹ 5,854)	3,513	2,049	---
	8,482	6,505	7,513

(*c*) *Repeated Distribution Method*: Under this method, service departments' costs are distributed to other service and production departments on agreed percentages and this process continues to be repeated, till the figures of service departments are either exhausted or reduced to too small a figure. (Refer to the following illustration to understand this method)

Illustration 5: (Re-apportionment of costs under Repeated distribution method)

PH Ltd., is a manufacturing company having three production departments, 'A', 'B' and 'C' and two service departments 'X' and 'Y'. The following is the budget for December 2011:

	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct material		*1,000*	*2,000*	*4,000*	*2,000*	*1,000*
Direct wages		*5,000*	*2,000*	*8,000*	*1,000*	*2,000*
Factory rent	*4,000*					
Power	*2,500*					
Depreciation	*1,000*					
Other overheads	*9,000*					
Additional information:						
Area (Sq. ft.)		*500*	*250*	*500*	*250*	*500*
Capital value of assets (₹ lacs)		*20*	*40*	*20*	*10*	*10*
Machine hours		*1,000*	*2,000*	*4,000*	*1,000*	*1,000*
Horse power of machines		*50*	*40*	*20*	*15*	*25*

A technical assessment of the apportionment of expenses of service departments is as under:

	A	B	C	X	Y
Service Dept. 'X' (%)	*45*	*15*	*30*	*–*	*10*
Service Dept. 'Y' (%)	*60*	*35*	*–*	*5*	*–*

Required:

(i) A statement showing distribution of overheads to various departments.

(ii) A statement showing re-distribution of service departments expenses to production departments.

(iii) Machine hour rates of the production departments 'A', 'B' and 'C'.

Solution

(i) Overhead Distribution Summary

	Basis	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct materials	*Direct*	–	–	–	–	2,000	1,000
Direct wages	*Direct*	–	–	–	–	1,000	2,000
Factory rent	*Area*	4,000	1,000	500	1,000	500	1,000
Power	*H.P. × M/c Hrs.*	2,500	500	800	800	150	250
Depreciation	*Cap. value*	1,000	200	400	200	100	100
Other overheads	*M/c hrs.*	9,000	1,000	2,000	4,000	1,000	1,000
		16,500	2,700	3,700	6,000	4,750	5,350

(ii) Redistribution of Service Department's expenses:

	A (₹)	*B* (₹)	*C* (₹)	*X* (₹)	*Y* (₹)
Total overheads	2,700	3,700	6,000	4,750	5,350
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	2,138	712	1,425	–4,750	475
Dept. Y overhead apportioned in the ratio (60: 35:—:5 :—)	3,495	2,039	–	291	–5,825
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	131	44	87	–291	29
Dept. Y overhead apportioned in the ratio (60:35:—:5:—)	17	10	–	2	–29
Dept. X overhead apportioned in the ratio (45:15:30:—:10)	1	–	1	–2	–
	8,482	6,505	7,513	–	–

(iii) Machine hour rate:

Machine hours	1,000	2,000	4,000
Machine hour rate (₹)	8.48	3.25	1.88
	(₹ 8,482/ 1,000 hrs)	(₹ 6,505/ 2,000 hrs.)	(₹ 7,513/ 4,000 hrs.)

Illustration 6: (Re-apportionment of costs under Repeated distribution method)

The ABC Company has the following account balances and distribution of direct charges on 31st March, 2011.

	Total	*Production Depts.*		*Service Depts.*	
		Machine Shop	*Packing*	*Gen. Plant*	*Store & Maintenance*
Allocated Overheads:	*(₹)*	*(₹)*	*(₹)*	*(₹)*	*(₹)*
Indirect labour	*14,650*	*4,000*	*3,000*	*2,000*	*5,650*
Maintenance material	*5,020*	*1,800*	*700*	*1,020*	*1,500*
Misc. supplies	*1,750*	*400*	*1,000*	*150*	*200*
Superintendent's salary	*4,000*	*–*	*–*	*4,000*	*–*
Cost & payroll salary	*10,000*	*–*	*–*	*10,000*	*–*
Overheads to be apportioned :					

Power	*8,000*				
Rent	*12,000*				
Fuel and heat	*6,000*				
Insurance	*1,000*				
Taxes	*2,000*				
Depreciation	*1,00,000*				
	1,64,420	*6,200*	*4,700*	*17,170*	*7,350*

The following data were compiled by means of the factory survey made in the previous year:

	Floor Space		***Radiator Sections***	***No. of Employees***	***Investment ₹***	***H.P hours***
Machine Shop	*2,000*	*Sq. ft.*	*45*	*20*	*640,000*	*3,500*
Packing	*800*	*" "*	*90*	*10*	*200,000*	*500*
General Plant	*400*	*" "*	*30*	*3*	*10,000*	*–*
Store & Maint.	*1,600*	*" "*	*60*	*5*	*150,000*	*1,000*
	4,800	*" "*	*225*	*38*	*1,000,000*	*5,000*

Expenses charged to the stores and maintenance departments are to be distributed to the other departments by the following percentages:

Machine shop 50%; Packing 20%; General Plant 30%; General Plant overheads is distributed on the basis of number of employees:

(a) Prepare an overhead distribution statement with supporting schedules to show computations and basis of distribution including distribution of the service department expenses to producing department.

(b) Determine the service department distribution by the method of continued distribution. Carry through 3 cycles. Show all calculations to the nearest rupee.

Solution

(a) Overhead Distribution Statement

	Production Departments		***Service Departments***	
Allocated Expenses:	***Machine Shop***	***Packing***	***General Plant***	***Stores & Maintenance***
Indirect labour	4,000	3,000	2,000	5,650
Maintenance material	1,800	700	1,020	1,500
Superintendent's salary	–	–	4,000	–
Misc. supplies	400	1,000	150	200

Cost & payroll salaries	–	–	10,000	–
Total	6,200	4,700	17,170	7,350
Apportioned expenses (See schedule below)	77,720	25,800	2,830	22,650
Total	83,920	30,500	20,000	30,000

Schedule of Apportioned Expenses

Item	*Basis*	*Machine Shop (₹)*	*Packing (₹)*	*General Plant (₹)*	*Stores & Maintenance (₹)*
Power	Horse Power Hrs.	5,600	800	–	1,600
Rent	Floor Space	5,000	2,000	1,000	4,000
Fuel & Heat	Radiator Secs.	1,200	2,400	800	1,600
Insurance	Investment	640	200	10	150
Taxes	Investment	1,280	400	20	300
Depreciation	Investment	64,000	20,000	1,000	15,000
Total		77,720	25,800	2,830	22,650

(b) Distribution of Service Department Expenses

	Production Departments		*Service Departments*	
	Machine	*Packing Plant*	*General Maintenance*	*Stores &*
	(₹)	*(₹)*	*(₹)*	*(₹)*
Total Expense [as per (*a*)]	83,920	30,500	20,000	30,000
Transfer from Stores & Maintenance	15,000	6,000	9,000	–30,000
Transfer from General Plant	16,571	8,286	–29,000	4,143
Transfer from Stores & Maintenance	2,072	829	1,242	–4,143
Transfer from General Plant	710	355	–1,242	177
Transfer from Stores & Maintenance	88	36	53	–177
Transfer from General Plant	35	18	–53	—
Total	1,18,396	46,024	—	—

Illustration 7: (Re-apportionment of costs under Repeated distribution method)

Modern Manufactures Ltd. has three Production Departments P_1, P_2, P_3 and two Service Departments S_1 and S_2 details pertaining to which are as under:

	P_1	P_2	P_3	S_1	S_2
Direct wages (₹)	3,000	2,000	3,000	1,500	195
Working hours	3,070	4,475	2,419	-	-
Value of machines (₹)	60,000	80,000	1,00,000	5,000	5,000
H.P. of machines	60	30	50	10	-
Light points	10	15	20	10	5
Floor space (sq. ft.)	2,000	2,500	3,000	2,000	500

The following figures extracted from the Accounting records are relevant:

	(₹)
Rent and Rates	5,000
General Lighting	600
Indirect Wages	1,939
Power	1,500
Depreciation on Machines	10,000
Sundries	9,695

The expenses of the Service Departments are allocated as under :

	P_1	P_2	P_3	S_1	S_2
S_1	20%	30%	40%	-	10%
S_2	40%	20%	30%	10%	-

Find out the total cost of product X which is processed for manufacture in Departments P_1, P_2 and P_3 for 4, 5 and 3 hours respectively, given that its Direct Material Cost is ₹ 50 and Direct Labour Cost is ₹ 30.

Solution

Statement Showing Distribution of Overheads of Modern Manufactures Ltd.

			Production Departments			Service Departments	
Particulars	**Basis**	**Total**	P_1	P_2	P_3	S_1	S_2
		(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Direct wages	Actual	1,695	-	-	-	1,500	195
Rent & rates	Area	5,000	1,000	1,250	1,500	1,000	250

General lighting	Light points	600	100	150	200	100	50
Indirect wages	Direct wages	1,939	600	400	600	300	39
Power	H.P.	1,500	600	300	500	100	–
Depreciation of machines	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundries	Direct wages	9,695	3,000	2,000	3,000	1,500	195
		30,429	7,700	7,300	9,800	4,700	929

Redistribution of Service Department's Expenses over Production Departments

	Total (₹)	P_1 (₹)	P_2 (₹)	P_3 (₹)	S_1 (₹)	S_2 (₹)
Total Overheads	30,429.00	7,700	7,300	9,800	4,700	929
Dept. S_1 Overheads apportioned in the ratio: (20:30:40:—:10)	4,700.00	940	1,410	1,880	–4,700	470
Dept. S_2 overheads apportioned in the ration :(40:20:30:10:—)	1,399.00	559.60	279.80	419.70	139.90	–1,399.00
Dept. S_1 overheads apportioned in the ratio (20:30:40:—:10)	139.90	27.98	41.97	55.96	–139.90	13.99
Dept. S_2 overheads apportioned in the ratio (40:20:30:10:—)	13.99	5.60	2.80	4.20	1.39	–13.99
Dept. S_1 overheads apportioned in the ratio (20:30:40:—:10)	1.39	0.28	0.42	0.56	–1.39	0.13
Dept. S_2 overheads apportioned in the ratio (40:20:30:10:—)	0.13	0.06	0.03	0.04		–0.13
Total	9,233.52	9,035.02	12,160.46			
Working hours		3,070.00	4,475.00	2,419.00		
Working rate per hour		3.00	2.02	5.03		

Cost of the Product 'X'

	(₹)
Direct material cost	50.00
Direct labour cost	30.00
Overhead cost (See working note)	37.19
	117.19

Working Note :

Overhead cost :

(₹ 3 × 4 hrs.) + (₹ 2.02 × 5 hrs.) + (₹ 5.03 × 3 hrs.)

= ₹ 12 + ₹ 10.10 + ₹ 15.09 = ₹ 37.19

Illustration 8: (Re-apportionment of costs under Step Method or Step Ladder Method)

Deccan Manufacturing Ltd., have three departments which are regarded as production departments. Service departments' costs are distributed to these production departments using the "Step Ladder Method" of distribution. Estimates of factory overhead costs to be incurred by each department in the forthcoming year are as follows. Data required for distribution is also shown against each department:

Department	Factory overhead (₹)	Direct labour hours	No. of employees	Area in sq.m.
Production:				
X	*1,93,000*	*4,000*	*100*	*3,000*
Y	*64,000*	*3,000*	*125*	*1,500*
Z	*83,000*	*4,000*	*85*	*1,500*
Service:				
P	*45,000*	*1,000*	*10*	*500*
Q	*75,000*	*5,000*	*50*	*1,500*
R	*1,05,000*	*6,000*	*40*	*1,000*
S	*30,000*	*3,000*	*50*	*1,000*

The overhead costs of the four service departments are distributed in the same order, viz., P,Q,R and S respectively on the following basis.

Department	Basis
P	*Number of employees*
Q	*Direct labour hours*
R	*Area in square metres*
S	*Direct labour hours*

You are required to:

(a) Prepare a schedule showing the distribution of overhead costs of the four service departments to the three production departments; and

(b) Calculate the overhead recovery rate per direct labour hour for each of the three production departments.

Solution

(a) Deccan Manufacturing Limited

Schedule Showing the Distribution of Overhead Costs among Departments

		Service			*Production*		
	P	*Q*	*R*	*S*	*X*	*Y*	*Z*
	(₹)	*(₹)*	*(₹)*	*(₹)*	*(₹)*	*(₹)*	*(₹)*
Overhead costs	45,000	75,000	1,05,000	30,000	1,93,000	64,000	83,000
Distribution of over-head cost of Dept. 'P'	(45,000)	5,000	4,000	5,000	10,000	12,500	8,500
Distribution of over-head costs of Dept. 'Q'		(80,000)	24,000	12,000	16,000	12,000	16,000
Distribution of over-head cost of Dept. 'R'		-	(1,33,000)	19,000	57,000	28,500	28,500
Distribution of over-head costs of Dept. 'S'		-	-	(66,000)	24,000	18,000	24,000
Total (A)					3,00,000	1,35,000	1,60,000
(b) Direct labour hours (B)					4,000	3,000	4,000
Overhead recovery rate per hour			$\frac{(A)}{(B)}$		₹ 75	₹ 45	₹ 40

4.4.5 Absorbing overheads over cost units, products, etc.: Collection of the figure of overheads for the factory as a whole or for various departments is not enough. It is clearly necessary to ascertain how much of the overheads is to be debited to the cost of the various jobs, products etc. This process is called absorbing the overhead to cost units. We take up below the various implications of this process. However, if only one uniform type of work is done, the task is easy and under such a situation the overhead expenses to be absorbed may be calculated by dividing actual overheads by the number of units of work done or estimated overheads by the estimated output.

4.5 Methods of Absorbing Overheads to Various Products or Jobs

The method selected for charging overheads to products or jobs should be such as will ensure:

(i) that the total amount charged (or recovered) in a period does not differ materially from the actual expenses incurred in the period. and

(ii) that the amount charged to individual jobs or products is equitable. In case of factory overhead, this means:

(a) that the time spent on completion of each job should be taken into consideration;

(b) that a distinction should be made between jobs done by skilled workers and those done by unskilled workers. and

(c) that jobs done by manual labour and those done by machines should be distinguished.

In addition, the methods should be capable of being used conveniently; and yield uniform result from period to period as far as possible; any change that is apparent should reflect a change in the underlying situation such as substitution of human labour by machines.

Several methods are commonly employed either individually or jointly for computing the appropriate overhead rate. The more common of these are:

(1) Percentage of direct materials,

(2) Percentage of prime cost,

(3) Percentage of direct labour cost,

(4) Labour hour rate,

(5) Machine hour rate and

(6) Rate per unit of Output

4.5.1 Percentage of Direct material cost: Under this method, the cost of direct material consumed is the base for calculating the amount of overhead absorbed. This overhead rate is computed by the following formula:

$$\text{Overhead rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Direct Material cost of all products}} \times 100$$

4.5.2 Percentage of Prime cost method: This method is based on the fact that both materials as well as labour contribute in raising factory overheads. Hence, the total of the two i.e. Prime cost should be taken as base for absorbing the factory overhead. The overhead rate in this method is computed by the following formals:

$$\text{Overhead rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Prime Cost}} \times 100$$

Example for the above two methods:

Suppose for a given period, actual figures are estimated as follows:

	₹
Direct materials	2,00,000
Direct labour	1,00,000
Factory overheads	90,000

The percentage of factory overheads to direct materials will be 45%, to prime cost 30% . If, on a job, material cost is ₹ 10,000 and direct labour is ₹ 7,000 the cost, after absorbing factory overhead, will be as follows :

(*i*) ₹ 17,000 + 45% ₹ 10,000 or ₹ 21,500,

(*ii*) ₹ 17,000 + 30% ₹ 17,000 or ₹ 22,100, and

One can see how, with a different method, the works cost comes out to be different. Of these methods, the first and second are generally considered to be unsuitable on account of the following reasons:

(i) Manufacturing overhead expenses are mostly a function of time i.e., time is the determining factor for the incurrence and application of manufacturing overhead expenses. That they are so would be clear if we recall that overhead expenses, specially manufacturing expenses, can in the ultimate analysis be regarded as expenditure incurred in providing the necessary facilities and service to workers employed in the productive process. The question of facilities and service made available to workers naturally is dependent on the length of time during which workers make use of the facilities. It may, therefore, be said that the job or product on which more time has been spent would entail larger manufacturing expenses than the job requiring less time. The factor is ignored altogether by the first method and largely by the second method.

(ii) Overheads are neither related to the prime cost nor to direct material cost except to a very small extent. Thus, if the percentage of material cost is used when there are two jobs requiring the same operational time but using material having varying prices, their manufacturing overhead cost would be different whereas this should not normally be so.

The method of absorbing overhead costs on the basis of prime cost also does not take into consideration the time factor. The fact that the amount includes labour cost in addition to material cost does not render the prime cost to be more suitable; infact, the results are liable to be more misleading because of the cumulative error of using both the labour and material cost as the basis of allocation of overhead expenses, on neither of which they are already dependent.

(iii) Since material prices are prone to frequent and wide fluctuations, the manufacturing overheads, if based on material cost or prime cost, also would fluctuate violently from period to period.

(iv) The skill of the workers involved and whether machines were used or not, are ignored when these methods are used.

Percentage of materials cost may, however, be used for the limited purpose of absorbing material handling and store overheads.

4.5.3 Percentage of direct labour cost: Formula to be used under this method is-

Direct Labour Cost Percentage Rate

$$\text{Overhead rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Direct Labour Cost}} \times 100$$

Advantages	Disadvantages
(i) The method is simple and economical to apply.	(i) It gives rise to certain inaccuracies due to the time factor not being given full importance.
(ii) The time factor is given recognition even if indirectly.	(ii) Where machinery is used to some extent in the process of manufacture, an allowance for such a factor is not made.
(iii) Total expenses recovered will not differ much from the estimated figure since total wages paid are not likely to fluctuate much.	(iii) It does not provide for varying skills of workers

4.5.4 Labour hour rate: This method is an improvement on the percentage of direct wage basis, as it fully recognises the significance of the element of time in the incurring and absorption of manufacturing overhead expenses. This method is admirably suited to operations which do not involve any large use of machinery. To calculate labour hour rate, the amount of factory overheads is divided by the total number of direct labour hours. Suppose factory overheads are estimated at ₹ 90,000 and labour hours at 1,50,000. The overhead absorption rate will be ₹ 0.60. If 795 direct labour hours are spent on a job, ₹ 477 will be absorbed as overhead. It can be calculated for each category of workers.

Formula to be used under this method is-

$$\text{Direct Labour Hour Rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Direct labour Hours}}$$

4.5.5 Machine hour rate: By the machine hour rate method, manufacturing overhead expenses are charged to production on the basis of number of hours machines are used on jobs or work orders.

The machine hour rate is computed by the following formula:

$$\text{Machine hour rate} = \frac{\text{Production overhead}}{\text{No. of machine hours}}$$

There is a basic similarity between the machine hour and the direct labour hour rate method insofar as both are based on the time factor. The choice of one or the other method is conditioned by the actual circumstance of the individual case. In respect of departments or operations in which machines predominate and the operators perform relatively a passive part, the machine hour rate is more appropriate.

In such case, the machine hour rate method alone can be depended on to correctly absorb the manufacturing overhead expenses to different items of production. Usually, the computation is made on the basis of the estimated expenses or the normal expenses for the coming period. Thus the machine hour rate usually is a predetermined rate. It is desirable to work out a rate for each individual machine; where a number of similar machines are working in a group, there may be single rate for the whole group.

Methods of computing Machine Hour Rate: There are two methods of computing the machine hour rate.

(i) Direct Machine hour rate: According to the first method, only the expenses directly or immediately connected with the operation of the machine are taken into account e.g., power, depreciation, repairs and maintenance, insurance, etc. The rate is calculated by dividing the estimated total of these expenses for a period by the estimated number of operational hours of the machines during the period.

(ii) Comprehensive Machine hour rate: It will be obvious, however, that in addition to the expenses stated above there may still be other manufacturing expenses such as supervision charges, shop cleaning and lighting, consumable stores and shop supplies, shop general labour, rent and rates, etc. incurred for the department as a whole and, hence, not charged to any particular machine or group of machines. In order to see that such expenses are not left out of production costs, one should include a portion of such expenses to compute the machine hour rate. Alternatively, the overheads not directly related to machines may be absorbed on the basis of Productive Labour Hour Rate Method or any other suitable method.

Note: Some people even prefer to add the wages paid to the machine operator in order to get a comprehensive rate of working a machine for one hour.

If all expenses are not allocated to machines, it will be necessary to calculate another rate for charging the general department expenses to production. This second rate can be calculated on the basis of direct labour hours. In effect therefore, both the machine hour and the direct labour hour rate will be applied, though separately.

Advantages and disadvantages of Machine hour rate:

Advantages	Disadvantages
(1) Where machines are the main factor of production, it is usually the best method of charging machine operating expenses to production. (2) The under-absorption of machine overheads would indicate the extent to which the machines have been idle. (3) It is particularly advantageous where one operator attends to several machines	(1) Additional data concerning the operation time of machines, not otherwise necessary, must be recorded and maintained. (2) As general department rates for all the machines in a department may be suitable, the computation of a separate machine hour rate for each machine or group of machines would mean further additional

(e.g. automatic screw manufacturing machine), or where several operators are engaged on the machine e.g. the belt press used in making conveyer belts.	work.

4.5.6 Rate per unit of output method: This is the simplest of all the methods. In this method overhead rate is determined by the following formula:

$$\text{Overheads rate} = \frac{\text{Amount of overhead}}{\text{No. of Units}}$$

4.6 Types of Overhead Rates

The overhead rates may be of the following types:

1. Normal Rate: This rate is calculated by dividing the actual overheads by actual base. It is also known as actual rate.

It is calculated by the following formula:

$$\text{Normal overhead rate} = \frac{\text{Actual amount of overheads}}{\text{Actual base}}$$

2. Pre-determined Overhead Rate: This rate is determined in advance by estimating the amount of the overhead for the period in which it is to be used. It is computed by the following formula:

$$\text{Pre-determined rate} = \frac{\text{Budgeted amount of overhead}}{\text{Budgeted base}}$$

The amount of overhead rate of expenses for absorbing them to production may be estimated on the following three basis.

(1) The figure of the previous year or period may be adopted as the overhead rate to be charged to production in the current year. The assumption is that the value of production as well as overheads will remain constant or that the two will change, proportionately.

(2) The overhead rate for the year may be determined on the basis of estimated expenses and anticipated volume of production activity.

For instance, if expenses are estimated at ₹10,000 and output at 4,000 units, the overhead rate will be ₹ 2.50 per unit.

(3) The overhead rate for a year may be fixed on the basis of the normal volume of the business.

3. Blanket Overhead Rate: Blanket overhead rate refers to the computation of one single overhead rate for the whole factory. It is to be distinguished from the departmental overhead rate which refers to a separate rate for each individual cost centre or department. The use of

blanket rate may be proper in certain factories producing only one major product in a continuous process or where the work performed in every department is fairly uniform or standardised.

This overhead rate is computed as follows:

$$\text{Blanket rate} = \frac{\text{Total overheads for the factory}}{\text{Total number of units of base for the factory}}$$

A blanket rate should be applied in the following cases:

(1) Where only one major product is being produced.

(2) Where several products are produced, but

  (a) All products pass through all departments; and

  (b) All products are processed for the same length of time in each department.

Where these conditions do not exist, departmental rates should be used.

4. Departmental Overhead Rate: It refers to the computation of one single overhead rate for a particular production unit or department. Where the product lines are varied or machinery is used to a varying degree in the different departments, that is, where conditions throughout the factory are not uniform, the use of departmental rates is to be preferred.

This overhead rate is determined by the following formula:

$$\text{Departmental overhead rate} = \frac{\text{Overhead of department or cost centre}}{\text{Corresponding base}}$$

Illustration 9: (Computation of pre-determined overhead rate and preparation of performance report)

A Ltd., manufactures two products A and B. The manufacturing division consists of two production departments P_1 and P_2 and two service departments S_1 and S_2.

Budgeted overhead rates are used in the production departments to absorb factory overheads to the products. The rate of Department P_1 is based on direct machine hours, while the rate of Department P_2 is based on direct labour hours. In applying overheads, the pre-determined rates are multiplied by actual hours.

For allocating the service department costs to production departments, the basis adopted is as follows :

(i) Cost of Department S_1 to Department P_1 and P_2 equally, and

(ii) Cost of Department S_2 to Department P_1 and P_2 in the ratio of 2 : 1 respectively.

The following budgeted and actual data are available:

Annual profit plan data :

Factory overheads budgeted for the year:

Departments	P_1	*25,50,000*	S_1	*6,00,000*
	P_2	*21,75,000*	S_2	*4,50,000*

Budgeted output in units :

Product A 50,000; B 30,000.

Budgeted raw-material cost per unit :

Product A ₹ 120; Product B ₹ 150.

Budgeted time required for production per unit :

Department P_1 : Product A : 1.5 machine hours

Product B : 1.0 machine hour

Department P_2 : Product A : 2 Direct labour hours

Product B : 2.5 Direct labour hours

Average wage rates budgeted in Department P_2 are :

Product A - ₹ 72 per hour and Product B – ₹ 75 per hour.

All materials are used in Department P_1 only.

Actual data : (for the month of July, 2011)

Units actually produced : Product A : 4,000 units

Product B : 3,000 units

Actual direct machine hours worked in Department P_1 :

On product A 6,100 hours, Product B 4,150 hours.

Actual direct labour hours worked in Department P_2 :

on product A 8,200 hours, Product B 7,400 hours.

Costs actually incurred:

	Product A ₹	*Product B* ₹
Raw materials	*4,89,000*	*4,56,000*
Wages	*5,91,900*	*5,52,000*

		₹		₹
Overheads : Department	P_1	*2,31,000*	S_1	*60,000*
	P_2	*2,04,000*	S_2	*48,000*

You are required to :

(i) Compute the pre-determined overhead rate for each production department.

(ii) Prepare a performance report for July, 2011 that will reflect the budgeted costs and actual costs.

Solution

(i) Computation of predetermined overhead rate for each production department from budgeted data

	Production Deptts.		*Service Deptts.*	
	P_1	P_2	S_1	S_2
Budgeted factory overheads for the year in (₹)	25,50,000	21,75,000	6,00,000	4,50,000
Allocation of service department S_1's costs to production departments P_1 and P_2 equally in (₹)	3,00,000	3,00,000	–6,00,000	–
Allocation of service department S_2's costs to production departments P_1 and P_2 in the ratio of 2:1 in (₹)	3,00,000	1,50,000	–	–4,50,000
Total (₹)	31,50,000	26,25,000	*Nil*	*Nil*
Budgeted machine hours in department P_1 (*Refer to working note 1*)	1,05,000			
Budgeted labour hours in department P_2 (*Refer to working note 2*)		1,75,000		
Budgeted machine hour rate (₹ 31,50,000/1,05,000)	₹ 30			
Budgeted labour hour rate (₹ 26,25,000/1,75,000)		₹ 15		

(ii) Performance report for July, 2011

(When 4,000 and 3,000 units of products A and B respectively were actually produced)

	Budgeted (₹)	*Actual (₹)*
Raw materials used in department P_1		
A : 4,000 units × ₹ 120	4,80,000	4,89,000
B : 3,000 units × ₹ 150	4,50,000	4,56,000
Direct labour		
Cost on the basis of labour hours worked in department P_2		
A : 4,000 units × 2 hrs. × ₹ 72	5,76,000	5,91,900
B : 3,000 units × 2.5 hrs. × ₹ 75	5,62,500	5,52,000
Overhead absorbed on machine hour basis in department P_1		
A : 4,000 units × 1.5 hrs. × ₹ 30	1,80,000	1,74,400*
B : 3,000 units × 1 hr. × ₹ 30	90,000	1,18,649
Overhead absorbed on labour hour basis in department P_2		
A : 4,000 units × 2 hrs. × ₹ 15	1,20,000	1,31,364 **
B : 3,000 units × 2.5 hrs. × ₹ 15	1,12,500	1,18,548
	25,71,000	26,31,861

* (*Refer to working note 4*) ** (*Refer to working note 5*)

Working notes :

		Product A	*Product B*	*Total*
1.	Budgeted output (in units)	50,000	30,000	
	Budgeted machine hours in department P_1	75,000 (50,000×1.5 hrs.)	30,000 (30,000×1 hr.)	1,05,000
	Budgeted labour hours in department P_2	1,00,000 (50,000×2 hrs.)	75,000 (30,000×2.5 hrs.)	1,75,000
		Product A	*Product B*	*Total*
2.	Actual output (in units)	4,000	3,000	
	Actual machine hours *utilised in department P1*	*6,100*	*4,150*	*10,250*
	Actual labour hours utilised in department P_2	8,200	7,400	15,600

3. *Computation of actual overhead rates for each production department from actual data*

	Production Deptts.		*Service Deptts.*	
	P_1	P_2	S_1	S_2
Actual factory overheads for the month of July, 2011 in (₹)	2,31,000	2,04,000	60,000	48,000
Allocation of service department S_1's costs in (₹) over production departments P1 and P2 equally	30,000	30,000	–60,000	–
Allocation of service department S_2's costs in (₹) over production departments P_1 and P_2 in the ratio 2 : 1	32,000	16,000	–	–48,000
Total (₹)	2,93,000	2,50,000	*Nil*	*Nil*
Actual machine hours in department P_1 *(Refer to working note 2)*	10,250	–	–	–
Actual labour hours in department P_2 *(Refer to working note 2)*	–	15,600	–	–
Machine hour rate (₹ 2,93,000/10,250)	₹ 28.59	–	–	–
Labour hour/rate (₹ 2,50,000/15,600)	–	₹ 16.02	–	–

4. Actual overheads absorbed (based on machine hours)

   A : 6,100 hrs × ₹ 28.59 = ₹ 1,74,400

   B : 4,150 hrs × ₹ 28.59 = ₹ 1,18,649

5. *Actual overheads absorbed (based on labour hours)*

   A : 8,200 hrs × ₹ 16.02 = ₹ 1,31,364

   B : 7,400 hrs × ₹ 16.02 = ₹ 1,18,548

Illustration 10: (Calculation of machine hour rate)

A machine costing ₹ 10,000 is expected to run for 10 years. At the end of this period its scrap value is likely to be ₹ 900. Repairs during the whole life of the machine are expected to be ₹ 18,000 and the machine is expected to run 4,380 hours per year on the average. Its electricity consumption is 15 units per hour, the rate per unit being 5 paise. The machine occupies one-fourth of the area of the department and has two points out of a total of ten for lighting. The foreman has to devote about one sixth of his time to the machine. The monthly rent of the department is ₹ 300 and the lighting charges amount to ₹ 80 per month. The foreman is paid a monthly salary of ₹ 960. Find out the machine hour rate, assuming insurance is @ 1% p.a. and the expenses on oil, etc., are ₹ 9 per month.

Solution

Fixed expenses per month

			(₹)
Rent (one fourth of the total)			75.00
Lighting (one fifth of the total)			16.00
Foreman's salary (one sixth of the total)			160.00
Sundry expenses–oil, waste etc.			9.00
Insurance (1% on the value of the machine per year)			8.33
Total constant expenses per month			268.33
Total number of hours per annum	4,380		
Total number of hours per month	365		
		(₹)	(₹)
Fixed expenses per hour : $\frac{₹\ 268.33}{365\ hrs.}$			0.735
Variable expenses per hour :			
Depreciation :			
Cost of the machine		10,000	
Less: Scrap value		900	
		9,100	
Depreciation per annum		910	
Depreciation per hour: $\frac{910}{4,380\ hrs.}$			0.208
Repairs for the whole life		18,000	
for one hour $\frac{₹\ 18,000}{4,380 \times 10\ years}$			0.411
Electricity for one hour : 15 units @ 0.05 P			0.750
Machine hour rate :			2.104

Illustration 11: (Calculation of machine hour rate)

Gemini Enterprises undertakes three different jobs A, B and C. All of them require the use of a special machine and also the use of a computer. The computer is hired and the hire charges work out to ₹ 4,20,000 per annum. The expenses regarding the machine are estimated as follows:

	(₹)
Rent for the quarter	*17,500*
Depreciation per annum	*2,00,000*
Indirect charges per annum	*1,50,000*

During the first month of operation the following details were taken from the job register:

	Job		
	A	*B*	*C*
Number of hours the machine was used :			
(a) Without the use of the computer	*600*	*900*	*—*
(b) With the use of the computer	*400*	*600*	*1,000*

You are required to compute the machine hour rate :

(a) For the firm as a whole for the month when the computer was used and when the computer was not used.

(b) For the individual jobs A, B and C.

Solution

Working notes:		**(₹)**
(i)	Total machine hours used (600 + 900 + 400 + 600 + 1,000)	3,500
(ii)	Total machine hours without the use of computers (600 + 900)	1,500
(iii)	Total machine hours with the use of computer (400 + 600 + 1,000)	2,000
(iv)	Total overheads of the machine per month	
	Rent (₹ 17,500 ÷ 3 months)	5,833.33
	Depreciation (₹ 2,00,000 ÷ 12 months)	16,666.67
	Indirect Charges (₹ 1,50,000 ÷ 12 months)	12,500.00
	Total	35,000.00
(v)	Computer hire charges for a month = ₹ 35,000 (₹ 4,20,000 ÷ 12 months)	

(vi) Overheads for using machines without computer

$= \frac{₹\ 35,000}{3,500\ \text{hrs.}} \times 1,500\ \text{hrs.} = ₹\ 15,000$

(vii) Overheads for using machines with computer

$= \frac{₹\ 35,000}{3,500\ \text{hrs}} 2,000\ \text{hrs.} + ₹\ 35,000 = ₹\ 55,000$

(a) Machine hour rate of Gemini Enterprises for the firm as a whole for a month.

(1) When the Computer was used: $\frac{₹\ 55,000}{2,000\ \text{hours}} = ₹\ 27.50\ \text{per hour}$

(2) When the computer was not used: $\frac{₹\ 15,000}{1,500\ \text{hrs.}} = ₹\ 10\ \text{per hour}$

(b) Machine hour rate for individual job

	Rate per hr.	Job A		Job B		Job C	
	(₹)	Hrs.	(₹)	Hrs.	(₹)	Hrs.	(₹)
Overheads							
Without Computer	10.00	600	6,000	900	9,000	–	–
With computer	27.50	400	11,000	600	16,500	1,000	27,500
		1,000	17,000	1,500	25,500	1,000	27,500
Machine hour rate			₹ 17		₹ 17		₹ 27.50

Illustration 12: (Computation of comprehensive machine hour rate)

A machine shop has 8 identical Drilling machines manned by 6 operators. The machine cannot be worked without an operator wholly engaged on it. The original cost of all these machines works out to ₹ 8 lakhs. These particulars are furnished for a 6 months period:

Normal available hours per month	*208*
Absenteeism (without pay) hours	*18*
Leave (with pay) hours	*20*
Normal idle time unavoidable-hours	*10*
Average rate of wages per worker for 8 hours a day.	*₹ 20*
Production bonus estimated	*15% on wages*
Value of power consumed	*₹ 8,050*
Supervision and indirect labour	*₹ 3,300*
Lighting and electricity	*₹ 1,200*

These particulars are for a year

Repairs and maintenance including consumables 3% of value of machines.

Insurance ₹ 40,000

Depreciation 10% of original cost.

Other sundry works expenses ₹ 12,000

General management expenses allocated ₹ 54,530.

You are required to work out a comprehensive machine hour rate for the machine shop.

Solution

Computation of comprehensive machine hour rate of machine shop

	(₹)
Operator's wages (*Refer to working note 2*)	17,100
Production bonus (15% on wages)	2,565
Power consumed	8,050
Supervision and indirect labour	3,300
Lighting and electricity	1,200
Repairs and maintenance	12,000
Insurance	20,000
Depreciation	40,000
Sundry works expenses	6,000
General management expenses	27,265
	1,37,480

$$\text{Machine hour rate} = \frac{\text{Total overheads of machine shop}}{\text{Hours of machines operation}}$$

$$= \frac{₹\ 1,37,480}{5,760} \text{ (}\textit{Refer to working note 1}\text{)} = ₹\ 23.87$$

Working notes.

1. *Computation of hours, for which 6 operators are available for 6 months.*

Normal available hours p.m. per operator.		208
Less: Absenteeism hours	18	

Less: Leave hours	20	
Less: Idle time hours	10	
		48
Utilisable hours p.m. per operator		160

Total utilisable hours for 6 operators and for 6 months are = 160 × 6 × 6 = 5,760 hours

As machines cannot be worked without an operator wholly engaged on them therefore, hours for which 6 operators are available for 6 months are the hours for which machines can be used. Hence 5,760 hours represent total machine hours.

2. Computation of operator's wages

Average rate of wages : $\frac{₹\ 20}{8}$ = ₹ 2.50 per hour

Hours per month for which wages are paid to a worker (208 hours – 18 hours)

= 190 hours.

Total wages paid to 6 operators for 6 months

= 190 hours × 6 × 6 × ₹ 2.50 = ₹ 17,100

Illustration 13: (Ascertainment of works costs)

Job No. 198 was commenced on October 10, 2011 and completed on November 1, 2011. Materials used were ₹ 600 and labour charged directly to the job was ₹ 400. Other information is as follows:

Machine No. 215 used for 40 hours, the machine hour rate being ₹ 3.50.

Machine No. 160 used for 30 hours, the machine hour rate being ₹ 4.00. 6 welders worked on the job for five days of 8 hours each : the Direct labour hour per welder is 20P.

Expenses not included for calculating the machine hour or direct labour hour rate totalled ₹ 2,000,total direct wages for the period being ₹ 20,000. Ascertain the works costs of job No. 198.

Solution

		(₹)
Materials		600.00
Direct labour		400.00
		1,000.00
Factory overheads :	(₹)	
Machine No. 215 : 40 hours @ ₹ 3.50	140.00	
Machine No. 160 : 30 hours @ ₹ 4.00	120.00	

240[1] hours of welders @ ₹ 0.20 per hr.	48.00	
General[2] 10% of wages	40.00	348.00
Works cost		1,348.00

1. 6 welders × 5 days × 8 hours = 240 hours
2. Un apportioned expenses ₹ 2,000 which works out at 10% of direct wages.

4.7 Treatment of Under-absorbed and Over-absorbed Overheads in Cost Accounting

Overhead expenses are usually applied to production on the basis of pre-determined rates. Production overheads are to be determined in advance as follows for fixing selling price, quote tender price and to formulate budgets etc.

$$\text{Pre-determined overhead rate} = \frac{\text{Estimated / Normal overheads for the period}}{\text{Budgeted Number of units during the period}}$$

The actual overhead rate will rarely coincide with the pre-determined overhead rate, due to variation in pre-determined overhead rate and actual overhead rate. Such a variation may arise due to any one of the following situations:

(i) Estimated overheads for the period under consideration may remain the same or they coincide with actual overheads but the number of units produced during the period is either more or less in comparison with budgeted figure. In the former case actual overhead rate will be less and in the latter case, actual overhead rate will be more than the pre-determined overhead rate, hence over-absorption and under-absorption will occur respectively.

(ii) Similarly, if the number of units actually produced during the period remains the same as budgeted figure but the actual overheads incurred are more or less than the estimated overheads for the period, then a situation of under-absorption or over-absorption will arise respectively.

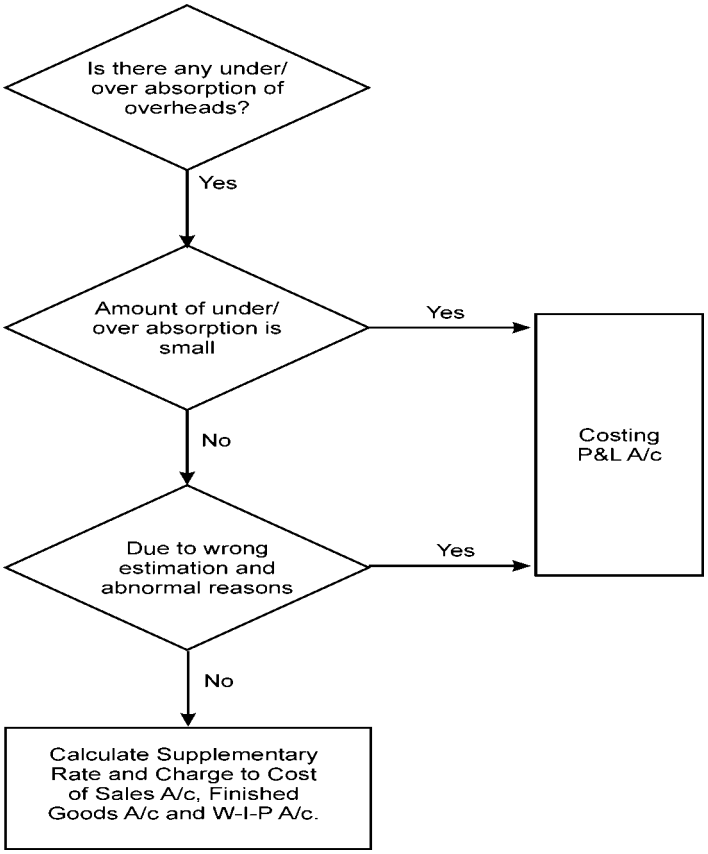
(iii) If changes occur in different proportion both in the actual overheads and in the number of units produced during the period, then a situation of under or over-absorption (depending upon the situation) will arise.

(iv) If the changes in the numerator (i.e. in actual overheads) and denominator (i.e. in number of units produced) occur uniformly (without changing the proportion between the two) then a situation of neither under nor of over-absorption will arise.

Such over or under-absorption as arrived at under different situations may also be termed as overhead variance. The amount of over-absorption being represented by a credit balance in

the account and conversely, the amount of under-absorption being a debit balance.

Treatment of such under/ over absorption of overheads can be understood with the help of the following flow chart:



Treatment of Under-absorbed and Over-absorbed of overheads in Cost Accounting

As regards the treatment of such debit or credit balances, the general view is that if the balances are small they should be transferred to the Costing Profit and Loss Account and the cost of individual products should not be increased or reduced as these would be representing normal cost.

Where, however the difference is large and due to wrong estimation, it would be desirable to adjust the cost of products manufactured, as otherwise the cost figures would convey a misleading impression. Such adjustments usually take the form of supplementary rates where there is a debit balance in the overhead account and a credit in the other case.

Now, the production of any period can be identified in three forms, goods finished and sold, goods finished but held in stock (not yet sold) and semi-finished goods (work in progress). So far as the first category of goods is concerned, it is arguable that the post-mortem of the costs

of individual products long after they have been sold may have some academic utility but it is frequently devoid of any practical significance. Therefore, it is suggested that the total variance concerning goods finished and sold should be adjusted by transferring the amount to the Cost of Sale Account, the costs of the individual items of such goods not being affected.

As regards the variance pertaining to goods finished and held in stock (*i.e.* not yet sold), it would be necessary to adjust the value of the stock; similarly the value of work-in-progress should be adjusted.

However, over or under recovery of overheads due to abnormal reasons (such as abnormal over or under capacity utilisation) should be transferred to the Costing Profit and Loss Account.

Illustration 14: (Use of supplementary overhead rate of absorption)

A light engineering factory fabricates machine parts to customers. The factory commenced fabrication of 12 Nos. machine parts to customers' specifications and the expenditure incurred on the job for the week ending 21st August, 2011 is given below:

	(₹)	(₹)
Direct materials (all items)		*78.00*
Direct labour (manual) 20 hours @₹ 1.50 per hour		*30.00*
Machine facilities :		
Machine No. I : 4 hours @ ₹ 4.50	*18.00*	
Machine No. II : 6 hours @ ₹ 6.50	*39.00*	*57.00*
Total		*165.00*
Overheads @ ₹ 0.80 per hour on 20 manual hours		*16.00*
Total cost		*181.00*

The overhead rate of ₹ 0.80 per hour is based on 3,000 man hours per week; similarly, the machine hour rates are based on the normal working of Machine Nos. I and II for 40 hours out of 45 hours per week.

After the close of each week, the factory levies a supplementary rate for the recovery of full overhead expenses on the basis of actual hours worked during the week. During the week ending 21st August, 2011, the total labour hours worked was 2,400 and Machine Nos. I and II had worked for 30 hours and 32½ hours respectively.

Prepare a Cost Sheet for the job for the fabrication of 12 Nos. machine parts duly levying the supplementary rates.

Solution

Fabrication of 12 Nos. machine parts (job No.....) Date of commencement : 16 August, 2011 Date of Completion. Cost sheet for the week ending, August 21, 2011 :

	(₹)	(₹)
Materials		78.00

Labour 20 hours @ ₹ 1.50		30.00
Machine facilities:		
Machine No. I : 4 hours @ ₹ 4.50	18.00	
Machine No. II : 6 hours @ ₹ 6.50	39.00	57.00
Overheads 20 hours @ ₹ 0.80 per hour		16.00
		181.00
Supplementary Rates		
Overheads 20 hours @ ₹ 0.20 per hour	4.00	
Machine facilities:		
Machine No. I - 4 hours @ ₹ 1.50	6.00	
Machine No. II - 6 hours @ ₹ 1.50	9.00	19.00
Cost		200.00

Working notes:

Overheads budgeted : 3,000 hours @ ₹ 0.80 = ₹ 2,400

Actual hours : 2,400

Actual rate per hour ₹ 2,400/2,400 hours = ₹ 1

Supplementary charge ₹ 0.20 (₹1 – ₹ 0.80) per hour

Machine facilities :

	Machine No. I	Machine No. II
Budgeted	(40 × ₹ 4.50) = ₹ 180	(40 × ₹ 6.50) = ₹ 260
Actual number of hours	30	32½
Actual rate per hour	₹ 6	₹ 8
Supplementary rate per hour	(₹ 6.00 – ₹ 4.50)	(₹ 8.00 – ₹ 6.50)
	₹ 1.50	₹ 1.50

Illustration 15: (Use of supplementary overhead rate with treatment in cost accounts)

In a factory, overheads of a particular department are recovered on the basis of ₹ 5 per machine hour. The total expenses incurred and the actual machine hours for the department for the month of August were ₹ 80,000 and 10,000 hours respectively. Of the amount of ₹ 80,000, ₹ 15,000 became payable due to an award of the Labour Court and ₹ 5,000 was in respect of expenses of the previous year booked in the current month (August). Actual production was 40,000 units, of which 30,000 units were sold. On analysing the reasons, it was found that 60% of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase. How would you treat the under-absorbed overhead in the cost accounts?

Solution

Under-absorbed overhead expenses during the month of August

	(₹)	(₹)
Total expenses incurred in the month of August :		80,000
Less: The amount paid according to labour court award (Assumed to be non-recurring)	15,000	
Expenses of previous year	5,000	20,000
Net overhead expenses incurred for the month		60,000
Overhead recovered for 10,000 hours @ ₹ 5 per hour		50,000
Under-absorbed overheads		10,000

Treatment of under-absorbed overhead in the Cost Accounts

It is given in the question that 40,000 units were produced out of which 30,000 units were sold. It is also given that 60% of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase.

		(₹)
1.	60 percent of under-absorbed overhead is due to defective planning. This being abnormal, should be debited to Profit and Loss A/c (60% of ₹ 10,000)	6,000
2.	Balance 40 percent of under-absorbed overhead should be distributed over, Finished Goods and Cost of Sales by supplementary rate (40% of ₹ 10,000)	4,000
		10,000

₹ 4,000 may be distributed over Finished Goods and Cost of Sales as follows :

Finished Goods	*₹ 1,000
Cost of Sales	*₹ 3,000

***Working notes**

Under-absorbed overhead	:	₹ 4,000
Units produced	:	40,000
Rate of under-absorbed overhead recover		₹ 0.10 per unit
Amount of under-absorbed overheads charged to finished goods (10,000 × ₹ 0.10)		₹ 1,000
Amount of under-absorbed overheads charged to cost of sales : (30,000 × ₹ 0.10)		₹ 3,000

Illustration 16: (Use of supplementary overhead rate with treatment in cost accounts)

In a manufacturing unit, factory overhead was recovered at a pre-determined rate of ₹ 25 per man-day. The total factory overhead expenses incurred and the man-days actually worked were ₹ 41.50 lakhs and 1.5 lakh man-days respectively. Out of the 40,000 units produced during a period, 30,000 were sold.

On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and the rest were attributable to increase in overhead costs.

How would unabsorbed overheads be treated in Cost Accounts ?

Solution

Computation of unabsorbed overheads

Man-days worked	1,50,000
	(₹)
Overhead actually incurred	41,50,000
Less: Overhead absorbed @ ₹ 25 per man-day	37,50,000
(₹ 25 × 1,50,000)	
Unabsorbed overheads	4,00,000
Unabsorbed overheads due to defective planning (*i.e.* 60% of ₹ 4,00,000)	2,40,000
Balance of unabsorbed overhead	1,60,000

Treatment of unabsorbed overheads in Cost Accounts

(*i*) The unabsorbed overheads of ₹ 2,40,000 due to defective planning to be treated as abnormal and therefore be charged to Costing Profit and Loss Account.

(*ii*) The balance unabsorbed overheads of ₹ 1,60,000 be charged to production *i.e.,* 40,000 units at the supplementary overhead absorption rate *i.e.,* ₹ 4 per unit (*Refer to Working Note*)

	(₹)
Charge to Costing Profit and Loss Account as part of the cost of unit sold (30,000 units @ ₹ 4 p.u.)	1,20,000
Add: To closing stock of finished goods (10,000 units @ ₹ 4 p.u.)	40,000
Total	1,60,000

Working Note :

$$\text{Supplementary overhead absorption rate} = \frac{₹\ 1,60,000}{40,000 \text{ units}} = ₹\ 4 \text{ p.u.}$$

Illustration 17: (Determination of selling price under different absorption rate methods)

A factory has three production departments. The policy of the factory is to recover the production overheads of the entire factory by adopting a single blanket rate based on the percentage of total factory overheads to total factory wages. The relevant data for a month are given below:

Department	Direct Materials (₹)	Direct Wages (₹)	Factory Overheads (₹)	Direct Labour hours	Machine hours
Budget:					
Machining	6,50,000	80,000	3,60,000	20,000	80,000
Assembly	1,70,000	3,50,000	1,40,000	1,00,000	10,000
Packing	1,00,000	70,000	1,25,000	50,000	–
Actual:					
Machining	7,80,000	96,000	3,90,000	24,000	96,000
Assembly	1,36,000	2,70,000	84,000	90,000	11,000
Packing	1,20,000	90,000	1,35,000	60,000	–

The details of one of the representative jobs produced during the month are as under:

Job No. CW 7083 :

Department	Direct Materials (₹)	Direct Wages (₹)	Direct Labour hours	Machine hours
Machining	1,200	240	60	180
Assembly	600	360	120	30
Packing	300	60	40	–

The factory adds 30% on the factory cost to cover administration and selling overheads and profit.

Required :

(i) Calculate the overhead absorption rate as per the current policy of the company and determine the selling price of the Job No. CW 7083.

(ii) Suggest any suitable alternative method(s) of absorption of the factory overheads and calculate the overhead recovery rates based on the method(s) so recommended by you.

(iii) Determine the selling price of Job CW 7083 based on the overhead application rates calculated in (ii) above.

(iv) Calculate the department-wise and total under or over recovery of overheads based on the company's current policy and the method(s) recommended by you.

Solution

(i) Computation of overhead absorption rate (as per the current policy of the company)

Department	*Budgeted factory overheads*	*Budgeted direct wages*
	(₹)	*(₹)*
Machinery	3,60,000	80,000
Assembly	1,40,000	3,50,000
Packing	1,25,000	70,000
Total	6,25,000	5,00,000

$$\text{Overhead absorption rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted direct wages}} \times 100$$

$$= \frac{₹\ 6,25,000}{₹\ 5,00,000} \times 100 = 125\% \text{ of Direct wages}$$

Selling Price of the Job No. CW-7083

	(₹)
Direct materials (₹ 1,200 + ₹ 600 + ₹ 300)	2,100.00
Direct wages (₹ 240 + ₹ 360 + ₹ 60)	660.00
Overheads (125% × ₹ 660)	825.00
Total factory cost	3,585.00
Add: Mark-up (30% × ₹ 3,585)	1,075.50
Selling price	4,660.50

(ii) Methods available for absorbing factory overheads and their overhead recovery rates in different departments

1. *Machining Department*

In the machining department, the use of machine time is the predominant factor of production. Hence machine hour rate should be used to recover overheads in this department. The overhead recovery rate based on machine hours has been calculated as under:—

$$\text{Machine hour rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted machine hours}}$$

$$= \frac{₹\ 3,60,000}{80,000 \text{ hours}} = ₹\ 4.50 \text{ per hour}$$

2. *Assembly Department*

In this department direct labour hours is the main factor of production. Hence direct labour hour rate method should be used to recover overheads in this department. The overheads recovery rate in this case is:

$$\text{Direct labour hour rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted direct labour hours}}$$

$$= \frac{₹\ 1,40,000}{1,00,000\ \text{hours}} = ₹\ 1.40\ \text{per hour}$$

3. *Packing Department*

Labour is the most important factor of production in this department. Hence direct labour hour rate method should be used to recover overheads in this department.

The overhead recovery rate in this case comes to:

Budgeted factory overhead

$$\text{Direct labour hour rate} = \frac{\text{Budgeted factory overheads}}{\text{Direct labour hours}}$$

$$= \frac{₹\ 1,25,000}{50,000\ \text{hours}} = ₹\ 2.50\ \text{per hour}$$

(iii) Selling Price of Job CW-7083 [based on the overhead application rates calculated in (ii) above]

	(₹)
Direct materials	2,100.00
Direct wages	660.00
Overheads (*Refer to Working note*)	1,078.00
Factory cost	3,838.00
Add: Mark up (30% of ₹ 3,838)	1,151.40
Selling price	4,989.40

Working note:

Overhead Summary Statement

Dept.	*Basis*	*Hours*	*Rate (₹)*	*Overheads (₹)*
Machining	Machine hour	180	4.50	810
Assembly	Direct labour hour	120	1.40	168

Packing	Direct labour hour	40	2.50	100
			Total	1,078

(iv) Department-wise statement of total under or over recovery of overheads

(a) Under current policy

Departments

	Machining (₹)	*Assembly (₹)*	*Packing (₹)*	*Total (₹)*
Direct wages (Actual)	96,000	2,70,000	90,000	
Overheads recovered @ 125% of Direct wages: (A)	1,20,000	3,37,500	1,12,500	5,70,000
Actual overheads: (B)	3,90,000	84,000	1,35,000	6,09,000
(Under)/Over recovery of overheads : (A—B)	(2,70,000)	2,53,500	(22,500)	(39,000)

(b) As per methods suggested

Basis of overhead recovery

	Machine hours	*Direct labour hours*	*Direct labour hours*	*Total (₹)*
Hours worked	96,000	90,000	60,000	
Rate/hour (₹)	4.50	1.40	2.50	
Overhead recovered (₹): (A)	4,32,000	1,26,000	1,50,000	7,08,000
Actual overheads (₹) : (B)	3,90,000	84,000	1,35,000	6,09,000
(Under)/Over recovery: (A–B)	42,000	42,000	15,000	99,000

Illustration 18: (Use of supplementary overhead rate and its implication on profit)

The total overhead expenses of a factory are ₹ 4,46,380. Taking into account the normal working of the factory, overhead was recovered in production at ₹ 1.25 per hour. The actual hours worked were 2,93,104. How would you proceed to close the books of accounts, assuming that besides 7,800 units produced of which 7,000 were sold, there were 200 equivalent units in work-in-progress?

On investigation, it was found that 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour and the remaining 50% was due to factory inefficiency. Also give the profit implication of the method suggested.

Solution

	(₹)
Actual factory overhead expenses incurred	4,46,380
Less: Overheads recovered from production (*2,93,104 hours* × ₹ *1.25*)	3,66,380
Unabsorbed overheads	80,000

Reasons for unabsorbed overheads

(i)	50% of the unabsorbed overhead was on account of increased in the cost of indirect materials and indirect labour	40,000
(ii)	50% of the unabsorbed overhead was due to factory inefficiency.	40,000

Treatment of unabsorbed overheads in Cost Accounting

1. Unabsorbed overhead amounting to ₹ 40,000, which were due to increase in the cost of indirect material and labour should be charged to units produced by using a supplementary rate.

   $$\text{Supplementary rate} = \frac{₹\ 40{,}000}{(7{,}800 + 200)\ \text{units}} = ₹\ 5 \text{ per unit}$$

   The sum of ₹ 40,000 (unabsorbed overhead) should be distributed by using a supplementary rate among cost of sales, finished goods and work-in progress as below:

	(₹)
Cost of sales (*7,000 units* × ₹ *5*)	35,000
Finished goods (*800 units* × ₹ *5*)	4,000
Work-in progress (*200 units* × ₹ *5*)	1,000
	40,000

   The use of cost of sales figure, would reduce the profit for the period by ₹ 35,000 and will increase the value of stock of finished goods and work-in-progress by ₹ 4,000 and ₹ 1,000 respectively.

2. The balance amount of unabsorbed overheads viz. of ₹ 40,000 due to factory inefficiency should be charged to Costing Profit & Loss Account, as this is an abnormal loss.

Illustration 19: (Use of supplementary overhead rate with treatment in cost accounts)

ABC Ltd. manufactures a single product and absorbs the production overheads at a pre-determined rate of ₹ 10 per machine hour.

At the end of financial year 2011-12, it has been found that actual production overheads incurred were ₹ 6,00,000. It included ₹ 45,000 on account of 'written off' obsolete stores and ₹ 30,000 being the wages paid for the strike period under an award.

The production and sales data for the year 2011-12 is as under :

Production :

Finished goods	*20,000 units*
Work-in-progress	*8,000 units*
(50% complete in all respects)	

Sales :

Finished goods	*18,000 units*

The actual machine hours worked during the period were 48,000. It has been found that one-third of the under-absorption of production overheads was due to lack of production planning and the rest was attributable to normal increase in costs.

(i) Calculate the amount of under-absorption of production overheads during the year 2011-12; and

(ii) Show the accounting treatment of under-absorption of production overheads.

Solution

(i) Amount of under-absorption of production overheads during the year 2011-12

		(₹)
Total production overheads actually incurred during the year 2011-12		6,00,000
Less : 'Written off' obsolete stores	₹ 45,000	
Wages paid for strike period	₹ 30,000	75,000
Net production overheads actually incurred : (A)		5,25,000
Production overheads absorbed by 48,000 machine hours @ ₹ 10 per hour : (B)		4,80,000
Amount of under – absorption of production overheads : [(A) – (B)]		45,000

(ii) Accounting treatment of under absorption of production overheads

It is given in the statement of the question that 20,000 units were completely finished and 8,000 units were 50% complete, one third of the under-absorbed overheads were due to lack of production planning and the rest were attributable to normal increase in costs.

	(₹)
1. (33 – 1/3% of ₹ 45,000) i.e., ₹ 15,000 of under-absorbed overheads were due to lack of production planning. This being abnormal, should be debited to the Costing Profit and Loss A/c.	15,000

2. Balance (66–2/3% of ₹ 45,000) i.e., ₹ 30,000 of under-absorbed overheads should be distributed over work-in-progress, finished goods and cost of sales by using supplementary rate. 30,000

Total under-absorbed overheads 45,000

Apportionment of unabsorbed overheads of ₹ 30,000 over, work-in progress, finished goods and cost of sales

	Equivalent Completed Units	*(₹)*
Work-in-Progress (*4,000 units × ₹1.25*) (*Refer to working note*)	4,000	5,000
Finished goods (*2,000 units × ₹1.25*)	2,000	2,500
Cost of sales (*18,000 units × ₹1.25*)	18,000	22,500
	24,000	30,000

Working Note:

$$\text{Supplementary rate per unit} = \frac{₹\ 30,000}{24,000} = ₹\ 1.25$$

4.8 Accounting and Control of Administrative Overheads

Definition - According to CIMA Terminology, Administrative overhead is defined as "The sum of those costs of general management and of secretarial accounting and administrative services, which cannot be directly related to the production, marketing, research or development functions of the enterprise." According to this definition, administrative overhead constitutes the expenses incurred in connection with the formulation of policy directing the organisation and controlling the operations of an undertaking. These overheads are also collected and classified in the same way as the factory overheads.

4.8.1 Accounting of Administrative Overheads: There are three distinct methods of accounting of administrative overheads, which are briefly discussed below:

(a) Apportioning Administrative Overheads between Production and Sales Departments: According to this method administrative overheads are apportioned over production and sales departments. The reason for the apportionment of overhead expenses over these departments, recognises the fact that administrative overheads are incurred for the benefit of both of these departments. Therefore each department should be charged with the proportionate share of the same. When this method is adopted, administrative overheads lose their identity and get merged with production and selling and distribution overheads.

Disadvantages:

(1) It is difficult to find suitable bases of administrative overhead apportionment over production and sales departments.
(2) Lot of clerical work is involved in apportioning overheads.
(3) It is not justified to apportion total administrative overheads only over production and sales departments when other equally important department like finance is also there.

(b) Charging to Profit and Loss Account: According to this method administrative overheads are charged to Costing Profit & Loss Account. The reason for charging to Costing Profit & Loss are firstly, the administrative overheads are concerned with the formulation of policies and thus are not directly concerned with either the production or the selling and distribution functions. Secondly, it is difficult to determine a suitable basis for apportioning administrative overheads over production and sales departments. Lastly, these overheads are the fixed costs. In view of these arguments, administrative overheads should be charged to Profit and Loss Account.

Disadvantages :

(1) Cost of products is understated as administrative overheads are not charged to costs.

(2) The exclusion of administrative overheads from cost of products is against sound accounting principle.

(c) Treating Administrative Overheads as a separate addition to Cost of Production/ Sales: This method considers administration as a separate function like production and sales and, as such costs relating to formulating the policy, directing the organisation and controlling the operations are taken as a separate charge to the cost of the jobs or a product, sold along with the cost of other functions. The basis which are generally used for apportionment are:

(i) Works cost

(ii) Sales value or quantity

(iii) Gross profit on sales

(iv) Quantity produced

(v) Conversion cost, etc.

4.8.2 Control of Administrative Overheads: Mostly administrative overheads are of fixed nature, and they arise as a result of management policies. These fixed overheads are generally non-controllable. But at the same time these overheads should not be allowed to grow disproportionately. Some degree of control has to be exercised over them. The methods usually adopted for controlling administrative overheads are as follows:

(i) *Classification and analysis of overheads by administrative departments according to their functions, and a comparison with the accomplished results:* According to this method the expenses incurred by each administrative department are collected under standing order numbers for each class of expenditure. These are compared with similar figures of the

previous period in relation to accomplishment. Such a comparison will reveal efficiency or inefficiency of the concerned department.

However, this method provides only a limited degree of control and comparison does not give useful results if the level of activity is not constant during the periods under comparison. To overcome this difficulty, overhead absorption rates may also be compared from period to period; the extent of over or under absorption will reveal the efficiency or otherwise of the department. It may be possible to compare the cost of a service department with that of similar services obtainable from outside and a decision may be taken whether it is economical to continue the department or entrust the work to outsiders.

(ii) *Control through Budgets* - According to this method, administration budgets (monthly or annually) are prepared for each department. The budgeted figures are compared with actual ones to determine variances. The variances are analysed and responsibility assigned to the concerned department to control these variances.

(iii) *Control through Standard* - Under this method, standards of performance are fixed for each administrative activity, and the actual performance is compared with the standards set. In this way, standards serve not only as yardstick of performance but also facilitate control of costs.

Illustration 20: (Reverse calculation of Factory overhead and Administrative overheads)

In an engineering company, the factory overheads are recovered on a fixed percentage basis on direct wages and the administrative overheads are absorbed on a fixed percentage basis on factory cost.

The company has furnished the following data relating to two jobs undertaken by it in a period:

	Job 101 (₹)	***Job 102 (₹)***
Direct materials	*54,000*	*37,500*
Direct wages	*42,000*	*30,000*
Selling price	*1,66,650*	*1,28,250*
Profit percentage on Total Cost	*10%*	*20%*

Required:

(i) Computation of percentage recovery rates of factory overheads and administrative overheads.

(ii) Calculation of the amount of factory overheads, administrative overheads and profit for each of the two jobs.

(iii) Using the above recovery rates fix the selling price of job 103. The additional data being:

Direct materials *₹ 24,000*

Direct wages	*₹ 20,000*
Profit percentage on selling price	*12-½%*

Solution

(i) Let factory overhead recovery rate, as percentage of direct wages be F and administrative overheads recovery rate, as percentage of factory cost be A.

Factory Cost of Jobs:

Job 101 = ₹ 96,000 + ₹ 42,000F

Job 102 = ₹ 67,500 + ₹ 30,000F

Total Cost of Production of Jobs:

Job 101 = (₹ 96,000 + ₹ 42,000F) + (₹ 96,000+ ₹ 42,000F) A = ₹ 1,51,500

Job-102 = (₹ 67,500 + ₹ 30,000F) + (₹ 67,500+ ₹ 30,000F) A = ₹ 1,06,875

(Refer to working note)

On solving above relations: F = 0.60 and A = 0.25

Hence, percentage recovery rates of factory overheads and administrative overheads are 60% and 25% respectively.

Working note:

	Job 101	*Job 102*
Total cost of production (₹)	1,51,500	1,06,875
$\frac{\text{Selling price}}{(100\% + \text{Percentage of profit})}$	(*₹1,66,650/110%*)	(*₹1,28,250/120%*)

(ii) Statement of jobs, showing amount of factory overheads, administrative overheads and profit

	Job 101 (₹)	*Job 102* (₹)
Direct materials	54,000	37,500
Direct wages	42,000	30,000
Prime cost	96,000	67,500
Factory overheads		
60% of direct wages	25,200	18,000
Factory cost	1,21,200	85,500
Administrative overheads		
25% of factory cost	30,300	21,375
Total cost	1,51,500	1,06,875
Profit	15,150	21,375
Selling price	1,66,650	1,28,250

(iii) Selling price of Job 103

	(₹)
Direct materials	24,000
Direct wages	20,000
Prime cost	44,000
Factory overheads (60% of Direct Wages)	12,000
Factory cost	56,000
Administrative overheads (25% of factory cost)	14,000
Total cost	70,000
Profit margin (balancing figure)	10,000
Selling price $\left[\frac{\text{Total Cost}}{87.5\%}\right]$	80,000

4.9 Accounting and Control of Selling and Distribution Overheads

Selling cost or overhead expenses are the expenses incurred for the purpose of promoting the marketing and sales of different products. Distribution expenses, on the other hand, are expenses relating to delivery and dispatch of goods sold. Examples of selling and distribution expenses have been considered earlier in this booklet. From the definitions it is clear that the two type of expenses represent two distinct type of functions. Some concerns group together these two type of overhead expenses into one composite class, namely, selling and distribution overhead, for the purpose of Cost Accounting.

4.9.1 Accounting of selling and distribution overheads: The collection and accumulation of each expense is made by means of appropriate standing order numbers in the usual way. Where it is decided to apportion a part of the administrative overhead to the selling division the same should also be collected through appropriate standing order numbers.

As in the case of administrative overheads, it is not easy to determine an entirely satisfactory basis for computing the overhead rate for absorbing selling overheads. The bases usually adopted are:

(a) Sales value of goods;
(b) Cost of goods sold;
(c) Gross Profit on sales; and
(d) Number of orders or units sold.

It is considered that the sale value is ordinarily the most logical basis, there being some connection between the amount of sales and the amount of expenses incurred to achieve them. The cost of

production, however, is not as satisfactory on basis as it may not have any direct relationship with the selling and distribution cost.

The basis of gross profit on sales results in a larger share of the selling overhead being applied to goods yielding a large margin of profit and vice versa. The basis therefore follows the principle of 'ability to pay, it may not reflect costs or incurred efforts.

An estimated amount per unit - The best method for absorbing selling and distributing expenses over various products is to separate fixed expenses from variable expenses. Apportion the fixed expenses according to the benefit derived by each product and thus ascertaining the fixed expenses per unit. We give below some of the fixed expenses and the basis of apportionment:

Expenses	Basis
Salaries in the Sales Department and of the sales men.	Estimated time devoted to the sale of various products.
Advertisement	Actual amount incurred for each product since these days it is usual to advertise each product separately; common expenses, such as in an exhibition, should be apportioned on the basis of advertisement expenditure on each product.
Show Room expenses	Average space occupied by each product.
Rent of finished goods godowns and Expenses on own delivery vans	Average quantities delivered during a period.

If a suitable basis for apportioning expenses does not exist it may be apportioned in the proportion of sales of various products.

The total of fixed expenses apportioned in this manner, divided by the number of units sold or likely to be sold, will give the fixed expenses per unit. To this should be added the variable expenses which will be different for each product. These expenses are, packaging, freight outwards, insurance in transit, commission payable to salesmen, rebate allowed to customers, etc. All these items will be worked out per unit for each product separately. These items added to fixed expenses per unit will give an estimated amount of the selling and distribution expenses per unit.

4.9.2 Control of Selling & Distribution Overheads: Control of selling and distribution expenses is a difficult task. The reasons for this are as follows:

1. The incidence of selling and distribution overheads depends mainly on external factors, such as distance of market, extent and nature of competition, terms of sales, etc. which are beyond the control of management.
2. These overheads are dependent upon the customers, behaviour, their liking and disliking, tastes etc. Therefore, as such control over the overheads may result in loss of customers.
3. These expenses being of the nature of policy costs, are not amenable to control.

In spite of the above difficulties, the following methods may be used for controlling them.

(a) *Comparison with past performance* - According to this method, selling and distribution overheads are compared with the figures of the previous period. Alternatively, the expenses may be expressed as a percentage of sales, and the percentages may be compared with those of the past period. This method is suitable for small concerns.

(b) *Budgetary Control* - A budget is set up for selling and distribution expenses. The expenses are classified into fixed and variable. If necessary, a flexible budget may be prepared indicating the expenses at different levels of sales. The actual expenses are compared with the budgeted figures and in the case of variances suitable actions are taken.

(c) *Standard Costing* - Under this method standards are set up in relation to the standard sales volume. Standards may be set up for salesmen, territories, products etc. Once the standards are set up, comparison is made between the actuals and standards : variances are enquired into and suitable action taken.

Illustration 21: (Apportionment of Sales & Distribution overheads)

A company which sells four products, some of them unprofitable, proposes discontinuing the sale of one of them. The following information is available regarding income, costs and activity for the year ended 31st March, 2012.

	Products			
	A	**B**	**C**	**D**
Sales (₹)	*3,00,000*	*5,00,000*	*2,50,000*	*4,50,000*
Cost of sales (₹)	*2,00,000*	*4,50,000*	*2,10,000*	*2,25,000*
Area of storage (Sq.ft.)	*50,000*	*40,000*	*80,000*	*30,000*
Number of parcels sent	*1,00,000*	*1,50,000*	*75,000*	*1,75,000*
Number of invoices sent	*80,000*	*1,40,000*	*60,000*	*1,20,000*

Selling and Distribution overheads and the basis of allocation are:

		Basis of allocation to products
Fixed Costs	(₹)	
Rent & Insurance	*30,000*	*Sq.Ft.*
Depreciation	*10,000*	*Parcel*
Salesmen's salaries & expenses	*60,000*	*Sales Volume*
Administrative wages and salaries	*50,000*	*No. of invoices*
Variable Costs :		
Packing wages & materials	*₹ 0.20 per parcel*	
Commission	*4% of sales*	
Stationery	*₹ 0.10 per invoice*	

You are required to prepare Profit & Loss Statement, showing the percentage of profit or loss to sales for each product.

Solution

Statement of Profit or Loss on Various Products during the year ended March 31, 2012.

		Products			
	Total (₹)	*A* (₹)	*B* (₹)	*C* (₹)	*D* (₹)
Sales	15,00,000	3,00,000	5,00,000	2,50,000	4,50,000
Variable costs					
Cost of sales	10,85,000	2,00,000	4,50,000	2,10,000	2,25,000
Commissions 4% of sales	60,000	12,000	20,000	10,000	18,000
Packing wages & materials @ ₹ *0.*20 per parcel	1,00,000	20,000	30,000	15,000	35,000
Stationery @ ₹ 0.10 per invoice	40,000	8,000	14,000	6,000	12,000
Total variable costs	12,85,000	2,40,000	5,14,000	2,41,000	2,90,000
Contribution (Sales– variable cost)	2,15,000	60,000	–14,000	9,000	1,60,000
Fixed Costs					
Rent & Insurance (5:4:8:3)	30,000	7,500	6,000	12,000	4,500
Depreciation (4:6:3:7)	10,000	2,000	3,000	1,500	3,500
Salesmen's salaries & expenses (6:10:5:9)	60,000	12,000	20,000	10,000	18,000
Administrative wages & salaries (4:7:3:6)	50,000	10,000	17,500	7,500	15,000
Total Fixed costs	1,50,000	31,500	46,500	31,000	41,000
Profit or Loss (Contribution–fixed Costs)	65,000	28,500	–60,500	–22,000	1,19,000
Percentage of profit or Loss on sales	4.3	9.5	–12.1	–8.8	26.4

4.10 Concepts Related to Capacity

(i) Installed/ Rated capacity: It refers to the maximum capacity of producing goods or providing services. Installed capacity is determined either on the basis of technical specification or through a technical evaluation. It is also known as theoretical capacity and is

could not be achieved in normal operating circumstances.

(ii) Practical capacity: It is defined as actually utilised capacity of a plant. It is also known as *operating capacity*. This capacity takes into account loss of time due to repairs, maintenance, minor breakdown, idle time, set up time, normal delays, Sundays and holidays, stock taking etc. Generally, practical capacity is taken between 80 to 90% of the rated capacity. It is also used as a base for determining overhead rates. Practical capacity is also called net capacity or available capacity.

(iii) Normal capacity: Normal capacity is the volume of production or services achieved or achievable on an average over a period under normal circumstances taking into account the reduction in capacity resulting from planned maintenance.

Normal capacity is determined as under:

Installed capacity			***xxx***
Adjustments for:			
(i)	*Time lost due to scheduled preventive or planned maintenance*	*xxx*	
(ii)	*Number of shifts or machine hours or man hours*		
(iii)	*Holidays, normal shut down days, normal idle time*	*xxx*	
(iv)	*Normal time lost in batch change over*	*xxx*	*xxx*
Normal Capacity			***xxx***

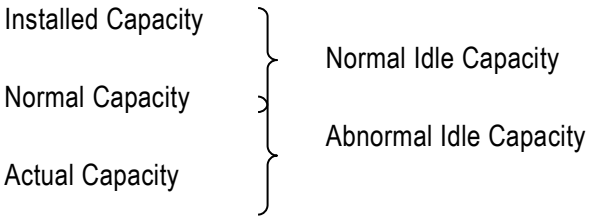
(iv) Actual capacity: It is the capacity actually achieved during a given period. It is presented as a percentage of installed capacity.

(v) Idle capacity: It is that part of the capacity of a plant, machine or equipment which cannot be effectively utilised in production.

(a) Normal Idle Capacity: It is the difference between Installed capacity and Normal capacity.

(b) Abnormal Idle Capacity: It is the difference between Normal capacity and Actual capacity utilization where the actual capacity is lower than the normal capacity.

The idle capacity may arise due to lack of product demand, non-availability of raw material, shortage of skilled labour, absenteeism, shortage of power fuel or supplies, seasonal nature of product etc.



Treatment of Idle capacity costs: Idle capacity costs can be treated in product costing, in the following ways :

(a) If the idle capacity cost is due to unavoidable reasons such as repairs, maintenance, changeover of job etc. a supplementary overhead rate may be used to recover the idle capacity cost. In this case, the costs are charged to the production capacity utilised.

(b) If the idle capacity cost is due to avoidable reasons such as faulty planning, power failure etc.; the cost should be charged to costing profit and loss account.

(c) If the idle capacity cost is due to seasonal factors, then, the cost should be charged to the cost of production by inflating overhead rates.

4.11 Treatment of Certain Items in Costing

(i) Interest and financing charges: It includes any payment in nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds. Example of interest and financing charges are interest on borrowings, financing charges in respect of finance leases, cash discount allowed to customers. The term interest and financing charges, finance costs and borrowing costs are used interchangeably. It does not include imputed costs.

Interest and financing charges shall be presented in the cost statement as a separate item of cost of sales.

(ii) Depreciation: Depreciation "is the diminution in the intrinsic value of an asset due to use and/or the lapse of time." Depreciation is thus the result of two factors *viz.,* the use, and the lapse of time. We know that each fixed asset loses its intrinsic value due to their continuous use and as such the greater the use the higher is the amount of depreciation. The loss in the intrinsic value may also arise even if the asset in question is not in service.

Assignment of Depreciation:

It shall be traced to the cost object to the extent economically feasible. Where it is not directly traceable it should be assigned using either or two principles i.e. (i) Cause and Effect and (ii) Benefit received.

(iii) Packing expenses: Cost of primary packing necessary for protecting the product or for convenient handling, should become a part of the prime cost. The cost of packing to facilitate the transportation of the product from the factory to the customer should become a part of the distribution cost. If the cost of special packing is at the request of the customer, the same should be charged to the specific work order or the job. The cost of fancy packing necessary to attract customers is an advertising expenditure. Hence, it is to be treated as a selling overhead.

(iv) Fringe benefits: These are the additional payments or facilities provided to the workers apart from their salary and direct cost-allowances like house rent, dearness and city compensatory allowances. These benefits are given in the form of overtime, extra shift duty allowance, holiday pay, pension facilities etc.

These indirect benefits stand to improve the morale, loyalty and stability of employees towards the organisation. If the amount of fringe benefit is considerably large, it may be recovered as direct charge by means of a supplementary wage or labour rate; otherwise these may be collected as part of production overheads.

(v) Expenses on removal and re-erection of machines: Expenses are sometime incurred on removal and re-erection of machinery in factories. Such expenses may be incurred due to factors like change in the method of production; an addition or alteration in the factory building, change in the flow of production, etc. All such expenses are treated as production overheads. When amount of such expenses is large, it may be spread over a period of time.

If such expenses are incurred due to faulty planning or some other abnormal factor, then they may be charged to costing Profit and Loss Account.

(vi) Bad debts: There is no unanimity among different authors of Cost Accounting about the treatment of bad debts. One view is that 'bad debts' should be excluded from cost. According to this view bad debts are financial losses and therefore, they should not be included in the cost of a particular job or product.

According to another view it should form part of selling and distribution overheads, especially when they arise in the normal course of trading. Therefore bad debts should be treated in cost accounting in the same way as any other selling and distribution cost. However extra ordinarily large bad debts should not be included in cost accounts.

(vii) Training expenses: Training is an essential input for industrial workers. Training expenses in fact includes wages of workers, costs incurred in running training department, loss arising from the initial lower production, extra spoilage etc. Training expenses of factory workers are treated as part of the cost of production. The training expenses of office; sales or distribution workers should be treated as office; sales or distribution overhead as the case may be. These expenses can be spread over various departments of the concern on the basis of the number of workers on roll.

Training expenses would be abnormally high in the case of high labour turnover such expenses should be excluded from costs and charged to the costing profit and loss account.

(viii) Canteen expenses: The subsidy provided or expenses borne by the firm in running the canteen should be regarded as a production overhead. If the canteen is meant only for factory workers therefore this expenses should be apportioned on the basis of the number of workers employed in each department. If office workers also take advantage of the canteen facility, a suitable share of the expenses should be treated as office overhead.

(ix) Carriage and cartage expenses: It includes the expenses incurred on the movement (inward and outwards) and transportation of materials and goods. Transportation expenses related to direct material may be included in the cost of direct material and those relating to indirect material (stores) may be treated as factory overheads. Expenses related to the transportation of finished goods may be treated as distribution overhead.

(x) Expenses for welfare activities: All expenses incurred on the welfare activities of employees in a company are part of general overheads. Such expenses should be

apportioned between factory, office, selling and distribution overheads on the basis of number of persons involved.

(xi) Night shift allowance: Workers in the factories, which operate during night time are paid some extra amount known as 'night shift allowance'. This extra amount is generally incurred due to the general pressure of work beyond normal capacity level and is treated as production overhead and recovered as such.

If this allowance is treated as part of direct wages, the jobs/production carried at night will be costlier than jobs/production performed during the day. However, if additional expenditure on night shift is incurred to meet some specific customer order, such expenditure may be charged directly to the order concerned. If night shifts are run due to abnormal circumstances, the additional expenditure should be charged to the costing profit and loss account.

(xii) Research and Development Expenses: The Terminology defines research expenses as "the expenses of searching for new or improved products, new application of materials, or new or improved methods." Similarly, development expenses are defined as "the expenses of the process which begins with the implementation of the decision to produce a new or improved product."

If research is conducted in the methods of production, the research expenses should be charged to the production overhead; while the expenditure becomes a part of the administration overhead if research relates to administration. Similarly, market research expenses are charged to the selling and distribution overhead.

Development costs incurred in connection with a particular product should be charged directly to that product. Such expenses are usually treated as "deferred revenue expenses," and recovered as a cost per unit of the product when production is fully established.

General research expenses of a routine nature incurred on new or improved methods of manufacture or the improvement of the existing products should be charged to the general overhead.

Even in this case, if the amount involved is substantial it may be treated as a deferred revenue expenditure, and spread over the period during which the benefit would accrue. Expenses on fundamental research, not relating to any specific product, are treated as a part of the administration overhead. Where research proves a failure, the cost associated with it should be excluded from costs and charged to the costing Profit and Loss Account.

4.12 Summary

1. *Overheads represent expenses that have been incurred in providing certain ancillary facilities or services which facilitate or make possible the carrying out of the production process; by themselves these services are not of any use.*
2. *Overheads can be classified in to four types on the basis of function-*
    - *Factory or Manufacturing Overheads*

- *Office and Administration Overheads*
- *Selling and Distribution Overheads*
- *Research and Development Overheads*

3. *Overheads can be classified in to three types on the basis of nature-*
   - *Fixed Overhead- Expenses that are not affected by any variation in the volume of activity.*
   - *Variable- Expenses that change in proportion to the change in the volume of activity.*
   - *Semi variable- The expenses that do not change when there is a small change in the level of activity but change whenever there is a slightly big change or change in the same direction as change in the level of activity but not in the same proportion.*
4. ***Cost allocation-*** *The term 'allocation' refers to assignment or allotment of an entire item of cost to a particular cost center or cost unit.*
5. ***Cost apportionment-*** *Apportionment implies the allotment of proportions of items of cost to cost centres or departments.*
6. ***Re-apportionment-*** *The process of assigning service department overheads to production departments is called reassignment or re-apportionment.*
7. ***Absorption-*** *The process of recovering overheads of a department or any other cost center from its output is called recovery or absorption.*
8. *Following are the methods used for re-apportionment of service department expenses over the production departments-*
   - *Direct re-distribution method- Under this method service department costs are apportioned over the production departments only, ignoring the services rendered by one service department to the other.*
   - *Step Method or Non-reciprocal method- This method gives cognizance to the service rendered by service department to another service department. The sequence here begins with the department that renders service to the maximum number of other service departments.*
   - *Reciprocal Service Method- These methods are used when different service departments render services to each other, in addition to rendering services to production departments. In such cases various service departments have to share overheads of each other. The methods available for dealing with reciprocal services are*
     (a) *Simultaneous equation method;*
     (b) *Repeated distribution method;*
     (c) *Trial and error method.*

9. ***Blanket overhead rates-*** *Blanket overhead rate refers to the computation of one single overhead rate for the whole factory. It is to be distinguished from the departmental overhead rate which refers to a separate rate for each individual cost centre or department.*

$$\text{Blanket Overhead rate} = \frac{\text{Overhead costs for the whole factory}}{\text{Total units of the selected base}} \times 100$$

10. ***Percentage of direct material***

$$\text{Overhead rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Direct Material cost of all products}} \times 100$$

11. ***Percentage of prime cost***

$$\text{Overhead rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Prime Cost}} \times 100$$

12. ***Percentage of direct labour cost***

Direct Labour Cost Percentage Rate

$$= \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Direct Labour Cost}} \times 100$$

- ***Labour hour rate***

$$\text{Direct Labour Hour Rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Direct labour Hours}}$$

- ***Machine hour rate***

$$\text{Direct Machine Hour Rate} = \frac{\text{Total Production Overheads of a Department}}{\text{Budgeted Machine Hours}}$$

13. ***Methods of accounting of administrative overheads***

- *Apportioning Administrative Overheads between Production and Sales Departments.*
- *Charging to Costing Profit and Loss Account.*
- *Treating Administrative Overheads as a separate addition to Cost of Production/Sales*
- *The basis which are generally used for apportionment are :*
  - *(i) Works cost*
  - *(ii) Sales value or quantity*
  - *(iii) Gross profit on sales*
  - *(iv) Quantity produced*
  - *(v) Conversion cost, etc.*

5

Non-Integrated Accounts

Learning Objectives

After studying this chapter you should be able to

- Differentiate between integrated and non-integrated systems of accounting
- Identify the ledgers maintained by financial as well as cost departments
- Understand the reasons for differences between financial and cost accounts
- Prepare a reconciliation statement accordingly and
- Should be in a position to write the various journal entries for both integrated and non-integrated systems of accounting.

5.1 Introduction

To operate business operations efficiently and successfully, it is necessary to make use of an appropriate accounting system. Such a system should state in clear terms whether cost and financial transactions should be integrated or kept separately (Non-integrated). Where cost and financial accounting records are integrated, the system so evolved is known as integrated or integral accounting. In case cost and financial transactions are kept separately, the system is called Non-Integrated Accounting or Cost control System. While non-integrated system of accounting necessitates reconciliation between financial and cost accounts, no reconciliation between two sets of accounts is required under integrated accounting.

5.2 Non-Integrated Accounting System

It is a system of accounting under which separate ledgers are maintained for cost and financial accounts by Accountants. This system is also referred to as cost ledger accounting system. Under such a system the cost accounts restricts itself to recording only those transactions which relate to the product or service being provided. Hence items of expenses which have a bearing with sales or, production or for that matter any other items which are under the factory management are the ones dealt with in such accounts. This leads to the exclusion of certain expenses like interest, bad debts and revenue/income from 'other than the sale of product or service'.

A special feature of the non-integrated system of accounts is its ability to deal with notional

expenses like rent or interest on capital tied up in the stock. The accounting of notional rent facilitates comparisons amongst factories (some owned and some rented).

Non-Integrated Accounting Systems contain fewer accounts when compared with financial accounting because of the exclusion of purchases, expenses and also Balance Sheet items like fixed assets, debtors and creditors. Items of accounts which are excluded are represented by an account known as *Cost ledger control account*.

The important ledgers to be maintained under non-integrated accounting system in the Cost Accounting department are the following:

(a) ***Cost Ledger*** **-** This is the principle ledger of the cost department in which impersonal accounts are recorded. This ledger is made self-balancing by maintaining therein a Control Account for each subsidiary ledger.

(b) ***Stores Ledger*** **-** It contains an account for each item of stores. The entries in each account maintained in this ledger are made from the invoice, goods received note, material requisitions, material received note etc. Accounts in respect of each item of stores show receipt, issue and balance in physical as well as in monetary terms.

(c) ***Work-in-Progress Ledger*** **-** This ledger is also known as job ledger, it contains accounts of unfinished jobs and processes. All material costs, wages and overheads for each job in progress are posted to the respective job account in this ledger. The balance in a job account represents total balance of job/work-in-progress, as shown by the job account.

(d) ***Finished Goods Ledger*** **-** It contains an account for each item of finished product manufactured or the completed job. If the finished product is transferred to stores, a credit entry is made in the work-in-progress ledger and a corresponding debit entry is made in this ledger.

5.2.1 Principal Accounts : The main accounts which are usually prepared when a separate Cost Ledger is maintained are as follows :

(1) ***Cost Ledger Control Account*** **-** This account is also known as General Ledger Adjustment Account. This account is made to complete double entry. All items of expenditure are credited to this account. Sales are debited to this account and net profit/loss is transferred to this account. The balance in this account at the end of the particular period represents the net total of all the balances of the impersonal account

(2) ***Stores Ledger Control Account*** **–**This account is debited for the purchase of material and credited for issue of materials from stores. The balance in this account indicates the total balance of all the individual stores accounts. Abnormal losses or gains if any in this account, are transferred to Costing Profit & Loss Account. Entries are made on the basis of goods received notes and stores requisitions etc.

(3) ***Wage Control Account*** **-** This account is debited with total wages paid (direct and indirect). Direct wages are further transferred to Work-in-Progress Account and indirect wages to Production Overhead; Administration Overhead or Selling & Distribution Overhead Account, as the case may be. Wages paid for abnormal idle time are transferred to Costing Profit &

Loss Account either directly or through Abnormal Loss Account.

(4) ***Manufacturing/Production/Works Overhead Control Account*** **-** This account is debited with indirect costs of production such as indirect material, indirect labour, indirect expenses (carriage inward etc.). Overhead recovered is credited to this Account. The difference between overhead incurred and overhead recovered (i.e. Under Absorption or Over Absorption of Overheads) is transferred to Overhead Adjustment Account.

(5) ***Work-in-Progress Control Account*** **-** This account is debited with the total cost of production, which includes—direct materials, direct labour, direct expenses, production overhead recovered, and is credited with the amount of finished goods completed and transferred. The balance in this account represents total balances of jobs/works-in-progress, as shown by several job accounts.

(6) ***Administrative Overhead Control Account*** **-** This account is debited with overhead incurred and credited with Overhead recovered. The Overhead recovered are debited to Finished Goods Account. The difference between Administrative Overhead incurred and recovered is transferred to Overhead Adjustment Account.

(7) ***Finished Goods Control Accounts*** **-** This account is debited with the value of goods transferred from work-in-progress account, administration costs recovered. This account is credited with the cost of goods sold and Cost of Sales Account is debited. The balance of this account represents the value of goods lying at hand.

(8) ***Selling and Distribution Overhead Account*** **-** This account is debited with Selling and Distribution Overhead incurred and credited with the recovered Overhead. The difference between incurred and recovered overhead is transferred usually to Overhead Adjustment Account.

(9) ***Cost of Sales Account*** **-** This account is debited with the cost of finished goods transferred from Finished Goods Account for sale as well as with the amount of selling and distribution overhead costs recovered. The balance of this account is ultimately transferred to Sales Account or Costing Profit & Loss Account.

(10) ***Costing Profit & Loss Account*** **–** This account is debited with cost of goods sold, under-absorbed overheads and abnormal losses. And is credited with sales value, over-absorbed overhead and abnormal gains. The net profit or loss in this account is transferred to Cost Ledger Control Account.

(11) ***Overhead Adjustment Account*** **-** This account is to be debited for under-recovery of overhead and credited with over-recovery of overhead amount. The net balance in this account is transferred to Costing Profit & Loss Account.

Note: *Sometimes, Overhead Adjustment Account is dispensed with and under/over absorbed overheads is directly transferred to Costing Profit & Loss Account from the respective overhead accounts.*

5.2.2 Scheme of Entries; The manner in which the Cost Ledger, when maintained on a double entry basis, would operate is illustrated by the following statements of various journal entries as would appear in the cost books.

Material:

				(₹)	(₹)
(a)	Purchase—₹ 5,000 (credit or cash)				
	(i) Material Control A/c	Dr.		5,000	
	To Cost Ledger Control A/c				5,000
	(ii) Stores Ledger Control A/c	Dr.		5,000	
	To Material Control A/c				5,000

Note: Sometimes Material Control Account is dispensed with and entries are directly made into Stores Ledger Control A/c, giving a credit to Cost Ledger Control A/c.

(b)	Purchases worth ₹ 500 for special job				
	Work-in-Progress Ledger Control A/c.....	Dr.		500	
	To Cost Ledger Control A/c				500
(c)	Material returned to vendor—*₹ 500*				
	Cost Ledger Control A/c	Dr.		500	
	To Store Ledger Control A/c				500
(d)	(i) Material (Direct) issued to production—*₹ 1,000*				
	Work-in-Progress Control A/c.....	Dr.		1,000	
	To Store Ledger Control A/c				1,000
	(ii) Material (Indirect) issued to production—*₹ 200*				
	Manufacturing Overhead A/c.....	Dr.		200	
	To Store Ledger Control A/c				200
(e)	(i) Material worth ₹ 200 returned from shop to stores				
	Stores Ledger Control A/c.....	Dr.		200	
	To Work-in-Progress Control A/c				200
	(ii) Material worth ₹ 100 is transferred from Job-1 to Job- 2				
	Job- 2 A/c.....	Dr.		100	
	To Job- 1 A/c				100
(f)	Material worth ₹ 100 is issued from stores for repairs				
	Manufacturing Overhead A/c.....	Dr.		100	
	To Stores Ledger Control A/c				100

Labour:

(g)	Direct wages paid to workers— ₹ 1,000				
	Wages Control A/c.....	Dr.		1,000	
	To Cost Ledger Control A/c				1,000

(h)	Indirect wages paid to workers in the production— ₹ 700			
	(i) Wages Control A/c……	Dr.	700	
	To Cost Ledger Control A/c			700
	(ii) Production Overhead A/c……	Dr.	700	
	To Wages Control A/c			700
(i)	Indirect wages paid to workers in administration— ₹ 500			
	(i) Wages Control A/c……	Dr.	500	
	To Cost Ledger Control A/c			500
	(ii) Administration Overhead A/c……	Dr.	500	
	To Wages Control A/c			500
(j)	Indirect wages paid to workers in Selling & Dist. department— ₹ 300			
	(i) Wages Control A/c……	Dr.	300	
	To Cost Ledger Control A/c			300
	(ii) Selling & Dist. Overhead A/c……	Dr.	300	
	To Wages Control A/c			300
Direct Expenses:				
(k)	Direct expenses incurred ₹ 500 for Job No. 12			
	Job No. 12 A/c (WIP Control A/c)……	Dr.	500	
	To Cost Ledger Control A/c			500
Overheads:				
(l)	Overhead expenses incurred ₹ 500 *(*Production ₹150; Administrative ₹150; Selling and Distribution ₹200)			
	Production Overhead Control A/c……	Dr.	150	
	Administrative Overhead Control A/c……	Dr	150	
	Selling & Dist. Overhead Control A/c……	Dr	200	
	To Cost Ledger Control A/c			500
(m)	Carriage Inward—*₹ 100*			
	Manufacturing Overhead A/c……	Dr.	100	
	To Cost Ledger Control A/c			100
(n)	Production overhead recovered—₹ 1,000			
	Work-in-Progress Ledger Control A/c……	Dr.	1,000	
	To Production Overhead A/c			1,000
(o)	Administrative Overhead recovered ₹ 500 from finished goods			
	Finished Goods Ledger Control A/c……	Dr.	500	
	To Administrative Overhead A/c			500

(p)	Selling and Distribution Overhead ₹ 100 recovered from sales			
	Cost of Sales A/c……..	Dr.	100	
	To Selling & Dist. Overhead A/c			100
(q)	Under recovery of overheads			
	Costing Profit & Loss A/c……..	Dr.	xxx	
	To Administrative Overhead A/c			xxx
(r)	Over recovery of overheads			
	Production Overheads A/c……..	Dr.	xxx	
	To Costing Profit & Loss A/c			xxx
Sales:				
(s)	Cost Ledger Control A/c……..	Dr.	xxx	
	To Costing Profit & Loss A/c			xxx
Profit/ Loss:				
(t)	In case of Profit			
	(i) Costing Profit & Loss A/c……	Dr.	xxx	
	To Cost Ledger Control A/c			xxx
(u)	In case of Loss			
	(ii) Cost Ledger Control A/c……	Dr.	xxx	
	To Costing Profit & Loss A/c			xxx

Non-Integrated Accounting System-flowchart

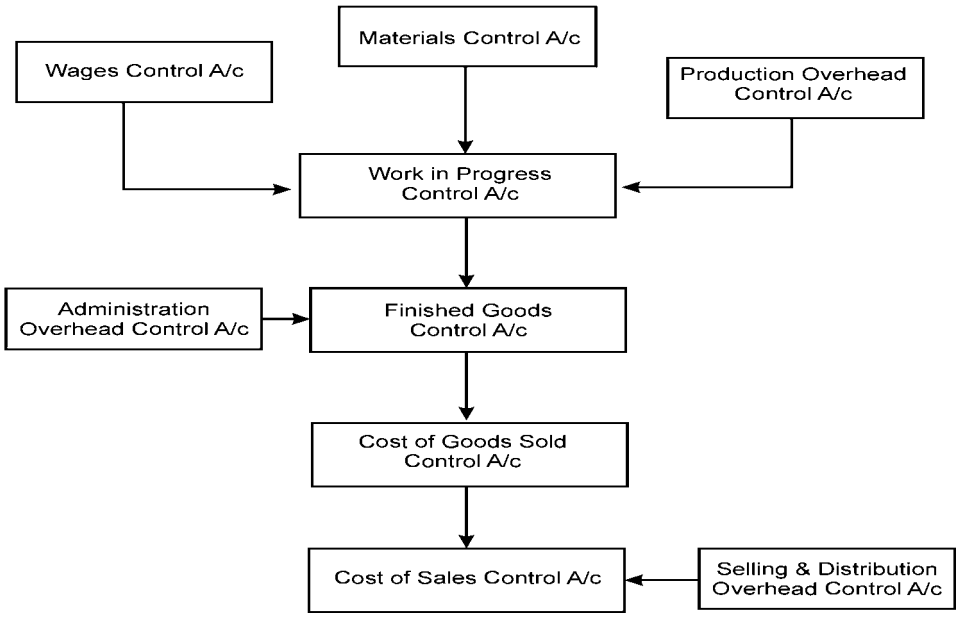


Illustration 1: (Non-Integrated accounts journal entries)

As on 31st March, 2013, the following balances existed in a firm's Cost Ledger:

	Dr. (₹)	Cr. (₹)
Stores Ledger Control A/c	*3,01,435*	
Work-in-Progress Control A/c	*1,22,365*	
Finished Stock Ledger Control A/c	*2,51,945*	
Manufacturing Overhead Control A/c		*10,525*
Cost Ledger Control A/c		*6,65,220*
	6,75,745	*6,75,745*

During the next three months the following items arose:

	(₹)
Finished product (at cost)	*2,10,835*
Manufacturing overhead incurred	*91,510*
Raw materials purchased	*1,23,000*
Factory Wages	*50,530*
Indirect Labour	*21,665*
Cost of Sales	*1,85,890*
Material issued to production	*1,27,315*
Sales returned at Cost	*5,380*
Material returned to suppliers	*2,900*
Manufacturing overhead charged to production	*77,200*

You are required to pass the Journal Entries; write up the accounts and schedule the balances, stating what each balance represents.

Solution:

Journal entries are as follows:

			Dr. (₹)	Cr. (₹)
1.	Finished stock ledger Control A/c……..	Dr.	2,10,835	
	To Work-in-Progress Control A/c			2,10,835
2.	Manufacturing Overhead Control A/c……	Dr.	91,510	
	To Cost Ledger Control A/c			91,510
3.	Stores Ledger Control A/c……..	Dr.	1,23,000	
	To Cost Ledger Control A/c			1,23,000

4.	(i) Wage Control A/c.....	Dr.	72,195	
	To Cost Ledger Control A/c			72,195
	(ii) Work-in-progress Control A/c.....	Dr.	50,530	
	To Wages Control A/c			50,530
	(iii) Manufacturing Overhead Control A/c.....	Dr.	21,665	
	To Wages Control A/c			21,665
5.	Cost of Sales A/c.....	Dr.	1,85,890	
	To Finished Stock Ledger A/c			1,85,890
6.	Work-in-Progress Control A/c.....	Dr.	1,27,315	
	To Stores Ledger Control A/c			1,27,315
7.	Finished Stock Ledger Control A/c.....	Dr.	5,380	
	To Cost of Sales A/c			5,380
8.	Cost Ledger Control A/c.....	Dr.	2,900	
	To Stores Ledger Control A/c			2,900
9.	Work-in-Progress Control A/c.....	Dr.	77,200	
	To Manufacturing Overhead Control A/c			77,200

COST LEDGER

Cost Ledger Control Account

		(₹)			(₹)
To	Stores Ledger Control A/c (return)	2,900	By	Balance b/d	6,65,220
”	Balance c/d	9,49,025	”	Manufacturing OH Control A/c	91,510
			”	Stores Ledger Control A/c	1,23,000
			”	Wages Control A/c	72,195
		9,51,925			9,51,925

Stores Ledger Control Account

		(₹)			(₹)
To	Balance b/d	3,01,435	By	Work in Progress Control A/c	1,27,315
”	Cost Ledger Control A/c	1,23,000	”	Cost Ledger Control A/c	2,900
			”	Balance c/d	2,94,220
		4,24,435			4,24,435

Work-in-Progress Control Account

		(₹)			(₹)
To	Balance b/d	1,22,365	By	Finished Stock Ledger Control A/c	2,10,835
”	Wages Control A/c	50,530	”	Balance c/d	1,66,575
	Stores Ledger Control A/c	1,27,315			
	Manufacturing OH Control A/c	77,200			
		3,77,410			3,77,410

Finished Stock Ledger Control Account

		(₹)			(₹)
To	Balance b/d	2,51,945	By	Cost of Sales Control A/c	1,85,890
”	Work in Progress Control A/c	2,10,835	”	Balance c/d	2,82,270
”	Cost of Sales Control A/c (Return at cost)	5,380			
		4,68,160			4,68,160

Manufacturing Overhead Control Account

		(₹)			(₹)
To	Cost Ledger Control A/c	91,510	By	Balance b/d	10,525
”	Wages Control A/c	21,665	”	Work in Progress Control A/c	77,200
			”	Balance c/d	25,450
		1,13,175			1,13,175

Wages Control Account

		(₹)			(₹)
To	Cost Ledger Control A/c	72,195	By	Work in Progress Control A/c	50,530
			”	Manufacturing OH Control A/c	21,665
		72,195			72,195

Cost of Sales Account

		(₹)			(₹)
To	Finished Stock Ledger Control	1,85,890	By	Finished Stock Ledger Control (Return)	5,380
			”	Balance c/d	1,80,510
		1,85,890			1,85,890

Trial Balance

	Dr. (₹)	Cr. (₹)
Stores Ledger Control A/c	2,94,220	
Work-in-Progress Control A/c	1,66,575	
Finished Stock Ledger Control A/c	2,82,270	
Manufacturing Overhead Control A/c	25,450	
Cost of Sales A/c	1,80,510	
Cost Ledger Control A/c		9,49,025
	9,49,025	9,49,025

Illustration 2: (Preparation of condensed P&L statement and supporting schedules)

The following figures are extracted from the Trial Balance of Go-getter Co. on 30th September, 2012:

	Dr. (₹)	*Cr. (₹)*
Inventories:		
Finished Stock	*80,000*	
Raw Materials	*1,40,000*	
Work-in-Progress	*2,00,000*	
Office Appliances	*17,400*	
Plant & Machinery	*4,60,500*	
Building	*2,00,000*	
Sales		*7,68,000*
Sales Return and Rebates	*14,000*	
Materials Purchased	*3,20,000*	
Freight incurred on Materials	*16,000*	
Purchase Returns		*4,800*
Direct Labour	*1,60,000*	
Indirect Labour	*18,000*	
Factory Supervision	*10,000*	
Repairs and Upkeep Factory	*14,000*	
Heat, Light and Power	*65,000*	

Rates and Taxes	*6,300*	
Miscellaneous Factory Expenses	*18,700*	
Sales Commission	*33,600*	
Sales Travelling	*11,000*	
Sales Promotion	*22,500*	
Distribution Deptt.—Salaries and Expenses	*18,000*	
Office Salaries and Expenses	*8,600*	
Interest on Borrowed Funds	*2,000*	

Further details are available as follows:

(i)	*Closing Inventories:*	
	Finished Goods	*1,15,000*
	Raw Materials	*1,80,000*
	Work-in-Progress	*1,92,000*
(ii)	*Accrued expenses on:*	
	Direct Labour	*8,000*
	Indirect Labour	*1,200*
	Interest on Borrowed Funds	*2,000*
(iii)	*Depreciation to be provided on:*	
	Office Appliances	*5%*
	Plant and Machinery	*10%*
	Buildings	*4%*
(iv)	*Distribution of the following costs:*	
	Heat, Light and Power to Factory, Office and Distribution in the ratio 8 : 1 : 1.	
	Rates and Taxes two-thirds to Factory and one-third to Office.	
	Depreciation on Buildings to Factory, Office and Selling in the ratio 8 : 1 : 1.	

With the help of the above information, you are required to prepare a condensed Profit and Loss Statement of Go-getter Co. for the year ended 30th September, 2012 along with supporting schedules of:

(i) Cost of Sales.

(ii) Selling and Distribution Expenses.

(iii) Administration Expenses.

Solution:

Profit and Loss Statement of Go-getter Company
for the year ended 30th September, 2012

	(₹)	(₹)
Gross Sales	7,68,000	
Less: Returns	(14,000)	7,54,000
Less: Cost of Sales [Refer to Schedule (i)]		(7,14,020)
Net Operating Profit		39,980
Less: Interest on borrowed funds		(4,000)
Net Profit		35,980

(i) Schedule of Cost of Sales

	(₹)	(₹)
Raw Material (Inventory opening balance)		1,40,000
Add: Material Purchased	3,20,000	
Add: Freight on Material	16,000	
Less: Purchase Returns	(4,800)	3,31,200
		4,71,200
Less: Closing Raw Material Inventory		(1,80,000)
Materials consumed in Production		2,91,200
Direct Labour (₹1,60,000 + ₹8,000)		1,68,000
Prime Cost		4,59,200
Factory Overheads:		
Indirect Labour (₹18,000 + ₹1,200)	19,200	
Factory Supervision	10,000	
Repairs and Factory Upkeep	14,000	
Heat, Light and Power (₹65,000 × 8/10)	52,000	
Rates and Taxes (₹6,300 × 2/3rd)	4,200	
Miscellaneous Factory Expenses	18,700	
Depreciation of Plant (10% of ₹4,60,500)	46,050	
Depreciation of Buildings (4% of ₹2,00,000 × 8/10)	6,400	1,70,550
Gross Works cost		6,29,750

Add: Opening Work-in-Process inventory		2,00,000
Less: Closing Work-in-Process inventory		(1,92,000)
Works Cost		6,37,750
Add: Opening Finished Goods inventory		80,000
Less: Closing Finished Goods inventory		(1,15,000)
Cost of Production		6,02,750
Add: Administration Expenses [*See* Schedule (*iii*)]		18,870
Cost of Goods Sold		6,21,620
Add: Selling and Distribution Expenses [*See* Schedule (*ii*)]		92,400
Cost of Sales		7,14,020

(ii) Schedule of Selling and Distribution Expenses

	(₹)
Sales Commission	33,600
Sales Travelling	11,000
Sales Promotion	22,500
Distribution Deptt.—Salaries and Expenses	18,000
Heat, Light and Power	6,500
Depreciation of Buildings	800
	92,400

(iii) Schedule of Administration Expenses

	(₹)
Office Salaries and Expenses	8,600
Depreciation of Office Appliances	870
Depreciation of Buildings	800
Heat, Light and Power	6,500
Rates and Taxes	2,100
	18,870

Illustration 3: (Preparation of ledger as per integrated accounting system)

In the absence of the Chief Accountant, you have been asked to prepare a month's cost accounts for a company which operates a batch costing system fully integrated with the financial accounts. The following relevant information is provided to you:

	(₹)	(₹)
Balances at the beginning of the month:		
Stores Ledger Control Account		*25,000*
Work-in-Progress Control Account		*20,000*
Finished Goods Control Account		*35,000*
Prepaid Production Overheads brought forward from previous month		*3,000*
Transactions during the month:		
Materials Purchased		*75,000*
Materials Issued:		
To Production	*30,000*	
To Factory Maintenance	*4,000*	34,000
Materials transferred between batches		*5,000*
Total wages paid:		
To Direct workers	*25,000*	
To Indirect workers	*5,000*	30,000
Direct wages charged to batches		*20,000*
Recorded non-productive time of direct workers		*5,000*
Selling and Distribution Overheads Incurred		*6,000*
Other Production Overheads Incurred		*12,000*
Sales		*1,00,000*
Cost of Finished Goods Sold		*80,000*
Cost of Goods completed and transferred into finished goods during the month		*65,000*
Physical value of work-in-progress at the end of the month		*40,000*

The production overhead absorption rate is 150% of direct wages charged to work-in-progress.

Required:

Prepare the following accounts for the month:

(a) Stores Ledger Control Account.

(b) Work-in-Progress Control Account.

(c) Finished Goods Control Account.

(d) Production Overhead Control Account.

(e) Profit and Loss Account.

Solution:

(a) Stores Ledger Control Account

		(₹)			(₹)
To	Balance b/d	25,000	By	Work in Progress Control A/c	30,000
”	Creditors/ Bank A/c	75,000	”	Production OH Control A/c	4,000
			”	Balance c/d	66,000
		1,00,000			1,00,000

(b) Work-in-Progress Control Account

		(₹)			(₹)
To	Balance b/d	20,000	By	Finished Goods Control A/c	65,000
”	Store Ledger Control A/c	30,000	”	Balance c/d (Physical value)	40,000
”	Wages Control A/c	20,000			
”	Production Overhead Control A/c (150% of direct wages)	30,000			
”	Profit & Loss A/c (Stock Gains)	5,000			
		1,05,000			1,05,000

(c) Finished Goods Control Account

		(₹)			(₹)
To	Balance b/d	35,000	By	Cost of Goods A/c or Profit & Loss A/c	80,000
”	Work-in-Progress Control A/c	65,000			
			By	Balance c/d	20,000
		1,00,000			1,00,000

(d) Production Overhead Control Account

			(₹)			(₹)
To	Balance b/d (Prepaid amount)		3,000	By	Work-in-Progress Control A/c (150% of direct wages)	30,000
”	Stores Ledger Control A/c		4,000			
”	*Wages Control A/c:*					
	Direct Workers	5,000				

	Indirect Workers	5,000	10,000		
”	Bank		12,000		
”	Profit & Loss A/c*		1,000		
	(Over absorption, balancing figure)				
			30,000		30,000

* Alternatively the over absorbed overhead may be carried forward.

(e) Profit & Loss Account

		(₹)			(₹)
To	Finished goods Control A/c or Cost of goods sold A/c	80,000	By	Sales A/c	1,00,000
”	Selling & Distribution Overhead A/c	6,000	”	Production Overhead Control A/c	1,000
”	Balance c/d	20,000	”	Work-in-Progress Control A/c (Stock gain)	5,000
		1,06,000			1,06,000

Notes:

(1) Materials transferred between batches will not affect the Control Accounts.

(2) Non-production time of direct workers is a production overhead and therefore will not be charged to work-in-progress control A/c.

(3) Production overheads absorbed in work-in-progress Control A/c will then equal ₹ 30,000 (150% of ₹ 20,000).

(4) In the work-in-progress Control A/c the excess physical value of stock is taken resulting in stock gain. Stock gain is transferred to Profit & Loss A/c.

Illustration 4: (Preparation of ledger under non-integrated accounting system)

From the following details show the necessary accounts in the Cost Ledger

	Materials (₹)	*Work-in-Progress* (₹)	*Finished Stock* (₹)
Opening Balance	*8,000*	*5,000*	*10,000*
Closing Balance	*11,000*	*9,000*	*12,000*
Transactions during the period:			*(₹)*
Materials purchased			*25,000*
Wages paid (including ₹ 2,000 indirect)			*10,000*
Overheads incurred			*8,000*
Overheads absorbed			*9,000*
Sales			*50,000*

Solution:

Cost Ledger

General Ledger Adjustment Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Cost of Sales A/c	50,000	By	Balance b/d	23,000
To balance c/d	32,000	By	Stores Led. Control A/c	25,000
		By	Wages Control A/c	10,000
		By	Overheads A/c	8,000
		By	Costing P & L A/c (Profit)	16,000
	82,000			82,000

Stores Ledger Control Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Balance b/d	8,000	By	Work-in-Progress A/c	22,000
To Gen. Led. Adj. A/c	25,000	By	Balance c/d	11,000
	33,000			33,000

Work-in-Progress Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Balance b/d	5,000	By	Finished stock	35,000
To Stores Led. Control A/c	22,000		(Balancing figure)	
To Wages Control A/c	8,000	By	Balance c/d	9,000
To Overheads A/c	9,000			
	44,000			44,000

Finished Stock Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Balance b/d	10,000	By	Cost of Sales A/c	33,000
To W.I.P. A/c	35,000		(Balancing figure)	
		By	Balance c/d	12,000
	45,000			45,000

Wages Control Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Gen. Led. Adj. A/c	10,000	By	Work-in-Progress A/c	8,000
		By	Overheads A/c	2,000
	10,000			10,000

Overheads Account

Dr.				*Cr.*
	(₹)			*(₹)*
To General Ledger Adjustment A/c	8,000	By	W.I.P. A/c	9,000
To Wages Control A/c	2,000	By	Costing P & L A/c*	1,000
	10,000			10,000

* [(Overhead incurred + Indirect wages) – Overheads absorbed]
[(₹ 8,000 + ₹ 2,000) - ₹ 9,000] = ₹ 1,000 (under-absorption)

Cost of Sales Account

Dr.			*Cr.*
	(₹)		*(₹)*
To Finished Stock A/c	33,000	By Costing P & L A/c	33,000
	33,000		33,000

Costing P & L Account

Dr.				*Cr.*
	(₹)			*(₹)*
To Cost of Sales A/c	33,000	By	General Ledger	
To Overheads (Under absorbed)	1,000		Adjustment A/c (Sales A/c)	50,000
To General Ledger				
Adjustment A/c (Profit)	16,000			
	50,000			50,000

Illustration 5: (Preparation of ledger accounts)

On 31st March, 2013 the following balances were extracted from the books of the Supreme Manufacturing Company:

	Dr.	*Cr.*
	(₹)	*(₹)*
Stores Ledger Control A/c	*35,000*	
Work-in-Progress Control A/c	*38,000*	
Finished Goods Control A/c	*25,000*	
Cost Ledger Control A/c		*98,000*
	98,000	*98,000*

The following transactions took place in April 2013 :

	(₹)
Raw Materials :	
Purchased	*95,000*
Returned to suppliers	*3,000*

Issued to Production	*98,000*
Returned to stores	*3,000*
Productive wages	*40,000*
Indirect labour	*25,000*
Factory overhead expenses incurred	*50,000*
Selling and Administrative expenses	*40,000*
Cost of finished goods transferred to warehouse	*2,13,000*
Cost of Goods sold	*2,10,000*
Sales	*3,00,000*

Factory overheads are applied to production at 150% of direct wages, any under/over absorbed overhead being carried forward for adjustment in the subsequent months. All administrative and selling expenses are treated as period costs and charged off to the Profit and Loss Account of the month in which they are incurred.

Show the following Accounts:

(a) Cost Ledger Control A/c

(b) Stores Ledger Control A/c

(c) Work-in-Progress Control A/c

(d) Finished Goods Stock Control A/c

(e) Factory Overhead Control A/c

(f) Costing Profit and Loss A/c

(g) Trial Balance as at 30th April, 2013.

Solution:

(a) Cost Ledger Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Costing Profit &		By	Balance b/d	98,000
	Loss A/c (Sales)	3,00,000	”	Stores Ledger Control A/c	95,000
”	Stores Ledger Control A/c	3,000	”	Wages Control A/c	65,000
”	Balance c/d	95,000		(Productive wages + Indirect wages)	
			”	Factory Overhead Control A/c	50,000
			”	Selling & Admn. Overhead Expenses	40,000
		_____	”	Costing Profit & Loss A/c	50,000
		3,98,000			3,98,000

(b) Stores Ledger Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	35,000	By	Cost Ledger Control A/c	3,000
”	Cost Ledger Control A/c	95,000	”	Work-in-Progress Control A/c	98,000
”	Work-in-Progress Control A/c	3,000	”	Balance c/d	32,000
		1,33,000			1,33,000

(c) Work-in-Progress Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	38,000	By	Stores Ledger Control A/c	3,000
”	Stores Ledger Control A/c	98,000	”	Finished Goods A/c	2,13,000
”	Wages Control A/c	40,000	”	Balance c/d	20,000
”	Factory Overhead control A/c	60,000			
		2,36,000			2,36,000

(d) Finished Goods Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	25,000	By	Cost of goods sold A/c	2,10,000
”	Work in Progress Control A/c	2,13,000	”	Balance c/d	28,000
		2,38,000			2,38,000

(e) Factory Overhead Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Wage Control A/c (Indirect Labour)	25,000	By	Work-in-Progress A/c	60,000
”	Cost Ledger Control A/c	50,000	”	Balance c/d	15,000
		75,000			75,000

(f) Costing Profit and Loss A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Cost of Goods Sold A/c	2,10,000	By	Cost Ledger Control A/c	
”	Selling and Admn. Overhead A/c	40,000		(Sales)	3,00,000
”	Cost Ledger Control A/c (Costing profit)	50,000			
		3,00,000			3,00,000

(g) Trial Balance (as at 30th April, 2013)

		Dr. (₹)	Cr. (₹)
To	Stores Ledger Control A/c	32,000	
"	Work-in-Progress Control A/c	20,000	
"	Finished Goods Control A/c	28,000	
"	Factory Overhead Control A/c	15,000	
"	Cost Ledger Control A/c	_____	95,000
		95,000	95,000

Working Notes:

(1) Wages Control A/c

		Dr. (₹)			Cr. (₹)
To	Cost Ledger Control A/c	65,000	By	Work-in-Progress Control A/c	40,000
		_____	By	Factory Overhead Control A/c	25,000
		65,000			65,000

(2) Cost of Goods Sold A/c

		Dr. (₹)			Cr. (₹)
To	Finished Goods Control A/c	2,10,000	By	Costing Profit & Loss A/c	2,10,000
		2,10,000			2,10,000

(3) Selling & Administrative Expenses A/c

		Dr. (₹)			Cr. (₹)
To	Cost Ledger Control A/c	40,000	By	Costing Profit & Loss A/c	40,000
		40,000			40,000

Illustration 6 (Preparation of cost ledger and trial balance)

Acme Manufacturing Co. Ltd. opens the costing records, with the balances as on 1st July, 2012 as follows:

	Dr. (₹)	Cr. (₹)
Material control A/c	*1,24,000*	
Work-in-progress A/c	*62,500*	
Finished Goods A/c	*1,24,000*	
Production Overheads A/c	*8,400*	
Administration Overhead		*12,000*
Selling and Distribution Overhead A/c	*6,250*	

General Ledger Control A/c	_____	*3,13,150*
	3,25,150	*3,25,150*

The following are the transactions for the quarter ended 30th September 2012 :

	(₹)
Materials purchased	*4,80,100*
Materials issued to jobs	*4,77,400*
Materials to works maintenance	*41,200*
Materials to administration office	*3,400*
Materials to selling department	*7,200*
Wages direct	*1,49,300*
Wages indirect	*65,000*
Transportation for indirect materials	*8,400*
Production overheads	*2,42,250*
Absorbed production overheads	*3,59,100*
Administration overheads	*74,000*
Administration allocation to production	*52,900*
Administration allocation to sales	*14,800*
Sales overheads	*64,200*
Sales overheads absorbed	*82,000*
Finished goods produced	*9,58,400*
Finished goods sold	*9,77,300*
Sales Realisation	*14,43,000*

Make up the various accounts as you envisage in the Cost Ledger and prepare a Trial Balance as at 30th September, 2012.

Solution:

Acme Manufacturing Co. Ltd.
Cost Ledger
Material Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	1,24,000	By	Work-in-progress	4,77,400
To	General ledger control A/c (Purchases)	4,80,100	By	Production overheads A/c	41,200
			By	Administration overhead A/c	3,400

			By	Selling and distribution overhead A/c	7,200
			By	Balance c/d	74,900
		6,04,100			6,04,100
To	Balance b/d	74,900			

Wages Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	General ledger control A/c (₹ 1,49,300 + ₹ 65,000)	2,14,300	By	Work-in-progress	1,49,300
			"	Production overheads A/c	65,000
		2,14,300			2,14,300

Production Overhead A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	8,400	By	Work-in-progress A/c	3,59,100
To	General Ledger control A/c:		"	Balance c/d	6,150
	Transportation 8,400				
	Production overheads 2,42,250	2,50,650			
To	Wages control A/c	65,000			
To	Material control A/c	41,200			
		3,65,250			3,65,250
To	Balance b/d	6,150			

Administration Overhead A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	General ledger control A/c	74,000	By	Balance b/d	12,000
To	Material control A/c	3,400	"	Work-in-progress A/c	52,900
To	Balance c/d	2,300	"	Cost of sales A/c	14,800
		79,700			79,700
			By	Balance b/d	2,300

Selling and Distribution Overhead A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	6,250	By	Cost of Sales A/c	82,000
To	General ledger control A/c	64,200			
To	Material control A/c	7,200			
To	Balance c/d	4,350			
		82,000			82,000
			By	balance b/d	4,350

Work-in-Progress A/c

Dr.					*Cr.*
		(₹)			(₹)
To	Balance b/d	62,500	By	Finished Goods A/c	9,58,400
”	Material control A/c	4,77,400	”	Balance c/d	1,42,800
”	Wages control A/c	1,49,300			
”	Production overheads A/c	3,59,100			
”	Administration overhead A/c	52,900			
		11,01,200			11,01,200
To	Balance b/d	1,42,800			

Finished Goods A/c

Dr.					*Cr.*
		(₹)			(₹)
To	Balance b/d	1,24,000	By	Cost of sales A/c	9,77,300
”	Work-in-progress	9,58,400	By	Balance c/d	1,05,100
		10,82,400			10,82,400
To	Balance b/d	1,05,100			

Cost of Sales A/c

Dr.					*Cr.*
		(₹)			(₹)
To	Finished goods A/c	9,77,300	By	Costing profit & loss A/c	10,74,100
”	Administration overheads A/c	14,800			
”	Selling & distribution overheads A/c	82,000			
		10,74,100			10,74,100

General Ledger Control A/c

Dr.					*Cr.*
		(₹)			(₹)
To	Costing profit and loss A/c	14,43,000	By	Balance b/d	3,13,150
To	Balance c/d	3,22,300	”	Material control A/c	4,80,100
			”	Wages Control A/c	2,14,300
			”	Production overhead A/c	2,50,650
			”	Administration overhead A/c	74,000
			”	Selling and distribution overhead A/c	64,200
			”	Costing profit & loss A/c	3,68,900
		17,65,300			17,65,300
			By	Balance b/d	3,22,300

Costing Profit & Loss A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Cost of sales A/c	10,74,100	By	General ledger control A/c	
"	General ledger control A/c (Profit for the period)	3,68,900		(Sales)	14,43,000
		14,43,000			14,43,000

Trial Balance as at 30th September, 2012

	Dr.	*Cr.*
	(₹)	*(₹)*
Material control A/c	74,900	
Production overhead A/c	6,150	
Administration overhead A/c		2,300
Selling and distribution overhead A/c		4,350
Work-in-progress A/c	1,42,800	
Finished goods A/c	1,05,100	
General ledger control A/c		3,22,300
	3,28,950	3,28,950

Illustration 7 (Computation of missing figures)

(a) A fire destroyed some accounting records of a company. You have been able to collect the following from the spoilt papers/records and as a result of consultation with accounting staff in respect of January, 2013:

(i) Incomplete Ledger Entries:

Raw Materials A/c

	(₹)		*(₹)*
Beginning Inventory	*32,000*		

Work-in-Progress A/c

	(₹)		*(₹)*
Beginning Inventory	*9,200*	*Finished Stock*	*1,51,000*

Creditors A/c

	(₹)		*(₹)*
		Opening Balance	*16,400*
Closing Balance	*19,200*		

Manufacturing Overheads A/c

	(₹)		(₹)
Amount Spent	*29,600*		

Finished Goods A/c

	(₹)		(₹)
Opening Inventory	*24,000*		
		Closing Inventory	*30,000*

(ii) Additional Information:

(1) The cash-book showed that ₹ 89,200 have been paid to creditors for raw-material.

(2) Ending inventory of work-in-progress included material ₹ 5,000 on which 300 direct labour hours have been booked against wages and overheads.

(3) The job card showed that workers have worked for 7,000 hours. The wage rate is ₹ 10 per labour hour.

(4) Overhead recovery rate was ₹ 4 per direct labour hour.

You are required to complete the above accounts in the cost ledger of the company:

Solution:

Dr. **Creditors A/c** *Cr.*

	(₹)		(₹)
To Cash & Bank (1)	89,200	By Balance b/d	16,400
To Balance c/d	19,200	By Purchases (Balancing figure)	92,000
	1,08,400		1,08,400

Dr. **Work-in-progress A/c** *Cr.*

	(₹)			(₹)
To Balance b/d	9,200	By Finished stock		1,51,000
To Raw-materials (Balancing figure)	53,000	By Balance c/d : Material (2) :	₹ 5,000	
To Wages Control (3) (7,000 hrs. × ₹ 10)	70,000	Labour (2) : (300 hrs. × ₹10)	₹ 3,000	
To Overheads Control (4) (7,000 hrs. × ₹ 4)	28,000	Overheads (2) : (300 hrs. × ₹4)	₹ 1,200	9,200
	1,60,200			1,60,200

Dr. **Raw-materials A/c** *Cr.*

	(₹)		(₹)
To Balance b/d	32,000	By Work-in-progress	53,000
To Purchases	92,000	(As above)	
(As above)		By Balance c/d	71,000
	1,24,000		1,24,000

Dr. **Finished Goods A/c** *Cr.*

	(₹)		(₹)
To Balance b/d	24,000	By Cost of sales	1,45,000
To W.I.P.	1,51,000	(Balancing figure)	
(As above)		By Balance c/d	30,000
	1,75,000		1,75,000

Dr. **Manufacturing Overheads A/c** *Cr.*

	(₹)		(₹)
To Sundries	29,600	By W.I.P. (7000 hrs. × ₹ 4)	28,000
		By Under-absorbed Overheads A/c	1,600
	29,600		29,600

Illustration 8: (Finding out of missing figures)

The following incomplete accounts are furnished to you for the month ended 31st October, 2012.

Stores Control Account

1.10.12 To Balance ₹ 54,000

Work in Progress Control Account

1.10.12 To Balance ₹ 6,000

Finished Goods Control Account

1.10.12 To Balance ₹ 75,000

Factory Overheads Control Account

Total debits for October, 2012 ₹ 45,000

Factory Overheads Applied Account

Cost of Goods Sold Account

Creditors for Purchases Account

1.10.12 by Balance	*₹ 30,000*

Additional information:

(i) The factory overheads are applied by using a budgeted rate based on Direct Labour Hours. The budget for overheads for 2012 is ₹ 6,75,000 and the budget of direct labour hours is 4,50,000.

(ii) The balance in the account of creditors for purchases on 31.10.12 is ₹ 15,000 and the payments made to creditors in October, 2012 amount to ₹ 1,05,000.

(iii) The finished goods inventory as on 31st October, 2012 is ₹ 66,000.

(iv) The cost of goods sold during the month was ₹ 1,95,000.

(v) On 31st October, 2012 there was only one unfinished job in the factory. The cost records show that ₹ 3,000 (1,200 direct labour hours) of Direct Labour Cost and ₹ 6,000 of Direct Material Cost had been charged.

(vi) A total of 28,200 direct labour hours were worked in October, 2012. All factory workers earn same rate of pay.

(vii) All actual factory overheads incurred in October, 2012 have been posted.

You are required to find:

(a) Materials purchased during October, 2012.

(b) Cost of goods completed in October, 2012.

(c) Overheads applied to production in October, 2012.

(d) Balance of work in progress on 31st October, 2012.

(e) Direct materials consumed during October, 2012.

(f) Balance of Stores Control Account on 31st October, 2012.

(g) Over absorbed or under absorbed overheads for October, 2012.

Solution :

Working Notes :

(i) Overhead recovery rate per direct labour hour :

Budgeted factory overheads	:	₹ 6,75,000
Budgeted direct labour hours	:	4,50,000

$$\text{Overhead recovery rate} = \frac{\text{Budgeted factory overheads}}{\text{Budgeted direct labour hours}}$$

$$= \frac{₹\ 6,75,000}{4,50,000 \text{ hours}}$$

= ₹ 1.50 per direct labour

(ii) Direct wage rate per hour :

Direct labour cost of WIP (on 31st October 2012)	:	₹ 3,000
Direct labour hours of WIP	:	1,200 hours

$$\text{Direct wage rate per hour} = \frac{\text{Direct labour cost on WIP}}{\text{Direct labour hours on WIP}}$$

$$= \frac{₹\ 3,000}{1,200 \text{ hours}} = ₹2.50$$

(iii) Total direct wages charged to production:

Total direct labour hours spent on production × Direct wage rate per hour

= 28,200 hours × ₹ 2.50 = ₹ 70,500

(a) Material purchased during October, 2012

	(₹)
Payment made to creditors	1,05,000
Add : Closing balance in the account of creditors for purchase	15,000
	1,20,000
Less : Opening balance	30,000
Material purchased	90,000

(b) Cost of goods completed in October, 2012

	(₹)
The cost of goods sold during the month	1,95,000
Add : Closing finished goods inventory	66,000
	2,61,000
Less : Opening finished goods inventory	75,000
Cost of goods completed during the month	1,86,000

(c) Overhead applied to production in October, 2012

= 28,200 hours × ₹ 1.50 = ₹ 42,300

(d) Balance of Work-in-progress on 31st October, 2012

	(₹)
Direct material cost	6,000
Direct labour cost	3,000
Overheads (1,200 hours × ₹ 1.50)	1,800
	10,800

(e) Direct material consumed during October, 2012 ₹ 78,000

(Refer to following Account)

Dr. **Work in progress Control A/c** *Cr.*

		(₹)			(₹)
1.10.12	To Opening Balance	6,000	By	Finished goods	1,86,000
,,	To Direct wages	70,500		*(As per (b) above)*	
	[Refer to Working Note (iii)]		By	Balance of WIP	10,800
	To Factory Overheads	42,300		*(As per (d) above)*	
	[As per (c) above]				
	To Balancing figure	78,000			
	(Material consumed)				
		1,96,800			1,96,800

(f) Balance of Stores Control Account on 31st October, 2012 ₹ 66,000

(Refer to following Account)

Dr. **Stores Control Account** *Cr.*

		(₹)			(₹)
1.10.12	To Balance	54,000	31.10.12	By W.I.P. Control A/c	78,000
	To Creditors A/c	90,000		*(As per (e) above)*	
	for materials purchased			By Balance c/d	66,000
	(As per (a) above)			*(Balancing figure)*	
		1,44,000			1,44,000

(g) Over-absorbed or under-absorbed overheads for October, 2012 *:* Balance in Factory Overhead Account below showing that ₹ 2,700 is under-absorbed.

Dr. **Factory Overhead Account** *Cr.*

	(₹)			(₹)
To General Ledger Adj. A/c	45,000	31.10.12	By Factory overhead applied	42,300
(Total debits for Oct. 2012)			*[Refer to (c) above]*	
			Balance *(Under-absorbed)*	2,700
		45,000		45,000

5.3 Integrated (or Integral) Accounting System

Integrated Accounts is the name given to a system of accounting, whereby cost and financial accounts are kept in the same set of books. Obviously, then there will be no separate sets of books for Costing and Financial records. Integrated accounts provide or meet out fully the information requirement for Costing as well as for Financial Accounts. For Costing it provides

information useful for ascertaining the Cost of each product, job, process, operation of any other identifiable activity and for carrying necessary analysis. Integrated accounts provide relevant information which is necessary for preparing profit and loss account and the balance sheets as per the requirement of law and also helps in exercising effective control over the liabilities and assets of its business.

5.3.1 Advantages: The main advantages of Integrated Accounts are as follows:

(a) *No need for Reconciliation*- The question of reconciling costing profit and financial profit does not arise, as there is only one figure of profit.

(b) *Less efforts*- Due to use of one set of books, there is a significant saving in efforts made.

(c) *Less Time consuming*- No delay is caused in obtaining information as it is provided from books of original entry.

(d) *Economical process*- It is economical also as it is based on the concept of "Centralisation of Accounting function".

5.3.2 Essential pre-requisites for Integrated Accounts: The essential pre-requisites for integrated accounts include the following steps:

1. The management's decision about the extent of integration of the two sets of books. Some concerns find it useful to integrate up to the stage of primary cost or factory cost while other prefer full integration of the entire accounting records.
2. A suitable coding system must be made available so as to serve the accounting purposes of financial and cost accounts.
3. An agreed routine, with regard to the treatment of provision for accruals, prepaid expenses, other adjustment necessary for preparation of interim accounts.
4. Perfect coordination should exist between the staff responsible for the financial and cost aspects of the accounts and an efficient processing of accounting documents should be ensured.

Under this system there is no need for a separate cost ledger. Of course, there will be a number of subsidiary ledgers; in addition to the useful Customers' Ledger and the Bought Ledger, there will be: (a) Stores Ledger; (b) Stock Ledger and (c) Job Ledger.

5.3.3 Features of Integrated Accounting System: Following are the main points of integrated accounting:

(a) Complete analysis of cost and sales are kept.

(b) Complete details of all payments in cash are kept

(c) Complete details of all assets and liabilities are kept and this system does not use a notional account to represent all impersonal accounts

In non-integrated system, a cost control account or general ledger adjustment account is used in cost ledger. In this system, general ledger adjustment account is eliminated and detailed accounts for assets and liabilities are maintained. In other words, following accounts are used for "General Ledger Adjustment Account" of non-integrated system:

(a) Bank account

(b) Debtors account

(c) Creditors account

(d) Provision for depreciation account etc.

In integrated system, all accounts necessary for showing classification of cost will be used but the general ledger adjustment account of non-integrated accounting is replaced by use of following accounts:

(a) Bank account

(b) Debtors account

(c) Creditors account

(d) Provision for depreciation account

(e) Fixed assets account

(f) Share capital account

If the illustration given below is to be worked out on integrated account basis, the journal entries would be as follows:

Illustration 9: (Journal entries under integrated accounting system)

Journalise the following transactions assuming that cost and financial transactions are integrated:

	(₹)
Raw materials purchased	*2,00,000*
Direct materials issued to production	*1,50,000*
Wages paid (30% indirect)	*1,20,000*
Wages charged to production	*84,000*
Manufacturing expenses incurred	*84,000*
Manufacturing overhead charged to production	*92,000*
Selling and distribution costs	*20,000*
Finished products (at cost)	*2,00,000*
Sales	*2,90,000*
Closing stock	*Nil*
Receipts from debtors	*69,000*
Payments to creditors	*1,10,000*

Solution:

Journal

		Dr. *(₹)*	*Cr.* *(₹)*
Stores Ledger Control A/c	Dr.	2,00,000	
To Creditors A/c			2,00,000
(Material Purchased)			
Work-in-Progress Control A/c	Dr.	1,50,000	
To Stores Ledger Control A/c			1,50,000
(Materials issued to production)			
Wages Control A/c	Dr.	1,20,000	
To Bank A/c			1,20,000
(Wages paid)			
Factory Overhead Control A/c	Dr.	36,000	
To Wages Control A/c			36,000
(30% of wages paid being indirect charged to overhead)			
Work-in-Progress Control A/c	Dr.	84,000	
To Wages Control A/c			84,000
(Direct wages charged to production)			
Factory Overhead Control A/c	Dr.	84,000	
To Bank A/c			84,000
(Manufacturing overhead incurred)			
Work-in-Progress Control A/c	Dr.	92,000	
To Factory overhead charged A/c			92,000
(Manufacturing overhead charged to production)			
Selling and Distribution Overhead Control A/c	Dr.	20,000	
To Bank A/c			20,000
(Selling and distribution costs incurred)			
Finished Goods Ledger Control A/c	Dr.	2,00,000	
To Work-in-Progress Control A/c			2,00,000
(Cost of goods finished)			
Cost of Sales A/c	Dr.	2,20,000	
To Finished Stock Ledger Control A/c			2,00,000
To Selling and Distribution Control A/c			20,000
(Costs of goods sold)			
Sundry Debtors A/c	Dr.	2,90,000	
To Sales A/c			2,90,000
(Finished stock sold)			
Bank A/c	Dr.	69,000	
To Sundry Debtors A/c			69,000
(Receipts from debtors)			

Sundry (Creditors) A/c	Dr.	1,10,000	
To Bank A/c			1,10,000
(Payment made to creditors)			

Illustration 10: (Journal entries under integrated accounting system)

Dutta Enterprises operates an integral system of accounting. You are required to pass the Journal Entries for the following transactions that took place for the year ended 30th June, 2012.

(Narrations are not required.)

	(₹)
Raw materials purchased (50% on Credit)	*6,00,000*
Materials issued to production	*4,00,000*
Wages paid (50% Direct)	*2,00,000*
Wages charged to production	*1,00,000*
Factory overheads incurred	*80,000*
Factory overheads charged to production	*1,00,000*
Selling and distribution overheads incurred	*40,000*
Finished goods at cost	*5,00,000*
Sales (50% Credit)	*7,50,000*
Closing stock	*Nil*
Receipts from debtors	*2,00,000*
Payments to creditors	*2,00,000*

Solution :

Journal Entries under integrated system of accounting for transactions taking place for the year ended on 30th June, 2012

		Dr. (₹)	*Cr. (₹)*
Stores Ledger Control A/c	Dr.6,00,000		
To Sundry Creditors Account			3,00,000
To Cash or Bank Account			3,00,000
Work-in-Progress Control A/c	Dr.4,00,000		
To Stores Ledger Control A/c			4,00,000
Wages Control A/c	Dr.2,00,000		
To Cash or Bank Account			2,00,000
Work-in-Progress Control A/c	Dr.1,00,000		
To Wages Control A/c			1,00,000
Factory Overhead Control A/c	Dr.1,00,000		

To Wages Control A/c		1,00,000
Factory Overhead Control A/c	Dr. 80,000	
To Cash or Bank A/c		80,000
Work-in-Progress Control A/c	Dr.1,00,000	
To Factory Overhead Control A/c		1,00,000
Selling and Distribution Overhead Control A/c	Dr. 40,000	
To Cash or Bank A/c		40,000
Finished Stock Ledger Control A/c	Dr.5,00,000	
To Work-in-Progress Control A/c		5,00,000
Cost of Sales A/c	Dr.5,40,000	
To Finished Stock Ledger Control A/c		5,00,000
To Selling and Distribution Control A/c		40,000
Sundry Debtors Account	Dr.3,75,000	
Cash or Bank Account	Dr.3,75,000	
To Sales Account		7,50,000
Cash or Bank A/c	Dr.2,00,000	
To Sundry Debtors A/c		2,00,000
Sundry Creditors A/c	Dr.2,00,000	
To Cash or Bank A/c		2,00,000

Illustration 11: (Preparation of ledgers and trial balance under integrated accounting system)

Bangalore Petrochemicals Co. keeps books on integrated accounting system. The following balances appear in the books as on 1st January, 2012.

	Dr. (₹)	*Cr. (₹)*
Stores control A/c	*18,000*	
Work-in-Progress A/c	*17,000*	
Finished goods A/c	*13,000*	
Bank A/c	*10,000*	
Creditors A/c		*8,000*
Fixed assets A/c	*55,000*	
Debtors A/c	*12,000*	
Share capital A/c		*80,000*
Depreciation provision A/c		*5,000*
Profit and loss A/c		*32,000*
	1,25,000	*1,25,000*

Transaction for the year ended 31st Dec., 2012 were as given below:

	(₹)	(₹)
Wages-direct	*87,000*	
Wages-indirect	*5,000*	*92,000*
Purchase of materials (on credit)		*1,00,000*
Materials issued to production		*1,10,000*
Materials for repairs		*2,000*
Goods finished during the year (at cost)		*2,15,000*
Sales (credit)		*3,00,000*
Cost of goods sold		*2,20,000*
Production overhead absorbed		*48,000*
Production overhead incurred		*40,000*
Administration overhead incurred		*12,000*
Selling overhead incurred		*14,000*
Payments of creditors		*1,01,000*
Payments of debtors		*2,90,000*
Depreciation of machinery		*1,300*
Prepaid rent (included in factory overheads)		*300*

Write up accounts in the integrated ledger and prepare a trial balance.

Solution :

Stores Control Account

Dr.					*Cr.*
2012		***(₹)***	***2012***		***(₹)***
Jan. 1	To Balance b/d	18,000	Dec.31	By Work-in-Progress A/c	1,10,000
Dec. 31	" Creditors A/c	1,00,000		" Production overheads A/c	2,000
				" Balance c/d	6,000
		1,18,000			1,18,000
2013					
Jan. 1	To Balance b/d	6,000			

Wages Control Account

2012		***(₹)***	***2012***		***(₹)***
Dec. 31	To Bank A/c	92,000	Dec. 31	By Work-in-Progress A/c	87,000
				" Production overheads A/c	5,000
		92,000			92,000

Work-in-Progress A/c

2012			(₹)	2012			(₹)
Jan. 1	To	Balance b/d	17,000	Dec. 31	By	Finished goods A/c	2,15,000
Dec. 31	"	Stores control A/c	1,10,000		"	Balance c/d	47,000
	"	Wages control A/c	87,000				
	"	Production overheads A/c	48,000				
			2,62,000				2,62,000
2013							
Jan. 1	To	Balance b/d	47,000				

Production Overhead A/c

2012			(₹)	2012			(₹)
Dec. 31	To	Wages Control A/c	5,000	Dec. 31	By	Work-in-Progress A/c	48,000
	"	Stores Control A/c	2,000		"	Prepaid Rent A/c	3,00
	"	Bank A/c	40,000				
	"	Depreciation Provision	1,300				
			48,300				48,300

Finished Goods A/c

2012			(₹)	2012			(₹)
Jan. 1	To	Balance b/d	13,000	Dec. 31	By	Cost of Sales A/c	2,20,000
Dec. 31	"	Work-in-Progress	2,15,000		"	Balance c/d	20,000
	"	Admn. Overhead	12,000				
			2,40,000				2,40,000
2013							
Jan. 1	"	Balance b/d	20,000				

Administration Overheads A/c

2012			(₹)	2012			(₹)
Dec. 31	To	Bank A/c	12,000	Dec. 31	By	Finished Goods A/c	12,000
			12,000				12,000

Cost of Sales A/c

2012			(₹)	2012			(₹)
Dec. 31	To	Finished Goods A/c	2,20,000	Dec. 31	By	Sales A/c	2,34,000
	"	Selling and Dist. Overheads A/c	14,000				
			2,34,000				2,34,000

Selling and Distribution Overheads A/c

2012		(₹)	2012		(₹)
Dec. 31	To Bank A/c	14,000	Dec. 31	By Cost of Sales A/c	14,000
		14,000			14,000

Sales A/c

2012		(₹)	2012		(₹)
Dec. 31	To Cost of Sales	2,34,000	Dec. 31	By Debtors A/c	
	" P & L A/c (Profit)	66,000		(Cr. Sales)	3,00,000
		3,00,000			3,00,000

Prepaid Rent A/c

2012		(₹)	2012		(₹)
Dec. 31	To Production Overheads	300	Dec. 31	By Balance c/d	300
		300			300
2013					
Jan. 1	To Balance b/d	300			

Depreciation Provision A/c

2012		(₹)	2012			(₹)
Dec. 31	To Balance c/d	6,300	Jan. 1	By	Balance b/d	5,000
			2012			
			Dec. 31	"	Production Overhead A/c	1,300
		6,300				6,300
			2013			
			Jan.1	By	Balance b/d	6,300

Profit and Loss A/c

2012		(₹)	2012			(₹)
Dec. 31	To Balance c/d	98,000	Dec. 31	By	Sales A/c	66,000
				"	Profit b/d (last year)	32,000
		98,000				98,000
			2013			
			Jan. 1	By	Balance b/d	98,000

Debtors A/c

2012		(₹)	2012			(₹)
Jan. 1	To Balance b/d	12,000	Dec. 31	By	Bank A/c	2,90,000

Dec. 31	To Sales	3,00,000		By Balance c/d	22,000
		3,12,000			3,12,000
2013					
Jan. 1	To Balance b/d	22,000			

Creditors A/c

2012		(₹)	2012		(₹)
Dec. 31	To Bank	1,01,000	Jan. 1	By Balance b/d	8,000
	To Balance c/d	7,000	Dec. 31	By Stores Control A/c	1,00,000
		1,08,000			1,08,000
			2013		
			Jan. 1	By Balance b/d	7,000

Bank A/c

2012		(₹)	2012		(₹)
Jan. 1	To Balance b/d	10,000	Dec. 31	By Creditors	1,01,000
Dec. 31	" Debtors	2,90,000		" Wages Control A/c	92,000
				" Production Overhead A/c	40,000
				" Admn. Overhead A/c	12,000
				" Selling & Distribution Overhead A/c	14,000
				" Balance c/d	41,000
		3,00,000			3,00,000
2013					
Jan. 1	To Balance b/d	41,000			

Fixed Assets A/c

2012		(₹)	2012		(₹)
Jan. 1	To Balance b/d	55,000	Dec. 31	By Balance c/d	55,000
		55,000			55,000
2013					
Jan. 1	To Balance b/d	55,000			

Share Capital A/c

2012		(₹)	2012		(₹)
Dec. 31	To Balance c/d	80,000	Jan. 1	By Balance b/d	80,000
		80,000			80,000
			2013		
			Jan. 1	By Balance b/d	80,000

Trial Balance
As on 31st December, 2012

	Dr. (₹)	*Cr. (₹)*
Stores Control A/c	6,000	
Work-in-Progress A/c	47,000	
Finished Goods A/c	20,000	
Bank A/c	41,000	
Creditors A/c		7,000
Fixed Assets A/c	55,000	
Debtors A/c	22,000	
Share Capital A/c		80,000
Depreciation Provision A/c		6,300
Profit and Loss A/c		98,000
Prepaid Rent A/c	300	
	1,91,300	1,91,300

Illustration 12: (Preparation of control accounts under non-integrated accounting system)

A company operates on historic job cost accounting system, which is not integrated with the financial accounts. At the beginning of a month, the opening balances in cost ledger were:

			₹ (in lakhs)
Stores Ledger Control Account			*80*
Work-in-Progress Control Account			*20*
Finished Goods Control Account			*430*
Building Construction Account			*10*
Cost Ledger Control Account			*540*
During the month, the following transaction took place:			
Materials	–	*Purchased*	*40*
		Issued to production	*50*
		Issued to general maintenance	*6*
		Issued to building construction	*4*
Wages	–	*Gross wages paid*	*150*
		Indirect wages	*40*
		For building construction	*10*
Works Overheads	–	*Actual amount incurred*	*160*

	(excluding items shown above)	
	Absorbed in building construction	*20*
	Under absorbed	*8*
Royalty paid		*5*
Selling, distribution and administration overheads		*25*
Sales		*450*

At the end of the month, the stock of raw material and work-in-progress was ₹ 55 lakhs and ₹ 25 lakhs respectively. The loss arising in the raw material accounts is treated as factory overheads. The building under construction was completed during the month. Company's gross profit margin is 20% on sales.

Prepare the relevant control accounts to record the above transactions in the cost ledger of the company.

Solution: *Amount (in lakhs)*

Dr. **Cost Ledger Control A/c** *Cr.*

	(₹)		*(₹)*
To Costing P & L A/c	450	By Balance b/d	540
To Building Const. A/c	44	By Stores Ledger Control A/c	40
To Balance c/d	483	By Wages Control A/c	150
		By Works Overhead Control A/c	160
		By Royalty A/c	5
		By Selling, Distribution and Administration Overheads A/c	25
		By Costing Profit & Loss A/c	57
	977		977

Dr. **Stores Ledger Control A/c** *Cr.*

	(₹)		*(₹)*
To Balance b/d	80	By WIP Control A/c	50
To Cost Ledger Control A/c	40	By Works Overhead Control A/c	6
		By Building Const. A/c	4
		By Balance c/d	55
		By Works Overhead Control A/c (Loss)	5
	120		120

Dr.	**Work-in-Progress Control A/c**			*Cr.*
	(₹)			*(₹)*
To Balance b/d	20	By	Finished Goods Control A/c	333
To Stores Ledger Control A/c	50	By	Closing Balance	25
To Wage Control A/c	100			
To Works Overhead Control A/c	183			
To Royalty A/c	5			
	358			358

Dr.	**Works Overhead Control A/c**			*Cr.*
	(₹)			*(₹)*
To Stores Ledger Control A/c	6	By	Building Const. A/c	20
To Wage Control A/c	40	By	WIP Control A/c	183
To Cost Ledger Control A/c	160	By	Balance (Costing P & L A/c)	8
To Stores Ledger Control A/c (Loss)	5			
	211			211

Dr.	**Wages Control A/c**			*Cr.*
	(₹)			*(₹)*
To Cost Ledger Control A/c	150	By	Works Overhead Control A/c	40
		By	Building Const. A/c	10
		By	WIP Control A/c	100
	150			150

Dr.	**Royalty A/c**			*Cr.*
	(₹)			*(₹)*
To Cost Ledger Control A/c	5	By	WIP Control A/c	5
	5			5

Dr.	**Cost of Goods Sold A/c**			Cr.
	(₹)			*(₹)*
To Finished Goods Control A/c	360	By	Cost of Sales A/c	360
	360			360

Dr.	**Selling, Distribution and Administration Overhead A/c**			*Cr.*
	(₹)			*(₹)*
To Cost Ledger Control A/c	25	By	Cost of Sales A/c	25
	25			25

Dr.	**Finished Goods Control A/c**			*Cr.*
	(₹)			*(₹)*
To Balance b/d	430	By	Cost of Goods Sold A/c *(450 x 80/100)*	360
To WIP Control A/c	333	By	Balance	403
	763			763

Dr.	**Cost of Sales A/c**			*Cr.*
	(₹)			*(₹)*
To Cost of Goods Sold A/c	360	By	Costing P & L A/c	385
To Selling, distribution and administration overhead A/c	25			
	385			385

Dr.	**Costing P & L A/c**			*Cr.*
	(₹)			*(₹)*
To Cost of Sales A/c	385	By	Cost Ledger Control A/c	450
To Works Overhead Control A/c	8			
To Cost Ledger Control A/c (Profit)	57			
	450			450

Dr.	**Building Construction A/c**			*Cr.*
	(₹)			*(₹)*
To Balance b/d	10	By	Cost Ledger Control A/c	44
To Stores Ledger Control A/c	4			
To Wage Control A/c	10			
To Works Overhead Control A/c	20			
	44			44

(₹ in lakhs)

Trial Balance

	Dr.	*Cr.*
To Stores Ledger Control A/c	55	
To WIP Control A/c	25	
To Finished Goods Control A/c	403	
To Cost Ledger Adjustment A/c		483
	483	483

5.4 Reconciliation of Cost and Financial Accounts

When the cost and financial accounts are kept separately, it is imperative that those should be reconciled, otherwise the cost accounts would not be reliable. In this connection, it is necessary to remember that a reconciliation of the two sets of accounts only can be made if both the sets contain sufficient details as would enable the causes of differences to be located. It is, therefore, important that in the financial accounts, the expenses should be analysed in the same way as in the cost accounts.

In the text book, there appears a General Ledger Adjustment Account as would appear in the Cost Ledger, students should study the entries therein as well as a discussion that follows to explain the manner in which the details of items included therein could be reconciled with the corresponding items appearing in the financial accounts. They would thus realise that the reconciliation of the balances generally, is possible preparing a *Memorandum Reconciliation Account*. In this account, the items charged in one set of accounts but not in the other or those charged in excess as compared to that in the other are collected and by adding or subtracting them from the balance of the amount of profit shown by one of the accounts, shown by the other can be reached. The procedure is similar to the one followed for reconciling the balance with a bank that shown by the cash book or the ledger.

It is important, however, to know the causes which, generally, give rise to differences in the Cost and Financial Accounts. These are briefly summarised below :

5.4.1 Items included in the financial accounts but not in cost accounts:

1. Items included in Financial Accounts only-

(a) *Purely Financial Expenses :*

(i) Interest on loans or bank mortgages.

(ii) Expenses and discounts on issue of shares, debentures etc.

(iii) Other capital losses i.e., loss by fire not covered by insurance etc.

(iv) Losses on the sales of fixed assets and investments

(v) Goodwill written off

(vi) Preliminary expenses written off

(vii) Income tax, donations, subscriptions

(viii) Expenses of the company's share transfer office, if any.

(b) *Purely Financial Income*

(i) Interest received on bank deposits, loans and investments

(ii) Dividends received

(iii) Profits on the sale of fixed assets and investments

(iv) Transfer fee received.

(v) Rent receivables

2. **Item included in the cost accounts only (notional expenses):**

(i) Charges in lieu of rent where premises are owned

(ii) Interest on capital at notional figure though not incurred

(iii) Salary for the proprietor at notional figure though not incurred

(iv) Notional Depreciation on the assets fully depreciated for which book value is nil.

(c) *Items whose treatment is different in the two sets of accounts.* The objective of cost accounting is to provide information to management for decision making and control purposes while financial accounting conforms to external reporting requirements. Hence there are chances that certain items are treated differently in the two sets of accounts. For example, LIFO method is not allowed for inventory valuation in India as per the Accounting Standard 2 issued by the Council of the ICAI. However, this method may be adopted for cost accounts as it is more suitable for arriving at costs which shall be used as a base for deciding selling prices. Similarly cost accounting may use a different method of depreciation than what is allowed under financial accounting.

(d) *Varying basis of valuation*: It is another factor which sometimes is responsible for the difference. It is well known that in financial accounts stock are valued either at cost or market price, whichever is lower. But in Cost Accounts, stocks are only valued at cost.

5.4.2 Procedure for reconciliation : There are 3 steps involved in the procedure for reconciliation.

1. Ascertainment of profit as per financial accounts

2. Ascertainment of profit as per cost accounts

3. Reconciliation of both the profits *(similar to the bank reconciliation statement)*

Circumstances where reconciliation statement can be avoided*:* When the Cost and Financial Accounts are integrated - there is no need to have a separate reconciliation statement between the two sets of accounts. Integration means that the same set of accounts fulfil the requirement of both i.e., Cost and Financial Accounts.

Illustration 13: (Calculation of profit as per financial accounts and as per cost accounts and reconciliation of profits)

The following figures are available from the financial records of ABC Manufacturing Co. Ltd. for the year ended 31-3-2013.

	(₹)
Sales (20,000 units)	*25,00,000*
Materials	*10,00,000*

Wages	*5,00,000*
Factory Overheads	*4,50,000*
Office and administrative Overhead	*2,60,000*
Selling and distribution Overheads	*1,80,000*
Finished goods (1,230 units)	*1,50,000*

	(₹)	
Work-in-Progress :		
Materials	*30,000*	
Labour	*20,000*	
Factory overheads	*20,000*	*70,000*
Goodwill written off		*2,00,000*
Interest on capital		*20,000*

In the Costing records, factory overhead is charged at 100% wages, administration overhead 10% of factory cost and selling and distribution overhead at the rate of ₹ 10 per unit sold.

Prepare a statement reconciling the profit as per cost records with the profit as per financial records.

Solution :

Profit & Loss Account of ABC Manufacturing Co. Ltd.
(for the year ended 31-3-2013)

	(₹)			*(₹)*
To Opening Stock	-	By	Sales (20,000 units)	25,00,000
To Materials	10,00,000	"	Closing Stock :	
To Wages	5,00,000	"	Finished goods (1,230 units)	1,50,000
To Factory Overheads	4,50,000		Work-in-Progress	70,000
To Office & Admn. Overheads	2,60,000			
To Selling & Dist. Overheads	1,80,000			
To Goodwill written off	2,00,000			
To Interest on Capital	20,000			
To Profit	1,10,000			
	27,20,000			27,20,000

Cost Sheet

	(₹)
Materials	10,00,000
Wages	5,00,000
Direct Expenses	Nil
Prime Cost	15,00,000
Add : Factory overhead at 100% wages	5,00,000

	20,00,000
Less : Closing WIP	(70,000)
Factory Cost of (20,000 + 1,230) units	19,30,000
Office & Admn. Overhead 10% of Factory cost	1,93,000
	21,23,000
Less: Closing Stock of finished goods (1,230 units)	(1,23,000)*
Production Cost of 20,000 units	20,00,000
Selling & Dist. Overhead @ ₹ 10 per unit	2,00,000
Cost of sales of 20,000 units	22,00,000
Sales of 20,000 units	25,00,000
Profit	3,00,000

* (₹ 21,23,000 x 1,230 units/ 21,230 units)

Reconciliation Statement

	(₹)	*(₹)*
Profit as per Cost Accounts		3,00,000
Add : Factory overheads over-absorbed (₹ 5,00,000 – ₹ 4,50,000)	50,000	
Selling & Dist. Overhead over-absorbed (₹ 2,00,000 – ₹ 1,80,000)	20,000	
Difference in the valuation of closing stock of finished goods (₹ 1,50,000 – ₹ 1,23,000)	27,000	97,000
		3,97,000
Less: Office & Admn. overhead under-absorbed (₹ 2,60,000 – ₹ 1,93,000)	67,000	
Goodwill written off taken in financial accounts	2,00,000	
Interest on capital	20,000	2,87,000
Profit as per financial accounts		1,10,000

Illustration 14: (Calculation of profit as per financial account and cost account and reconciliation of profit)

Following are the figures extracted from the Cost Ledger of a manufacturing unit.

	(₹)
Stores :	
Opening balance	*15,000*
Purchases	*80,000*
Transfer from WIP	*40,000*
Issue to WIP	*80,000*
Issue to repairs and maintenance	*10,000*
Sold as a special case of cost	*5,000*

Shortage in the year	*3,000*
Work-in-Progress :	
Opening inventory	*30,000*
Direct labour cost charged	*30,000*
Overhead cost charged	*1,20,000*
Closing Balance	*20,000*

Finished Products :

Entire output is sold at 10% profit on actual cost from work-in-process.

Others :	
Wages for the period	*35,000*
Overhead Expenses	*1,25,000*

Ascertain the profit or loss as per financial account and cost accounts and reconcile them.

Solution :

Stores Control A/c

Dr.					*Cr.*
		(₹)			*(₹)*
To	Balance b/d	15,000	By	WIP Control A/c	80,000
”	Purchases	80,000	”	Overhead Control A/c	10,000
”	WIP Control A/c	40,000	”	General Ledger Adjustment	5,000
			”	Overhead Control A/c (Shortages)	3,000
			”	Balance c/d	37,000
		1,35,000			1,35,000

Wage Control A/c

		(₹)			*(₹)*
To	General Ledger Adjustment A/c	35,000	By	WIP Control A/c	30,000
			”	Overhead Control A/c	5,000
		35,000			35,000

Overhead Control A/c

		(₹)			*(₹)*
To	Material Control A/c	10,000	By	WIP Control A/c	1,20,000
”	Stores Ledger Control A/c	3,000	By	Balance c/d	23,000
”	GLA A/c	1,25,000			
”	Wage Control A/c	5,000			
		1,43,000			1,43,000

WIP Control A/c

		(₹)			(₹)
To	Stores Control A/c	80,000	By	Stores Control A/c	40,000
"	Opening WIP A/c	30,000	"	Closing Balance	20,000
"	Wage Control A/c	30,000	"	Finished goods	2,00,000
"	Overhead Control A/c	1,20,000			
		2,60,000			2,60,000

	(₹)
Finished output at cost	2,00,000
Profit at 10% on actual cost from WIP Sales	20,000
	2,20,000

Statement of Profit as per Costing Records

	(₹)
Direct material Cost	40,000
Direct wages	30,000
Prime Cost	70,000
Production Overheads	1,20,000
Works Cost	1,90,000
Add: Opening WIP	30,000
	2,20,000
Less: Closing WIP	(20,000)
Cost of finished goods	2,00,000
Profit (10% of cost)	20,000
Sales	2,20,000

Profit & Loss A/c

		(₹)			(₹)
To	Material (Op. bal. +		By	Sale	2,20,000
	Purchases - Sale)	90,000	"	Closing W-I-P	20,000
"	WIP	30,000	"	Closing stores	37,000
"	Wages	35,000	"	Net loss	3,000
"	Overhead	1,25,000			
		2,80,000			2,80,000

Reconciliation Statement

	(₹)
Profit (loss) as per Financial Accounts	(3,000)

Add: Overheads over absorbed in Cost A/c	23,000
Net Profit as per Accounts	20,000

Illustration15: (Reconciliation of profit)

The following figures, have been extracted from the Financial Accounts of a Manufacturing Firm for the first year of its operation:

	(₹)
Direct Material Consumption	*50,00,000*
Direct Wages	*30,00,000*
Factory Overhead	*16,00,000*
Administration Overheads	*7,00,000*
Selling and Distribution Overheads	*9,60,000*
Bad Debts	*80,000*
Preliminary Expenses written off	*40,000*
Legal Charges	*10,000*
Dividends Received	*1,00,000*
Interest Received on Deposits	*20,000*
Sales (1,20,000 units)	*1,20,00,000*
Closing Stock :	
Finished Goods (4,000 units)	*3,20,000*
Work-in-Progress	*2,40,000*

The cost accounts for the same period reveal that the direct material consumption was ₹ 56,00,000. Factory overhead is recovered at 20% on prime cost. Administration overhead is recovered at ₹ 6 per unit of production. Selling and distribution overheads are recovered at ₹ 8 per unit sold.

Prepare the Profit and Loss Accounts both as per financial records and as per cost records. Reconcile the profits as per the two records.

Solution:

Profit and Loss Account

(*As per financial records*)

		(₹)			*(₹)*
To	Direct Material	50,00,000	By	Sales (1,20,000 units)	1,20,00,000
To	Direct Wages	30,00,000	By	*Closing Stock*	
To	Factory Overheads	16,00,000		WIP	2,40,000
”	Gross Profit	29,60,000		Finished Goods (4,000 units)	3,20,000
		1,25,60,000			1,25,60,000
To	Administration Overheads	7,00,000	By	Gross Profit b/d	29,60,000
”	Selling and Distribution Overheads	9,60,000	”	Dividend	1,00,000
			”	Interest	20,000

"	Bad Debts	80,000	
"	Preliminary Expenses written off	40,000	
"	Legal Charge	10,000	
"	Net Profit	12,90,000	
		30,80,000	30,80,000

Statement of Cost and Profit

(*As per Cost Records*)

		Total (₹)
	Direct Material	56,00,000
	Direct Wages	30,00,000
	Prime Cost	86,00,000
	Factory Overhead	17,20,000
		1,03,20,000
Less:	Closing Stock (WIP)	(2,40,000)
	Works Cost (1,24,000 units)	1,00,80,000
	Administration overhead (1,24,000 units @ ₹ 6 p.u.)	7,44,000
	Cost of production of (1,24,000 units)	1,08,24,000
Less:	Finished Goods (4,000 units @ ₹ 87.29)	(3,49,160)
	Cost of goods sold (1,20,000 units)	1,04,74,840
	Selling and Distribution Overhead (1,20,000 @ ₹ 8 p.u.)	9,60,000
	Cost of Sales	1,14,34,840
	Net profit (Balancing figure)	5,65,160
Sales Revenue		1,20,00,000

Statement of Reconciliation of profit as obtained under Cost and Financial Accounts

		(₹)	(₹)
	Profit as per Cost Records		5,65,160
Add:	Excess of Material Consumption	6,00,000	
	" Factory Overhead	1,20,000	
	" Administration Overhead	44,000	
	Dividend Received	1,00,000	
	Interest Received	20,000	8,84,000
			14,49,160
Less:	Bad debts	80,000	
	Preliminary expenses written off	40,000	
	Legal Charges	10,000	
	Over-valuation of stock in cost book (₹3,49,160 – ₹3,20,000)	29,160	(1,59,160)
	Profit as per Financial Records		12,90,000

Illustration 16: (Calculation of profit and profit reconciliation)

The following information is available from the financial books of a company having a normal production capacity of 60,000 units for the year ended 31st March, 2013:

(i) Sales ₹10,00,000 (50,000 units).

(ii) There was no opening and closing stock of finished units.

(iii) Direct material and direct wages cost were ₹5,00,000 and ₹2,50,000 respectively.

(iv) Actual factory expenses were ₹1,50,000 of which 60% are fixed.

(v) Actual administrative expenses were ₹45,000 which are completely fixed.

(vi) Actual selling and distribution expenses were ₹30,000 of which 40% are fixed.

(vii) Interest and dividends received ₹15,000.

You are required to:

(a) Find out profit as per financial books for the year ended 31st March,2013;

(b) Prepare the cost sheet and ascertain the profit as per cost accounts for the year ended 31st March, 2013 assuming that the indirect expenses are absorbed on the basis of normal production capacity; and

(c) Prepare a statement reconciling profits shown by financial and cost books.

Solution:

Working Note:

Profit & Loss Account
(for the year ended 31st March, 2013)

	(₹)		(₹)
To Direct material	5,00,000	By Sales 50,000 units	10,00,000
To Direct wages	2,50,000	By Interest and dividends	15,000
To Actual factory expenses	1,50,000		
To Actual administrative expenses	45,000		
To Actual selling and distribution expenses	30,000		
To Profit	40,000		
	10,15,000		10,15,000

(a) Profit as per financial books for the year ended 31st March, 2013 is ₹ 40,000 (Refer to above Working note).

(b) **Cost Sheet**
(for the year ended 31st March, 2013)

			(₹)
Direct material			5,00,000
Direct wages			2,50,000
Prime cost			7,50,000
Factory expenses:			
Variable :		₹ 60,000	
Fixed : (₹90,000 x 50,000/60,000)		₹ 75,000	1,35,000
Works cost			8,85,000
Administrative expenses: (₹45,000 x 50,000/60,000)			37,500
Cost of production			9,22,500
Selling & distribution expenses:			
Variable :	₹ 18,000		
Fixed :	₹ 10,000 (₹12,000 x 50,000/60,000)		28,000
Cost of Sales			9,50,500
Profit			49,500
Sales revenue			10,00,000

(c) **Statement of Reconciliation**
(Reconciling profit shown by Financial and Cost Accounts)

	(₹)	(₹)
Profit as per Cost Account	49,500	–
Add : Income from interest and dividends	15,000	64,500
Less: Factory expenses under-charged in Cost Accounts (₹ 1,50,000 – ₹ 1,35,000)	15,000	
Administrative expenses under-charged in Cost Accounts (₹ 45,000 – ₹ 37,500)	7,500	
Selling & distribution expenses under—charged in Cost Accounts (₹ 30,000 – ₹ 28,000)	2,000	24,500
Profit as per Financial Accounts		40,000

Illustration 17: (Preparation of memorandum reconciliation account)

M/s. H.K. Piano Company showed a net loss of ₹ 4,16,000 as per their financial accounts for the year ended 31st March, 2013. The cost accounts, however, disclosed a net loss of ₹ 3,28,000 for the same period. The following information was revealed as a result of scrutiny of the figures of both the sets of books:

		(₹)
(i)	*Factory overheads under-recovered*	*6,000*
(ii)	*Administration overheads over-recovered*	*4,000*
(iii)	*Depreciation charged in financial accounts*	*1,20,000*

(iv)	*Depreciation recovered in costs*	*1,30,000*
(v)	*Interest on investment not included in costs*	*20,000*
(vi)	*Income-tax provided*	*1,20,000*
(vii)	*Transfer fees (credit in financial books)*	*2,000*
(viii)	*Stores adjustment (credit in financial books)*	*2,000*

Prepare a Memorandum reconciliation account.

Solution:

Memorandum Reconciliation Account

Dr. *Cr.*

	Particulars	*(₹)*		*Particulars*	*(₹)*
To	Net loss as per costing books	3,28,000	By	Administration overhead	
To	Factory overheads			over-recovered in costs	4,000
	under-recovered in costs	6,000	By	Interest on investments	
To	Income-tax not provided in costs	1,20,000		not included in costs	20,000
			By	Depreciation overcharged	
				in costs	10,000
			By	Transfer fees in financial books	2,000
			By	Stores adjustment	2,000
			By	Net loss as per financial	
		_____		books	4,16,000
		4,54,000			4,54,000

5.5 Summary

- ***Cost Control Accounts:*** *These are accounts maintained for the purpose of exercising control over the costing ledgers and also to complete the double entry in cost accounts.*
- ***Integral System of Accounting:*** *A system of accounting where both costing and financial transactions are recorded in the same set of books.*
- ***Non- Integral System of Accounting****: A system of accounting where two sets of books are maintained- (i) for costing transactions; and (ii) for financial transactions*
- ***Reconciliation****: In the Non-Integral System of Accounting, since the cost and financial accounts are kept separately, it is imperative that those should be reconciled, otherwise the cost accounts would not be reliable. The reason for differences in the cost & financial accounts can be of purely financial nature(Income and expenses) and notional nature.*

6

Job Costing & Batch Costing

Learning Objectives

When you have finished studying this chapter, you should be able to

- Understand the meaning and distinctive features of Job and Batch Costing.
- Understand the accounting procedures to be applied in Job Costing and Batch Costing.

6.1 Methods of Costing

Today business and industry needs costing systems to meet their individual requirements. Costing experts believe that it may not be possible to devise a single costing system to fulfill everybody's needs. They have developed different methods of costing for different industries depending upon the type of manufacture and their nature. Mainly the industries can be grouped into two basic types i.e. Industries doing job work and Industries engaged in mass production of a single product or identical production.

6.1.1 For industry doing job work: A concern engaged in the execution of specification order is characterised as a firm producing several items distinguishable from one another by respective specifications and other details. Such a concern is thought of involved in performing job works. Production under job work is strictly according to customer's specifications and each lot, job or production order is unique. Examples of jobs order type of production are: ships building, roads, bridges, manufacture of heavy electrical machinery, machine tools, iron foundries, wood working shops, etc. Here each job or unit of production is treated as a separate identity for the purpose of costing. The methods of costing and for ascertaining cost of each job are known as a job costing, contract costing and Batch costing.

6.1.2 For continuous and process type of industries: The continuous or process type of industry is characterised by the continuous production of uniform products according to standard specifications. In such a case the successive lots are generally indistinguishable as to size and form and, even if there is some variation in specifications, it is of a minor character. Examples of continuous type of industries are chemical and pharmaceutical products, paper/food products, canning, paints, and varnish oil, rubber, textile etc. Here the

methods of Costing used for the purpose of ascertaining costs are: process costing; single costing; operating costing etc.

6.2 Job Costing

6.2.1 Meaning of Job Costing: CIMA London defines Job Costing as "the category of basic costing methods which is applicable where the work consists of separate contracts, jobs or batches each of which is authorised by specific order or contract." According to this method costs are collected and accumulated according to jobs, contracts, products or work orders. Each job or unit of production is treated as a separate entity for the purpose of costing. Job costing is carried out for the purpose of ascertaining cost of each job and takes into account the cost of materials, labour and overhead etc. The job costing method is also applicable to industries in which production is in batches since batch production basically is of the same character as the job order production, the *difference being mainly one in the size of different orders*. The method then may also be described as "Batch Costing".

6.2.2 Principles of Job Costing: The job costing method of costing may be regarded as the principal method of costing since the basic object and purpose of all costing

- Analysis and ascertain cost of each unit of production
- Control and regulate cost
- Determine the profitability

The basic principles enunciated for the job costing method are valid essentially for all types of industry. For example, printing; furniture; hardware; ship-building; heavy machinery; interior decoration, repairs and other similar work.

6.2.3 Process of Job costing

- *Prepare a separate cost sheet for each job*
- *Disclose cost of materials issued for the job*
- *Labour charges incurred(on the basis of bill of material and time cards respectively)*
- *When job is completed, overhead charges are added for ascertaining total expenditure*

6.2.4 Suitability of Job Costing

- When jobs are executed for different customers according to their specifications.
- When no two orders are alike and each order/job needs special treatment.
- Where the work-in-progress differs from period to period on the basis of the number of jobs in hand.

6.2.5 Format of Job Cost Sheet:

JOB COST SHEET

Description :_____ Job No.:_____

Blue Print No.:_____ Quantity:_____

Material No.:_____ Date of delivery:_____

Reference No.:_____ Date commenced:_____

Date finished:_____

Date	Reference	Details	Material	Labour	Overhead
		Total			

Summary of costs	*Estimated (₹)*	*Actual (₹)*
Direct material cost		
Direct wages		
Production overhead		
PRODUCTION COST		
Admn. Selling & Distrn. Ovds.		
TOTAL COST		
PROFIT/LOSS		
SELLING PRICE		

For the job _____

Units produced _____

Cost/unit _____

Remarks _____

Prepared by : _____

Checked by: _____

6.2.6 Difference between Job Costing and Process Costing: The main points which distinguish job costing and process costing are as below:

Job Costing	Process Costing
(i) A Job is carried out or a product is	The process of producing the product has a continuous flow and the product produced is

produced by specific orders.	homogeneous.
(ii) Costs are determined for each job.	Costs are compiled on time basis i.e., for production of a given accounting period for each process or department.
(iii) Each job is separate and independent of other jobs.	Products lose their individual identity as they are manufactured in a continuous flow.
(iv) Each job or order has a number and costs are collected against the same job number.	The unit cost of process is an average cost for the period.
(v) Costs are computed when a job is completed. The cost of a job may be determined by adding all costs against the job.	Costs are calculated at the end of the cost period. The unit cost of a process may be computed by dividing the total cost for the period by the output of the process during that period.
(vi) As production is not continuous and each job may be different, so more managerial attention is required for effective control.	Process of production is usually standardized and is therefore, quite stable. Hence control here is comparatively easier.

6.3 Procedure of job Cost Accounting

Accounting for Materials: An essential requirement of job cost accounting is that direct materials and their cost must be traced to and identified with specific job or work order. This segregation of materials cost by jobs or work order is brought about by the use of separate stores requisitions for each job or work order. Where a bill of material is prepared, it provides the basis for the preparation of these stores requisitions. But when the entire quantity of materials specified in the bill of materials is drawn in one lot or in installments, the bill itself could be made to serve as a substitute for the stores requisition.

After the materials have been issued and the stores requisitions have been priced, it is usual to enter the value of the stores requisition in a material abstract or analysis book. It serves to analyse and collect the cost of all direct materials according to job or work orders and departmental standing orders or expense code numbers. From the abstract book, the summary of materials cost of each job is posted to individual job cost sheets or cards in the Work-in-Progress ledger. The postings are usually made weekly or monthly. Similarly, at periodical intervals, from the material abstract books, summary cost of indirect material is posted to different standing orders or expense code numbers in the Overhead Expenses ledger. If any special material has been purchased for a particular job, it is generally the practice to charge such special material direct to the job concerned without passing it through the Stores Ledger, as soon as it is purchased.

If any surplus material is left over in the case of any job, unless it can be immediately and economically used on some other job, the same is returned to the store room with a proper supporting document/stores Debit Note or Shop Credit, and the relevant job account is credited with the value of excess material returned to the store room. If the surplus material is utilised on some other job, instead of being returned to the store room first, a material transfer note is prepared. The transfer note would show the number of the transfer to job as well as transferee job (or jobs) so that, on that basis, the cost thereof can be adjusted in the Work-in-Progress Ledger.

Accounting for Labour: All direct labour cost must be analysed according to individual jobs or work orders. Similarly, different types of indirect labour cost also must be collected and accumulated under appropriate standing order or expenses code number. The analysis of labour according to jobs or work orders is, usually, made by means of job time cards or sheets. All direct labour is booked against specific jobs in the job time cards or sheets. All the idle time also is booked against appropriate standing order expense code number either in the job time card for each job or on a separate idle time card for each worker (where the job time card is issued job-wise). The time booked or recorded in the job time and idle time cards is valued at appropriate rates and entered in the labour abstract or analysis book. All direct labour cost is accumulated under relevant job or work order numbers, and the total or the periodical total of each job or work order is then posted to the appropriate job cost card or sheet in Work-in-Progress ledger. The postings are usually made at the end of each week or month.

The abstraction of idle time costs under suitable standing order or expenses code numbers is likewise done and the amounts are posted to the relevant departmental standing order or expense code number in the Overhead Expenses Ledger at periodical intervals. As regards other items of indirect labour cost these are collected from the payrolls books for the purpose of posting against standing order or expenses code numbers in the Overhead Expenses ledger.

Accounting for Overhead: Manufacturing overheads are collected under suitable standing order numbers and selling and distribution overheads against cost accounts numbers. Total overhead expenses so collected are apportioned to service and production departments on some suitable basis. The expenses of service departments are finally transferred to production departments. The total overhead of production departments is then applied to products on some realistic basis, *e.g.* machine hour; labour hour; percentage of direct wages; percentage of direct materials; etc. It should be remembered that the use of different methods will lead to a different amounts being computed for the works overhead charged to a job hence to different total cost. The problem of accurately absorbing, in each individual job or work order, the overhead cost of different cost centres or departments involved in the manufacture is difficult under the job costing method. It is because the cost or the expenses thereof cannot be

traced to or identified with any particular job or work order. In such circumstances, the best that can be done is to apply a suitable overhead rate to each individual article manufactured or to each production order. This is essentially an *arbitrary* method.

Price of a job: Price of a job may be arrived by adding the desired percentage of profit to the total cost of the job.

Treatment of spoiled and defective work: Spoiled work is the quantity of production that has been totally rejected and cannot be rectified.

Defective work refers to production that is not as perfect as the saleable product but is capable of being rectified and brought to the required degree of perfection provided some additional expenditure is incurred. Normally, all the manufacturing operations are not fully successful; they result in turning out a certain amount of defective work. Nonetheless, over a period of time it is possible to work out a normal rate of defectives for each manufacturing process which would represent the number of defective articles which a process shall produce in spite of due care. Defects arise in the following circumstances:

Circumstances	Treatment
(1) Where a percentage of defective work is allowed in a particular batch as it cannot be avoided.	When a normal rate of defectives has already been established, if the actual number of defectives is within the normal limit or is near thereto the cost of rectification will be charged to the whole job and spread over the entire output of the batch. If, on the other hand, the number of defective units substantially exceeds the normal, the cost of rectification of the number which exceeds the normal will be written off as a loss in the Costing Profit and Loss Account.
(2) Where defect is due to bad workmanship.	In this case cost of rectification will be abnormal cost, *i.e.,* not a legitimate element of the cost. Therefore, the cost of rectification shall be written off as a loss, unless by an arrangement, it is to be recovered as a penalty from the workman concerned. It is possible, however that the management did provide for a certain proportion of defectives on account of bad workmanship as an unavoidable feature of production. If that be the case, the cost of rectifying to the extent provided for by the management will be treated as a normal cost and charged to the batch.
(3) Where defect is due to the Inspection Department wrongly	In this case the cost of rectification will be charged to the department and will not be considered as cost of manufacture of the batch. Being an abnormal cost, it

accepting incoming material of poor quality.	will be written off to the Costing Profit and Loss Account.

6.3.1 Entries in Control Accounts

1. *For purchase of materials-*

   Stores Ledger Control A/c Dr.
   To Cost Ledger Control A/c*

2. *For the value of direct materials issued to jobs-*

   Work-in-Progress Control A/c Dr.
   To Stores Ledger Control A/c

3. *For return of direct materials from jobs-*

   Stores Ledger Control A/c Dr.
   To Work-in-Progress Control A/c

4. *For return of materials to suppliers –*

   Cost Ledger Control A/c Dr.
   To Stores Ledger Control A/c

5. *For indirect materials-*

   Factory Overhead Control A/c Dr.
   To Stores Ledger Control A/c

6. *For wages paid-*

   Wages Control A/c Dr.
   To Cost Ledger Control A/c

7. *For direct wages incurred on jobs-*

   Work-in-Progress Control A/c Dr.
   To Wages Control A/c

8. *For indirect wages –*

   Factory Overhead Control A/c Dr.
   To Wages Control A/c

9. *For any indirect expense paid-*

   Factory Overhead Control A/c Dr.
   To Cost Ledger Control A/c

10. *For charging overhead to jobs-*

    Work-in-Progress Control A/c Dr.

	To Factory Overhead Control A/c	
11.	*For the total cost of jobs completed-*	
	Cost of Sales A/c	Dr.
	To Work-in-Progress Control A/c	
12.	*The balance of Cost of Sales A/c is transferred to Costing Profit and Loss a/c; For such transfer –*	
	Costing Profit and Loss A/c	Dr.
	To Cost of Sales A/c	
13.	*For the sales value of jobs completed -*	
	Cost Ledger Control A/c	Dr.
	To Costing Profit and Loss A/c**	

*General ledger adjustment account is the other name of Cost Ledger Control Account.

**The balance of Costing Profit and Loss Account shall now represent profit or loss. The balance of Cost Ledger Control Account shall be carried forwarded. With the balance on all the accounts trial balance can be drawn.

Illustration 1 (Journal entries in Cost Accounting)

The manufacturing cost of a work order is ₹ 1,000; 8% of the production against that order spoiled and the rejection is estimated to have a realisable value of ₹ 20 only. The normal rate of spoilage is 2%. Record this in the costing journal.

Solution:

Actual loss due to spoilage = 8% of ₹ 1,000 = ₹80 and Normal loss = 2% of ₹ 1,000 = ₹ 20, therefore abnormal loss = ₹ 60.

The rejection has a realisable value of ₹ 20, which is to be apportioned between normal loss and abnormal loss in the ratio of 2 : 6.

The accounting entries necessary for recording the above facts would be :

		(₹)	*(₹)*
Material Control Account	Dr.	20	
Overhead Control Account	Dr.	15	
Costing Profit and Loss Control Account	Dr.	45	
To Work-in-Progress Control Account			80

In the case of defectives being inherent in the manufacturing process, the rectification cost may be charged to the specific jobs in which they have arisen. In case detectives cannot be identified with jobs, the cost of rectification may be treated as factory overheads. Abnormal defectives should be written off to the Costing Profit and Loss Account.

Illustration 2 (Preparation of job cost sheet)

A shop floor supervisor of a small factory presented the following cost for Job No. 303, to determine the selling price.

	Per Unit (₹)
Materials	70
Direct wages 18 hours @ ₹2.50	45
(Deptt. X 8 hours ; Deptt. Y 6 hours; Deptt. Z 4 hours)	
Chargeable expenses	5
	120
Add : 33-1/3 % for expenses cost	40
	160

Analysis of the Profit/Loss Account
(for the year 2012)

		(₹)		(₹)
Materials used		1,50,000	Sales less returns	2,50,000
Direct wages:				
Deptt. X	10,000			
Deptt. Y	12,000			
Deptt. Z	8,000	30,000		
Special stores items		4,000		
Overheads:				
Deptt. X	5,000			
Deptt. Y	9,000			
Deptt. Z	2,000	16,000		
Works cost		2,00,000		
Gross profit c/d		50,000		
		2,50,000		2,50,000
Selling expenses		20,000	Gross profit b/d	50,000
Net profit		30,000		
		50,000		50,000

It is also noted that average hourly rates for the three Departments X, Y and Z are similar.

You are required to:

Draw up a job cost sheet.
Calculate the entire revised cost using 2012 actual figures as basis.
Add 20% to total cost to determine selling price.

Solution:

Job Cost Sheet

Customer Details ——— Job No._____
Date of commencement —— Date of completion _____

Particulars	*Amount (₹)*
Direct materials	70
Direct wages :	
Deptt. X ₹ 2.50 × 8 hrs. = ₹ 20.00	
Deptt. Y ₹ 2.50 × 6 hrs. = ₹ 15.00	
Deptt. Z ₹ 2.50 × 4 hrs. = ₹ 10.00	45
Chargeable expenses	5
Prime cost	120
Overheads:	
Deptt. X = $\frac{₹\ 5,000}{₹\ 10,000} \times 100$ = 50% of ₹ 20 = ₹ 10.00	
Deptt. Y = $\frac{₹\ 9,000}{₹\ 12,000} \times 100$ = 75% of ₹ 15 = ₹ 11.25	
Deptt. Z = $\frac{₹\ 2,000}{₹\ 8,000} \times 100$ = 25% of ₹ 10 = ₹ 2.50	23.75
Works cost	143.75
Selling expenses = $\frac{₹\ 20,000}{₹\ 2,00,000} \times 100$ = 10% of work cost	14.38
Total cost	158.13
Profit (20% of total cost)	31.63
Selling price	189.76

Illustration 3 (Preparation of factory cost statement and Invoice price of Job)

In a factory following the Job Costing Method, an abstract from the work-in-progress as on 30th September was prepared as under.

Job No.	*Materials (₹)*	*Direct hrs.*	*Labour (₹)*	*Factory Overheads applied (₹)*
115	*1325*	*400 hrs.*	*800*	*640*
118	*810*	*250 hrs.*	*500*	*400*
120	*765*	*300 hrs.*	*475*	*380*
	2,900		*1,775*	*1,420*

Materials used in October were as follows:

Materials Requisition No.	Job No.	Cost (₹)
54	118	300
55	118	425
56	118	515
57	120	665
58	121	910
59	124	720
		3,535

A summary for labour hours deployed during October is as under:

Job No.	Number of Hours	
	Shop A	Shop B
115	25	25
118	90	30
120	75	10
121	65	--
124	25	10
	275	75
Indirect Labour: Waiting of material	20	10
Machine breakdown	10	5
Idle time	5	6
Overtime premium	6	5
	316	101

A shop credit slip was issued in October, that material issued under Requisition No. 54 was returned back to stores as being not suitable. A material transfer note issued in October indicated that material issued under Requisition No. 55 for Job 118 was directed to Job 124.

The hourly rate in shop A per labour hour is ₹ 3 per hour while at shop B, it is ₹ 2 per hour. The factory overhead is applied at the same rate as in September. Job 115, 118 and 120 were completed in October.

You are asked to compute the factory cost of the completed jobs. It is the practice of the management to put a 10% on the factory cost to cover administration and selling overheads and invoice the job to the customer on a total cost plus 20% basis. What would be the invoice price of these three jobs?

Solution:

Factory Cost Statement of Completed Job.

Month	*Job No.*	*Materials*	*Direct labour*	*Factory overheads (80% of direct labour cost)*	*Factory cost*
	(₹)	(₹)	(₹)	(₹)	(₹)
September	115	1,325	800	640	2765
October	115	--	125	100	225
Total		1,325	925	740	2,990
September	118	810	500	400	1,710
October	118	515	330	264	1,109
Total		1,325	830	664	2,819
September	120	765	475	380	1,620
October	120	665	245	196	1,106
Total		1,430	720	576	2,726

Invoice Price of Complete Job

Job No.	*115* (₹)	*118* (₹)	*120* (₹)
Factory cost	2,990.00	2,819.00	2,726.00
Administration and selling overheads @ 10% of factory cost	299.00	281.90	272.60
Total cost	3,289.00	3,100.90	2,998.60
Profit (20% of total cost)	657.80	620.18	599.72
Invoice Price	3,946.80	3,721.08	3,598.32

Assumption: - Indirect labour costs have been included in the factory overhead which has been recovered as 80% of the labour cost.

6.3.2 Advantages and Disadvantages of Job Costing

Some of the advantages and disadvantages of Job costing are summarised as below:

Advantages	Disadvantages
1. The details of Cost of material, labour and overhead for all job is available to control.	1. Job Costing is costly and laborious method.
2. Profitability of each job can be derived.	2. As lot of clerical process is involved the

	chances of error is more.
3. It facilitates production planning.	3. This method is not suitable in inflationary condition.
4. Budgetary control and Standard Costing can be applied in job costing.	4. Previous records of costs will be meaningless if there is any change in market condition.
5. Spoilage and detective can be identified and responsibilities can be fixed accordingly.	

6.4 Batch Costing

6.4.1 Meaning of Batch Costing: In batch costing articles are produced in a lot i.e. one unit of product is not produced but a lot of 'say' 500 or 1000 units of such product is produced.

This is a form of job costing. Under job costing, executed job is used as a cost unit, whereas under batch costing, a lot of similar units which comprises the batch may be used as a cost unit for ascertaining cost. In the case of batch costing separate cost sheets are maintained for each batch of products by assigning a batch number. Cost per unit in a batch is ascertained by dividing the total cost of a batch by number of items produced in that batch. In batch costing Material cost, direct labour engaged in batch wise and overhead are also recovered in batchwise. Such a method of Costing is used in the case of pharmaceutical or drug industries, ready-made garments, industries manufacturing electronic parts of T.V., radio sets etc

Cost per unit in a batch= Total cost of a batch/Number of item produced.

Illustration 4 (Calculation of cost and profit per piece of each batch)

A jobbing factory has undertaken to supply 200 pieces of a component per month for the ensuing six months. Every month a batch order is opened against which materials and labour hours are booked at actual. Overheads are levied at a rate per labour hour. The selling price contracted for is ₹ 8 per piece. From the following data present the cost and profit per piece of each batch order and overall position of the order for 1,200 pieces.

Month	*Batch Output*	*Material cost (₹)*	*Direct wages (₹)*	*Direct labour hours*
January	*210*	*650*	*120*	*240*
February	*200*	*640*	*140*	*280*
March	*220*	*680*	*150*	*280*
April	*180*	*630*	*140*	*270*
May	*200*	*700*	*150*	*300*
June	*220*	*720*	*160*	*320*

The other details are:

Month	*Chargeable expenses (₹)*	*Direct labour hours*
January	*12,000*	*4,800*
February	*10,560*	*4,400*
March	*12,000*	*5,000*
April	*10,580*	*4,600*
May	*13,000*	*5,000*
June	*12,000*	*4,800*

Solution:

		Jan.	*Feb.*	*March*	*April*	*May*	*June*	*Total*
Batch output (in units)		210	200	220	180	200	220	1,230
Sale value	₹	1,680	1,600	1,760	1,440	1,600	1,760	9,840
Material cost	₹	650	640	680	630	700	720	4,020
Direct wages	₹	120	140	150	140	150	160	860
Chargeable expenses*	₹	600	672	672	621	780	800	4,145
Total cost	₹	1,370	1,452	1,502	1,391	1,630	1,680	9,025
Profit per batch	₹	310	148	258	49	–30	80	815
Total cost per unit	₹	6.52	7.26	6.83	7.73	8.15	7.64	7.34
Profit per unit	₹	1.48	0.74	1.17	0.27	–0.15	0.36	0.66

Overall position of the order for 1,200 units

Sales value of 1,200 units @ ₹ 8 per unit	₹ 9,600
Total cost of 1,200 units @ ₹ 7.34 per unit	₹ 8,808
Profit	₹ 792

$$* \frac{\text{Chargeable expenses}}{\text{Direct labour hour for the month}} \times \text{Direct labour hours for batch}$$

Illustration 5 (Preparation of Statement of Cost under batch costing)

Rio Limited undertakes to supply 1000 units of a component per month for the months of January, February and March 2013. Every month a batch order is opened against which materials and labour cost are booked at actual. Overheads are levied at a rate per labour hour. The selling price is contracted at ₹ 15 per unit.

From the following data, present the profit per unit of each batch order and the overall position of the order for the 3000 units.

Month	*Batch Output (Numbers)*	*Material Cost (₹)*	*Labour Cost (₹)*
January 2013	*1,250*	*6,250*	*2,500*
February 2013	*1,500*	*9,000*	*3,000*
March 2013	*1,000*	*5,000*	*2,000*

Labour is paid at the rate of ₹ 2 per hour. The other details are:

Month	*Overheads (₹)*	*Total Labour Hours*
January 2013	*12,000*	*4,000*
February 2013	*9,000*	*4,500*
March 2013	*15,000*	*5,000*

Solution:

Statement of Cost and Profit per unit of each batch

	Jan. 2013	*Feb. 2013*	*March. 2013*	*Total*
a) Batch Output (Nos.)	1,250	1,500	1,000	3,750
b) Sales Value (@ ₹ 15 per unit)	(₹) 18,750	(₹) 22,500	(₹) 15,000	(₹) 56,250
Cost				
Material	6,250	9,000	5,000	20,250
Wages	2,500	3,000	2,000	7,500
Overheads	3,750	3,000	3,000	9,750
c) Total	12,500	15,000	10,000	37,500
d) Profit per batch (b) – (c)	6,250	7,500	5,000	18,750
e) Cost per unit (c) ÷ (a)	10	10	10	
f) Profit per unit (d) ÷ (a)	5	5	5	

Overall Position of the Order for 3000 Units

Sales value (3,000 units × ₹ 15)	₹45,000
Less: Total cost (3,000 units × ₹ 10)	30,000
Profit	15,000

Calculation of overhead per hour:

	Jan. 2013	Feb. 2013	March 2013
i. Labour hours:			

$= \frac{\text{Labour cost}}{\text{Labour rates per hour}}$	$\frac{₹\ 2,500}{2} = 1,250$	$\frac{₹\ 3,000}{2} = 1,500$	$\frac{₹\ 2,000}{2} = 1,000$
ii. Overhead per hour :			
$= \frac{\text{Total Overheads}}{\text{Total labour hour}}$	$\frac{₹\ 12,000}{4,000} = ₹\ 3$	$\frac{₹\ 9,000}{4,500} = ₹\ 2$	$\frac{₹\ 15,000}{5,000} = ₹\ 3$
iii. **Overhead for batch** (i) × (ii)	₹ 3,750	₹ 3,000	₹ 3,000

6.4.2 Economic Batch Quantity: In batch costing the most important problem is the determination of optimum size of the batch (how much to produce) or Economic Batch Quantity.

The determination of economic batch quantity involve two types of costs viz.,

(i) Set up cost (or preparation cost) and

(ii) Carrying cost.

With the increase in the batch size, there is an increase in the carrying cost but the set up cost per unit of product is reduced; this situation is reversed when the batch size is reduced. Thus there is one particular batch size for which both set up and carrying costs are minimum. This size is known as economic or optimum batch quantity.

Economic batch quantity can be determined with the help of a table, graph or mathematical formula. The mathematical formula usually used for its determination is as follows :

$$EBQ = \sqrt{\frac{2\,DS}{C}}$$

Where, D = Annual demand for the product

S = Setting up cost per batch

C = Carrying cost per unit of production

Note : If the rate of interest (I) and unit cost of production (C) are given, the following formula should be used for determining EBQ.

$$EBQ = \sqrt{\frac{2\,DS}{C}}$$

Illustration 6 (Determination of economic batch quantity)

Monthly demand for a product	*500 units*
Setting-up cost per batch	*₹ 60*
Cost of manufacturing per unit	*₹ 20*
Rate of interest	*10% p.a.*

Determine economic batch quantity.

Solution:

$$EBQ = \sqrt{\frac{2DS}{C}} = \sqrt{\frac{2 \times 500 \times 12 \times 60}{0.1 \times 20}} = 600 \text{ units.}$$

Illustration 7 (Calculation of EBQ and minimum inventory holding cost)

X Ltd. is committed to supply 24,000 bearings per annum to Y Ltd. on steady basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is ₹ 324.

(a) What would be the optimum run size for bearing manufacture?

(b) Assuming that the company has a policy of manufacturing 6,000 bearings per run, how much extra costs the company would be incurring as compared to the optimum run suggested in (a) above?

(c) What is the minimum inventory holding cost?

Solution:

(a) Optimum production run size (Q) = $\sqrt{\frac{2DS}{C}}$

where,

D = *No. of units to be produced within one year.*

S = *Set-up cost per production run*

C = *Carrying cost per unit per annum.*

$$= \sqrt{\frac{2DS}{C}} = \sqrt{\frac{2 \times 24{,}000 \times ₹ 324}{0.10 \times 12}} = 3{,}600 \text{ bearings.}$$

(b) Total Cost (of maintaining the inventories) when production run size (Q) are 3,600 and 6,000 bearings respectively

Total cost = Total set-up cost + Total carrying cost.

	When run size is 3,600 bearings	When run size is 6,000 bearings
Total set up cost	$= \frac{24{,}000}{3{,}600} \times ₹ 324 = ₹ 2{,}160$	$= \frac{24{,}000}{6{,}000} \times ₹ 324 = ₹ 1{,}29$
Total Carrying cost	1/2×3,600 × 0.10P × ₹12 = ₹ 2,160	1/2 × 6,000 × 0.10P × ₹12 = ₹ 3,600
Total Cost	₹ 4,320	₹ 4,896

(c) Minimum inventory holding cost = 1/2 Q × C
(when Q = 3,600 bearings) = 1/2 × 3,600 bearings × 0.10P × ₹12 = ₹2,160

6.5 Summary

- *Job Costing : Production/work done as per customer specification*
- *Meaning of spoiled and defective work under job costing:-*
  - *Spoiled :- Produced units cannot be rectified.*
  - *Defective :- Units can be rectified with some additional cost.*
- *Batch Costing :- Articles are produced in a lot and cost are computed per unit in a batch. Cost per unit in a batch = Total cost of a batch/Number of item produced.*

  EBQ = Points where Set up and carrying cost are minimum.

  $$EBQ = \sqrt{\frac{2DS}{C}}$$

7

Contract Costing

Learning Objectives

When you have finished studying this chapter, you should be able to

- Understand the meaning of a contract and other terms used in contract costing.
- Compute profit of an incomplete contract, cost of contract and cost of work certified.
- Understand the meaning of escalation clause in contract and its impact on contract price.

7.1 Introduction

A contract takes longer period to complete and the result of the contract can be known only after the completion of the contract. If the profit on such contracts is calculated only after their completion, then wide fluctuations may be noted in the profit figures of contractors from year to year. The profit in respect of each contract in progress is transferred to the costing profit and loss account of the year by calculating the notional profit. *The portion of notional profit to be transferred to the costing profit and loss account depends on the stage of completion of a contract.* To determine such a profit figure the knowledge of various concepts as discussed below is essential in contract costing.

7.2 Meaning of Contract Costing

Contract costing is a form of specific order costing where job undertaken is relatively large and normally takes period longer than a year to be getting completed. Contract costing is usually adopted by the contractors engaged in the task of executing Civil Contracts. Contract costing have the following distinct features:

1. The major part of the work in connection with each contract is ordinarily carried out at the site of the contract.
2. The bulk of the expenses incurred by the contractor are considered as direct.
3. The indirect expenses mostly consist of office expenses of the yards, stores and works.
4. A separate account is usually maintained for each contract.

5. The number of contracts undertaken by a contractor at a time is usually few.
6. The cost unit in contract costing is the contract itself.

7.3 Recording of contract costs

Material Cost: All materials supplied from the stores or purchased directly for the contract are debited to the concerned contract account. In the case of transfer of excess material from one contract to other contract, their costs would be adjusted on the basis of material transfer note, signed both by the transferee and the transferor foreman. In case the return of surplus material appears uneconomical on account of high cost of transportation, the same is sold and the concerned contract account is credited with the sale price. Any loss or profit arising there-from is transferred to the Costing Profit and Loss Account. Any theft or destruction of material by fire represents a loss and as such, the same is transferred to the Costing Profit and Loss Account. If any stores items are used for manufacturing tools, the cost of such stores items are charged to the work expenses account. If the contractee has supplied some materials without affecting the contract price, no accounting entries will be made in the contract account, only a note may be given about it.

Labour Cost: Labour actually employed on the site of the contract is regarded as direct (irrespective of the nature of the task performed) and the wages paid to them are charged to the concerned contract directly or on the basis of a wage analysis sheet (if concurrently a number of contracts are carried on and labourers are required to devote their time on two or more contracts).

Direct Expenses: Direct expenses (if any) are directly charged to the concerned contract account.

Indirect Expenses: Indirect expenses (such as expenses of engineers, surveyors, supervisors etc.) may be distributed over several contracts as a percentage of cost of materials, or wages paid or of the prime cost. If however, the contracts are big, the labour hour method may be used for the distribution of expenses.

Plant and Machinery: The value of the plant in a contract may be either debited to contract account and the written down value thereof at the end of the year entered on the credit side for closing the contract account, or only a charge (depreciation) for use of the plant may be debited to the contract account.

Sub-Contract: Sub-contract costs are also debited to the Contract Account.

Extra work: The extra work amount payable by the contractee should be added to the contract price. If extra work is *substantial*, it is better to treat it as a separate contract. If it is *not substantial*, expenses incurred should be debited to the contract account as “Cost of Extra work”.

7.4 Meaning of the terms used in contract costing

(i) Cost of Work Certified or Value of Work Certified: A contract is a continuous process and to know the cost or value of the work completed as on a particular date; assessment of the work is carried out by the surveyor or architect. Surveyor or architect based on his assessment certifies the percentage of work completion. This portion of called value or cost of work certified.

Mathematically:

(a) Value of Work Certified = Value of Contract x Work certified (%)

(b) Cost of Work Certified = Cost of work to date – (Cost of work uncertified + Material in hand + Plant at site)

(ii) Progress Payment: Contractors receive payments from the contractee periodically for the work done on the contract. This is known as progress payment or running payment. This is paid based on the certificate issued by the surveyor or architect.

Mathematically:

Progress payment = Value of work certified – Retention money – Payment to date

(iii) Retention Money: A contractor does not receive full payment of the work certified by the surveyor. Contractee retains some amount (say 10% to 20%) to be paid, after sometime, when it is ensured that there is no fault in the work carried out by contractor. If any deficiency or defect is noticed in the work, it is to be rectified by the contractor before the release of the retention money. Retention money provides a safeguard against the risk of loss due to faulty workmanship.

Mathematically:

Retention Money = Value of work certified – Payment actually made/ cash paid

(iv) Cost of Work Uncertified: It represents the cost of the work which has been carried out by the contractor but has not been certified by the architect. It is always shown at cost price. The cost of uncertified work may be ascertained as follows:

	(₹)	*(₹)*
Total cost to date		—
Less: Cost of work certified	—	
Material in hand	—	
Plant at site	—	—
Cost of work uncertified		—

(v) Cash Received: It is ascertained by deducting the retention money from the value of work certified *i.e.*

Cash received = Value of work certified – Retention money.

(vi) Work-in-Progress: In Contract Accounts, the value of the work-in-progress consists of

(i) the cost of work completed, both certified and uncertified;

(ii) the cost of work not yet completed; and

(iii) the amount of profit taken as credit.

In the Balance Sheet (prepared for management), the work-in-progress is usually shown under two heads, viz., certified and uncertified. The cost of work completed and certified and the profit credited will appear under the head 'certified' work-in-progress, while the completed work not yet certified and the cost of labour, material and expenses of work which has not yet reached the stage of completion are shown under the head "uncertified" work-in-progress.

(vii) Notional Profit: It represents the difference between the value of work certified and cost of work certified. It is determined:

Notional profit = Value of work certified – (Cost of work to date – Cost of work not yet certified)

(viii) Estimated Profit: It is the excess of the contract price over the estimated total cost of the contract.

Illustration 1 (Computation of estimated profit)

Compute a conservative estimate of profit on a contract (which has been 90% complete) from the following particulars:

	(₹)
Total expenditure to date	*22,50,000*
Estimated further expenditure to complete the contract (including contingencies)	*2,50,000*
Contract price	*32,50,000*
Work certified	*27,50,000*
Work uncertified	*1,75,000*
Cash received	*21,25,000*

Solution:

Calculation of conservative Estimate of Profit	(₹)
Total expenditure to date	22,50,000
Estimated further expenditure to complete the contract (including contingencies)	2,50,000
	25,00,000
Estimated profit on contract	7,50,000
Contract price	32,50,000

Profit to be transferred to Contract Profit and Loss A/c

$$\text{Estimated Profit} \times \frac{\text{Cash Received}}{\text{Contract Price}}$$

$$= ₹\ 7,50,000 \times \frac{₹\ 21,25,000}{₹\ 32,50,000} = ₹\ 4,90,385$$

7.5 Profit/loss on incomplete contracts

To determine the profit to be taken to Costing Profit and Loss Account, in the case of incomplete contracts, the following four situations may arise:

Students may note that profit/ loss determined here is on the basis of prudence and for the internal managerial decision making purpose only. For financial reporting purpose, profit/ loss from a contract is to be determined in accordance with relevant Accounting Standards in force.

Note: "Students are requested to refer the Study Material and Practice Manual of 'Accounting' (Paper-1 CA-Intermediate) to see and learn financial accounting perspective of contract accounting and applicability of Accounting Standard- 7. Here only specific aspect of Contract Costing is discussed."

(i) ***Completion of contract is less than 25 per cent*:** In this case no profit should be taken to Costing Profit and Loss Account.

(ii) ***Completion of contract is 25 per cent or more but less than 50 per cent:*** In this case one-third of the notional profit, reduced in the ratio of cash received to work certified, should be transferred to the Costing Profit and Loss Account. Mathematically:

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(iii) ***Completion of contract is 50 per cent or more but less than 90 per cent:*** In this case, two-third of the notional profit, reduced by proportion of cash received to work certified, is transferred to the Costing Profit and Loss Account. Mathematically:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(iv) ***Completion of contract is 90 per cent or more*** i.e. *it is nearing completion*: In this case the profit to be taken to Costing Profit and Loss Account is computed by determining the estimated profit and using any one of the following formulas:

(a) $\text{Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$

(b) $\text{Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$

OR

$$\text{Estimated Profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

(c) $$\text{Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}}$$

(d) $$\text{Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(e) $$\text{Notional Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

(This formula may be preferably used in the absence of estimated profit figure).

[It is preferable to use formula (b) in the absence of specific instructions.]

7.6 Cost plus contract

Under Cost plus Contract, the contract price is ascertained by adding a percentage of profit to the total cost of the work. Such types of contracts are entered into when it is not possible to estimate the contract cost with reasonable accuracy due to unstable condition of factors that affect the cost of material, labour services, etc.

Cost plus contracts have the following advantages and disadvantages:

Advantages:

(i) The Contractor is assured of a fixed percentage of profit. There is no risk of incurring any loss on the contract.

(ii) It is useful specially when the work to be done is not definitely fixed at the time of making the estimate.

(iii) Contractee can ensure himself about 'the cost of the contract', as he is empowered to examine the books and documents of the contractor to ascertain the veracity of the cost of the contract.

Disadvantages - The contractor may not have any inducement to avoid wastages and effect economy in production to reduce cost.

Escalation Clause - If during the period of execution of a contract, the prices of materials, or labour etc., rise beyond a certain limit, the contract price will be increased by an agreed amount. Inclusion of such a clause in a contract deed is called an "Escalation Clause".

Illustration 2 (Preparation of contract account)

The following expenses were incurred on a contract :	*(₹)*
Material purchased	*6,00,000*
Material drawn from stores	*1,00,000*

Wages	*2,25,000*
Plant issued	*75,000*
Chargeable expenses	*75,000*
Apportioned indirect expenses	*25,000*

The contract was for ₹ 20,00,000 and it commenced on January 1, 2011. The value of the work completed and certified upto 30th November, 2011 was ₹ 13,00,000 of which ₹ 10,40,000 was received in cash, the balance being held back as retention money by the contractee. The value of work completed subsequent to the architect's certificate but before 31st December, 2011 was ₹ 60,000. There were also lying on the site materials of the value of ₹ 40,000. It was estimated that the value of plant as at 31st December, 2011 was ₹ 30,000.

Solution

Dr. **Contract Account** Cr.

		(₹)			(₹)
To	Material purchased	6,00,000	By	Work-in-progress :	
”	Stores issued	1,00,000		Work certified	13,00,000
”	Wages	2,25,000		Work uncertified	60,000
”	Plant	75,000		Material unused	40,000
”	Chargeable expenses	75,000		Plant less depreciation	30,000
”	Indirect expenses	25,000			
”	Profit and Loss Account, 2/3rds of profit on cash basis	1,76,000*			
”	Work-in-progress balance of profit c/d	1,54,000			
		14,30,000			14,30,000
”	Balance b/d: Work certified	13,00,000			
	Uncertified	60,000			
	Material at site	40,000			
	Plant at site	30,000			
		14,30,000			
	Less: Reserve	1,54,000			
		12,76,000			

*	Computation of Profit :	(₹)
	Apparent profit	3,30,000
	2/3rd of that since 65% of the work is complete	2,20,000
	80% of that on cash basis	1,76,000

An alternative method of presentation can be to deduct the balance of profit to be carried down (₹ 1,54,000 in the above case) from the work certified before it is entered in the contract account. It will be ₹ 11,46,000 in the illustration given above. Of course, the reserve to be so deducted from the work certified will have to be first ascertained by considering the value of the work certified.

Illustration 3 (Preparation of contract account and calculation of profit to be transferred)

A contractor prepares his accounts for the year ending 31st December each year. He commenced a contract on 1st April, 2011.

The following information relates to the contract as on 31st December, 2011:

	(₹)
Material issued	*2,51,000*
Labour charges	*5,65,600*
Salary to Foreman	*81,300*

A machine costing ₹ 2,60,000 has been on the site for 146 days, its working life is estimated at 7 years and its final scrap value at ₹ 15,000.

A supervisor, who is paid ₹ 8,000 p.m. has devoted one-half of his time to this contract.

All other expenses and administration charges amount to ₹ 1,36,500.

Material in hand at site costs ₹ 35,400 on 31st December, 2011.

The contract price is ₹ 20,00,000. On 31st December, 2011 two-third of the contract was completed. The architect issued certificates covering 50% of the contract price, and the contractor had been paid ₹ 7,50,000 on account.

Prepare Contract A/c and show how much profit or loss should be included in financial accounts to 31st December, 2011.

Solution

Dr. **Contract Account** Cr.

		(₹)			(₹)
To	Material issued	2,51,000	By	Machine (See note 1)	2,46,000
”	Labour charges	5,65,600			
”	Foreman salary	81,300	By	Material (in hand)	35,400
”	Machine	2,60,000	By	Works cost	10,49,000
”	Supervisor’s salary (₹ 8,000 × 9)/2	36,000			
”	Adm. charges	1,36,500			
		13,30,400			13,30,400
To	Works cost	10,49,000	By	Work certified	10,00,000
To	Notional profit	2,13,250	By	Work uncertified (See Note 2)	2,62,250
		12,62,250			12,62,250
To	Costing P & L A/c (see note 3)	1,06,625	By	Notional Profit	2,13,250
To	Work-in-Progress (reserve)	1,06,625			
		2,13,250			2,13,250

Notes :

1. Machine :

   $[(₹\ 2,60,000 – ₹\ 15,000) \div 7] \times \frac{146}{365} = ₹\ 14,000$

   Hence the value of machine after the period of 146 days is

   ₹ 2,60,000 – ₹ 14,000 = ₹ 2,46,000

2. The cost of 66.67% of the contract is ₹ 10,49,000

   ∴ Cost of 100% " " " " $\frac{₹\ 10,49,000}{66.67} \times 100 = ₹\ 15,73,500$

   ∴ Cost of 50% of the contract which has been certified by the architect is ₹7,86,750. Also the cost of 16.67% of the contract, which has been completed but not certified by the architect is ₹ 2,62,250.

3. $\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$ or, $\frac{2}{3} \times 2,13,250 \times \frac{7,50,000}{10,00,000} = ₹\ 1,06,625$

Illustration 4 (Preparation of contract account, contractee account extracts of B/S)

M/s. Bansals Construction Company Ltd. took a contract for ₹ 60,00,000 expected to be completed in three years. The following particulars relating to the contract are available:

	2011 (₹)	***2012 (₹)***	***2013 (₹)***
Materials	*6,75,000*	*10,50,000*	*9,00,000*
Wages	*6,20,000*	*9,00,000*	*7,50,000*
Cartage	*30,000*	*90,000*	*75,000*
Other expenses	*30,000*	*75,000*	*24,000*
Cumulative work certified	*13,50,000*	*45,00,000*	*60,00,000*
Cumulative work uncertified	*15,000*	*75,000*	—

Plant costing ₹ 3,00,000 was bought at the commencement of the contract. Depreciation was to be charged at 25% per annum, on the written down value method. The contractee pays 75% of the value of work certified as and when certified, and makes the final payment on completion of the contract.

You are required to make a contract account and contractee account as they would appear in each of the three years. Also show how the work-in-progress and other items should appear in the balance sheet.

Solution

Dr. **Contract Account** *Cr.*

2011		(₹)	2011			(₹)
To Materials		6,75,000	By Plant at site c/d			2,25,000
To Wages		6,20,000	By Work-in-progress c/d :	(₹)		
To Cartage		30,000	Work certified	13,50,000		
To Other expenses		30,000	Work uncertified	15,000		13,65,000
To Plant		3,00,000	By Costing P & L A/c			65,000
			(Loss transferred)			
		16,55,000				16,55,000

2012			(₹)	2012			(₹)
To Work-in-progress b/d :				By Work-in-progress c/d :			
Work certified	13,50,000			Work certified	45,00,000		
Work uncertified	15,000	13,65,000		Work uncertified	75,000	45,75,000	
To Plant b/d			2,25,000	By Plant at site c/d			1,68,750
To Materials			10,50,000				
To Wages			9,00,000				
To Cartage			90,000				
To Other expenses			75,000				
To Notional profit c/d			10,38,750				
			47,43,750				47,43,750
To Costing P & L A/c			5,19,375	By Notional profit b/d			10,38,750
To Work-in-progress c/d (profit in reserve) (*Refer to working note 2*)			5,19,375				
			10,38,750				10,38,750

2013			(₹)	2013			(₹)
To Work-in-progress b/d:				By Work-in-progress b/d (profit in reserve)			5,19,375
Work certified	45,00,000						
Work uncertified	75,000	45,75,000		By Plant at site			1,26,562
				By Contractee's A/c			60,00,000

			(contract price)
To	Plant b/d	1,68,750	
To	Materials	9,00,000	
To	Wages	7,50,000	
To	Cartage	75,000	
To	Other expenses	24,000	
To	Costing P & L A/c	1,53,187	
		66,45,937	66,45,937

Working Notes:

1. In 2011 there is a loss, and so the whole of it will be transferred to the Costing Profit and Loss Account.

2. In 2012, the contract is 3/4th complete. Hence, the profit to be transferred to the Costing Profit and Loss Account will be determined as under:

$$= \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \frac{2}{3} \times ₹10,38,750 \times \frac{₹\ 33,75,000}{₹45,00,000} = ₹\ 5,19,375$$

Contractee's account

	(₹)		(₹)
2011		2011	
To Balance c/d	10,12,500	By Bank	10,12,500
2012		2012	
To Balance c/d	33,75,000	By Balance b/d	10,12,500
		By Bank	23,62,500*
	33,75,000		33,75,000
2013		2013	
To Contract A/c	60,00,000	By Balance b/d	33,75,000
(Contract price)		By Bank	26,25,000
	60,00,000		60,00,000

*The total value of work certified at the end of 2012 was ₹ 45,00,000 of that worth ₹ 13,50,000 was certified in 2011. Hence, the cash to be received in 2012 is 75% of ₹ 31,50,000 (₹ 45,00,000 – ₹ 13,50,000) i.e. ₹ 23,62,500.

Balance Sheet (Extract) 2011

Liabilities	*(₹)*	*Assets*		*(₹)*
Capital	–	Plant at site		2,25,000
Less : Loss during the year	65,000			
		Work-in-progress :	(₹)	
		Work certified	13,50,000	
		Work uncertified	15,000	
			13,65,000	
		Less: Cash received	10,12,500	3,52,500

Balance sheet (Extract) 2012

Liabilities	*(₹)*	*Assets*		*(₹)*
Capital	–	Plant at site		1,68,750
Add: Profit during the year	5,19,375	*Work-in-progress* :	(₹)	
		Work certified	45,00,000	
		Work uncertified	75,000	
			45,75,000	
		Less: Profit in reserve	5,19,375	
			40,55,625	
		Less: Cash received	33,75,000	6,80,625

Balance sheet (Extract) 2013

Liabilities	*(₹)*	*Assets*	*(₹)*
Capital	–	Plant at site	1,26,562
Add: Profit during the year	1,53,187		

Illustration 5 (Computation of conservative estimate of profit)

Compute a conservative estimate of profit on a contract (which has been 90% complete) from the following particulars. Calculate the proportion of profit to be taken to Costing Profit & Loss Account under various methods and give your recommendation.

	(₹)
Total expenditure to date	*4,50,000*
Estimated further expenditure to complete the contract (including contingencies)	*25,000*
Contract price	*6,12,000*

Work certified	*5,50,800*
Work uncertified	*34,000*
Cash received	*4,40,640*

Solution

Computation of Notional Profit	*(₹)*
Value of work certified	5,50,800
Less: Cost of work certified (₹4,50,000 – ₹34,000)	4,16,000
Notional profit	1,34,800

Computation of Estimated Profit	*(₹)*	
Contract price		6,12,000
Less: Cost of work to date	4,50,000	
Estimated further expenditure to complete the contract	25,000	
Estimated total cost		4,75,000
Estimated profit		1,37,000

Profit to be transferred under various methods

(i) $\text{Notional profit} \times \frac{\text{Work certified}}{\text{Contract price}}$

$= ₹\ 1,34,800 \times \frac{₹\ 5,50,800}{₹\ 6,12,000} = ₹\ 1,21,320$

(ii) $\text{Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}}$

$= ₹\ 1,37,000 \times \frac{₹\ 5,50,800}{₹\ 6,12,000} = ₹\ 1,23,300$

(iii) $\text{Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$

$= ₹\ 1,37,000 \times \frac{₹\ 5,50,800}{₹\ 6,12,000} \times \frac{₹\ 4,40,640}{₹\ 5,50,800} = ₹\ 98,640$

(iv) $\text{Estimated profit} \times \frac{\text{Cost of work date}}{\text{Estimated total cost}}$

$= ₹\ 1,37,000 \times \frac{₹\ 4,50,000}{₹\ 4,75,000} = ₹\ 1,29,790$

(*v*) Estimated profit × $\frac{\text{Cost of work date}}{\text{Estimated total cost}}$ × $\frac{\text{Cash received}}{\text{Work certified}}$

= ₹ 1,37,000 × $\frac{₹\ 4,50,000}{₹\ 4,75,000}$ × $\frac{₹\ 4,40,640}{₹\ 5,50,800}$ = ₹ 1,03,832

Recommendation: It is recommended that a sum of ₹ 98,640 may be transferred to the Costing Profit and Loss Account. This amount is the least and has been arrived by using the formula (iii) above. According to this formula, profit transferred to the Costing Profit and Loss Account is generally kept the minimum and allows withholding in reserve a larger portion of notional profit to meet future unforeseen expenses and contingencies.

Illustration 6 (Calculation of admissible escalation claim)

A contractor has entered into a long term contract at an agreed price of ₹ 1,75,000 subject to an escalation clause for materials and wages as spelt out in the contract and corresponding actual are as follows :

	Standard		***Actual***	
Materials	*Qty (tonnes)*	*Rate (₹)*	*Qty (tonnes)*	*Rate (₹)*
A	*5,000*	*5*	*5,050*	*4.80*
B	*3,500*	*8*	*3,450*	*7.90*
C	*2,500*	*6*	*2,600*	*6.60*
Labour	*Hours*	*Hourly Rate (₹)*	*Hours*	*Hourly Rate (₹)*
X	*2,000*	*7.00*	*2,100*	*7.20*
Y	*2,500*	*7.50*	*2,450*	*7.50*
Z	*3,000*	*6.50*	*3,100*	*6.60*

Reckoning the full actual consumption of material and wages the company has claimed a final price of ₹ 1,77,360. Give your analysis of admissible escalation claim and indicate the final price payable.

Solution

Statement showing final claim

Materials	***Standard Qty/Hrs. (a)***	***Standard Rate (₹) (b)***	***Actual Rate (₹) (c)***	***Variation in Rate (₹) (d) = (c)–(b)***	***Escalation Claim (₹) (e) =(a) × (d)***
A	5,000	5.00	4.80	(–) 0.20	(–) 1,000
B	3,500	8.00	7.90	(–) 0.10	(–) 350
C	2,500	6.00	6.60	(+) 0.60	1,500
		Materials escalation claim : (P)			150
Labour					
X	2,000	7.00	7.20	(+) 0.20	400

Y	2,500	7.50	7.50	–	–
Z	3,000	6.50	6.60	(+) 0.10	300
		Wages escalation claim : (Q)			700
		Final claim: (P) + (Q)			850

Statement showing final price payable

Agreed price		₹ 1,75,000
Agreed escalation :		
Material cost	₹ 150	
Labour cost	₹ 700	₹ 850
Final price payable		₹ 1,75,850

The claim of ₹ 1,77,360 is based on the total increase in cost. This can be verified as shown below:

Statement showing total increase in cost

	Standard Cost			*Actual Cost*			*Increase/*
	Qty/hrs	*Rate (₹)*	*Amount (₹)*	*Qty/hrs*	*Rate (₹)*	*Amount (₹)*	*(Decrease)*
	(a)	*(b)*	*(c) = (a) × (b)*	*(d)*	*(e)*	*(f) =(d) × (e)*	*(g) =(f) – (c)*
I. Materials							
A	5,000	5.00	25,000	5,050	4.80	24,240	(760)
B	3,500	8.00	28,000	3,450	7.90	27,255	(745)
C	2,500	6.00	15,000	2,600	6.60	17,160	2,160
			68,000			68,655	655
II. Labour							
X	2,000	7.00	14,000	2,100	7.20	15,120	1,120
Y	2,500	7.50	18,750	2,450	7.50	18,375	(375)
Z	3,000	6.50	19,500	3,100	6.60	20,460	960
			52,250			53,955	1,705
		Total (I + II)					2,360
The final price claimed by the company is contract price							₹ 1,75,000
Add : Increase in cost							₹ 2,360
							₹ 1,77,360

This claim is not admissible because escalation clause covers only that part of increase in cost, which has been caused by inflation.

Note : It is fundamental principle that the contractee would compensate the contractor for the increase in costs which are caused by factors beyond the control of contractor and not for increase in costs which are caused due to inefficiency or wrong estimation.

Illustration 7 (Preparation of contract account and calculation of estimated profit)

AKP Builders Ltd. commenced a contract on April 1, 2012. The total contract was for ₹ 5,00,000. Actual expenditure for the period April 1, 2012 to March 31, 2013 and estimated expenditure for April 1, 2013 to December 31, 2013 are given below :

Particulars	*2012-13 (actual)*	*2013-14 (9 months) (estimated)*
Materials issued	*90,000*	*85,750*
Labour : Paid	*75,000*	*87,325*
Outstanding at the end	*6,250*	*8,300*
Plant	*25,000*	*-*
Sundry expenses : Paid	*7,250*	*6,875*
Prepaid at the end	*625*	*-*
Establishment charges	*14,625*	*-*

A part of the material was unsuitable and was sold for ₹18,125 (cost being ₹15,000) and a part of plant was scrapped and disposed of for ₹2,875. The value of plant at site on 31 March, 2013 was ₹ 7,750 and the value of material at site was ₹ 4,250. Cash received on account to date was ₹ 1,75,000, representing 80% of the work certified. The cost of work uncertified was valued at ₹ 27,375.

The contractor estimated further expenditure that would be incurred in completion of the contract :

- *The contract would be completed by 31st December, 2013.*
- *A further sum of ₹31,250 would have to be spent on the plant and the residual value of the plant on the completion of the contract would be ₹3,750.*
- *Establishment charges would cost the same amount per month as in the previous year.*
- *₹ 10,800 would be sufficient to provide for contingencies.*

Required: Prepare Contract Account and calculate estimated total profit on this contract. Profit transferrable to Costing Profit and Loss Account is to be calculated by reducing estimated profit in proportion of work certified and contract price.

Solution

AKP Builders Ltd.
Contract Account (2012-13)

	Particulars		*(₹)*		*Particulars*	*(₹)*
To	Materials issued		90,000	By	Material sold	18,125
To	Labour	75,000		By	Plant sold	2,875
	Add: Outstanding	6,250	81,250	By	Plant at site	7,750
To	Plant		25,000	By	Material at site	4,250

To	Sundry Expenses	7,250		By	Work-in-progress		
	Less : Prepaid	625	6,625		Work certified	2,18,750	
To	Establishment charges		14,625		Work uncertified	27,375	2,46,125
To	Costing P & L A/c (profit on sale of material)		3,125				
To	Notional profit c/d		58,500				
			2,79,125				2,79,125
To	Costing P & L A/c (transfer)		29,960	By	Notional profit b/d		58,500
To	Work-in-progress (reserve)		28,540				
			58,500				58,500

Profit to be transferred to Costing Profit and Loss Account

$$= \text{Estimated profit} \times \frac{\text{Work Certified}}{\text{Contract price}}$$

$$= ₹\ 68,481 \times \frac{2,18,750}{5,00,000} = ₹\ 29,960$$

Calculation of Estimated Profit (₹)

(1)	Material consumed	(90,000 + 3,125 – 18,125)	75,000	
	Add : Further consumption		85,750	1,60,750
(2)	Plant used	(25,000 – 2,875)	22,125	
	Add: Further plant introduced		31,250	
	Less: Closing balance of plant		3,750	49,625
(3)	Establishment charges		14,625	
	Add: Further charges for nine month	(14,625 × 9/12)	10,969	25,594
(4)	Sundry expenses		6,625	
	Add: Further expenses		6,875	
	Add: Prepaid expenses		625	14125
(5)	Labour cost		81,250	
	Add: Further cost	(87,325 – 6,250)	81,075	
	Add: Outstanding		8,300	1,70,625
(6)	Reserve for contingencies			10,800
Estimated profit		(balancing figure)		68,481
Contract price				5,00,000

Illustration 8 (Preparation of contract account and determination of profit)

RST Construction Ltd. commenced a contract on April 1, 2011. The total contract was for ₹ 49,21,875. It was decided to estimate the total profit on the contract and to take to the credit of Costing Profit and Loss A/c that proportion of estimated profit on cash basis, which work completed bore to total contract. Actual expenditure for the period April 1, 2011 to March 31, 2012 and estimated expenditure for April 1, 2012 to September 30, 2012 are given below:

	April 1, 2011 to March 31, 2012 (Actual) (₹)	***April 1, 2012 to Sept. 30, 2012 (Estimated) (₹)***
Materials issued	*7,76,250*	*12,99,375*
Labour : Paid	*5,17,500*	*6,18,750*
Prepaid	*37,500*	*-*
Outstanding	*12,500*	*5,750*
Plant purchased	*4,00,000*	*-*
Expenses: Paid	*2,25,000*	*3,75,000*
Outstanding	*25,000*	*10,000*
Prepaid	*15,000*	*-*
Plant returns to store (historical cost)	*1,00,000*	*3,00,000*
	(on September 30, 2011)	*(on September 30, 2012)*
Work certified	*22,50,000*	*Full*
Work uncertified	*25,000*	*-*
Cash received	*18,75,000*	*-*
Materials at site	*82,500*	*42,500*

The plant is subject to annual depreciation @ 25% on written down value method. The contract is likely to be completed on September 30, 2012.

Required : *Prepare the Contract A/c. Determine the profit on the contract for the year 2011-12 on prudent basis, which has to be credited to Costing Profit and Loss A/c.*

Solution

Calculation of written down value of plant as on 30-9-2012. (₹)

Plant purchased on 1-4-2011	4,00,000
Less: Plant returned to store on 30-9-2011	1,00,000
(Depreciation on it ₹1,00,000 × 25/100 × 6/12 = ₹12,500)	
	3,00,000
Less: Depreciation on Balance plant (3,00,000 × 25/100)	75,000
WDV of Plant on 1-4-2012	2,25,000
Less : Depreciation (2,25,000 × 25/100 × 6/12)	28,125
WDV of plant returned to store on 30-9-2012	1,96,875

Contract A/c (1-4-2011 to 31-3-2012)

	Particulars		(₹)		Particulars		(₹)
To	Materials issued		7,76,250	By	Plant returned to		
To	Labour	5,17,500			Store on 30-9-2011	1,00,000	
	Less: Prepaid	37,500			Less: Depreciation(1/2)	12,500	87,500
		4,80,000					
	Add : Outstanding	12,500	4,92,500	By	Plant at site on 31.3.12	3,00,000	
To	Plant purchased		4,00,000		Less: Depreciation	75,000	2,25,000
To	Expenses	2,25,000		By	Materials at site		82,500
	Less : Prepaid	15,000		By	Work-in-progress		
		2,10,000			Work certified		22,50,000
	Add : Outstanding	25,000	2,35,000		Work uncertified		25,000
To	Notional profit c/d		7,66,250				-
			26,70,000				26,70,000
To	Costing P&L A/c (Transfer)		3,89,000	By	Notional profit b/d		7,66,250
To	Work-in-progress (Reserve)		3,77,250				-
			7,66,250				7,66,250

Computation of Estimated Profit

Contract A/c (1-4-2011 to 30-9-2012)

	Particulars	(₹)		Particulars	(₹)
To	Materials issued (7,76,250+12,99,375)	20,75,625	By	Materials at site	42,500
To	Labour (5,17,500 - 37,500 + 12,500 + 6,18,750+37,500 -12,500 + 5,750)	11,42,000	By	Plant returned to store on 30.9.2011 (1,00,000 – 12,500)	87,500
To	Plant purchased	4,00,000	By	Plant returned to store on 30.9.12 (4,00,000 – 1,00,000 – 1,03,125)	1,96,875
To	Expenses (2,25,000+25,000 - 15,000+ 3,75,000 - 25,000 + 15,000 + 10,000)	6,10,000	By	Contractee A/c	49,21,875
To	Estimated profit	10,21,125			
		52,48,750			52,48,750

Since the contract is nearing completion, the following formula is used for transfer of profit to Costing Profit and Loss Account.

$$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

$$= 10,21,125 \times \frac{18,75,000}{49,21,875} = ₹3,89,000.$$

Illustration 9 (Determination of profit on the contract)

A contractor commenced a building contract on October 1, 2010. The contract price is ₹ 4,40,000. The following data pertaining to the contract for the year 2011-2012 has been compiled from his books and is as under :

		(₹)
April 1, 2011	*Work-in-progress not certified*	*55,000*
	Materials at site	*2,000*
2011–12	*Expenses incurred :*	
	Materials issued	*1,12,000*
	Wages paid	*1,08,000*
	Hire of plant	*20,000*
	Other expenses	*34,000*
March 31, 2012	*Materials at site*	*4,000*
	Work-in-progress : Not certified	*8,000*
	Work-in-progress : Certified	*4,05,000*

The cash received represents 80% of work certified. It has been estimated that further costs to complete the contract will be ₹ 23,000 including the materials at site as on March 31, 2012.

Required :

Determine the profit on the contract for the year 2011-12 on prudent basis, which has to be credited to Costing P/L A/c.

Solution

Contract Account for the year 2011-12

Dr. *Cr.*

Particulars	***(₹)***	***Particulars***	***(₹)***
1.4.11			
To Work-in-progress (not certified)	55,000	By Materials at site	4,000
To Materials at site	2,000		
2011–12			
To Materials issued	1,12,000	By Cost of contract c/d (to date)	3,27,000

To Wages paid	1,08,000		
To Hire of plant	20,000		
To Other expenses	34,000		
	3,31,000		3,31,000
31.3.12			
To Cost of contract b/d	3,27,000	By Work-certified	4,05,000
(to date)		By Work-not certified	8,000
To Costing P& L A/c	66,273		
To Profit in reserve	19,727		
	4,13,000		4,13,000

Profit for the year 2011-12 = ₹ 4,13,000 – ₹ 3,27,000 = ₹ 86,000

Estimated profit *(on the completion of the contract)*

	(₹)
Cost of the contract (to date)	3,27,000
Further cost of completing the contract	23,000
Total cost: (A)	3,50,000
Contract price: (B)	4,40,000
Estimated profit on the completion of contract: {(A) – (B)}	90,000

Since, $\left(\frac{\text{Work certified}}{\text{Contract price}}\right) \times 100 = \frac{₹\ 4,05,000}{₹\ 4,40,000} \times 100 = 92.05\%$

$$\text{Profit} = \text{Estimated profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

$$= ₹\ 90,000 \times \frac{3,24,000}{4,40,000} = ₹\ 66,273$$

Illustration 10 (Determination of profit for the contracts)

A construction company under-taking a number of contracts, furnished the following data relating to its uncompleted contracts as on 31st March, 2012 :

	(₹ in lacs) Contract Numbers			
	723	*726*	*729*	*731*
Total Contract Price	*23.20*	*14.40*	*10.08*	*28.80*
Estimated Costs on completion of contract	*20.50*	*11.52*	*12.60*	*21.60*
Expenses for the year ended 31.3.12 :				
Direct Materials	*5.22*	*1.80*	*1.98*	*0.80*
Direct Wages	*2.32*	*4.32*	*3.90*	*2.16*

Overheads (Excluding Depreciation)	*1.06*	*2.60*	*2.62*	*1.05*
Profit Reserve as on 1.4.11	*1.50*	*—*	*—*	*—*
Plant issued at Cost	*5.00*	*3.50*	*2.75*	*3.00*
Materials at Site on 1.4.11	*0.75*	*—*	*—*	*—*
Materials at Site on 31.3.12	*0.45*	*0.20*	*0.08*	*0.05*
Work Certified till 31.3.11	*4.65*	*—*	*—*	*—*
Work Certified during the year 2011-12	*12.76*	*13.26*	*7.56*	*4.32*
Work Uncertified as on 31.3.12	*0.84*	*0.24*	*0.14*	*0.18*
Progress payments received during the year	*9.57*	*9.0*	*5.75*	*3.60*

Depreciation @ 20% per annum is to be charged on plant issued. While the Contract No. 723 was carried over from last year, the remaining contracts were started in the 1st week of April, 2011.

Required:

(i) Determine the profit/loss in respect of each contract for the year ended 31st March, 2012.

(ii) State the profit/loss to be carried to Profit & Loss A/c for the year ended 31st March, 2012.

Solution

(i) Statement of Profit/Loss for the year ended 31st March, 2012

(₹ in lacs)

		Contract Numbers			
		723	**726**	**729**	**731**
A.	*Contract completion percentage :*				
	Work certified : (a)	17.41	13.26	7.56	4.32
	Contract price : (b)	23.20	14.40	10.08	28.80
	Percentage of completion : [(a) – (b)]	75.04	92.08	75.00	15.00
B.	*Estimated profit on completion :*				
	Contract price : (c)	23.20	14.40	10.08	28.80
	Estimated costs on completion : (d)	20.50	11.52	12.60	21.60
	Estimated profit (loss) on completion : [(c) – (d)]	2.70	2.88	(2.52)	7.20
C.	*Profit of the year :*				
	Opening stock of materials	0.75	—	—	—
	Materials issued	5.22	1.80	1.98	0.80
	Direct wages	2.32	4.32	3.90	2.16
	Overheads	1.06	2.60	2.62	1.05
	Depreciation	1.00	0.70	0.55	0.60
	Total : (P)	10.35	9.42	9.05	4.61

Profit in reserve	1.50	—	—	—
Material at site on 31/3/12	0.45	0.20	0.08	0.05
Total : (Q)	1.95	0.20	0.08	0.05
Cost of contract : (R) = [(P) – (Q)]	8.40	9.22	8.97	4.56
Work certified	12.76	13.26	7.56	4.32
Work not certified	0.84	0.24	0.14	0.18
Total : (S)	13.60	13.50	7.70	4.50
Profit (loss) for the year [(R) – (S)]	5.20	4.28	(1.27)	(0.06)

(ii) Profit to be taken to Costing Profit & Loss Account of the year in respect of respective contract

Contract 723 $= \frac{2}{3} \times$ Notional profit $\times \frac{\text{Cash received}}{\text{Work certified}}$

$= \frac{2}{3} \times 5.20 \times \frac{9.57}{17.41} =$ ₹ 1.9056 lacs

= Balance ₹ 3.2944 lacs to reserve.

Contract 726 = Estimated total profits on completion $\times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$

$= ₹\ 2.88 \times \frac{13.26}{14.40} \times \frac{9.0}{13.26} =$ ₹ 1.80

Illustration 11 (Preparation of contract account and determination of profit)

MNP Construction Ltd. commenced a contract on April 1, 2010. The total contract was for ₹ 17,50,000. It was decided to estimate the total profit and to take to the credit of Costing P/L A/c the proportion of estimated profit on cash basis which work completed bore to the total contract. Actual expenditure in 2010-11 and estimated expenditure in 2011-2012 are given below:

	2010-2011 (Actual) (₹)	*2011-2012 (Estimated) (₹)*
Materials issued	*3,00,000*	*5,50,000*
Labour : Paid	*2,00,000*	*2,50,000*
: Outstanding at end	*20,000*	*30,000*
Plant purchased	*1,50,000*	*—*
Expenses : Paid	*75,000*	*1,50,000*
: Prepaid at end	*15,000*	*—*
Plant returns to store (historical cost)	*50,000*	*1,00,000*

		(on Dec. 31, 2011)
Material at site	*20,000*	*50,000*
Work certified	*8,00,000*	*Full*
Work uncertified	*25,000*	*—*
Cash received	*6,00,000*	*Full*

The plant is subject to annual depreciation @ 25% of WDV Cost. The contract is likely to be completed on Dec. 31, 2011. Prepare the Contract A/c. Determine the profit on the contract for the year 2010-2011 on prudent basis, which has to be credited to Costing P/L A/c.

Solution

MNP Construction Ltd.
Contract Account (1st April, 2010 to 31st March, 2011)

Dr. Cr.

Particulars		*Amount (₹)*	*Particulars*	*Amount (₹)*
Materials issued		3,00,000	By Plant returned to store (*Refer to working note 1*)	37,500
Labour : Paid	2,00,000			
Outstanding	20,000	2,20,000	By Materials at site	20,000
To Plant purchased		1,50,000	By Work certified	8,00,000
			By Work uncertified	25,000
To Expenses (*Refer to working note 4*)		60,000	By Plant at site	75,000
To Notional profit c/d		2,27,500	(*Refer to working note 2*)	
		9,57,500		9,57,500
To Costing P & L A/c (*Refer to working note 5*)		66,322	By Notional profit b/d	2,27,500
To Work in Progress A/c *(Profit in reserve)*		1,61,178		
		2,27,500		2,27,500

MNP Construction Ltd.
Contract Account (1st April, 2010 to 31st December, 2011)
(For computing estimated profit)

Dr. Cr.

Particulars	*Amount (₹)*	*Particulars*	*Amount (₹)*
To Materials issued (₹ 3,00,000 + ₹5,50,000)	8,50,000	By Materials at site	50,000
		By Plant returned to store on 31st March, 2011 *(Refer to working note 1)*	37,500
To Labour (*paid & outstanding*) (₹ 2,20,000 + ₹ 2,30,000 + ₹ 30,000)	4,80,000		
To Plant purchased	1,50,000	By Plant returned to store on 31st December, 2011	60,938
To Expenses	2,25,000		

(₹ 60,000 + ₹ 1,65,000)		(*Refer to working note 3*)	
To Estimated profit	1,93,438	By Contractee's A/c	17,50,000
	18,98,438		18,98,438

Working Notes :

1.	*Value of the plant returned to store on 31st March, 2011*	(*₹*)
	Historical cost of the plant returned	50,000
	Less : Depreciation @ 25% of WDV cost for 1 year	12,500
	Value of the plant returned to store on 31st March, 2011	37,500
2.	*Value of plant at site :*	(*₹*)
	Historical cost of the plant at site	1,00,000
	Less : Depreciation @ 25% of WDV cost for 1 year	25,000
	Value of the plant at site on 31st March, 2011	75,000
3.	*Value of the plant returned to store on 31st December, 2011*	(*₹*)
	Value of the plant on 31st March, 2011	75,000.00
	Less : Depreciation @ 25% of WDV for a period of 9 months	14,062.50
	Value of the plant on 31-12-2011	60,937.50
4.	*Expenses paid :*	(*₹*)
	Total expenses paid	75,000
	Less : Prepaid expenses at end	15,000
	Expenses paid for the year 2010-2011	60,000

5. Profit to be credited to Costing P/L A/c on 31st March, 2011 for the contract likely to be completed on 31st December, 2011

$$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{\text{Work certified}}{\text{Total Contract price}}$$

$$= ₹\ 1,93,438 \times \frac{6,00,000}{8,00,000} \times \frac{8,00,000}{17,50,000} = ₹\ 66,322$$

7.7 Summary

- *Contract costing:-*
  - *Accounts maintained as per contract wise.*

- *Some contract not complete within the Financial year so computation of profit are main point so profit computation is as follow:-.*

the case of incomplete contracts, the following four situations may arise:

(i) Completion of contract is less than 25 per cent: No profit should be taken to profit and loss account.

(ii) Completion of contract is 25 per cent or more but less than 50 per cent:

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(iii) Completion of contract is 50 per cent or more but less than 90 per cent:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(iv) Completion of contract is 90 per cent or more i.e. it is nearing completion:

(a) $$\text{Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

(b) $$\text{Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

OR

$$\text{Estimated Profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

(c) $$\text{Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}}$$

(d) $$\text{Estimated Profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(e) $$\text{Notional Profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

8

Operating Costing

Learning Objectives

When you have finished studying this chapter, you should be able to

- Understand the meaning and distinctive features of Operating Costing
- Understand the units used in different service industries
- Understand the meaning of multiple costing.

8.1 Meaning of Operating Costing

Operating Costing is a method of ascertaining costs of providing or operating a service. This method of costing is applied by those undertakings which provide services rather than production of commodities. The emphasis under operating costing is on the ascertainment of cost of services rather than on the cost of manufacturing a product. This costing method is usually made use of by transport companies, gas and water works departments, electricity supply companies, canteens, hospitals, theatres, schools etc.

CIMA (London) defined operating costing as "that form of operation costing which applies where standardised services are rendered either by an undertaking or by a service cost centre within an undertaking."

8.2 Unit of Cost in Operating Costing

For computing the operating cost, it is necessary to decide first, *about the unit* for which the cost is to be computed, this may often require the study of some technical and operating data, for finding out the factors which have a bearing on cost. Cost units are usually the units of physical measurement like number, weight, area, volume, length, time and value. The followings are the examples of cost units used in operating costing:

Service industry	Unit of cost used
Transport Services	Passenger- km., (In public transportation) Quintal- km., or Tonne- km. (In goods carriage)
Supply service	Kilowatt- hour (kWh) (In power generation & distribution)

	Cubic feet (In water supply) per kg., per litre.
Hospital	Patient per day, room per day or per bed, per operation etc.
Canteen	Per item, per meal etc.
Cinema	Per ticket.

Composite Cost Unit: Some time two measurement units are combined together to know the cost of service or operation. These are called composite cost units. For example a public transportation undertaking would measure the operating cost per passenger per kilometre.

Examples of Composite units are Tonne- km., Quintal- km, Passenger-km., Patient-day etc. Composite unit may be computed in two ways.

(i) Absolute (Weighted Average) Tonne-km., Quintal- km. etc.

(ii) Commercial (Simple Average) Tonne-km., Quintal- km. etc.

(i) Absolute (Weighted Average) Tonne-km.: Absolute tonne-km., are the sum total of tonne-km., arrived at by multiplying various distances by respective load quantities carried.

$$\sum(\text{Weight Carried} \times \text{Distance})_1 + (\text{Weight Carried} \times \text{Distance})_2 + \ldots + (\text{Weight Carried} \times \text{Distance})_n$$

(ii) Commercial (Simple Average) Tonne-km.: Commercial tonne-km., are arrived at by multiplying total distance km., by average load quantity.

$$\sum(\text{Distance}_1 + \text{Distance}_2 + \ldots\ldots\ldots\ldots + \text{Distance}_n) \times \left(\frac{W_1 + W_2 + \ldots\ldots\ldots + W_n}{n}\right)$$

Note: To understand the concept of absolute tonne-km., and commercial tonne-km., students should refer to the following illustration.

Illustration 1 (Computation of absolute tonne-km. and commercial tonne-km.)

A lorry starts with a load of 20 tonnes of goods from station A. It unloads 8 tonnes at station B and rest of goods at station C. It reaches back directly to station A after getting reloaded with 16 tonnes of goods at station C. The distance between A to B, B to C and then from C to A are 80 km., 120 km., and 160 km., respectively. Compute 'Absolute tonne-km.,' and 'Commercial tonnes-km.

Solution:

Absolute tonne-km. =

A to B	(20 tonne × 80 km.)	1,600 tonne-km.
B to C	(12 tonne × 120 km.)	1,440 tonne-km.
C to A	(16 tonne × 160 km.)	2,560 tonne-km.
		5,600 tonne-km.

Commercial tonne-km. = Average load × total kilometers travelled

$$= \left(\frac{20+12+16}{3}\right) \text{tonne} \times (80 \text{ km.} + 120 \text{ km.} + 160 \text{ km.})$$

= 16 tonne × 360 km. = 5,760 tonne-km.

8.3 Preparation of Cost Sheet under Operating Costing

For preparing a cost sheet under operating cost, costs are usually accumulated for a specified period viz., a month, a quarter, or a year etc.

All of the accumulated costs should be classified under the following three heads:

1. Fixed costs or Standing charges,
2. Variable costs or Running charges,
3. Semi-variable costs or Maintenance costs.

Note : In the absence of information about semi-variable costs, the costs may be shown under two heads only, i.e., fixed and variable.

$$\text{Operating Cost per unit} = \frac{\text{Total Operating Costs}}{\text{Total units of service}}$$

Treatment of Depreciation and Interest - Depreciation if related to efflux of time (e.g. useful life is say five years) are treated as fixed cost. On the other hand, if depreciation is related with the activity level (e.g. useful life is say 20,000 km.), it may be treated as variable cost.

If information about interest is explicitly given, it may be treated as fixed cost.

Illustration 2 (Calculation of bus fare to be charged from each passenger)

You have been given a permit to run a bus on a route of 20 km. long. The bus costs you ₹ 9,00,000. It has to be insured @ 3% p.a. and the annual tax will be ₹ 10,000. Garage rent is ₹ 10,000 p.m. Annual repairs will be ₹ 10,000 and the bus is likely to last for 5 years and at the end of which the scrap value is likely to be ₹ 60,000.

The driver's salary will be ₹ 1,500 p.m. and the conductor's ₹ 1,000 together with 10% of the takings as commission (to be shared equally by both). Stationery will cost ₹ 500 p.m. The manager-cum-accountant's salary will be ₹ 3,500 p.m.

Diesel and oil be ₹ 450 per hundred kilometres. The bus will make 3 round trips for carrying on the average 40 passengers on each trip. Assuming 15% profit on takings, calculate the bus fare to be charged from each passenger. The bus will work on the average 25 days in a month.

Solution:

Working Notes:

(i) Calculation of Depreciation of Bus (Per month)

$$= \frac{\text{Cost of the bus} - \text{Scrap value at the end of the 5 years}}{\text{Expected life of the bus}}$$

$$= \frac{₹9,00,000 - ₹60,000}{5 \text{ years}}$$

= ₹ 1,68,000 p.a.

Depreciation per month = $\frac{₹1,68,000}{12 \text{ months}} = ₹14,000$

(ii) Calculation of total distance travelled and Passenger-km. per month

Total distance = 3 trips × 2 × 20 k.m. × 25 days = 3,000 k.m.

Total Passenger-km. = 3 trips × 2 × 20 k.m. × 25 days × 40 passengers

= 1,20,000 Passenger-k.m.

(iii) Cost of Diesel & oil (Per month)

Diesel and Oil = $\frac{\text{Total distance travelled}}{100 \text{ K.m.}} \times ₹450$

$= \frac{3,000 \text{ K.m.}}{100 \text{ K.m.}} \times ₹450$

= ₹ 13,500

Statement showing the Operating Cost per Passenger-km.

	(₹)	(₹)
(i) Standing Charges:		
Depreciation {Working Note- (i)}	14,000	
Insurance Charge $\left(\frac{₹9,00,000}{12} \times 3\%\right)$	2,250	
Manager-cum-accountant's salary	3,500	
Annual Tax (p.m.) $\left(\frac{₹10,000}{12}\right)$	833.33	
Garage Rent	10,000	30,583.33

(ii)	***Maintenance Charges:***		
	Repair & Maintenance per month $\left(\frac{₹10,000}{12}\right)$		833.33
(iii)	***Running Cost:***		
	Driver's Salary	1,500	
	Conductor's Salary	1,000	
	Stationery	500	
	Diesel and oil {Working Note- (iii)}	13,500	
	Total running cost before deducting commission to driver and conductor	16,500	16,500
	Total cost excluding commission to driver and conductor		47,916.66
	Driver's commission on collection*		3,194.45
	Conductor's commission on collection*		3,194.44
	Total Cost {(i) +(ii) + (iii)}		54,305.55
	Add: Profit**		9,583.33
	Total Collection		63,888.88

Working note:

Total costs before commission on collection and net profit is ₹ 47,916.66.

Commission on collection to driver and conductor is 10% of collection and Profit is 15% of collection means

100% - (10% + 15%) i.e. 75% = ₹ 47,916.66

So, Total collection $= \frac{₹47,916.66}{75} \times 100 = ₹63,888.88$

*Total Commission on collection = 10% × ₹ 63,888.88 = ₹ 6,388.89

Driver's share = 50% × ₹ 6,388.89 = ₹ 3,194.45

Conductor's share = 50% × ₹ 6,388.89 = ₹3,194.44

** Profit on collection = ₹ 63,888.88 × 15% = ₹ 9,583.33

$$\text{Fare per Passenger-km.} = \frac{\text{Total Collection}}{\text{Total Passenger - km. \{Working Note (ii)\}}}$$

$$= \frac{₹\ 63,888.88}{1,20,000}$$

$$= ₹\ 0.53 \text{ (appx.)}$$

Illustration 3 (Calculation of average cost per student per month)

SMC is a public school having five buses each plying in different directions for the transport of its school students. In view of a larger number of students availing of the bus service the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The work-load of the students has been so arranged that in the morning the first trip picks up senior students and the second trip plying an hour later picks up the junior students. Similarly in the afternoon the first trip takes the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 km. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all 12 months in a year.

The details of expenses for a year are as under :

Driver's salary	*₹ 4,500 per month per driver*
Cleaner's salary	*₹ 3,500 per month*
(Salary payable for all 12 months)	
(one cleaner employed for all the five buses)	
Licence fee, taxes, etc.	*₹ 8,600 per bus per annum*
Insurance	*₹ 10,000 per bus per annum*
Repairs & maintenance	*₹ 35,000 per bus per annum*
Purchase price of the bus	*₹ 15,00,000 each*
Life of each bus	*12 years*
Scrap value of buses at the end of life	*₹ 3,00,000*
Diesel cost	*₹ 45.00 per litre*

Each bus gives an average mileage of 4 km. per litre of diesel.

Seating capacity of each bus is 50 students.

The seating capacity is fully occupied during the whole year.

Students picked up and dropped within a range upto 4 km. of distance from the school are charged half fare and fifty per cent of the students travelling in each trip are in this category.

Ignore interest. Since the charges are to be based on average cost you are required to :

(i) Prepare a statement showing the expenses of operating a single bus and the fleet of five buses for a year.

(ii) Work out the average cost per student per month in respect of –

(A) students coming from a distance of upto 4 km. from the school and

(B) students coming from a distance beyond 4 km. from the school.

Solution:

(i) Statement of Expenses of operating bus/ buses for a year

Particulars	Rate (₹)	Per Bus per annum (₹)	Fleet of 5 buses p.a. (₹)
(i) Standing Charges:			
Driver's salary	4,500 p.m.	54,000	2,70,000
Cleaner's salary	3,500 p.m.	8,400	42,000
Licence fee, taxes etc.	8,600 p.a.	8,600	43,000
Insurance	10,000 p.a.	10,000	50,000
Depreciation (15,00,000 – 3,00,000) ÷ 12 yrs	1,00,000 p.a.	1,00,000	5,00,000
(ii) Maintenance Charges:			
Repairs & maintenance	35,000 p.a.	35,000	1,75,000
(iii) Operating Charges:			
Diesel (Working Note 1)		1,62,000	8,10,000
Total Cost [(i) + (ii) + (iii)]		3,78,000	18,90,000
Cost per month		31,500	1,57,500
Total no. of equivalent students		150	750
Total Cost per half fare equivalent student		₹ 210	₹ 210

(ii) Average cost per student per month:

A. Students coming from distance of upto 4 km. from school

$$= \frac{\text{Total cost per month}}{\text{Total no. of equivalent students}} = \frac{₹31,500}{150 \text{ students}} = ₹210$$

B. Students coming from a distance beyond 4 km. from school

= Cost of per half fare student × 2 = ₹ 210 × 2 = ₹ 420

Working Notes :

1. Calculation of diesel cost per bus :

Distance travelled in a year	: (8 round trip × 8 km. × 25 days × 9 months)
Distance travelled p.a.	: 14,400 km.
Cost of diesel (per bus p.a.)	: $\frac{14,400 \text{km.}}{4 \text{kmpl}} \times ₹45 =$ ₹1,62,000

2. Calculation of Equivalent number of students per bus :

Seating capacity of a bus	50 students
Half fare students (50% of 50 students)	25 students
Full fare students (50% of 50 students)	25 students
Total number of students equivalent to half fare students	
Full fare students (25 students × 2)	50 students
Add: Half fare students	25 students
Total Equivalent number of students in a trip	75 students
Total number of equivalent students in two trips (Senior + Junior)	150 students

Illustration 4 (Computation of cost per absolute tonne-km. and profit for the month)

Global Transport Ltd. charges ₹ 90 per ton for its 6-tonnes truck lorry load from city 'A' to city 'B'. The charges for the return journey are ₹ 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station 'C'. In January 2012, the truck made 12 outward journeys for city 'B' with full load out of which 2 tons were unloaded twice in the way at city 'C'. The truck carried a load of 8 tonnes in its return journey for 5 times but was once caught by police and ₹ 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city 'C', but it returned without any load once only from 'C' station to 'A' station. The distance from city 'A' to city 'C' and city 'B' are 140 km. and 300 km. respectively.

Annual fixed costs and maintenance charges are ₹ 60,000 and ₹ 12,000 respectively. Running charges spent during January 2012 are ₹ 2,944.

You are required to find out the cost per absolute tonne-kilometre and the profit for January, 2012.

Solution:

Calculation of total monthly cost for running truck.

	Amount per annum (₹)	Amount per month (₹)
(i) *Standing Charges:*		
Annual fixed costs	60,000	5,000
(ii) *Maintenance Charges:*	12,000	1,000
(iii) *Running Cost:*		
Running charges		2,944
Total monthly cost		8,944

Cost per absolute tonne-km. = $\frac{₹\,8,944}{44,720\,\text{tonne}-\text{km.}}$ = ₹ 0.20

(Refer to working note)

Calculation of profit for the month of January 2012:

	(₹)	(₹)
Truck hire charges received during the month:		
From Outward journey (12 trips × 6 tonne × ₹ 90)	6,480	
From return journey {(5 trips × 8 tonne × ₹ 84) + (7 trips × 6 tonne × ₹ 84)}	6,888	13,368
Less: Monthly running cost	8,944	
Fine paid for overloading	1,200	(10,144)
Profit earned for the month		3,224

Working Notes:

Calculation of Absolute Tonne-km:

	Tonne-km.	Tonne-km.
Outward journeys:		
From city A to city B (10 journey × 300 km. × 6 tonne)	18,000	
From city A to city C (2 journeys × 140 km. × 6 tonne)	1,680	
From city C to city B (2 journeys × 160 km. × 4 tonne)	1,280	20,960
Return journeys:		
From city B to city A (5 journeys × 300 km. × 8 tonne)	22,800	

+ (6 journeys × 300 km. × 6 tonne)		
From city B to city C (1 journey × 160 km.. × 6 tonne)	960	23,760
Total Absolute Tonne-km		44,720

Note: (i) While calculating absolute tonne-km., actual load carried are considered irrespective of the fact it attracts fines or penalty. (ii) Fine paid for overloading is an abnormal expenditure and is not included in the operating cost of the bus. This amount will be debited to Costing Profit and Loss A/c.

Illustration 5 (Calculation of fare to be charged from passengers from different routes)

Mr. X owns a bus which runs according to the following schedule:

(i)	*Delhi to Chandigarh and back, the same day.*	
	Distance covered:	*250 km. one way.*
	Number of days run each month :	*8*
	Seating capacity occupied	*90%.*
(ii)	*Delhi to Agra and back, the same day.*	
	Distance covered:	*210 km. one way*
	Number of days run each month :	*10*
	Seating capacity occupied	*85%*
(iii)	*Delhi to Jaipur and back, the same day.*	
	Distance covered:	*270 km. one way*
	Number of days run each month :	*6*
	Seating capacity occupied	*100%*
(iv)	*Following are the other details:*	
	Cost of the bus	*₹ 12,00,000*
	Salary of the Driver	*₹ 24,000 p.m.*
	Salary of the Conductor	*₹ 21,000 p.m.*
	Salary of the part-time Accountant	*₹ 5,000 p.m.*
	Insurance of the bus	*₹ 4,800 p.a.*
	Diesel consumption 4 km. per litre at	*₹ 56 per litre*
	Road tax	*₹ 15,915 p.a.*
	Lubricant oil	*₹ 10 per 100 km.*
	Permit fee	*₹ 315 p.m.*
	Repairs and maintenance	*₹ 1,000 p.m.*
	Depreciation of the bus	*@ 20% p.a.*
	Seating capacity of the bus	*50 persons.*

Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 30% on total takings. The fares are to be indicated per passenger for the journeys:

(i) Delhi to Chandigarh (ii) Delhi to Agra and (iii) Delhi to Jaipur.

Solution:

Working Notes:

Total Distance (in km.) covered per month

Bus route	Km. per trip	Trips per day	Days per month	Km. per month
Delhi to Chandigarh	250	2	8	4,000
Delhi to Agra	210	2	10	4,200
Delhi to Jaipur	270	2	6	3,240
				11,440

Passenger- km. per month

	Total seats available per month (at 100% capacity)	Capacity utilised		Km. per trip	Passenger- Km. per month
		(%)	Seats		
Delhi to Chandigarh & Back	800 (50 seats × 2 trips × 8 days)	90	720	250	1,80,000 (720 seats × 250 km.)
Delhi to Agra & Back	1,000 (50 seats × 2 trips × 10 days)	85	850	210	1,78,500 (850 seats × 210 km.)
Delhi to Jaipur & Back	600 (50 seats × 2 trips × 6 days)	100	600	270	1,62,000 (600 seats × 270 km.)
Total					5,20,500

Monthly Operating Cost Statement

	(₹)	(₹)
(i) Running Costs		
- Diesel {(11,440 km ÷ 4 km) × ₹ 56}	1,60,160	
- Lubricant oil {(11,440 km ÷ 100) × ₹ 10}	1,144	1,61,304
(ii) Maintenance Costs		
- Repairs & Maintenance		1,000

(iii) Standing charges		
- Salary to driver	24,000	
- Salary to conductor	21,000	
- Salary of part-time accountant	5,000	
- Insurance (₹ 4,800 ÷12)	400	
- Road tax (₹ 15,915 ÷12)	1,326.25	
- Permit fee	315	
- Depreciation {(₹ 12,00,000 × 20%) ÷ 12}	20,000	72,041.25
Total costs per month before Passenger Tax (i)+(ii)+(iii)		2,34,345.25
Passenger Tax*		93,738.10
Total Cost		3,28,083.35
Add: Profit*		1,40,607.15
Total takings per month		4,68,690.50

*Let, total takings be X then

X = Total costs per month before passenger tax + 0.2 X (passenger tax) + 0.3 X (profit)

X = ₹ 2,34,345.25 + 0.2 X + 0.3 X

0.5 X = ₹ 2,34,345.25 or, X = ₹4,68,690.50

Passenger Tax = 20% of ₹4,68,690.50 = ₹ 93,738.10

Profit = 30% of ₹4,68,690.50 = ₹ 1,40,607.15

Calculation of Rate per passenger km. and fares to be charged for different routes

$$\textbf{Rate per Passenger-Km.} = \frac{\text{Total takings per month}}{\text{Total Passenger} - \text{Km. per month}}$$

$$= \frac{₹\,4,68,690.50}{5,20,500\,\text{Passenger} - \text{Km.}} = ₹\ 0.90$$

Bus fare to be charged per passenger.

Delhi to Chandigarh	= ₹ 0.90 × 250 km	=	₹ 225.00
Delhi to Agra	= ₹ 0.90 × 210 km	=	₹ 189.00
Delhi to Jaipur	= ₹ 0.90 × 270 km	=	₹ 243.00

Illustration 6 (Evaluation of conveyance facilities)

A company is considering three alternative proposals for conveyance facilities for its sales personnel who has to do considerable traveling, approximately 20,000 kilometres every year. The proposals are as follows:

(i) Purchase and maintain its own fleet of cars. The average cost of a car is ₹ 6,00,000.

(ii) Allow the Executive use his own car and reimburse expenses at the rate of ₹ 10 per kilometer and also bear insurance costs.

(iii) Hire cars from an agency at ₹ 1,80,000 per year per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available:

Petrol ₹6 per km.	*Repairs and maintenance ₹0.20 per km.*
Tyre ₹0.12 per km.	*Insurance ₹ 1,200 per car per annum*
Taxes ₹ 800 per car per annum	*Life of the car: 5 years with annual mileage of 20,000 km.*

Resale value: ₹ 80,000 at the end of the fifth year.

Work out the relative costs of three proposals and rank them.

Solution:

Calculation of relative costs of three proposals and their ranking

	per annum (₹)	I Use of company's car per km. (₹)	II Use of own car per km. (₹)	III Use of hired car per km. (₹)
Reimbursement		--	10.00	9.00*
Fixed cost:				
Insurance	1,200	0.06	0.06	--
Taxes	800	0.04	--	0.04
Depreciation (₹ 6,00,000 - ₹80,000) ÷ 5 year	1,04,000	5.20	--	--

Running and Maintenance Cost:				
Petrol	--	6.00	--	6.00
Repairs and Maintenance	--	0.20	--	--
Tyre	--	0.12	--	0.12
Total cost per km.	--	11.62	10.06	15.16
Cost for 20,000 km.		2,32,400	2,01,200	3,03,200
Ranking of proposals		**II**	**I**	**III**

* (₹ 1,80,000 ÷ 20,000 km.)

The Second alternative i.e., use of own car by the executive and reimbursement of expenses by the company is the best alternative from company's point of view.

Illustration 7 (Calculation of cost of per kWh by a power generation company)

From the following data pertaining to the year 2014-15 prepare a cost statement showing the cost of electricity generated per kwh by Chambal Thermal Power Station.

Total units generated	*10,00,000 kwh*
	(₹)
Operating labour	*15,00,000*
Repairs & maintenance	*5,00,000*
Lubricants, spares and stores	*4,00,000*
Plant supervision	*3,00,000*
Administration overheads	*20,00,000*

5 kwh. of electricity generated per kg. of coal consumed @₹ 4.25 per kg. Depreciation charges @ 5% on capital cost of ₹2,00,00,000.

Solution

Cost Statement of Chambal Thermal Power Station

Total units generated 10,00,000 kwh.

	Per annum (₹)	**Per k.w.h. (₹)**
Fixed costs :		
Plant supervision	3,00,000	
Administration overheads	20,00,000	
Depreciation (5% of ₹ 2,00,00,000 p.a.)	10,00,000	
Total fixed cost: (A)	33,00,000	3.30

Variable costs:		
Operating labour	15,00,000	
Lubricants, spares and stores	4,00,000	
Repairs & maintenance	5,00,000	
Coal cost (Refer to working note)	8,50,000	
Total variable cost: (B)	32,50,000	3.25
Total cost [(A) + (B)]	65,50,000	6.55

Working Note:
Coal cost (10,00,000 kwh. ÷ 5 kwh) × ₹ 4.25 per kg. = ₹ 8,50,000

8.4 Standard Load

An alternative unit for the distribution of transport cost is the 'standard load'. Where the goods to be transported are of varying bulk and weight, the calculation of actual number of tonne-kilometres is not an easy matter. For example, if a business delivers its own products by its own transport, the cost per tonne-kilometres may be most misleading, for an article may have a bulk which is twice that of the other, though of the same weight. In such a case 'standard load' is selected as the unit, *i.e.,* the load which a lorry would carry. This would have reference both to bulk and weight and would give an efficient method for distributing the cost of transport over different departments. Thus, if the turnover of various departments is reduced to 'standard load' by first calculating their weight and then the bulk of article produced, the costs of distributing the product would be easily ascertained.

This principle also can be extended for associating cost with convenient units of service rendered by an organisation so that management is able to judge whether the organisation is running efficiently and in the manner in which the service requires to be improved or be made more economical. The cost of generation of electricity on the same principle is correlated with units generated and also with units sold; in hospitals the cost of their maintenance is co-related to units of 'available bed-days'.

8.5 Multiple Costing

It refers to the method of costing followed by a business wherein a large variety of articles are produced, each differing from the other both in regard to material required and process of manufacture. In such cases, cost of each article is computed separately by using, generally, two or more methods of costing. For instance, for ascertaining the cost of a bicycle, cost of each part will be ascertained by using batch or job costing method and, then the cost of assembling the parts will be ascertained by following the method of single or output costing.

8.6 Summary

Operating Costing:- Used by those undertakings which provide services rather than producing commodities.

Cost units used in the following services undertaken as below:-

Transport service –	Passenger km., quintal km., or tonne km.
Supply service –	Kwh, Cubic metre, per kg., per litre.
Hospital –	Patient per day, room per day or per bed, per operation etc.
Canteen–	Per item, per meal etc.
Cinema –	Per ticket.

9

PROCESS & OPERATION COSTING

Learning Objectives

After studying this chapter, you should be able to

- Understand the meaning of Process and Operation costing
- Understand the accounting treatment required for normal and abnormal process losses
- Understand the treatment for abnormal gain
- Understand the treatment of inter process profit in the process accounts

9.1 Meaning of Process Costing

Process Costing is a method of costing used in industries where the material has to pass through two or more processes for being converted into a final product. It is defined as "a method of Cost Accounting whereby costs are charged to processes or operations and averaged over units produced". A separate account for each process is opened and all expenditure pertaining to a process is charged to that process account. Such type of costing method is useful in the manufacturing of products like steel, paper, medicines, soaps, chemicals, rubber, vegetable oil, paints, varnish etc. where the production process is continuous and the output of one process becomes the input of the following process till completion.

9.1.1 Basic features: Industries, where process costing can be applied, have normally one or more of the following features:

1. Each plant or factory is divided into a number of processes, cost centres or departments, and each such division is a stage of production or a process.
2. Manufacturing activity is carried on continuously by means of one or more process run sequentially, selectively or simultaneously.
3. The output of one process becomes the input of another process.
4. The end product usually is of like units not distinguishable from one another.
5. It is not possible to trace the identity of any particular lot of output to any lot of input materials. For example, in the sugar industry, it is impossible to trace any lot of sugar bags to a particular lot of sugarcane fed or *vice versa*.
6. Production of a product may give rise to Joint and/or By-Products.

9.1.2 Costing Procedure: The Cost of each process comprises the cost of :

(*i*) Materials (*ii*) Labour

(*iii*) Direct expenses, and (*iv*) Overheads of production.

Materials - Materials and supplies which are required for each process are drawn against material requisitions from stores. Each process for which the above drawn materials will be used should be debited with the cost of materials consumed on the basis of the information received from the Cost Accounting department. The finished product of first process generally become the raw materials of second process; under such a situation the account of second process, be debited with the cost of transfer from the first process and the cost of any additional material required under this second process.

Labour - Each process account should be debited with the labour cost or wages paid to labour for carrying out the processing activities. Sometimes the wages paid are apportioned over the different processes after selecting appropriate basis.

Direct expenses - Each process account should be debited with direct expenses like depreciation, repairs, maintenance, insurance etc. associated with it.

Overheads of production - Expenses like rent, power expenses, lighting bills, gas and water bills etc. are known as production overheads. These expenses cannot be allocated to a process. The suitable wayout to recover them is to apportion them over different processes by using suitable basis. Usually, these expenses are estimated in advance and the processes debited with these expenses on a pre-determined basis.

9.2 Operation Costing

It is defined as the refinement of process costing. It is concerned with the determination of the cost of each operation rather than the process. In those industries where a process consists of distinct operations, the method of costing applied or used is called operation costing. Operation costing offers better scope for control. It facilitates the computation of unit operation cost at the end of each operation by dividing the total operation cost by total output units.

Operation costing is just a variant of unit or output costing. The expenses of operating a service for a particular period are grouped under suitable headings and their total is divided by the number of service units for the same period and thus cost per unit of service is obtained.

The cost for a further period may be estimated on the basis of estimated service units and the estimated costs. This will help in fixing the price to be charged for the service units and the estimated cost.

Illustration 1: (Preparation of process cost accounts)

From the following data, prepare process accounts indicating the cost of each process and the total cost. The total units that pass through each process were 240 for the period.

	Process A (₹)	*Process B (₹)*	*Process C (₹)*
Materials	*1,500*	*500*	*200*
Labour	*800*	*2,000*	*600*
Other expenses	*260*	*720*	*250*

Indirect expenses amounting to ₹ 850 may be apportioned on the basis of wages. There was no opening or closing stock.

Solution:

Dr. **Process 'A' Account** *Cr.*

Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)
To Material	6.25	1,500	By Process 'B' A/c	11.50	2,760
" Labour	3.34	800	(Transfer to Process-B)		
" Other expenses	1.08	260			
" Indirect expenses*	0.83	200			
	11.50	2,760		11.50	2,760

Dr. **Process 'B' Account** *Cr.*

Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)
To Process-A A/c	11.50	2,760	By Process 'C' A/c	27.00	6,480
" Material	2.08	500	(Transfer to Process-C)		
" Labour	8.34	2,000			
" Other expenses	3.00	720			
" Indirect expenses*	2.08	500			
	27.00	6,480		27.00	6,480

Dr. **Process 'C' Account** *Cr.*

Particulars	Per unit (₹)	Total (₹)	Particulars	Per unit (₹)	Total (₹)
To Process-B A/c	27.00	6,480	By Finished Stock A/c	32.00	7,680
Material	0.83	200	(Transferred)		
" Labour	2.50	600			

"	Other expenses	1.04	250			
"	Indirect expenses*	0.63	150			
		32.00	7,680		32.00	7,680

* Apportionment of Indirect expenses among Process-A, Process-B and Process-C

Total Wages to processes (A +B +C) = ₹ 800 + ₹ 2,000 + ₹ 600 = ₹ 3,400

Apportionment to:

Process- A = $\frac{₹850}{₹3,400} \times ₹800 = ₹200$; Process- B = $\frac{₹850}{₹3,400} \times ₹2,000 = ₹500$ and

Process- C = $\frac{₹850}{₹3,400} \times ₹600 = ₹150$

9.3 Treatment of Normal Process Loss, Abnormal Process Loss And Abnormal Gain In Cost Accounting

Loss of material is inherent during processing operation. The loss of material under different processes arises due to reasons like evaporation or a change in the moisture content etc. Process loss is defined as the loss of material arising during the course of a processing operation and is equal to the difference between the input quantity of the material and its output.

There are two types of material losses viz. (*i*) Normal loss and (*ii*) Abnormal loss.

(i) ***Normal Process Loss*****:** It is defined as the loss of material which is inherent in the nature of work. Such a loss can be reasonably anticipated from the nature of the material, nature of operation, the experience and technical data. It is unavoidable because of nature of the material or the process. It also includes units withdrawn from the process for test or sampling.

Treatment in Cost Accounts : The cost of normal process loss in practice is absorbed by good units produced under the process. The amount realised by the sale of normal process loss units should be credited to the process account.

(ii) Abnormal Process Loss: It is defined as the loss in excess of the pre-determined loss (Normal process loss). This type of loss may occur due to the carelessness of workers, a bad plant design or operation, sabotage etc. Such a loss cannot obviously be estimated in advance. But it can be kept under control by taking suitable measures.

Treatment in Cost Accounts: The cost of an abnormal process loss unit is equal to the cost of a good unit. The total cost of abnormal process loss is credited to the process account from which it arises. Cost of abnormal process loss is not treated as a part of the cost of the

product. In fact, the total cost of abnormal process loss is debited to costing profit and loss account.

***(iii) Abnormal Process Gain*:** Sometimes, loss under a process is less than the anticipated normal figure. In other words, the actual production exceeds the expected figures. Under such a situation the difference between actual and expected loss or actual and expected production is known as abnormal gain. So abnormal gain may be defined as an unexpected gain in production under the normal conditions.

Treatment in Cost Accounts: The process account under which abnormal gain arises is debited with the abnormal gain and credited to abnormal gain account which will be closed by transferring to the Costing Profit and Loss account. The cost of abnormal gain is computed on the basis of normal production.

To be more clear about the above concepts we consider the following illustration.

Illustration 2: (Treatment of normal loss, abnormal loss and abnormal gain)

A product passes through three processes. The output of each process is treated as the raw material of the next process to which it is transferred and output of the third process is transferred to finished stock.

	1st Process (₹)	*2nd Process (₹)*	*3rd Process (₹)*
Materials issued	*40,000*	*20,000*	*10,000*
Labour	*6,000*	*4,000*	*1,000*
Manufacturing overhead	*10,000*	*10,000*	*15,000*

10,000 units have been issued to the 1st process and after processing, the output of each process is as under:

	Output	*Normal Loss*
1st Process	*9,750 units*	*2%*
2nd Process	*9,400 units*	*5%*
3rd Process	*8,000 units*	*10%*

No stock of materials or of work-in-progress was left at the end. Calculate the cost of the finished articles.

Solution:

Dr. **1st Process Account** *Cr.*

Particulars	Units	Total (₹)	Particulars	Units	Total (₹)
To Material	10,000	40,000	By Normal Loss A/c (2% of 10,000 units)	200	--

" Labour	--	6,000	" Abnormal Loss A/c (₹ 5.7142 × 50 units)	50	286
" Manufacturing OH	--	10,000	" 2nd Process A/c (₹ 5.7142 × 9,750 units)	9,750	55,714
	10,000	56,000		10,000	56,000

Cost per unit of completed units and abnormal loss:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹56,000}{10,000\text{ units} - 200\text{ units}} = ₹\ 5.7142$$

Dr. **2nd Process Account** *Cr.*

Particulars	Units	Total (₹)	Particulars	Units	Total (₹)
To 1st Process A/c	9,750	55,714	By Normal Loss A/c (5% of 9,750 units)	488	--
" Material	--	20,000	" 3rd Process A/c (₹ 9.6862 × 9,400 units)	9,400	91,051
" Labour	--	4,000			
" Manufacturing OH	--	10,000			
" Abnormal Gain A/c (₹ 9.6862 × 138 units)	138	1,337			
	9,888	91,051		9,888	91,051

Cost per unit of completed units and abnormal gain:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹89,714}{9,750\text{ units} - 488\text{ units}} = ₹\ 9.6862$$

Dr. **3rd Process Account** *Cr.*

Particulars	Units	Total (₹)	Particulars	Units	Total (₹)
To 2nd Process A/c	9,400	91,051	By Normal Loss A/c (10% of 9,400 units)	940	--
" Material	--	10,000	" Abnormal Loss A/c (₹13.8358 × 460 units)	460	6,364

" Labour	--	1,000	" Finished Stock A/c (₹13.8358 × 8,000 units)	8,000	1,10,687
" Manufacturing OH	--	15,000			
	9,400	1,17,051		9,400	1,17,051

Cost per unit of completed units and abnormal loss:

$$\frac{\text{Total Cost}}{\text{Inputs} - \text{Normal loss}} = \frac{₹1,17,051}{9,400\text{ units} - 940\text{ units}} = ₹13.8358$$

Illustration 3 (Preparation of process accounts)

RST Limited processes Product Z through two distinct processes – Process I and Process II. On completion, it is transferred to finished stock. From the following information for the year 2011-12, prepare Process I, Process II and Finished Stock A/c:

Particulars	***Process I***	***Process II***
Raw materials used	*7,500 units*	--
Raw materials cost per unit	*₹ 60*	--
Transfer to next process/finished stock	*7,050 units*	*6,525 units*
Normal loss (on inputs)	*5%*	*10%*
Direct wages	*₹ 1,35,750*	*₹ 1,29,250*
Direct Expenses	*60% of Direct wages*	*65% of Direct wages*
Manufacturing overheads	*20% of Direct wages*	*15% of Direct wages*
Realisable value of scrap per unit	*₹ 12.50*	*₹ 37.50*

6,000 units of finished goods were sold at a profit of 15% on cost. Assume that there was no opening or closing stock of work-in-progress.

Solution

Process I A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Raw material used (₹60 × 7,500 units)	7,500	4,50,000	By Normal loss (5% of 7,500 units)× ₹12.5	375	4,688
To Direct wages	--	1,35,750	By Process II A/c (₹96.7947 × 7,050 units)	7,050	6,82,403

To Direct expenses	--	81,450	By Abnormal loss (₹96. 7947 × 75 units)	75	7,259
To Manufacturing overhead		27,150			
	7,500	6,94,350		7,500	6,94,350

Cost per unit of completed units and abnormal loss: $\frac{\text{Total Cost} - \text{Realisable value from normal loss}}{\text{Inputs units} - \text{Normal loss units}}$

$= \frac{₹6,94,350 - ₹4,688}{7,500 \text{units} - 375 \text{ units}} = \frac{₹6,89,662}{7,125 \text{ units}} = ₹96.7947$

Process II A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process I A/c	7,050	6,82,403	By Normal loss (10% of 7,050 units)× ₹ 37.5	705	26,438
To Direct wages	--	1,29,250	By Finished Stock A/c (₹140.0496 × 6,525 units)	6,525	9,13,824
To Direct expenses	--	84,013			
To Manufacturing overhead	--	19,387			
To Abnormal gain (₹140.0496 × 180 units)	180	25,209			
	7,230	9,40,262		7,230	9,40,262

Cost per unit of completed units and abnormal loss: $\frac{\text{Total Cost} - \text{Realisable value from normal loss}}{\text{Inputs units} - \text{Normal loss units}}$

$= \frac{₹9,15,053 - ₹26,438}{7,050 \text{ units} - 705 \text{ units}} = \frac{₹8,88,615}{6,345 \text{ units}} = ₹140.0496$

Finished Goods Stock A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process II A/c	6,525	9,13,824	By Cost of Sales (₹140.0496 × 6,000 units)	6,000	8,40,298
			By Balance c/d	525	73,526
	6,525	9,13,824		6,525	9,13,824

Income Statement

Particulars	(₹)	Particulars	(₹)
To Cost of sales (₹140.0496 × 6,000 units)	8,40,298	By Abnormal gain {180 units × (₹140.0496 – ₹37.50)}	18,459
To Abnormal loss {75 units × (₹96.7947 – ₹12.50)}	6,322	By Sales (₹8,40,298 × 115%)	9,66,343
To Net Profit	1,38,182		
	9,84,802		9,84,802

9.4 Costing of Equivalent Production Units

In the case of process type of industries, it is possible to determine the average cost per unit by dividing the total cost incurred during a given period of time by the total number of units produced during the same period. But this is hardly the case in most of the process type industries where manufacturing is a continuous activity. The reason is that the cost incurred in such industries represents the cost of work carried on opening work-in-progress, closing work-in-progress and completed units. Thus to ascertain the cost of each completed unit it is necessary to ascertain the cost of work-in-progress in the beginning and at the end of the process.

The valuation of work-in-progress presents a good deal of difficulty because it has units under different stages of completion from those in which work has just begun to those which are only a step short of completion. Work-in-progress can be valued on actual basis, *i.e.,* materials used on the unfinished units and the actual amount of labour expenses involved. However, the degree of accuracy in such a case cannot be satisfactory. An alternative method is based on converting partly finished units into equivalent finished units.

Equivalent production means converting the incomplete production units into their equivalent completed units. Under each process, an estimate is made of the percentage completion of work-in-progress with regard to different elements of costs, *viz.,* material, labour and overheads. It is important that the estimate of percentage of completion should be as accurate as possible. The formula for computing equivalent completed units is:

$$\text{Equivalent completed units} = \begin{pmatrix} \text{Actual number of units in} \\ \text{the process of manufacture} \end{pmatrix} \times \begin{pmatrix} \text{Percentage of} \\ \text{Work completed} \end{pmatrix}$$

For instance, if 25% of work has been done on the average of units still under process, then 200 such units will be equal to 50 completed units and the cost of work-in-progress will be equal to the cost of 50 finished units.

9.4.1 Valuation of work-in-progress: For the valuation of work-in-progress following three methods are available :

a. First-in-First Out (FIFO) method.
b. Last-in-First Out (LIFO) method.
c. Average Cost method (or weighted average cost method).

(1) First-in-first-out method: Under this method the units completed and transferred include completed units of opening work-in-progress and subsequently introduced units. Proportionate cost to complete the opening work-in-progress and that to process the completely processed units during the period are derived separately. The cost of opening work-in-progress is added to the proportionate cost incurred on completing the same to get the complete cost of such units. Complete cost of such units plus cost of units completely processed constitute the total cost of units transferred. In this method the closing stock of Work in progress is valued at current cost.

Illustration 4: (Computation of equivalent production and cost per equivalent unit under FIFO method)

Opening work-in-progress 1,000 units (60% complete); Cost ₹ 1,100. Units introduced during the period 10,000 units; Cost ₹ 19,300. Transferred to next process - 9,000 units.

Closing work-in-progress - 800 units (75% complete). Normal loss is estimated at 10% of total input including units in process at the beginning. Scrap realise ₹1 per unit. Scraps are 100% complete.

Compute equivalent production and cost per equivalent unit. Also evaluate the output.

Solution:

Statement of Equivalent Production Units (Under FIFO Method)

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	1,000	From opening W-I-P	1,000	40	400
Units introduced	10,000	From fresh inputs	8,000	100	8,000
		Units completed (Transferred to next process)	9,000		
		Normal Loss {10% (1,000 + 10,000 units)}	1,100	--	--
		Closing W-I-P	800	75	600
		Abnormal loss (Balancing figure)	100	100	100
	11,000		11,000		9,100

Computation of cost per equivalent production unit :

Cost of the Process (for the period)	₹19,300
Less: Scrap value of normal loss (₹ 1 × 1,100 units)	(₹1,100)
Total process cost	₹ 18,200

Cost per equivalent unit = $\frac{₹18,200}{9,100 \text{ units}}$ = ₹ 2

Statement of Evaluation

Particulars		Equivalent Units (EU)	Cost per EU (₹)	Amount (₹)
(i)	Opening W-I-P completed	400	2.00	800
	Add: Cost of W-I-P	--	--	1,100
	Complete cost of 1,000 units of opening W-I-P	1,000	1.90	1,900
(ii)	Completely processes units	8,000	2.00	16,000
(iii)	Abnormal Loss	100	2.00	200
(iv)	Closing W-I-P	600	2.00	1,200

(2) ***Last-in first-out Method*****:** According to this method units lastly entering in the process are the first to be completed. This assumption has a different impact on the costs of the completed units and the closing inventory of work-in-progress. The completed units will be shown at their current cost and the closing inventory of work-in-progress will continue to appear at the cost of the opening inventory of work-in-progress.

It may be noted that Last in First out (LIFO) is not permitted under Accounting Standard (AS)-2: Valuation of Inventories. However for the purpose of academic knowledge LIFO method is included in this Study Material

Illustration 5: (Computation of equivalent production and cost per equivalent unit under LIFO method)

From the following information relating to the month of April 2015, calculate the equivalent production units and the value of finished production and work-in-progress, using the LIFO method.

Opening work-in-progress on 1st April: 5,000 units; 50% complete.

Cost	*(₹)*
Materials	*6,000*
Labour	*8,000*
Overheads	*8,000*
	22,000

Units introduced into the process : 10,000.

Cost	*(₹)*
Materials	*30,000*
Labour	*52,500*
Overheads	*70,000*
	1,52,500

During the period 7,500 units were completed and transferred to the next process. Closing work-in-progress on 30th April: 7,500 units, 50% complete.

Solution:

(i) **Statement of Equivalent Production Units (Under LIFO Method)**

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	5,000	From fresh units (Units completed and transferred to next process)	7,500	100	7,500
Units introduced	10,000	Closing W-I-P:			
		-From fresh units	2,500	50	1,250
		-From Opening W-I-P*	5,000	--	--
	15,000		15,000		8,750

* Since the units in the opening work in process were already 50% complete; no work has been done on these units during the period.

(ii) **Cost per unit of equivalent production** = $\frac{₹\ 1,52,500}{8,750 \text{ units}}$ =₹ 17.43

Valuation of finished production and WIP:

1.	Finished Production (7,500 units × ₹ 17.43)	₹ 1,30,725.00
2.	Closing W-I-P {₹ 22,000 + (1,250 units × ₹17.43)}	₹ 43,787.50

(3) ***Average Cost Method*** **:** Under this method, the cost of opening work-in-progress and cost of the current period are aggregated and the aggregate cost is divided by output in terms of completed units. The equivalent production in this case consists of work-load already contained in opening work-in-process and work-load of current period.

The main difference between FIFO method and average method is that units of opening work in progress and their cost are taken in full under average method while under FIFO method only the remaining work done now is considered.

Illustration 6: (Computation of equivalent production and cost per equivalent unit under Average cost method)

*Refer to information provided in **Illustration 4** above and solve this by Average Cost Method.*

Solution:

Statement of Equivalent Production Units (Under Average Cost Method)

Particulars	Input units	Particulars	Output units	Equivalent Production	
				(%)	Equivalent units
Opening W-I-P	1,000	Units completed (Transferred to next process)	9,000	100	9,000
Units introduced	10,000	Normal Loss {10% (1,000 + 10,000 units)}	1,100	--	--
		Closing W-I-P	800	75	600
		Abnormal loss (Balancing figure)	100	100	100
	11,000		11,000		9,700

Computation of cost per equivalent production unit :

Cost of Opening W-I-P	₹ 1,100
Cost of the Process (for the period)	₹19,300
Less: Scrap value of normal loss (₹ 1 × 1,100 units)	(₹1,100)
Total process cost	₹ 19,300

$$\text{Cost per equivalent unit} = \frac{₹19,300}{9,700 \text{ units}} = ₹ 1.99$$

Statement of Evaluation

Particulars	Equivalent Units (EU)	Cost per EU (₹)	Amount (₹)
(i) Units Completed and transferred to next process	9,000	1.99	17,910

(ii) Abnormal Loss	100	1.99	199
(iii) Closing W-I-P	600	1.99	1,194

Illustration 7: (Computation of equivalent production and cost per equivalent unit under Average cost method)

Following information is available regarding process A for the month of February, 2015 :

Production Record:	
Units in process as on 1.2.2015	*4,000*
(All materials used, 25% complete for labour and overhead)	
New units introduced	*16,000*
Units completed	*14,000*
Units in process as on 28.2.2015	*6,000*
(All materials used, 33-1/3% complete for labour and overhead)	
Cost Records:	
Work-in-process as on 1.2.2015	*(₹)*
Materials	*6,000*
Labour	*1,000*
Overhead	*1,000*
	8,000
Cost during the month	
Materials	*25,600*
Labour	*15,000*
Overhead	*15,000*
	55,600

Presuming that average method of inventory is used, prepare:

(i) Statement of equivalent production.
(ii) Statement showing cost for each element.
(iii) Statement of apportionment of cost.
(iv) Process cost account for Process A.

Solution

(i) Statement of equivalent production (Average cost method)

Particulars	Input Units	Particulars	Output Units	Equivalent Production			
				Material		Labour & O.H.	
				%	Units	%	Units
Opening WIP	4,000	Completed and transferred	14,000	100	14,000	100	14,000

Units introduced	16,000	Closing WIP	6,000	100	6,000	*33-1/3*	2,000
	20,000		20,000		20,000		16,000

(ii) Statement showing cost for each element

Particulars	Materials (₹)	Labour (₹)	Overhead (₹)	Total (₹)
Cost of opening work-in-progress	6,000	1,000	1,000	8,000
Cost incurred during the month	25,600	15,000	15,000	55,600
Total cost : (A)	31,600	16,000	16,000	63,600
Equivalent units : (B)	20,000	16,000	16,000	
Cost per equivalent unit : (C) = (A ÷ B)	1.58	1	1	3.58

(iii) Statement of apportionment of cost

	Amount (₹)	Amount (₹)
1. Value of units completed and transferred (14,000 units × ₹ 3.58)		50,120
2. Value of Closing W-I-P:		
- Materials (6,000 units × ₹ 1.58)	9,480	
- Labour (2,000 units × ₹ 1)	2,000	
- Overheads (2,000 units × ₹ 1)	2,000	13,480

(iv) Process A Cost Account

Particulars	Units	(₹)	Particulars	Units	(₹)
To Opening W-I-P	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing W-I-P	6,000	13,480
To Labour	--	15,000			
To Overhead	--	15,000			
	20,000	63,600		20,000	63,600

Illustration 8: (Treatment of scrap and its realisable value under Average cost method)

Following details are related to the work done in Process 'A' XYZ Company during the month of March, 2015:

	(₹)
Opening work-in progress (2,000 units)	
Materials	*80,000*
Labour	*15,000*
Overheads	*45,000*

Materials introduced in Process 'A' (38,000 units)	*14,80,000*
Direct Labour	*3,59,000*
Overheads	*10,77,000*

Units scrapped : 3,000 units

Degree of completion :
Materials *100%*
Labour and overheads *80%*

Closing work-in progress : 2,000 units

Degree of completion :
Materials *100%*
Labour and overheads *80%*

Units finished and transferred to Process 'B' : 35,000 units

Normal Loss :

5% of total input including opening work-in-progress.
Scrapped units fetch ₹ 20 per piece.

You are required to prepare :

(i) Statement of equivalent production

(ii) Statement of cost

(iii) Statement of distribution cost, and

(iv) Process 'A' Account, Normal Loss Account and Abnormal Loss Account.

Solution

(i) Statement of Equivalent Production

Particulars	Input Units	Particulars	Output Units	Equivalent Production			
				Material		Labour & O.H.	
				%	Units	%	Units
Opening WIP	2,000	Completed and transferred to Process B	35,000	100	35,000	100	35,000
Units introduced	38,000	Normal Loss (5% of 40,000)	2,000	--	--	--	--
		Abnormal loss (Balancing figure)	1,000	100	1,000	80	800
		Closing WIP	2,000	100	2,000	80	1,600
	40,000		40,000		38,000		37,400

(ii) Statement showing cost for each element

Particulars	Materials (₹)	Labour (₹)	Overhead (₹)	Total (₹)
Cost of opening work-in-progress	80,000	15,000	45,000	1,40,000
Cost incurred during the month	14,80,000	3,59,000	10,77,000	29,16,000
Less: Realisable Value of normal scrap (₹ 20 × 2,000 units)	(40,000)	--	--	(40,000)
Total cost : (A)	15,20,000	3,74,000	11,22,000	30,16,000
Equivalent units : (B)	38,000	37,400	37,400	
Cost per equivalent unit : (C) = (A ÷ B)	40.00	10.00	30.0	80.00

(iii) Statement of Distribution of cost

	Amount (₹)	Amount (₹)
1. Value of units completed and transferred (35,000 units × ₹ 80)		28,00,000
2. Value of Abnormal Loss:		
- Materials (1,000 units × ₹ 40)	40,000	
- Labour (800 units × ₹ 10)	8,000	
- Overheads (800 units × ₹ 30)	24,000	72,000
3. Value of Closing W-I-P:		
- Materials (2,000 units × ₹ 40)	80,000	
- Labour (1,600 units × ₹ 10)	16,000	
- Overheads (1,600 units × ₹ 30)	48,000	1,44,000

(iv) Process A A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Opening W.I.P:			By Normal Loss (₹20 × 2,000 units)	2,000	40,000
- Materials	2,000	80,000	By Abnormal loss	1,000	72,000
- Labour	--	15,000	By Process B A/c	35,000	28,00,000
- Overheads	--	45,000	By Closing WIP	2,000	1,44,000
To Materials introduced	38,000	14,80,000			

To Direct Labour		3,59,000			
To Overheads		10,77,000			
	40,000	30,56,000		40,000	30,56,000

Normal Loss A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process A A/c	2,000	40,000	By Cost Ledger Control A/c	2,000	40,000
	2,000	40,000		2,000	40,000

Abnormal Loss A/c

Particulars	Units	(₹)	Particulars	Units	(₹)
To Process A A/c	1,000	72,000	By Cost Ledger Control A/c	1,000	20,000
			By Costing Profit & Loss A/c		52,000
	1,000	72,000		1,000	72,000

Illustration 9: (Preparation of statement of equivalent production)

A company produces a component, which passes through two processes. During the month of April, 2015, materials for 40,000 components were put into Process I of which 30,000 were completed and transferred to Process II. Those not transferred to Process II were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I costs incurred were as follows :

Direct material	*₹15,000*
Direct wages	*₹18,000*
Factory overheads	*₹12,000*

Of those transferred to Process II, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process II. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.

No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process II were :

Packing materials	*₹4,000*
Direct wages	*₹3,500*
Factory overheads	*₹4,500*

Required :

(i) Prepare Statement of Equivalent Production, Cost per unit and Process I A/c.

(ii) Prepare Statement of Equivalent Production, Cost per unit and Process II A/c.

Solution:

(i) Process I – Statement of Equivalent Production

Particulars	Completed Units	Closing stock of WIP			Equivalent Production units
		Units	% of Completion	Equivalent Units	
	(1)			(2)	(1) + (2)
Material	30,000	10,000	100%	10,000	40,000
Wages	30,000	10,000	50%	5,000	35,000
Overhead	30,000	10,000	50%	5,000	35,000

Process I

Particulars	Process Cost (₹)	Equivalent Production (units)	Process Cost p.u. (2)/(3)	WIP stock Equivalent units	Cost of WIP Stock (₹) (4) × (5)	Transfer to Process II (2)-(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	15,000	40,000	0.375	10,000	3,750	11,250
Wages	18,000	35,000	0.514	5,000	2,570	15,430
Overhead	12,000	35,000	0.343	5,000	1,715	10,285
	45,000				8,035	36,965

Process I A/c

Particulars	Unit	(₹)	Particulars	Units	(₹)
To Direct material	40,000	15,000	By Process II A/c	30,000	36,965
To Direct wages	--	18,000	By Closing W-I-P	10,000	8,035
To Factory overhead	--	12,000		--	--
	40,000	45,000		40,000	45,000

(ii) Process II – Statement of Equivalent Production

Particulars	Completed Units	Closing stock of WIP			Equivalent Production units
		Units	% of Completion	Equivalent Units	
	(1)			(2)	(1) + (2)
Material	28,000	1,800	100%	1,800	29,800
Wages	28,000	1,800	25%	450	28,450
Overhead	28,000	1,800	25%	450	28,450

Process II

Particulars	Process Cost (₹)	Equivalent Production (units)	Process Cost p.u. (2)/(3)	WIP stock Equivalent units	Cost of WIP Stock (₹) (4)×(5)	Transfer to Finished Stock (2)-(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Material	36,965	29,800	1.240	1,800	2,232	34,733
Wages	3,500	28,450	0.123	450	55	3,445
Overhead	4,500	28,450	0.158	450	71	4,429
	44,965				2,358	42,607
Add: Packing Material Cost						4,000
Cost of Finished Stock						46,607

Process II A/c

Particulars		Units	(₹)	Particulars		Units	(₹)
To	Process I	30,000	36,965	By	Finished Stock	28,000	46,607
To	Direct wages	--	3,500	By	Normal loss	200	--
To	Factory overhead	--	4,500	By	WIP stock	1,800	2,358
To	Packing charges	--	4,000				
		30,000	48,965			30,000	48,965

9.5 Inter-Process Profits

In some process industries the output of one process is transferred to the next process not at cost but at market value or cost plus a percentage of profit. *The difference between cost and the transfer price is known as inter-process profits.*

The advantages and disadvantages of using inter-process profit, in the case of process type industries are as follows:

Advantages:

1. Comparison between the cost of output and its market price at the stage of completion is facilitated.
2. Each process is made to stand by itself as to the profitability.

Disadvantages:

1. The use of inter-process profits involves complication.
2. The system shows profits which are not realised because of stock not sold out.

Illustration 10: (Preparation of process cost accounts with inter process profit)

A Ltd. produces product 'AXE' which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2014 :

	Process I (₹)	***Process II (₹)***	***Finished Stock (₹)***
Opening stock	*7,500*	*9,000*	*22,500*
Direct materials	*15,000*	*15,750*	*--*
Direct wages	*11,200*	*11,250*	*--*
Factory overheads	*10,500*	*4,500*	*--*
Closing stock	*3,700*	*4,500*	*11,250*
Inter-process profit included in opening stock	*--*	*1,500*	*8,250*

Output of Process I is transferred to Process II at 25% profit on the transfer price.

Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stock in process is valued at prime cost. Finished stock is valued at the price at which it is received from process II. Sales during the period are ₹ 1,40,000.

Prepare Process cost accounts and finished goods account showing the profit element at each stage.

Solution

Process I Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	7,500	7,500	--	Process II A/c	54,000	40,500	13,500
Direct materials	15,000	15,000	--				
Direct wages	11,200	11,200	--				
	33,700	33,700	--				
Less: Closing stock	(3,700)	(3,700)					
Prime cost	30,000	30,000	--				
Overheads	10,500	10,500	--				
Process cost	40,500	40,500	--				
Profit ($33\frac{1}{3}$ of total cost)	13,500	--	13,500				
	54,000	40,500	13,500		54,000	40,500	13,500

Process II Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	9,000	7,500	1,500	Finished Stock A/c	1,12,500	75,750	36,750
Transferred from Process I	54,000	40,500	13,500				
Direct materials	15,750	15,750	--				
Direct wages	11,250	11,250	--				
	90,000	75,000	15,000				
Less Closing stock*	(4,500)	(3,750)	(750)				
Prime cost	85,500	71,250	14,250				
Overheads	4,500	4,500	--				
Process cost	90,000	75,750	14,250				
Profit (25% on total cost)	22,500	--	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750

* Cost of Closing Stock = $\frac{₹75,000}{₹90,000} \times ₹4,500 = ₹3,750$

Finished Stock Account

Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
Opening stock	22,500	14,250	8,250	Process II A/c	1,40,000	82,500	57,500
Process II	1,12,500	75,750	36,750				
	1,35,000	90,000	45,000				
Less: Closing stock*	(11,250)	(7,500)	(3,750)				
Finished stock	1,23,750	82,500	41,250				
Profit	16,250	--	16,250				
	1,40,000	82,500	57,500		1,40,000	82,500	57,500

* Cost of Closing Stock = $\frac{₹90,000}{₹1,35,000} \times ₹11,250 = ₹7,500$

Working Notes:

Let the transfer price be 100 then profit is 25; *i.e.* cost price is ₹75.

1. If cost is ₹ 75 then profit is ₹ 25

   If cost is ₹ 40,500 then profit is $\frac{25}{75} \times 40,500 = ₹ 13,500$

2. If cost is ₹ 80 then profit is ₹ 20

   If cost is ₹ 90,000 then profit is $\frac{20}{80} \times 90,000 = ₹ 22,500$

9.6 Summary

Process Costing:- Used in industries where the material has to pass through two or more processes for being converted into a final product.

Operation Costing:- It is the refinement of process costing. It is concerned with the determination of the cost of each operation rather than the process.

Treatment of Losses in process costing:-

(i) ***Normal process loss -*** The cost of normal process loss is absorbed by good units produced under the process. The amount realised by the sale of normal process loss units should be credited to the process account.

(ii) ***Abnormal process loss*** - The total cost of abnormal process loss is credited to the process account from which it arises. The total cost of abnormal process loss is debited to costing profit and loss account.

Abnormal gain- The process account under which abnormal gain arises is debited with the abnormal gain and credited to Abnormal gain account which will be closed by transferring to the Costing Profit and loss account.

Equivalent production units: This concept is used in the industries where manufacturing is a continuous activity. Converting partly finished units into equivalent finished units.

Equivalent production means converting the incomplete production units into their equivalent completed units.

Equivalent completed units = {Actual number of units in the process of manufacture} × {Percentage of work completed}

Valuation of work-in-progress : three methods :

(1) First-in-First Out (FIFO) method.

(2) Last-in-First Out (LIFO) method.

(3) Average Cost method (or weighted average cost method).

Inter-Process Profits

The output of one process is transferred to the next process not at cost but at market value or cost plus a percentage of profit. The difference between cost and the transfer price is known as inter-process profits.

10
Joint Products & By Products

Learning Objectives

After studying this chapter, you should be able to

- Understand and differentiate between Joint and By products
- Understand the different methods joint cost apportionment over joint products
- Understand the different methods joint cost apportionment over by-products
- Understand the accounting treatment required for joint products and by products

10.1 Meaning of Joint Products and By-Products

Agricultural product industries, chemical process industries, sugar industries, and extractive industries are some of the industries where two or more products of equal or unequal importance are produced either simultaneously or in the course of processing operation of a main product.

In all such industries, the management is faced with the problems such as, valuation of inventory, pricing of product and income determination, problem of taking decision in matters of further processing of by-products and/or joint products after a certain stage etc. In fact the various problems relate to

(*i*) apportionment of common costs incurred for various products and

(*ii*) aspects other than mere apportionment of costs incurred upto the point of separation.

Before taking up the above problems, we first define the various necessary concepts.

Joint Products - Joint products represent "two or more products separated in the course of the same processing operation usually requiring further processing, each product being in such proportion that no single product can be designated as a major product".

In other words, two or more products of equal importance, produced, simultaneously from the same process, with each having a significant relative sale value are known as joint products. For example, in the oil industry, gasoline, fuel oil, lubricants, paraffin, coal tar, asphalt and kerosene are all produced from crude petroleum. These are known as joint products.

Co-Products - Joint products and co-products are used synonymously in common parlance, but strictly speaking a distinction can be made between two. Co-products may be defined as two or more products which are contemporary but do not emerge necessarily from the same material in the same process. For instance, wheat and gram produced in two separate farms with separate processing of cultivation are the co-products. Similarly timber boards made from different trees are co-products.

By-Products - These are defined as "products recovered from material discarded in a main process, or from the production of some major products, where the material value is to be considered at the time of severance from the main product." Thus by-products emerge as a result of processing operation of another product or they are produced from the scrap or waste of materials of a process. In short a by-product is a secondary or subsidiary product which emanates as a result of manufacture of the main product.

The point at which they are separated from the main product or products is known as split-off point. The expenses of processing are joint till the split –off point.

Examples of by-products are molasses in the manufacture of sugar, tar, ammonia and benzole obtained on carbonisation of coal and glycerin obtained in the manufacture of soap.

Distinction between Joint-Product and By-Product - The main points of distinction as apparent from the definitions of Joint Products and By-Products are:

a) Joint products are of equal importance whereas by-products are of small economic value.

b) Joint products are produced simultaneously but the by-products are produced incidentally in addition to the main products.

10.2 Apportionment of joint costs

Joint product costs occur in many industries such as petroleum, oil refinery, meat-making, textiles, dairy, flour mill, saw mill and many other process industries and top management of business concerns require the accountants to give their opinion for many managerial decisions such as to process further or to sell at split-off stage. To answer this question they require apportionment of joint costs over different products produced.

The main problem faced in the case of joint products/ by-products is the apportionment of the total cost incurred upto the point of separation of joint products/ or by products. For costs incurred after the split off point there is no problem, as these costs can be directly allocated to individual joint products or by-products. Thus the apportionment of joint costs over different products produced involve the following two cases.

1. When two or more products are simultaneously produced and there is by-product.
2. When there are both joint products and by-products.

10.3 Method of apportioning joint cost over joint products

Proper apportionment of joint cost over the joint products is of considerable importance, as

this affects (*a*) Valuation of closing inventory; (*b*) Pricing of products; and (*c*) Profit or loss on the sale of different products.

The commonly used methods for apportioning total process costs upto the point of separation over the joint products are as follows:

(i) Physical unit method
(ii) Average unit cost method
(iii) Survey method
(iv) Contribution margin method
(v) Market value method :
  (*a*) At the point of separation
  (*b*) After further processing
  (*c*) Net realisable value.

(i) *Physical Unit Method*: This method is based on the assumption that the joint products are capable of being measured in the same units. Accordingly joint costs here are apportioned on the basis of some physical base, such as weight or measure expressed in gallons, tonnes etc. In other words, the basis used for apportioning joint cost over the joint products is the physical volume of material present in the joint products at the point of separation. Any loss arising during the stage of processing is also apportioned over the products on the same basis. This method cannot be applied if the physical units of the two joint products are different. The main defect of this method is that it gives equal importance and value to all the joint products.

Illustration 1: (Apportionment of joint costs on the basis of physical unit method)

A coke manufacturing company produces the following products by using 5,000 tonnes of coal @ ₹ 15 per tonne into a common process.

Coke	3,500	tonnes
Tar	1,200	tonnes
Sulphate of ammonia	52	tonnes
Benzol	48	tonnes

Apportion the joint cost amongst the products on the basis of the physical unit method.

Solution:

	Products					
	Coke	**Tar**	**Sulphate of Ammonia**	**Benzol**	**Wastage**	**Total**
Output (in tonnes)	3,500	1,200	52	48	200	5,000
Wastage (in tonnes)	146	50	2	2		200

(apportioned on the basis of weights)					
Total weight (in tonnes)	3,646	1,250	54	50	5,000
Joint Cost (in ₹) @ ₹ 15 per tonne	54,690	18,750	810	750	75,000

Note : 1. Apportionment of wastage of 200 tonnes over the four products is as follows:

Coke : $\frac{200}{4,800}$ × 3,500 tonnes = 146 tonnes

Tar : $\frac{200}{4,800}$ × 1,200 tonnes = 50 tonnes

Sulphate of ammonia : $\frac{52}{4,800}$ × 3,500 tonnes = 2 tonnes

Benzol : $\frac{48}{4,800}$ × 3,500 tonnes = 2 tonnes

(ii) *Average Unit Cost Method*: Under this method, total process cost (upto the point of separation) is divided by total units of joint products produced. On division average cost per unit of production is obtained.

Average unit cost = Total process cost (upto the point of separation) ÷ Total units of joint product produced.

This is a simple method. The effect of application of this method is that all joint products will have uniform cost per unit. If this method is used as the basis for price fixation, then all the products may have more or less the same price. Under this method customers of high quality items are benefitted as they have to pay less price on their purchase.

Illustration 2 (Apportionment of joint costs on the basis of average unit cost method)

Find out the cost of joint products A, B and C using average unit cost method from the following data :

(a) Pre-separation Joint Cost ₹ 60,000

(b) Production data :

Products	*Units produced*
A	*500*
B	*200*
C	*300*
	1,000

Solution:

Average cost per unit = $\frac{\text{Total joint costs}}{\text{Units produced}} = \frac{₹\ 60,000}{1,000 \text{ units}}$ = ₹ 60

The joint costs apportioned @ ₹ 60 are as follows :

Products	Units	Costs per unit (₹)	Value (₹)
A	500	60	30,000
B	200	60	12,000
C	300	60	18,000
			60,000

(iii) Survey Method: This method is also known as point value method. It is based on technical survey of all the factors involved in the production and distribution of products. Under this method joint cost are apportioned over the joint products, on the basis of percentage/ point values, assigned to the products according to their relative importance. The percentage or points used for the purpose are usually computed by management with the help of technical advisers. This method is considered to be more equitable than other methods.

(iv) Contribution Margin Method: According to this method, joint costs are segregated into two parts - variable and fixed. The variable costs are apportioned over the joint products on the basis of units produced (average method) or physical quantities. In case the products are further processed after the point of separation, then all variable cost incurred be added to the variable costs determined earlier. In this way total variable cost is arrived which is deducted from their respective sales values to ascertain their contribution. The fixed costs are then apportioned over the joint products on the basis of the contribution ratios.

Illustration 3 (Apportionment of joint costs on the basis of contribution margin method)

Find out the cost of joint products A and B using contribution margin method from the following data :

Sales

A : 100 kg @ ₹ 60 per kg.

B : 120 kg @ ₹ 30 per kg.

Joint costs

Marginal cost ₹ 4,400

Fixed cost ₹ 3,900

Solution:

The marginal cost (variable cost) of ₹ 4,400 is apportioned over the joint products A and B in the ratio of their physical quantity *i.e* 100 : 120

$$\text{Marginal cost for Product A : ₹ 4,400} \times \frac{100}{220} = ₹\ 2,000$$

$$\text{Marginal cost for Product B : ₹ 4,400} \times \frac{120}{220} = ₹\ 2,400$$

The fixed cost of ₹ 3,900 is apportioned over the joint products A and B in the ratio of their contribution margin *i.e.* 40 : 12

(Refer to working note)

Product A : ₹ 3,900 × 40/52 = ₹ 3,000

Product B : ₹ 3,900 × 12/52 = ₹ 900

Working Note:

Computation of contribution margin ratio

Products	Sales revenue (₹)	Marginal cost (₹)	Contribution (₹)
A	6,000	2,000	4,000
B	3,600	2,400 (*Refer to above*)	1,200

Contribution ratio is 40 : 12

(*v*) *Market Value Method:* This is the most popular and convenient method because it makes use of a realistic basis for apportioning joint costs. Under this method joint costs are apportioned after ascertaining "what the traffic can bear". In other words, the products are made to bear a proportion of the joint cost on the basis of their ability to absorb the same. Market value means weighted market value *i.e.* units produced × price of a unit of joint product.

(*a*) *Market value at the point of separation:* This method is used for the apportionment of joint costs to joint products upto the split off point. It is difficult to apply this method if the market value of the products at the point of separation is not available. It is a useful method where further processing costs are incurred disproportionately.

To determine the apportionment of joint costs over joint products, a factor known as multiplying factor is determined. This multiplying factor on multiplication with the sales values of each joint product gives rise to the proportion of joint cost.

$$\text{Multiplying factor: } \frac{\text{Joint Cost}}{\text{Total Sales Revenue}} \times 100$$

For example, a concern incurs a joint cost of ₹ 64,500 in producing two products A (200 units), B (200 units) and earns a sales revenue of ₹ 86,000 by selling @ ₹ 170 per unit of product A and product B @ ₹ 260 per unit. The multiplying factor in this case is obtained by dividing the total joint cost by total sales revenue and finally multiplying the figure so obtained by 100. The multiplying factor based on the data can be computed as follows:

$$\text{Multiplying factor: } \frac{₹\ 64,500}{₹\ 86,000} \times 100 = 75\%$$

Joint cost apportioned over product A = Sales revenue of product A × 75%

= ₹ 34,000 × 75%

	=	₹ 25,500
Joint cost apportioned over product B	=	Sales revenue of product B × 75%
	=	₹ 52,000 × 75%
	=	₹ 39,000

Alternatively - This joint cost may be apportioned in the ratio of sales values of different joint products.

(b) ***Market value after processing*:** Here the basis of apportionment of joint cost is the total sales value of finished products and involves the same principle as discussed in (*a*) above. Suppose that in the example given in Part (*a*) above, if sales prices of products A and B after further processing are ₹ 200 and ₹ 300 respectively the joint cost apportioned over Products A and B is as follows:

The pre-separation costs of ₹ 64,500 will be apportioned in the ratio of (2 : 3) as follows:

Market sales value after further processing

		(₹)
A : 200 units × ₹ 200	=	40,000
B : 200 units × ₹ 300	=	60,000
		1,00,000

Joint cost apportioned :

$$A = ₹\ 64,500 \times \frac{₹\ 40,000}{₹\ 1,00,000} = ₹\ 25,800$$

$$B = ₹\ 64,500 \times \frac{₹\ 60,000}{₹\ 1,00,000} = ₹\ 38,700$$

The use of this method is unfair where further processing costs after the point of separation are disproportionate or when all the joint products are not subjected to further processing. The *net realisable value method which is* discussed as below overcomes the shortcoming of this method.

(c) ***Net realisable value method:*** From the sales value of the joint products (at finished stage) the followings are deducted:

(i) estimated profit margins,

(ii) selling and distribution expenses, if any, and

(iii) post-split off costs.

The resultant figure so obtained is known as net realisable value of joint products. Joint costs are apportioned in the ratio of net realisable value. Suppose that in the example given in part

(*a*) above if further processing costs for products A and B are ₹ 4,000 and ₹ 32,000 respectively the Joint cost may be apportioned to products A and B as follows:

Products	Sales revenue (₹) (a)	Further processing cost (₹) (b)	Net realisable value (₹) (c)=(a)–(b)	Joint cost apportionment ratio
A	34,000	4,000	30,000	3/5
B	52,000	32,000	20,000	2/5

Joint cost apportioned over product A = ₹ 64,500 × $^{3}/_{5}$ = ₹ 38,700

Joint cost apportioned over product B = ₹ 64,500 × $^{2}/_{5}$ = ₹ 25,800

This method is extensively used in many industries.

Illustration 13 (Apportionment of joint cost under different methods)

Inorganic Chemicals purchases salt and processes it into more refined products such as Caustic Soda, Chlorine and PVC. In the month of July, Inorganic Chemicals purchased Salt for ₹40,000. Conversion of ₹ 60,000 were incurred upto the split off point, at which time two sealable products were produced. Chlorine can be further processed into PVC.

The July production and sales information is as follows:

	Production (tonne)	*Sales quantity (tonne)*	*Selling price (per tonne)*
Caustic Soda	*1,200*	*1,200*	*₹ 50*
Chlorine	*800*	*—*	*—*
PVC	*500*	*500*	*₹200*

All 800 tonnes of Chlorine were further processed, at an incremental cost of ₹ 20,000 to yield 500 tonnes of PVC. There was no beginning or ending inventories of Caustic Soda, Chlorine or PVC in July.

There is active market for Chlorine. Inorganic Chemicals could have sold all its July production of Chlorine at ₹ 75 per tonne.

Required :

(1) To calculate how joint cost of ₹1,00,000 would be apportioned between Caustic Soda and Chlorine under each of following methods :

(a) Sales value at split off,

(b) Physical measure (method), and

(c) Estimated net realisable value.

(2) Lifetime Swimming Pool Products offers to purchase 800 tonnes of Chlorine in August at ₹75 per tonne. This sale of Chlorine would mean that no PVC would be produced in August. How the acceptance of this offer for the month of August would affect operating income ?

Solution:

1. (a) Sales value at split off method

Products	Sales in tonnes (a)	Selling price per tonne (₹) (b)	Sales revenue (₹) (c)=(a) × (b)	Joint cost apportioned* (₹)
Caustic Soda	1,200	50	60,000	50,000
Chlorine	800	75	60,000	50,000
			1,20,000	1,00,000

$$\text{* Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total sale value}} \times \text{Sale revenue of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{₹1,00,000}{₹1,20,000} \times ₹\ 60,000 = ₹50,000$$

$$\text{Joint cost apportioned to Chlorine} = \frac{₹\ 1,00,000}{₹\ 1,20,000} \times ₹60,000 = ₹50,000$$

(*b*) Physical measure method

Products	Sale in (tonnes)	Joint cost (₹) apportioned **
Caustic Soda	1,200	60,000
Chlorine	800	40,000
	2,000	1,00,000

$$\text{**Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total physical value}} \times \text{Physical units of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{₹\ 1,00,000}{2,000 \text{ tonnes}} \times 1,200 \text{ tonnes} = ₹60,000$$

$$\text{Joint cost apportioned to chlorine} = \frac{₹\ 1,00,000}{2,000 \text{ tonnes}} \times 800 \text{ tonnes} = ₹40,000$$

(c) Estimated net realisable value method

Products	Sale revenue (₹) (a)	Further processing cost (₹) (b)	Net realisable value (₹) (c) = (a) – (b)	Apportioned*** Joint cost (₹)
Caustic Soda (1,200 tonnes × ₹50)	60,000	–	60,000	42,857
Chlorine	1,00,000 (500 tonnes of PVC × ₹200)	20,000	80,000	57,143
			1,40,000	1,00,000

**Apportioned joint cost = $\frac{\text{Total joint cost}}{\text{Total net realisable value}}$ × Net realisable value of each product

Apportioned joint cost for Caustic Soda = $\frac{₹\ 1,00,000}{₹\ 1,40,000}$ × ₹60,000 = ₹42,857

Apportioned joint cost for Chlorine = $\frac{₹\ 1,00,000}{₹\ 1,40,000}$ × ₹80,000 = ₹57,143

2. Incremental revenue from further processing of Chlorine into PVC

(500 tonnes × ₹200 – 800 tonnes × ₹75)	₹40,000
Less : Incremental cost of further processing of Chlorine into PVC	₹20,000
Incremental operating income from further processing	₹20,000

The operating income of Inorganic Chemicals will be reduced by ₹20,000 in August if it sells 800 tonnes of Chlorine to Lifetime Swimming Pool Products, instead of further processing of Chlorine into PVC for sale.

Illustration 5 (Preparation of income forecast statement and suggest production plan)

Sun-moon Ltd. produces 2,00,000 : 30,000; 25,000; 20,000 and 75,000 units of its five products A, B, C, D and E respectively in a manufacturing process and sells them at ₹ 17, ₹ 13, ₹ 8, ₹ 10 and ₹ 14 per unit. Except product D remaining products can be further processed and then can be sold at ₹ 25, ₹ 17, ₹ 12 and ₹ 20 per unit in case of A, B, C and E respectively.

Raw material costs ₹ 35,90,000 and other manufacturing expenses cost ₹ 5,47,000 in the manufacturing process which are absorbed on the products on the basis of their 'Net realisable value'. The further processing costs of A, B, C and E are ₹ 12,50,000; ₹ 1,50,000; ₹ 50,000 and ₹ 1,50,000 respectively. Fixed costs are ₹ 4,73,000.

You are required to prepare the following in respect of the coming year:

(a) Statement showing income forecast of the company assuming that none of its products are to be further processed.

(b) Statement showing income forecast of the company assuming that products A, B, C and E are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits? If yes, then submit a statement showing income forecast arising out of adoption of that plan.

Solution:

Working Note:

Statement showing apportionment of joint costs on net realisable value basis

Products	Sales value (1) (₹)	Post separation (2) (₹)	Net realisable value (1)–(2)=(3) (₹)	Apportioned joint costs (4) (₹)
A	50,00,000 (2,00,000 units × ₹ 25)	12,50,000	37,50,000	26,25,000
B	5,10,000 (30,000 units × ₹ 17)	1,50,000	3,60,000	2,52,000
C	3,00,000 (25,000 units × ₹ 12)	50,000	2,50,000	1,75,000
D	2,00,000 (20,000 units × ₹ 10)	—	2,00,000	1,40,000
E	15,00,000 (75,000 units × ₹ 20)	1,50,000	13,50,000	9,45,000
			59,10,000	41,37,000

Total joint cost = Raw material costs + Manufacturing expenses

= ₹ 35,90,000 + ₹ 5,47,000 = ₹ 41,37,000

$$\text{Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total net realisable value}} \times \text{Net realisable value of each product}$$

$$\text{Apportioned joint cost for Product A} = \frac{₹\ 41,37,000}{₹\ 59,10,000} \times ₹\ 37,50,000 = ₹\ 26,25,000$$

Similarly, the apportioned joint cost for products B, C, D and E are ₹ 2,52,000; ₹ 1,75,000; ₹ 1,40,000 and ₹ 9,45,000 respectively.

(a) Statement showing income forecast of the company assuming that none of its products are further processed

	Products					
	A (₹)	B (₹)	C (₹)	D (₹)	E (₹)	Total (₹)
Sales revenue	34,00,000 (2,00,000 units × ₹ 17)	3,90,000 (30,000 units × ₹ 13)	2,00,000 (25,000 units × ₹ 8)	2,00,000 (20,000 units × ₹ 10)	10,50,000 (75,000 units × ₹ 14)	52,40,000
Less: Apportioned joint cost	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
				(*Refer to working note*)		
Excess of revenue over joint cost of manufacturing	7,75,000	1,38,000	25,000	60,000	1,05,000	11,03,000
Less: Fixed cost						4,73,000
Profit						6,30,000

(b) Statement showing income forecast of the company: assuming that products A, B, C and E are further processed (Refer to working note)

	Products					
	A (₹)	B (₹)	C (₹)	D (₹)	E (₹)	Total (₹)
Sales revenue : (X)	50,00,000	5,10,000	3,00,000	2,00,000	15,00,000	75,10,000
Apportioned joint cost : (Y)	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Further processing cost : (Z)	12,50,000	1,50,000	50,000	-	1,50,000	16,00,000
Total manufacturing cost : (K)=(Y)+(Z)	38,75,000	4,02,000	2,25,000	1,40,000	10,95,000	57,37,000
Excess of sales revenue over total manufacturing cost : [(X)–(K)]	11,25,000	1,08,000	75,000	60,000	4,05,000	17,73,000
Less: Fixed cost						4,73,000
Profit						13,00,000

Suggested production plan for maximising profits:

On comparing the figures of excess of revenue over cost of manufacturing in the above statements one observes that the concern is earning more after further processing of A, C and E products but is loosing a sum of ₹ 30,000 in the case of product B (if it is processed further). Hence the best production plan will be to sell A, C and E after further processing and B and D at the point of split off. The profit statement based on this suggested production plan is as below :

Profit statement based on suggested production plan

	Products					
	A	B	C	D	E	Total
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
1	2	3	4	5	6	7
Sales revenue : (X)	50,00,000	3,90,000	3,00,000	2,00,000	15,00,000	73,90,000
Appointed joint cost : (Y)	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Further processing cost : (Z)	12,50,000	-	50,000	-	1,50,000	14,50,000
Total manufacturing cost : (K)=(Y)+(Z)	38,75,000	2,52,000	2,25,000	1,40,000	10,95,000	55,87,000
Excess of sales revenue over manufacturing cost : [(X)–(K)]	11,25,000	1,38,000	75,000	60,000	4,05,000	18,03,000
Less: Fixed cost						4,73,000
Profit						13,30,000

Hence the profit of the company has increased by ₹ 30,000.

10.4 Methods of apportioning joint cost over by-products

The following methods may be adopted for the accounting of by-products and arriving at the cost of production of the main product:

(a) ***Market value or value on realisation:*** The realisation on the disposal of the by-product may be deducted from the total cost of production so as to arrive at the cost of the main product. For example, the amount realised by the sale of molasses in a sugar factory goes to reduce the cost of sugar produced in the factory.

When the by-product requires some additional processing and expenses are incurred in making it saleable to the best advantage of the concern, the expenses so incurred should be deducted from the total value realised from the sale of the by-product and only the net realisations should be deducted from the total cost of production to arrive at the cost of production of the main product. Separate accounts should be maintained for collecting additional expenses incurred on :

(i) further processing of the by-product, and

(ii) selling, distribution and administration expenses attributable to the by-product.

(b) ***Standard cost in technical estimates:*** By-products may be valued at standard costs. The standard may be determined by averaging costs recorded in the past and making technical estimates of the number of units of original raw material going into the main product and the number forming the by-product or by adopting some other consistent basis.

This method may be adopted where the by-product is not saleable in the condition in which it

emerges or comparative prices of similar products are not available.

(c) Comparative price: Under this method, the value of the by-product is ascertained with reference to the price of a similar or an alternative material.

Suppose in a large automobile plant a blast furnace not only produces the steel required for the car bodies but also produces gas which is utilised in the factory. This gas can be valued at the price which would have been paid to a gas company if the factory were to buy it from outside sources.

(d) Re-use basis: In some cases the by-product may be of such a nature that it can be reprocessed in the same process as part of the input of the process. In that case the value put on the by-product should be same as that of the materials introduced into the process. If, however, the by-product can be put into an earlier process only, the value should be the same as for the materials introduced into the process.

10.5 Treatment of By-Product Cost in Cost-Accounting

By-product cost can be dealt in cost accounting in the following ways:

(a) When they are of small total value: When the by-products are of small total value, the amount realised from their sale may be dealt in any one the following two ways :

1. The sales value of the by-products may be credited to the Profit and Loss Account and no credit be given in the Cost Accounts. The credit to the Profit and Loss Account here is treated either as miscellaneous income or as additional sales revenue.
2. The sale proceeds of the by-product may be treated as deductions from the total costs. The sale proceeds in fact should be deducted either from the production cost or from the cost of sales.

(b) When the by-products are of considerable total value: Where by-products are of considerable total value, they may be regarded as joint products rather than as by-products. To determine exact cost of by-products the costs incurred upto the point of separation, should be apportioned over by-products and joint products by using a logical basis. In this case, the joint costs may be divided over joint products and by-products by using relative market values; physical output method (at the point of split off) or ultimate selling prices (if sold).

(c) ***Where they require further processing:*** In this case, the net realisable value of the by-product at the split-off point may be arrived at by subtracting the further processing cost from the realisable value of by-products.

If total sales value of by-products at split-off point is small, it may be treated as per the provisions discussed above under (*a*).

In the contrary case, the amount realised from the sale of by-products will be considerable and thus it may be treated as discussed under (*b*).

10.6 Summary

Joint Products *- Two or more products of equal importance, produced, simultaneously from the same process, with each having a significant relative sale value are known as joint products.*

Co-Products *- Two or more products which are contemporary but do not emerge necessarily from the same material in the same process.*

By-Products *- Products recovered from material discarded in a main process, or from the production of some major products.*

Method of apportioning joint cost over joint products:

The commonly used methods for apportioning total process costs upto the point of separation over the joint products are as follows:

(i) Physical unit method

(ii) Average unit cost method

(iii) Survey method

(iv) Contribution margin method

(v) Market value method:

(a) At the point of separation

(b) After further processing

(c) Net realisable value.

Methods of apportioning joint cost over by-products:

(a) Market value or value on realisation- The realisation on the disposal of the by-product may be deducted from the total cost of production so as to arrive at the cost of the main product.

(b) Standard cost in technical estimates- The standard may be determined by averaging costs recorded in the past and making technical estimates of the number of units of original raw material going into the main product and the number forming the by-product or by adopting some other consistent basis.

This method may be adopted where the by-product is not saleable in the condition in which it emerges or comparative prices of similar products are not available.

(c) Comparative price- Value of the by-product is ascertained with reference to the price of a similar or an alternative material.

(d) Re-use basis- The value put on the by-product should be same as that of the materials introduced into the process.

Treatment of By-Product Cost in Cost-Accounting

(i) When they are of small total value:

1. *The sales value of the by-products may be credited to the Profit and Loss Account and no credit be given in the Cost Accounts. The credit to the Profit and Loss Account here is treated either as miscellaneous income or as additional sales revenue.*
2. *The sale proceeds of the by-product may be treated as deductions from the total costs. The sale proceeds in fact should be deducted either from the production cost or from the cost of sales.*

(ii) When the by-products are of considerable total value - The joint costs may be divided over joint products and by-products by using relative market values; physical output method (at the point of split off) or ultimate selling prices (if sold).

(iii) Where they require further processing -The net realisable value of the by-product at the split-off point may be arrived at by subtracting the further processing cost from the realisable value of by-products.

If total sales value of by-products at split-off point is small, it may be treated as per the provisions discussed above under (i).

In the contrary case, the amount realised from the sale of by-products will be considerable and thus it may be treated as discussed under (ii).

11
Standard Costing

Learning Objectives

After studying this chapter you should be able to;

- Understand the meaning of standard cost and variances.
- Understand the concept of capacity with reference to a product cost sheet.
- Understand the difference between controllable and uncontrollable variances.
- Compute variances related to material, labour, overhead and sales.
- Understand the reporting pattern which may be adopted for control and decision making purposes.
- Understand the meaning of disposition of variances.
- Understand the advantages and disadvantages of standard costing and variance analysis.

11.1 Introduction

Standard Costing is a method of costing which is used as a control tool by the management. Controlling is a principal function of management alongwith planning, directing and staffing. Every organisation sets a goal and to achieve it management of the organisation make plans, get these plans executed and monitor the work for any deviation from the plan. Please note the word deviation. Deviation means the amount by which a single measurement differs from a fixed value such as the mean or standard (here it is used in the context of cost accounting). Deviation is measured by comparing actual figure with the standard figure.

11.1.1 What is a standard or Standard Cost?

Standard cost is defined in the CIMA Official Terminology as "'the planned unit cost of the product, component or service produced in a period. The standard cost may be determined on a number of bases. The main use of standard costs is in performance measurement, control, stock valuation and in the establishment of selling prices." From the above definition Standard costs can be said as

- Planned cost
- Determined on a base or number of bases.

11.1.2 Why Standard or Standard Cost?

Standards or Standard costs are established to evaluate the performance of a particular cost centre or responsibility centre and to control costs. Apart from performance evaluation and cost control, standard costs are also used to value inventory where actual figures are not reliably available and to determine selling prices particularly while preparing quotations.

11.2 Standard Costing

Standard costing is a method of costing which measure the performance or an activity by comparing actual cost with standard cost, analyse the variances (deviations) and reporting of variances for investigation and appropriate action. Official Terminology of CIMA, London defines standard costing as "Control technique that reports variances by comparing actual costs to pre-set standards so facilitating action through management by exception."

11.3 Setting Up of Standard Cost

Standard cost is set on the basis of management estimation. Cost is estimated on the basis of technical specification provided by the engineering department or other expert such as production engineer. Generally while setting standards consideration is given to historical data, current production plan and expected conditions of future. For the sake of detailed analysis and control standard cost is set for each element of cost i.e. material, labour, variable overheads and fixed overheads. Apart from this standards are also set for the sales quantity and sales value; this is generally known as budgeted sales.

Standards are set in both quantity (units or hours) and in cost (price or rate). It is thus a measure in quantities, hours and value of the factors of production.

Standard costs are divided into three main cost components, such as

(a) Direct Material Cost (b) Direct Labour Cost and (c) Overheads

Standards are set in both physical and monetary terms for each cost components. Details are as follows:

(i) Physical Standards: Physical standards refer to expression of standards in units or hours. At this stage standard quantity and standard hours are determined for a particular product or service. The purpose of setting standards are to secure economies in scale of production and to set selling price for quotation purpose.

In manufacturing organisations, the task of setting physical standards is assigned to the industrial engineering department. While setting standards consideration is given to the

- Company's operating plan i.e. budgets
- Final output to be produced
- Material specification, in both quantity and quality provided by the engineering department.
- Proportion of material to be used in case of multiple inputs.
- Method of production i.e. fully automated, semi-automated or manual.
- Skill set of workers and availability of workers.
- Working conditions and internal factors.
- External factors (such as Labour Law, Factories Act, Govt. policy etc.).

Material quantity standards: The following procedure is usually followed for setting material quantity standards.

(a) Standardisation of products: At this phase products to be produced is decided based on production plan and customer's order. Generally following questions are answered at this stage: (i) What to be produced? (ii) Which type to be produced and (iii) How much to be produced?

(b) Product study: Product to be produced is analysed and studied for developments and production. Product study is carried out by the engineering department or product consultants. At this phase answers to the following questions are satisfied: (i) How can it be produced? (ii) What are the pre-requisites? (iii) Which type of materials to be used? (iv) How products can be accepted in the market? Etc.

(c) Preparation of specification list: After the product study a list of material is prepared. It specifies types (quality) and quantity of materials to be used, substitute of the materials, quantity and proportion of materials to be used, process to be followed, pre-requisites and condition required etc. While preparing specification list consideration to expected amount of wastage is given. It must be customised to adopt changes in the product.

(d) Test runs: Sample or test runs under specified conditions are carried out and sample products are tested for the desired quality and quantity. Any deviation from the specification is noted down and specification list is updated.

Labour time standards: The following are the steps involved in setting labour quantity standards:

(a) Standardisation of product and product study is carried out as explained above.

(b) Labour specification: Types of labour and labour time is specified. Labour time specification is based on past records and it takes into account normal wastage of time.

(c) Standardisation of methods: Selection of proper machines to use proper sequence and method of operations.

(d) Manufacturing layout: A plan of operation for each product listing the operations to be performed is prepared.

(e) Time and motion study: It is conducted for selecting the best way of completing the job or motions to be performed by workers and the standard time which an average worker will take for each job. This also takes into account the learning efficiency and learning effect.

(f) Training and trial: Workers are trained to do the work and time spent at the time of trial run is noted down.

Overheads time/ quantity standards: Variable overhead time/ quantity is estimated based on specification made by the engineering departments. Variable overheads may either be based on direct material quantity or labour hour. Generally it is based on labour time worked.

Fixed overhead time is based on budgeted production volume.

Problems faced while setting physical standards: The problems involved while setting physical standards will vary from industry to industry and may be illustrated as under:

(a) A situation may arise where the company is introducing the manufacture of a new line of product. In such case, it may be necessary to employ workers who have no experience in the job. This creates a problem of setting standard time because it is necessary to make adjustment for the inexperience of workers.

(b) Changes in technology may necessitate installation of sophisticated machines. When such machines are installed, the precise estimation of output and standard of efficiency achievable will pose a problem until after a long time when the working conditions are settled. Thus, setting standards for these machines and estimating the standard costs will need considerable amount of work.

(c) Often manufacturers prefer to product diversification to improve profitability. One of the most important problems that arise with the proposed change in product is re-setting of production facilities. For example, when an old copper part is to be changed into one made of bronze to suit the new product, special care has to be taken to order new tools which in turn, pose the problem of setting up of standard time in respect of the new tools.

(d) Standards of material specifications are established and if the materials are not available as per specifications, the standards may not be achievable.

(e) Very often the cost accountant is confronted with the problem of choosing the type of standards to be adopted. For example, the industrial engineer has furnished the standard time for all direct labour operations as under:

1. Standard time attainable by the best operations is 2 hours per unit of product including allowances for personal fatigue and delay.
2. Attainable good performance for the average trained operator is 2.10 hours per unit of product.
3. Average past performance is 2.60 hours per unit.

The problem is, should direct labour standard hour be based on maximum efficiency or attainable good performance or average past performance? If costs are to represent maximum efficiency, the unit cost used in selling price will relatively be low but a high debit variance may arise if the standard efficiency is not achieved.

If, however, the standard cost is based on attainable good performance, the variances may tend to be nil. If efficiency is to be gauged, maximum efficiency standard will reflect the off standard performance, thereby enabling the departmental head to exercise control.

Similar problems as those mentioned above, may also arise in setting of waste standards. For example, the question may arise as to whether only absolutely unavoidable wastage should be provided or the past average level of wastage may be provided. This will again have different impact on the standard cost of production.

(ii) Price or Rate Standards: Broadly, the price or rate standards can be set on either of the following bases:

(a) Actual average or mean price expected to prevail during the coming period, say one year; or

(b) Normal prices expected to prevail during a cycle of seasons which may be of a number of years.

Material price standards: Material prices are not altogether within the control of the manufacturer; but the purchasing department, on being apprised of production quantities required, should be able, from its knowledge of current market conditions and trends, to state with reasonable accuracy price for the constituent items. The standards for prices of materials should be based on the following factors, if price fluctuations are small and are not serious.

(a) Stock of materials on hand and the prices at which they are held;

(b) The prices at which orders for future deliveries of materials (agreement entered into) have already been placed,

(c) Minimum support price fixed by the appropriate authority and

(d) Anticipated fluctuation in price levels

In case there are unsystematic fluctuations in the market price, it may be difficult to determine standard costs of materials; fluctuations in the market price may be of different sorts; prices may be different from month to month, from one season to another or from one year to another. There may be a secular trend which, on the whole, is pushing price upwards or downwards. The nature of difficulties encountered in fixing standard costs of materials will naturally be different in each case. In addition the purchasing policy of the company and the objective to be achieved (from cost accounting) will make a difference.

The difficulty in determining the standard cost of material in such a situation can be resolved as follows:

(a) In case prices fluctuate from month to month, the average of prices of a year corrected for the known secular changes and any other expected change can very well serve as the standard price for the next year.

(b) If the fluctuations are seasonal, but the whole year's requirements are purchased at one time, the weighted average of the likely prices to be paid should be treated as the standard price. But, if buying is also spread over the whole year, the weighted average of the prices for the whole year should be the standard price.

(c) If prices fluctuate from one year to another, a careful estimate of the price likely to prevail next year, based on a statistical study, should be adopted as the standard price.

Wage rate standard: The type of labour required for performing a specific job would be the most important factor for deciding the rate of wage to be paid to workers. Standard wage rate for skilled and unskilled workers are set based on the following basis:

- Time taken by the workers to complete a unit of production.
- Time or piece rate prevailing in the industry. It can be known from the peers.
- Wage agreement entered into between the management and workers' union.
- Law prevailing in the area of operation, law like Payment of minimum wages Act, Payment of bonus Act etc.

Overhead expense standards: In computing the overhead expense standards, consideration should be given to the level of output and the expenses budgeted. A budget showing the level of output to be considered for arriving at overhead expense standards may be based on the practical manufacturing capacity or the average sales capacity or the budgeted capacity to be utilised in the coming year. After having chosen one of the bases for computing output level, the expenses can be budgeted under different heads for the level of output chosen. These expenses are classified under fixed and variable categories. Thus, the overhead expenses standards are set by computing the optimum level of output for the production departments and thereafter drafting a budget for fixed and variable expenses which will be incurred at this level. If production is seasonal or it fluctuates during the year, a flexible budget may be prepared to facilitate comparison between the target set and the actual expenditure for the period.

11.4 Types of Standards

The accuracy and relevance of an established standard cost depends upon the reliability of the standards being set up. In order to set standards we must know the degree of accuracy proximity of the standards with the actual result. Below are the few standards have been discussed below:

(i) Ideal Standards: These represent the level of performance attainable when prices for material and labour are most favourable, when the highest output is achieved with the best equipment and layout and when the maximum efficiency in utilisation of resources results in maximum output with minimum cost.

These types of standards are criticised on three grounds:

(a) Since such standards would be unattainable, no one would take these seriously.

(b) The variances disclosed would be variances from the ideal standards. These would not, therefore, indicate the extent to which they could have been reasonably and practically avoided.

(c) There would be no logical method of disposing of these variances.

(ii) Normal Standards: These are standards that may be achieved under normal operating conditions. The normal activity has been defined as "the number of standard hours which will produce at normal efficiency sufficient good to meet the average sales demand over a term of years".

These standards are, however, difficult to set because they require a degree of forecasting. The variances thrown out under this system are deviations from normal efficiency, normal sales volume, or normal production volume.

If the actual performance is found to be abnormal, large variances may result and necessitate revision of standards.

(iii) Basic or Bogey Standards: These standards are used only when they are likely to remain constant or unaltered over a long period. According to this standard, a base year is chosen for comparison purposes in the same way as statisticians use price indices. Since basic standards do not represent what should be attained in the present period, current standards should also be prepared if basic standards are used. Basic standards are, however, well suited to businesses having a small range of products and long production runs. Basic standards are set, on a long-term basis and are seldom revised. When basic standards are in use, variances are not calculated. Instead, the actual cost is expressed as a percentage of basic cost. The current cost is also similarly expressed and the two percentages are compared to find out how much the actual cost has deviated from the current standard. The percentages are next compared with those of the previous periods to establish the trend of

actual and current standard from basic cost.

(iv) Current Standards: These standards reflect the management's anticipation of what actual costs will be for the current period. These are the costs which the business will incur if the anticipated prices are paid for the goods and services and the usage corresponds to that believed to be necessary to produce the planned output.

The variances arising from expected standards represent the degree of efficiency in usage of the factors of production, variation in prices paid for materials and services and difference in the volume of production.

11.5 Need for Standard Costs

Standard costing system is widely accepted as it serves the different needs of an organisation. The standard costing is preferred for the following reasons:

(a) **Prediction of future cost for decision making:** Standard costs are set after taking into account all the future possibilities and can be termed as future cost. Standard cost is used for calculating profitability from a project/ order/ activity proposed to be undertaken. Hence, standard cost is very useful for decision making purpose.

(b) **Provide target to be achieved:** Standard costs are the target cost which should be no be crossed. It keeps challenging target before the responsibility centres. Management of responsibility centres monitor the performance continuously against the set standards and deviations are immediately corrected.

(c) **Used in budgeting and performance evaluation:** Standard costs are used to set budgets and based on these budgets managerial performance is evaluated. This is of two benefits, one managers of a responsibility centre will not compromise with the quality to fulfill the budgeted quantity and second, variances can be traced with the responsible department or person.

(d) **Interim profit measurement and inventory valuation:** Actual profit is known only after the closure of the account. Few organisations used to prepare profitability statement for some interim periods as per the requirement of the management. To arrive at the profitability figure standard costs are deducted from the revenue.

11.6 The Process of Standard Costing

The process of standard cost is as below:

(i) Setting of Standards: The first step is to set standards which are to be achieved, the process of standard setting is explained above.

(ii) Ascertainment of actual costs: Actual cost for each component of cost is ascertained.

Actual costs are ascertained from books of account, material invoices, wage sheet, charge slip etc.

(iii) Comparison of actual cost and standard cost: Actual costs are compared with the standards costs and variances are determined.

(iv) Investigation of variances: Variances arises are investigated for further action. Based on this performance is evaluated and appropriate actions are taken.

(v) Disposition of variances: Variances arise are disposed off by transferring it the relevant accounts (costing profit and loss account) as per the accounting method (plan) adopted.

11.7 Types of Variances

11.7.1 Controllable and un-controllable variances: The purpose of the standard costing reports is to investigate the reasons for significant variances so as to identify the problems and take corrective action.

Variances are broadly of two types, namely, controllable and uncontrollable. Controllable variances are those which can be controlled by the departmental heads whereas uncontrollable variances are those which are beyond their control. Responsibility centres are answerable for all adverse variances which are controllable and are appreciated for favourable variances. Controllability is a subjective matter and varies from situation to situation. If the uncontrollable variances are of significant nature and are persistent, the standard may need revision.

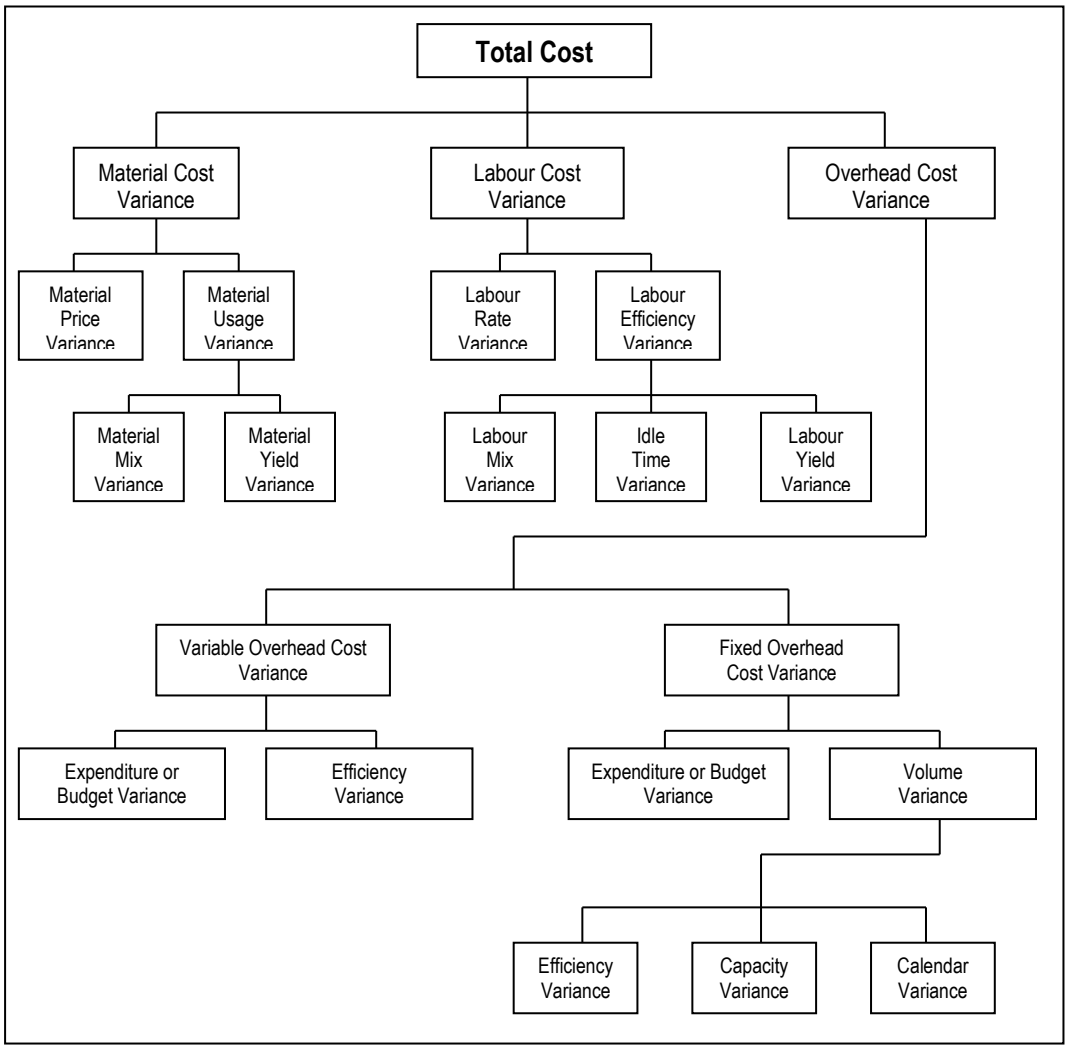
11.7.2 Favourable and Adverse variance: Favourable variances are those which are profitable for the company and adverse variances are those which causes loss to the company. While computing cost variances favourable variance means actual cost is less than standard cost. On the other hand adverse variance means actual cost is exceeding standard cost. The situation will be reversed for sales variance. Favourable variances means actual is more than budgeted and on contrary adverse variance is where actual is less than budgeted. These are credited and debited in the costing profit and loss account respectively. Favourable variance in short denoted by capital 'F' and adverse variances by capital 'A'.

Students may note that signs of favourable and adverse variance may or may not match exactly with mathematical signs i.e. (+) or (-).

11.8 Classification of Variances

Variances are broadly classified into two parts namely Revenue variance and Cost variance. At Revenue side variances is calculated by comparing actual sales from budgeted (standard) sales. On the other hand Cost side reflects variances in cost components. Cost variance classification is shown below with the help of a structured diagram.

Fig 8.1: Classification of Variances



11.8.1 Computation of variances: As discussed earlier variances are classified into two parts. Here we will start from cost side and discuss all cost components one by one with the help of appropriate example and illustrations.

(a) Material Cost Variance: Material cost variance is the difference between standard cost and actual cost. Mathematically it is written as.

Material Cost variance = (Standard quantity x Standard Price) – (Actual quantity x Actual price)

Or

MCV = (SQ × SP) – (AQ × AP)

Reasons: Material cost variance arises mainly because of either difference in material price from the standard price or difference in material consumption from standard consumption or because of both reasons. Analysis of material cost variance is done dividing it into two parts namely Material Price variance and Material Usage variance.

(i) Material Price variance: It measures variance arises in the material cost due to difference in actual material purchase price from standard material price. Mathematically it is written as:

Material Price Variance = Actual quantity* × (Standard price – Actual price)

Or

MPV = AQ × (SP – AP)

*Here actual quantity means actual quantity of material purchased. If in the question material purchase is not given, it is taken as equal to material consumed.

Material price variance can also be calculated taking material used as actual quantity instead of material purchased. This method is also correct but does not serve the purpose of variance computation. Material price variance may arise from variety of reasons out of which some may be controllable and some may be beyond the control of the purchase department. If price variance arises due to inefficiency of purchase department or any other reason within the control of the company, then it is very important to report variance as early as possible and this can be done by taking purchase quantity as actual quantity for price variance computation.

Responsibility: Generally, purchase department purchases materials from the market. Purchase department is expected to perform its function very prudently so that company never suffers loss due to its inefficiency. Purchase department is held responsible for adverse price variance arises due to the factors controllable by the department.

(ii) Material Usage Variance: It measures variance in material cost due to usage/ consumption of materials. It is computed as below:

Material Usage variance = Standard price (Standard quantity – Actual quantity*)

Or

MUV = SP × (SQ –AQ)

*Here actual quantity means actual quantity of material used.

Responsibility: Material usage is the responsibility of production department and it is held responsible for adverse usage variance.

Reasons of material usage variance: Actual material consumption may differ from the standard quantity due to either difference in proportion used from standard proportion or due to

difference in actual yield from standard yield. Material usage variance is divided into two parts (iia) Material usage mix variance and (iib) Material yield variance.

(iia) Material Mix Variance: Variance in material consumption may arise due to difference in proportion used actually from the standard mix/ proportion. It arises only when two more inputs are used to produce a product. Mathematically,

Material Mix Variance = (Revised standard quantity – Actual quantity) × Standard price

Or

MMV = (RSQ – AQ) × SP

Where,

Revised standard quantity =

$$\frac{\text{Standard quantity of one material}}{\text{Total of standard quantitiets of all materials}} \times \text{Total of actual quantities of all materials}$$

(iib) Material Yield Variance (or Material Sub-usage Variance): Variance in material consumption which arise due to yield or productivity of the inputs. It may arise due to use of sub standard quality of materials, inefficiency of workers or due to wrong processing.

Material Revised usage variance = (Standard quantity – Revised standard quantity) × Standard price

MRUV = (SQ – RSQ) × SP

Or

Material Yield Variance = (Actual yield – Standard yield) × Standard output price

MYV = (AY – SY) × SOP

Note: Material revised usage variance is also known as material sub – usage variance.

In each case there will be only one variance either material yield or material revised usage variance.

Verification of the formulae:

Material Cost Variance = Material Usage Variance + Material Price Variance*

Or, **Material Cost Variance** = (Material Mix Variance + Material Revised usage Variance) + Material price variance

*If material purchase quantity and material consumed quantity is same

Meaning of the terms used in the formulae:

Term	Meaning
Standard Quantity (SQ)	Quantity of inputs to be used to produce actual output.
Actual Quantity (AQ)	Quantity of inputs actually used to produce actual output.
Revised Standard Quantity (RSQ)	If Actual total quantity of inputs were used in standard proportion.
Actual Yield (AY)	Actual Output
Standard Yield (SY)	Actual output if inputs used in standard ratio
Standard Output Price (SOP)	Standard material cost for actual output

Illustration 1 (Calculation of material cost variance)

The standard and actual figures of product 'Z' are as under:

	Standard	*Actual*
Material quantity	*50 units*	*45 units*
Material price per unit	*₹ 1.00*	*₹ 0.80*

Calculate material cost variance.

Solution:

The variances may be calculated as under:

(a) Standard cost = Std. qty × Std. price = 50 units × ₹ 1.00 = ₹50

(b) Actual cost = Actual qty. × Actual price = 45 units × ₹ 0.80 = ₹ 36

Variances:

(i) Price variance = Actual qty (Std. price – Actual price)
= 45 units (₹ 1.00 – ₹ 0.80) = ₹ 9 (F)

(ii) Usage variance = Std. price (Std. qty – Actual qty.)
= ₹ 1 (50 units – 45 units) = ₹ 5 (F)

(iii) Material cost variance = Standard cost – Actual cost

(Total variance) = ₹ 50 – ₹ 36 = ₹ 14 (F)

Illustration 2 (Calculation of material usage, price and total cost variance)

NXE Manufacturing Concern furnishes the following information:

Standard:	*Material for 70 kg finished products*	*100 kg.*
	Price of material	*₹ 1 per kg.*
Actual:	*Output*	*2,10,000 kg.*

	Material used	*2,80,000 kg.*
	Cost of Materials	*₹ 2,52,000*
Calculate:	*(a) Material usage variance, (b) Material price variance, (c) Material cost variance.*	

Solution:

Standard Quantity of input for actual output (SQ) = 2, 10,000 kg × $\frac{100\text{ kg}}{70\text{ kg}}$ = 3, 00,000 kg.

Actual Price (AP) = (₹2, 52,000 ÷ 2, 80,000 kg) = ₹ 0.90 per kg.

(a) Material Usage Variance = (SQ – AQ) × SP
= (3,00,000 – 2,80,000) × 1
= ₹ 20,000 (F)

(b) Material Price Variance = (SP – AP) × AQ
= (1 – 0.90) × 2,80,000
= ₹ 28, 000 (F)

(c) Material Cost Variance = (SQ × SP) – (AQ × AP)
= (3, 00,000 × 1) – (2, 80,000 × 0.90)
= ₹ 48, 000 (F)

Check MCV = MPV + MUV
₹ 48, 000 (F) = ₹ 28, 000 (F) + ₹20, 000 (F)

Illustration 3 (Calculation of Material cost, price and usage variance)

For making 10 kg. of CEMCO, the standard material requirements is:

Material	*Quantity*	*Rate per kg. (₹)*
A	*8*	*6.00*
B	*4*	*4.00*

During April, 1,000 kg of CEMCO were produced. The actual consumption of materials is as under:

Material	*Quantity (Kg.)*	*Rate per kg. (₹)*
A	*750*	*7.00*
B	*500*	*5.00*

Calculate (A) Material Cost Variance; (b) Material Price Variance; (c) Material usage Variance.

Solution:

Basic Calculations

	Standard for 1,000 kg.			Actual for 1,000 kg.		
	Qty.	Rate	Amount	Qty.	Rate	Amount
	Kg.	(₹)	(₹)	Kg.	(₹)	(₹)
A	800*	6	4,800	750	7	5,250
B	400*	4	1,600	500	5	2,500
Total	1,200		6,400	1,250		7,750

(* A- 8÷10 ×1000 = 800 B- 4÷10 × 1000 = 400)

Calculation of Variances:

(a) Material Cost Variance = Std. cost for actual output – Actual cost

MCV = 6,400 – 7,750

= ₹1, 350 (A)

(b) Material Price Variance = (SP – AP) × AQ

A = (6 – 7) × 750 = ₹ 750 (A)

B = (4 – 5) × 500 = ₹ 500 (A)

MPV = ₹1,250 (A)

(c) Material Usages Variance = (SQ – AQ) × SP

A = (800 – 750) × 6 = ₹ 300 (F)

B = (400 – 500) × 4 = ₹ 400 (A)

MUV = ₹ 100 (A)

Check

MCV = MPV + MUV

1,350 (A) = 1,250 (A) + 100 (A)

Illustration 4 (Calculation of material mix and material yield variance)

The standard cost of a chemical mixture is as follows:

40% material A at ₹ 20 per kg.

60% material B at ₹ 30 per kg.

A standard loss of 10% of input is expected in production. The cost records for a period showed the following usage :

90 kg material A at a cost of ₹ 18 per kg.

110 kg material B at a cost of ₹ 34 per kg.

The quantity produced was 182 kg. of good product.

Calculate all material variances.

Solution:

Basic Calculation

Material	Standard for 180 kg. output			Actual for 182 kg. output		
	Qty. Kg.	Rate (₹)	Amount (₹)	Qty Kg.	Rate (₹)	Amount (₹)
A	80	20	1,600	90	18	1,620
B	120	30	3,600	110	34	3,740
Total	200		5,200	200		5,360
Less: Loss	20	–	–	18	–	–
	180		5,200	182		5,360

Std. cost of actual output = ₹5, 200 × $\frac{182}{180}$ = ₹ 5, 257.78

Calculation of Variances

1. Material Cost Variance = (Std. cost of actual output – Actual cost)
   = (5,227.78 – 5,360) = ₹ 102.22 (A)
2. Material Price Variance = (SP – AP) × AQ
   Material A = (20 – 18) × 90 = ₹ 180.00 (F)
   Material B = (30 – 34)) × 110 = ₹ 440.00 (A)
   MPV = ₹ 260.00 (A)
3. Material Usage Variance = (Std. Quantity for actual output – Actual Quantity) × Std. Price

   Material A = $\left(80 \times \frac{182}{180} - 90\right)$ × 20 = ₹ 182.22 (A)

   Material B = $\left(120 \times \frac{182}{180} - 110\right)$ × 30 = ₹340.00 (F)

   MUV = ₹157.78 (F)

Check

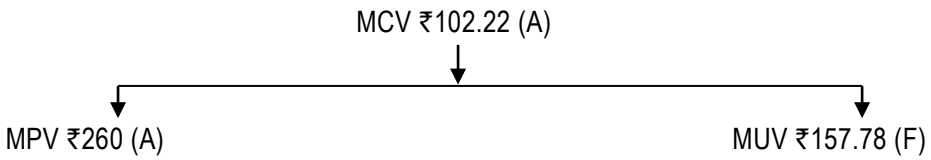


Illustration 5 (calculation of material mix variance and material yield variance)

The standard mix to produce one unit of product is as follows:

Material X 60 units @ ₹ 15 per unit	=	*900*
Material Y 80 units @ ₹ 20 per unit	=	*1,600*
Material Z 100 units @ ₹ 25 per unit	=	*2,500*
240 units		*5,000*

During the month of April, 10 units were actually produced and consumption was as follows:

Material X 640 units @ ₹ 17.50 per unit	=	*11,200*
Material Y 950 units @ ₹ 18.00 per unit	=	*17,100*
Material Z 870 units @ ₹ 27.50 per unit	=	*23,925*
2460 units		*52,225*

Calculate all material variances.

Solution:

Material	Standard for 10 units			Actual for 10 units		
	Qty. units	Rate (₹)	Amount (₹)	Qty. units	Rate (₹)	Amount (₹)
X	600	15	9,000	640	17.50	11,200
Y	800	20	16,000	950	18.00	17,100
Z	1,000	25	25,000	870	27.50	23,925
Total	2,400		50,000	2460		52,225

1. Material Cost Variance = Standard cost – Actual cost
   = ₹ 50,000 – ₹ 52,225
   MCV = ₹ 2,225 (A)
2. Material Price Variance = (Std. Price – Actual Price) × Actual Qty.
   Material X = (15 – 17.50) × 640 = ₹ 1,600 (A)
   Material Y = (20 – 18) × 950 = ₹ 1,900 (F)
   Material Z = (25 – 27.50) × 870 = ₹ 2,175 (A)
   MPV = ₹ 1,875 (A)
3. Material Usage Variance = (Std. Qty. – Actual Qty.) × Std. Price
   Material X = (600 – 640) × 15 = ₹ 600 (A)
   Material Y = (800 – 950) × 20 = ₹ 3,000 (A)
   Material Z = (1,000 – 870) × 25 = ₹ 3,250 (F)
   MUV = ₹ 350 (A)

Check MCV = MPV + MUV

₹2,225 (A) = ₹1,875 (A) + ₹350 (A)

4. Material Mix Variance = (Revised Std. Qty. – Actual Qty.) × Std. Price

Material	X	= (615* – 640) × 15	= ₹ 375 (A)
Material	Y	= (820* – 950) × 20	= ₹2,600 (A)
Material	Z	= (1,025 – 870) × 25	= ₹3,875 (F)
	MMV		= ₹ 900 (F)

*Revised Standard Quantity (RSQ) is calculated as follows:

$$\text{Material X} = \frac{2460}{2400} \times 600 = 615 \text{ units}$$

$$\text{Material Y} = \frac{2460}{2400} \times 800 = 820 \text{ units}$$

$$\text{Material Z} = \frac{2460}{2400} \times 1{,}000 = 1{,}025 \text{ units}$$

5. Material Yield Variance

For yield variance, certain basic calculations have to be made as follows :

$$\text{Standard Yield Variance} = \frac{\text{Actual usage of materials}}{\text{Standard usage per unit of output}} = \frac{2460}{240} = 10.25 \text{ units}$$

SOP (Std. material cost per unit of output) = ₹50,000 ÷ 10 units = ₹5,000

Material Yield Variance = (AY – SY) × SOP

MYV = (10 – 10.25) × 5,000 = ₹1,250 (A)

Material Revised Usage (or Sub-usage) Variance (MRUV)

= (Standard Quantity – Revised Standard Quantity) × Standard Price

Material X = (600 – 615) × 15	= ₹ 225 (A)
Material Y = (800 – 820) × 20	= ₹ 400 (A)
Material Z = (1,000 – 1,025) × 25	= ₹ 625 (A)
MRUV	= ₹1,250 (A)

Note : Either MMV or MRUV is calculated. These two are always equal.

Check

MUV = MMV + MYV (Or MRUV)

₹350 (A) = ₹900 (F) + ₹1,250 (A)

or

MCV = MPV + MMV + MYV (Or MRUV)

₹2,225 (A) = ₹1,875 (A) + ₹900 (F) + ₹1,250 (A)

(b) Labour Cost Variance: Labour cost variance is the difference between actual labour cost and standard cost . Mathematically

Labour Cost Variance = (Std. hours for actual output × Std. rate per hour) – (Actual hours × Actual rate per hour)

Or

LCV = (SH x SR) – (AH x AR)

Reason: Difference in labour cost arises either due to difference in the actual labour rate from the standard rate or difference in numbers of hours worked from standard hours. Labour cost variance can be divided into two parts namely (i) Labour Rate Variance and (ii) Labour Efficiency Variance.

(i) Labour Rate Variance: Labour rate variance arises due to difference in actual rate paid from standard rate. It is very similar to material price variance. It is calculated as below:

Labour Rate Variance = Actual time* (Std. rate – Actual rate)

LRV = AH x (SR – AR)

*Here actual time means time for which wage has been paid/ credited.

Responsibility: Generally labour rates are influenced by the external factors which are beyond the control of the organisation. However personnel manager is responsible for labour rate negotiation.

(ii) Labour Efficiency Variance: Labour efficiency variance arises due to deviation in the working hour from the set standard.

Labour Efficiency Variance = Std. rate (Std. hours for actual output – Actual hours*)

LEV = SR x (SH – AH)

*Actual time worked

Responsibility: Efficiency variance may arise due to ability of the workers, inappropriate team of workers, inefficiency of production manager or foreman etc. However, production manager or foreman can be held responsible for the adverse variance which otherwise can be controlled.

Labour efficiency variance is further divided into the following variances:

(iia) Idle Time Variance

(iib) Labour Mix Variance or Gang variance

(iic) Labour Yield Variance (or Labour Revised-efficiency Variance)

(iia) Idle Time Variance: It is calculated for the unproductive labour hours. Here idle time means labour idle time arises due to abnormal reasons. It is calculated as below:

Idle Time Variance = Idle hours x Standard rate

ITV = IH x SR

(iib) Labour Mix Variance: Labour efficiency variance which arises due to change in the proportion or combination of different skill set i.e. number of skilled workers, semi-skilled workers and un-skilled workers. Mathematically,

Labour Mix Variance = (Revised std. hours – Actual hours) x Standard rate

LMV = (RSH – AH) x SR

(iic) Labour Revised Efficiency Variance or Labour Yield Variance: Labour efficiency variance which arises due to productivity of workers.

Labour Revised Efficiency Variance = (Std. hours for actual output – Revised std. hours) x Standard rate

LREV = (SH – RSH) x SR

OR

Labour Yield Variance = (Actual yield – Std. yield from actual input) x Std. labour cost per unit of output

LYV = (AY – SY) x SLC

Verification of formulae:

Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance (if hours paid and hours worked is same)

OR

Labour Cost Variance = Labour Rate Variance + Idle Time Variance + Labour Efficiency Variance (if there is idle time)

Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance

Illustration 6 (Calculation of labour cost variance, labour efficiency and labour rate variance)

The standard and actual figures of a firm are as under

Standard time for the job	*1,000 hours*
Standard rate per hour	*₹ 0.50*
Actual time taken	*900 hours*
Actual wages paid	*₹ 360*

Compute the variances

Solution:

(a)	Std. labour cost	(₹)
	(1,000 hours × ₹ 0.50)	500
(b)	Actual wages paid	360
(c)	Actual rate per hour: ₹ 360/900 hours =	₹ 0.40

Variances

(i)	Rate variance	= Actual time (Std. rate – Actual rate)
		= 900 hours (₹ 0.50 – ₹0.40) = ₹ 90 (F)
(ii)	Efficiency variance	= Std. rate per hr. (Std. time – Actual time)
		= ₹ 0.50 (1,000 hrs. – 900 hrs.) = ₹ 50 (F)
(iii)	Total labour cost variance	= Std. labour cost – Actual labour cost = ₹140(F)

Illustration 7 (Calculation of material price and usage variance and labour rate and efficiency variance)

The following standards have been set to manufacture a product:

Direct Material:	*(₹)*
2 units of A @ ₹ 4 per unit	*8.00*
3 units of B @ ₹3 per unit	*9.00*
15 units of C @ ₹1 per unit	*15.00*
	32.00
Direct Labour: 3 hrs @ ₹8 per hour	*24.00*
Total standard prime cost	*56.00*

The company manufactured and sold 6,000 units of the product during the year. Direct material costs were as follows:

12,500 units of A at ₹4.40 per unit

18,000 units of B at ₹2.80 per unit

88,500 units of C at ₹1.20 per unit

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours, the company paid at ₹12 per hour while for the remaining, the wages were paid at standard rate. Calculate materials price variance and usage variance and labour rate and efficiency variances.

Solution:

For Material Cost Variances

	SQ × SP	AQ × AP	AQ × SP
A	12,000 x 4 = 48,000	12,500 x 4.40 = 55,000	12,500 x 4 = 50,000
B	18,000 x 3 = 54,000	18,000 x 2.80 = 50,400	18,000 x 3 = 54,000
C	90,000 x 1 = 90,000	88,500 x 1.20 = 1,06,200	88,500 x 1 = 88,500
Total	₹ 1,92,000	₹ 2,11,600	₹1,92,500

Variances:

Material Price Variance = Actual quantity (Std. price – Actual price)

Or, = (AQ x SP) – (AQ x AP)

Or, = ₹ 1,92,500 – ₹2,11,600

= ₹ 19,100 (A)

Material Usage Variance = Standard Price (Std. Quantity – Actual Quantity)

Or, = (SP x SQ) – (SP x AQ)

Or, = ₹ 1,92,000 – ₹ 1,92,500 = ₹ 500 (A)

For Labour Cost Variance :

	SH × SR	AH × AR	AH × SR
Labour	(6,000 x 3) x ₹ 8 = 1,44,000	2,500 x 12 = 30,000 15,000 x 8 = 1,20,000	17,500 x 8 = 1,40,000
Total	₹ 1,44,000	₹ 1,50,000	₹ 1,40,000

Variances :

Labour Rate Variance : Actual Hours (Std. Rate – Actual Rate)

Or, = (AH x SR) – (AH x AR)

Or, = ₹1,40,000 – ₹1,50,000

= ₹10,000 (A)

Labour Efficiency Variance : Standard Rate (Std. Hours – Actual Hours)

Or, = (SR x SH) – (SR x AH)

Or, = ₹1,44,000 – ₹1,40,000

= ₹4,000 (F)

Illustration 8 (Calculation of labour cost, rate, efficiency, mix and yield variance)

The standard labour employment and the actual labour engaged in a week for a job are as under :

	Skilled workers	*Semi-skilled workers*	*Unskilled workers*
Standard no. of workers in the gang	*32*	*12*	*6*
Actual no. of workers employed	*28*	*18*	*4*
Standard wage rate per hour	*3*	*2*	*1*
Actual wage rate per hour	*4*	*3*	*2*

During the 40 hours working week, the gang produced 1,800 standard labour hours of work. Calculate :

(a) Labour Cost Variance *(b) Labour Rate Variance*

(c) Labour Efficiency Variance *(d) Labour Mix Variance*

(e) Labour Yield Variance

Solution:

Category of workers	SH* x SR	AH@ x SR	AH@ x AR	RSH# x SR
Skilled	1,152 x 3 = 3,456	1,120 x 3 = 3,360	1,120 x 4 = 4,480	1,280 x 3 = 3,840
Semi-skilled	432 x 2 = 864	720 x 2 = 1,440	720 x 3 = 2,160	480 x 2 = 960
Unskilled	216 x 1 = 216	160 x 1 = 160	160 x 2 = 320	240 x 1 = 240
Total	₹ 4,536	₹ 4,960	₹ 6,960	₹ 5,040

$$* \text{ Actual hours produced } x \frac{\text{Std. labour hours}}{\text{Total Std. labour hours}}$$

Std. hrs. for actual output are calculated as follows :

$$\text{Skilled} = \frac{1,800}{2,000} \times 1,280 = 1,152 \text{ hrs.}$$

$$\text{Semi-skilled} = \frac{1,800}{2,000} \times 480 = 432 \text{ hrs.}$$

$$\text{Unskilled} = \frac{1,800}{2,000} \times 240 = 215 \text{ hrs.}$$

@ Actual no. of workers x 40 hours

$\text{Actual hours worked} \times \frac{\text{Std. hours}}{\text{Total Std. hours}}$

Labour Cost Variance = (SH x SR) – (AH x AR)

Or, = ₹4,536 – 6,960 = ₹2,424 (A)

Labour Rate Variance = AH (SR – AR) or (AH x SR) – (AH x AR)

Skilled = 3,360 – 4,480 = ₹1,120 (A)

Semi-skilled = 1,440 – 2,160 = ₹ 720 (A)

Unskilled = 160 - 320 = ₹ 160 (A) 2,000 (A)

Labour Efficiency Variance = SR (SH – AH) or (SR x SH) – (SR x AH)

Skilled = 3,456 – 3,360 = ₹ 96 (F)

Semi-skilled = 864 – 1,440 = ₹ 576 (A)

Unskilled = 216 - 160 = ₹ 56 (F) ₹424 (A)

Labour Mix Variance = SR (RSH – AH) or (SR x RSH) – (SR x AH)

Skilled = 3,840 – 3,360 = ₹480 (F)

Semi-skilled = 960 – 1,440 = ₹480 (A)

Unskilled = 240 - 160 = ₹ 80 (F) ₹ 80 (F)

Labour Yield Variance = SR (SH – RSH) or (SR x SH – SR x RSH)

Skilled = 3,456 - 3,840 = ₹384 (A)

Semi-skilled = 864 - 960 = ₹96 (A)

Unskilled = 216 - 240 = ₹ 24 (A) ₹ 504 (A)

Check

(i) LCV = LRV + LEV

₹2,424 (A) = ₹2,000 (A) + ₹424 (A)

(ii) LEV = LMV + LYV

₹424 (A) = ₹80 (F) + ₹504 (A)

(c) Overheads – Normally, for several type of overhead expenses either a single recovery rate or two recovery rates, one representing fixed overheads and the other representing variable overheads, will be prepared.

Overheads have been classified as both fixed and variable thereby giving a standard fixed

cost (overhead) per unit and standard variable cost (overhead) per unit.

The recovery of the fixed components of the estimated overheads depends upon capacity utilization.

In case a company produces less than the projected utilization it shall not be able to recover all the budgeted fixed overheads. This unrecovered portion is known as production volume variance.

The other variance is because of variations in actual spending when compared with both estimated fixed and estimated variable overheads. Such a variance is known as Overhead expenses variance.

The following detailed discussion shall help you have a clear understanding of these two variances.

(1) Production Volume Variance:

The term fixed overheads implies that the element of cost does not vary directly in proportion to the output. In other words fixed overheads do not change within a given range of activity.

However the unit cost changes even though the fixed overheads are constant in total within the given range of output. So, higher the level of activity, the lower will be the unit cost or vice versa.

The management is, therefore, faced with a costing difficulty because it requires a representative rate for charging fixed overheads irrespective of changes in volume of output. For example, if the fixed overheads are ₹ 10,000 and the output varies from 8,000 to 11,000 units, the cost per unit of output would be as under:

Fixed Overheads (₹)	*Output in units*	*Cost per unit of output (₹)*
10,000	8,000	1.25
10,000	9,000	1.11
10,000	10,000	1.00
10,000	11,000	0.91

We have, however, seen that in standard costing, a predetermined rate of overhead recovery is established for costing purposes. This involves the establishment of a predetermined capacity.

If we take, for example; 10,000 units as predetermine volume/capacity, the pre-determined rate will be ₹ 1 per unit. If the factory produces only 8,000 units, there will be a loss due to under-recovery which can be explained in two-ways:

(a) The actual cost will be ₹ 10,000 ÷ 8,000 units = ₹ 1.25 per unit whereas the absorbed cost is ₹ 1 per hour. Since the cost is more by ₹ 0.25 per unit, the total loss is 8,000 units × ₹ 0.25 or ₹ 2,000.

(b) Since the factory has produced only 8,000 units, the amount of overheads recovered is 8,000 units × ₹1 or ₹ 8,000. Since fixed overheads are constant, the amount which should have been ideally incurred for the department is ₹10,000. Hence there is a difference of ₹ 2,000 between the overheads recovered and the overheads estimated. This variance is known as production volume variance.

This shows the cost of failure on the part of the factory to produce at the planned activity of 10,000 units. If the company produces 11,000 units, the variance will show the benefits of operating at a level above the budgeted activity. If, however, the factory has produced 10,000 units, there will be no production volume variance because the actual activity equals what was budgeted i.e. the production of 10,000 units.

(2) Overhead Expenses Variance: As discussed above, the Production Volume Variance analyses the unrecovered fixed overheads. Apart from this, there can be variations in the actual spending of both fixed and variable overheads when compared to what was established as a standard. Such variations can be accounted for by analyzing an overhead expenses variance.

The following illustration shows how overhead expense rates are computed and variance analysed.

The analysis of overhead variances is different from that of material and labour variances. As overhead is the aggregate of indirect materials, indirect labour and indirect expenses, this variance is considered to be a difficult part of variance analysis. It is important to understand that overhead variance is nothing but under or over-absorption of overhead. There is a separate computation for overhead variances for fixed and variable overheads.

Variable Overheads Cost Variance: Variable overheads consist of expenses other than direct material and direct labour which vary with the level of production. If variable overhead consist of indirect materials then in this case it vary with the direct material used. On the other hand if variable overhead is depend on number of hours worked then in this case it will vary with labour hour or machine hours. If nothing is mentioned specifically then we take labour hour as basis. Variable overhead cost variance calculation is similar to labour cost variance. Variable overhead cost variance is divided into two parts (i) Variable Overhead Expenditure Variance and (ii) Variable Overhead Efficiency Variance.

Variable Overhead Cost Variance = Standard Cost – Actual Cost

OR

(SR x SH) – (AR x AH)

(i) Variable Overhead Expenditure Variance = Actual hours (Std. rate – Actual rate)

(ii) Variable Overhead Efficiency Variance = Std. Rate (Std. hours – Actual hours)

Meaning of the terms used in the formulae:

Term	Meaning
Standard Hours (SH)	Hours required producing actual output.
Actual Hours (AH)	Actual Hours taken to produce actual output.
Revised Standard Hours (RSH)	If actual labour hours worked were worked by standard mix (combination) of labour.
Actual Yield (AY)	Actual Hours worked
Standard Yield (SY)	Actual hours if labour worked in standard ratio
Standard Labour Cost (SLC)	Standard labour cost for actual output

Fixed Overhead Cost Variance: Fixed overhead cost variance is the difference between actual fixed overhead and absorbed fixed overhead. Fixed overhead variance is divided into two parts (i) Fixed Overhead Expenditure Variance and (ii) Fixed Overhead Volume Variance.

Fixed Overhead Cost Variance = Absorbed Fixed Overheads – Actual Fixed Overheads

Or, = (Std. hours for actual output x Std. fixed overhead rate) – Actual Fixed Overhead

(i) Fixed Overhead Expenditure Variance: This is the difference between the actual fixed overhead incurred and budgeted fixed overhead.

Fixed Overhead Expenditure Variance = Budgeted Fixed Overhead – Actual Fixed Overheads

Or, = (Budgeted hours x Std. fixed overhead rate) – Actual fixed overhead

(ii) Fixed Overhead Volume Variance: Variance in fixed overhead which arise due to the volume of production is called fixed overhead volume variance. Mathematically

Fixed Overhead Volume Variance = Absorbed Overhead – Budgeted Overhead

= SR (Std. hours for actual output – Budgeted hours)

= SR (SH –BH)

Fixed overhead volume variance is further divided into the three variances:

(iia) Efficiency Variance (iib) Capacity Variance and (iic) Calendar Variance

(iia) F.O. Efficiency Variance = (Absorbed fixed overhead – Standard fixed overhead)

= (Std. hours for actual output – Actual hours) × Std. fixed overhead rate

= SR (SH –AH)

(iib) F.O. Capacity Variance = (Standard fixed overhead – Budgeted overhead)

= (Actual hours – Budgeted hours) × Std. fixed overhead rate

= SR (AH – BH)

(iic) F.O. Calendar Variance = (Actual No. of working days – Std. No. of working days) × Std. fixed rate per day

Or = (Revised budgeted hours – Budgeted hours) × Std. fixed rate per hour

Where,

$$\text{Revised budgeted hours} = \text{Actual days} \times \frac{\text{Budgeted hours}}{\text{Budgeted days}}$$

Note: When calendar variance is computed, there will be a modification in the capacity variance. In that case revised capacity variance will be calculated and the formula is:

Revised Capacity Variance = (Actual hours – Revised budgeted hours) × Std. fixed rate per hour

Verification of formulae:

F.O. Cost Variance = F.O. Expenditure Variance + F.O. Volume Variance

F. O. Volume Variance = Efficiency Variance + Capacity Variance + Calendar Variance

Basic terms used in the computation of overhead variance

$$\text{Standard overhead rate (per hour)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted hours}}$$

Or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted output in units}}$$

Note: Separate overhead rates will be computed for fixed and variable overheads.

Basic calculations before the computation of overhead variances:

The following basic calculation should be made before computing variances.

(i) When overhead rate per hour is used:

(a) Standard hours for actual output (SHAO)

$$\text{SHAO} = \frac{\text{Budgeted Hours}}{\text{Budgeted Output}} \times \text{Actual Output}$$

(b) Absorbed (or Recovered) overhead = Std. hours for actual output × Std. overhead rate per hour

(c) Standard overhead = Actual hours × Std. overhead rate per hour

(d) Budgeted overhead = Budgeted hours × Std. overhead rate per hour

(e) Actual overhead = Actual hours × Actual overhead rate per hour

(ii) When overhead rate per unit is used

(a) Standard output for actual hours (SOAH)

$$\text{SOAH} = \frac{\text{Budgeted Output}}{\text{Budgeted Hours}} \times \text{Actual Hours}$$

(b) Absorbed overhead = Actual output × Std. overhead rate per unit

(c) Standard overhead = Std. output for actual time × Std. overhead rate per unit

(d) Budgeted overhead = Budgeted output × Std. overhead rate per unit

(e) Actual overhead = Actual output × Actual overhead rate per unit

Overhead cost variance = Absorbed overhead – Actual overhead

OCV = (Std. hours for actual output × Std. overhead rate) – Actual overhead

The following illustration shows how overhead expense rates are computed and variance analysed.

Illustration 9 (Calculation of production volume variance and overhead expense variance)

The overhead expense budget for a factory producing to a capacity of 200 units per month is as follows:

Description of overhead	*Fixed cost per unit in ₹*	*Variable cost per unit in ₹*	*Total cost per unit in ₹*
Power and fuel	*1,000*	*500*	*1,500*
Repair and maintenance	*500*	*250*	*750*
Printing and stationary	*500*	*250*	*750*
Other overheads	*1,000*	*500*	*1,500*
	₹ 3,000	*₹ 1,500*	*4,500*

The factory has actually produced only 100 units in a particular month. Details of overheads actually incurred have been provided by the accounts department and are as follows:

Description of overhead	*Actual cost*
Power and fuel	*₹ 4,00,000*
Repair and maintenance	*₹ 2,00,000*
Printing and stationary	*₹ 1,75,000*
Other overheads	*₹ 3,75,000*

You are required to compute the production volume variance and the overhead expenses variance.

Solution:

Production volume variance

Standard fixed overheads per unit	:	₹ 3,000 (Given)
Actual production	:	100 units
Standard production (capacity)	:	200 units
Unabsorbed units	:	100 units (200 – 100)
Production volume variance	:	₹ 3,000 × 100 units
		= ₹ 3,00,000 (Adverse)

Overhead expenses variance

Standard fixed overheads for actual production	:	₹ 6,00,000
Standard variable overheads for actual production	:	₹ 1,500 × 100 units
		= ₹ 1,50,000
Std total overheads for actual production	:	₹ 7,50,000
Actual overheads	:	₹ 11,50,000
Overhead expense variance	:	₹ 4,00,000 (Adverse)

Illustration10 (Calculation of production volume variance and overhead expense variance)

XYZ Company has established the following standards for factory overheads.

Variable overhead per unit:	*₹ 10/-*
Fixed overheads per month	*₹ 1,00,000*

Capacity of the plant 20,000 units per month.

The actual data for the month are as follows:

Actual overheads incurred	*₹ 3,00,000*
Actual output (units)	*15,000 units*

Required:

Calculate overhead variances viz :

(i) Production volume variance

(ii) Overhead expense variance

Solution:

Unutilised capacity	:	20,000 units less 15,000 units
	=	5,000 units
Std fixed overheads per unit	=	₹ 5 per unit
Production volume variance	=	5,000 units × ₹ 5
	=	₹ 25,000 (Adverse)
Std variable overheads for actual production	:	₹ 10 × 15,000 units
	=	₹ 1,50,000
Std fixed overheads	=	₹ 1,00,000
Total overheads on standards for actual production	=	₹ 2,50,000

Actual overheads incurred = ₹ 3,00,000

Overhead expense variance = ₹ 50,000

Illustration 11 (Calculation of variable overhead variance, fixed overhead expenditure and volume variance)

T*he following information was obtained from the records of a manufacturing unit using standard costing system.*

	Standard	***Actual***
Production	*4,000 units*	*3,800 units*
Working days	*20*	*21*
Fixed Overhead	*₹ 40,000*	*₹ 39,000*
Variable Overhead	*12,000*	*12,000*

You are required to calculate the following overhead variance:

(a) Variable overhead variance

(b) Fixed overhead variances

(i) Expenditure variances

(ii) Volume variance

Solution:

(a) For Variable Overhead Variance:

Actual variable overhead = ₹12, 000

Standard variable overhead for production (Budgeted output × Std. variable overhead rate per unit) = (12,000 ÷ 4,000) × 3,800

= ₹11, 400

Variable overhead variance: Standard variable overhead - Actual variable overhead

= ₹11, 400 – ₹12, 000

= 600 (A)

(b) For Fixed Overhead Variance:

Actual fixed overhead incurred = ₹ 39, 000

Budgeted fixed overhead for the period = ₹ 40, 000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

= (₹40, 000 ÷ 4,000 units) × 3,800 units = ₹38, 000.

Variances:

(i) Fixed Overhead Expenditure Variances:

Budgeted fixed overhead – Actual fixed overhead

= ₹40, 000 – ₹39, 000 = 1,000 (F)

(ii) Fixed Overhead Volume Variance : Standard fixed overhead – Budgeted fixed overhead

= ₹38, 000 – ₹40, 000 = ₹2, 000 (A)

(iii) Fixed Overhead Variance : Standard fixed overhead – Actual fixed overhead

= ₹38, 000 – ₹39, 000 = ₹1, 000 (A)

Illustration12 (Calculation of Fixed overhead cost, expenditure and volume variance)

A company has a normal capacity of 120 machines, working 8 hours per day of 25 days in a month. The fixed overheads are budgeted at ₹1, 44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In April, 2012, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹1, 42,000.

Compute:

(i) Expense variance
(ii) Volume variance
(iii) Total fixed overheads variance.

Solution

Working Notes:

		Budget	Actual
1.	Working hours per month	24,000	20,160
2.	Production units per month = (Budget 24,000 ÷ 4 hrs, Actual given)	6,000	5,305
3.	Standard fixed overhead rate per unit = ₹1,44,000 ÷ 6,000 = ₹ 24		
4.	Standard fixed overhead rate per hour = ₹1,44,000 ÷ 24,000 = ₹6		
5.	Standard fixed overhead rate per day = ₹1,44,000 ÷ 25 = ₹ 5,760		

Fixed Overhead Variances:

Actual Fixed overhead incurred = ₹1, 42,000 (given)

Budgeted fixed overhead for the period = ₹1, 44,000.

Standard fixed overhead for actual production (Standard output for actual time × Standard Fixed Overhead per unit) = 5,305 × ₹24 = ₹1, 27,320.

Variances:

(i) F.O. Expenditure Variance = (Budgeted fixed overhead – Actual fixed overhead)
= 1, 44,000 – 1, 42,000 = ₹ 2, 000 (F)

(ii) Total Volume Variance = (Standard fixed overhead – Budgeted fixed overhead)
= 1, 27,320 – 1, 44,000 = ₹16, 680 (A)

(iii) Fixed overhead variance = (Standard fixed overhead – Actual Fixed overhead)
= 1, 27,320 – 1, 42,000 = ₹14, 680 (A)

Alternatively:

Expenditure Variance + Volume Variance = 2,000 (F) + 16,680 (A) = ₹14, 680 (A)

Illustration13 (calculation of Fixed overhead cost, expenditure and volume variance)

Following information is available from the records of a factory:

	Budget	***Actual***
Fixed overhead for June, 2012	*₹10,000*	*₹12,000*
Production in June, 2012 (units)	*2,000*	*2,100*
Standard time per unit (hours)	*10*	*–*
Actual hours worked in June	*–*	*21,000*

Compute:

(i) Fixed overhead cost variance,

(ii) Expenditure variance,

(iii) Volume variance.

Solution:

For fixed overhead variances:

Actual F.O. incurred (given)	₹12,000
Budgeted F.O. for the period	₹10,000
Standard F.O. for production (Standard output for actual time × Standard Fixed Overhead per unit)	
2,100 units × {₹10,000 ÷ 2,000 units}	₹10,500

(i) Fixed Overhead Variance = Standard F.O. – Actual F.O.
= ₹ 10,500 – ₹12,000
= ₹1,500 (A)

(ii) F.O. Expenditure Variance = Budgeted F.O – Actual F.O.
= ₹10,000 – ₹12,000
= ₹2,000 (A)

(iii) F.O. Volume Variance = Standard F.O – Budgeted F.O.
= ₹10,500 – ₹ 10,000
= ₹ 500 (F)

Illustration 14 (Calculation of Fixed overhead variance and variable overhead variance)

XYZ Ltd. has furnished you the following information for the month of August, 2012:

	Budget	***Actual***
Output (units)	*30,000*	*32,500*
Hours	*30,000*	*33,000*
Fixed overhead	*₹ 45,000*	*50,000*
Variable overhead	*₹ 60,000*	*68,000*
Working days	*25*	*26*

Calculate overhead variances.

Solution:

Basic Calculations:

Standard hours per unit $= \frac{\text{Budgeted hours}}{\text{Budgeted units}} = \frac{30,000}{30,000} = 1$ hour

Std. hrs. for actual output = 32,500 units × 1 hr = 32,500

Standard overhead rate per hour $= \frac{\text{Budgeted overhead}}{\text{Budgeted hours}}$

For fixed overhead $= \frac{45,000}{30,000} =$ ₹1.50 per hour

For variable overhead $= \frac{60,000}{30,000} =$ ₹2 per hour

Std. F.O. rate per day = ₹45,000 ÷ 25 days = ₹1,800

Recovered overhead = Std. hrs. for actual output × St. rate

For fixed overhead = 32,500 hrs. × ₹1.50 = ₹48,750

For variable overhead = 32,500 hrs. × ₹2 = ₹65,000

Standard overhead = Actual hours × Std. rate

For fixed overhead = 33,000 × 1.50 = ₹49,500

For variable overhead = 33,000 × 2 = ₹66,000

Revised budget hours $= \frac{\text{Budgeted hours}}{\text{Budgeted days}} \times \text{Actual days}$

$= \frac{30,000}{25} \times 26 = 31,200 \text{ hours}$

Revised budgeted overhead (for fixed overhead) = 31,200 × 1.50 = ₹46,800

Calculation of variances

Fixed Overhead Variances:

(i) F.O. cost Variance = Recovered Overhead – Actual Overhead
= 48,750 – 50,000
= ₹1,250 (A)

(ii) F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead
= 45,000 – 50,000
= ₹ 5,000 (A)

(iii) F.O. Volume Variance = Recovered Overhead – Budgeted Overhead
= 48,750 – 45,000
= ₹ 3,750 (F)

(iv) F.O. Efficiency Variance = Recovered Overhead – Standard Overhead
= 48,750 – 49,500 = ₹750 (A)

(v) F.O. Capacity Variance = Standard Overhead- Revised Budgeted Overhead
= 49,500-46800 =₹ 2,700 (F)

(v) Calendar Variance $= \begin{pmatrix} \text{Actual} \\ \text{Days} \end{pmatrix} - \begin{pmatrix} \text{Budgeted} \\ \text{Days} \end{pmatrix} \times \text{St. rate per day.}$

= (26 – 25) × 1,800 = ₹1,800 (F)

Variable Overhead Variances

(i) V.O. Cost variance = Recovered Overhead – Actual Overhead
= 65,000 – 68,000 = ₹ 3,000 (A)

(ii) V.O. Expenditure Variance = Standard Overhead – Actual Overhead
= 66,000 – 68,000 = ₹ 2,000 (A)

(iii) V.O. Efficiency Variance = Recovered Overhead – Standard Overhead
= 65,000 – 66,000 = ₹1,000 (A)

Check

(i) F.O. Cost Variance = Expenditure variance + Volume variance
1,250 (A) = 5,000 (A) + 3,750 (F)

(ii) F.O. Volume Variance = Efficiency Variance + Capacity Variance + Calendar Variance
3,750 (F) = 750 (A) + 2,700 (F) + 1,800 (F)

(iii) V.O. Cost Variance = Expenditure Variance + Efficiency Variance
3,000 (A) = 2,000 (A) + 1,000 (A).

Illustration 15 (Calculation of fixed overhead volume, expenditure and cost variance)

S.V. Ltd. has furnished the following data:

	Budget	***Actual, July (2012)***
No. of working days	*25*	*27*
Production in units	*20,000*	*22,000*
Fixed overheads	*₹ 30,000*	*₹ 31,000*

Budgeted fixed overhead rate is ₹ 1.00 per hour. In July, 2012, the actual hours worked were 31,500.

Calculate the following variances:

(i) Volume variance.

(ii) Expenditure variance.

(iii) Total overhead variance.

Solution:

For Fixed Overhead Variances

Actual fixed overhead incurred	₹ 31,000
Budgeted fixed overhead for the period	30,000
Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit) (₹ 30,000 ÷ 20,000 units) × 22,000	33,000

Computation of Variances:

(i) Fixed overhead expenditure variance:

= Budgeted fixed overhead – Actual fixed overhead

= ₹30,000 – ₹31,000 = ₹ 1,000 (*A*)

(ii) Fixed overhead volume variance:

= Standard fixed overhead – Budgeted fixed overhead

= ₹33,000 – ₹ 30,000 = ₹ 3,000 (*F*)

(iii) Fixed overhead variance :

= Standard fixed overhead – Actual fixed overhead

= ₹33,000 – ₹ 31,000 = ₹ 2,000 (*F*)

Illustration 16 (Calculation of fixed overhead volume, expenditure and cost variance)

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of budgeted working days	*25*
Budgeted man-hours per day	*6,000*
Output (budgeted) per man-hour (in units)	*1*
Fixed overhead cost as budgeted	*₹ 1,50,000*
Actual number of working days	*27*
Actual man-hours per day	*6,300*
Actual output per man-hour (in-units)	*0.9*
Actual fixed overhead incurred	*₹ 1,56,000*

Calculate fixed overhead variances:

(a) Expenditure Variance

(b) Volume Variance,

(c) Fixed Cost Variance.

Solution:

For Fixed overhead Variances:

Actual fixed overhead incurred = ₹1,56,000

Budgeted fixed overhead for the period = 1,50,000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

(6,300 hrs × 27 days × 0.9) × (₹1,50,000 ÷ ₹1,50,000 units) = ₹1,53,090

(a)	Fixed Overhead Expenditure Variance	= Budgeted fixed overhead – Actual fixed overhead = ₹1,50,000 – ₹1,56,000 =	₹ 6,000 (A)
(b)	Fixed Overhead Volume Variance	= Standard fixed overhead – Budgeted fixed overhead = ₹1,53,090 – ₹ 1,50,000 =	₹ 3,090 (F)
(c)	Fixed Overhead Variance	= Standard fixed overhead – Actual fixed overhead = ₹1,53,090 – ₹ 1,56,000 =	₹ 2,910 (A)

Sales Variances: We have discussed the variances which arise due deviations in cost components from the set standards. Now we will discuss revenue side. Sales is the main source of revenue. Variances which arise due to a change in the actual selling price and the actual quantity of units sold from that what was budgeted are known as sales variances.

These variances are computed on the basis of sales value. They provide the sales manager an idea of the effect of various factors affecting sales such as prices, quantity and sales mix on the overall sales value.

The sales value variances are more or less similar to material cost variances or labour cost variances. Sales variances may be analysed on the basis of margin or on the basis of turnover.

Sales Value Variance: It is the difference between the budgeted sales and actual sales. The variance can be bifurcated into sales price variance and sales volume variance. Sales variance

Sales Value Variance = Actual Sales – Budgeted Sales

Or, = (Actual Price x Actual Quantity) – (Budgeted Price x Budgeted Quantity)

If variance is calculated based on margin:

Sales Margin Variance = Actual Margin* – Budgeted Margin**

Or, = (Actual Quantity x Actual Margin) – (Budgeted Quantity x Budgeted Margin)

(a) Sales Price Variance: Variance which arises due to change in sales price from the budgeted one is called sales price variance. Mathematically,

Sales Price Variance = Actual Quantity (Actual Price – Budgeted Price)

Or, = AQ (AP – BP)

If variance is calculated based on margin:

Sales Margin Price Variance = Actual Quantity (Actual Margin – Budgeted Margin)

Or, = AQ (AM – BM)

(b) Sales Volume Variance: Variance which arises due to changes in actual sales quantity from budgeted quantity is called sales volume variance. Mathematically,

Sale Volume Variance = Budgeted Price (Actual Quantity – Budgeted Quantity)

Or, = BP (AQ – BQ)

If variance is calculated based on margin:

Sales Margin Volume Variance = Budgeted Margin (Actual Quantity – Budgeted Quantity)

Or, = BM (AQ –BQ)

* Actual Margin = Actual Sales price per unit – Standard cost per unit
** Budgeted Margin = Budgeted Sales price per unit – Standard cost per unit

Illustration 17 (calculation of Sale value, price and volume variance)

Compute the sales variances from the following figures: -

Product	*Budgeted Quantity*	*Budgeted Price* (₹)	*Actual Quantity* (₹)	*Actual Price* (₹)
A	*2,000*	*2.50*	*2,400*	*3.00*
B	*1,500*	*5.00*	*1,400*	*4.50*
C	*1,000*	*7.50*	*1,200*	*7.00*
D	*500*	*10.00*	*400*	*10.50*

Solution:

Basic calculation:

Product	BQ x BP	AQ x AP	AQ x BP
A	2,000 x 2.50 = ₹5,000	2,400 x 3.00 = ₹ 7,200	2,400 x 2.50 = ₹ 6,000
B	1,500 x 5.00 = ₹7,500	1,400 x 4.50 = ₹ 6,300	1,400 x 5.00 = ₹ 7,000
C	1,000 x 7.50 = ₹ 7,500	1,200 x 7.00 = ₹ 8,400	1,200 x 7.50 = ₹ 9,000
D	500 x 10.00 = ₹ 5,000	400 x 10.50 = ₹ 4,200	400 x 10.00 = ₹ 4,000
Total	₹ 25,000	₹ 26,100	₹ 26,000

Computation of Variances

Sales Price Variance	=	Actual quantity (Actual price – Budgeted price)
	=	(AQ x AP) – (AQ x BP)
	=	₹ 26,100 – ₹ 26,000 = ₹ 100(F)
Sales Volume Variance	=	Budgeted price (Actual quantity – Budgeted quantity)
	=	(BP x AQ) – (BP x BQ)
	=	₹ 26,000 – ₹ 25,000 = ₹ 1,000 (F)
Total variance	=	Actual sales – Budgeted sales
	=	₹ 26,100 – ₹ 25,000 = ₹1,100 (F)

Illustration 18 (Calculation of Material Cost, price and usage variance)

J.K. Ltd. manufactures NXE by mixing three raw materials. For every batch of 100 kg. of NXE, 125 kg. of raw materials are used. In April, 2012, 60 batches were prepared to produce an output of 5,600 kg. of NXE. The standard and actual particulars for April, 2012, are as follows :

Raw Materials	Standard		Actual		Quantity of Raw Materials Purchased
	Mix	Price per kg.	Mix	Price per Kg.	
	(%)	(₹)	(%)	(₹)	(Kg.)
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate all variances.

Solution:

Actual material used = 125 kg × 60 = 7,500 kg.

Actual cost of actual material used (AQ × AR)			(₹)
A	60%	4,500 kg × ₹21 =	94,500
B	20%	1,500 kg × ₹ 8 =	12,000
C	20%	1,500 kg × ₹ 6 =	9,000
		7,500	1,15,500

Standard cost of actual material used (AQ × SR) *(₹)*

A	4,500 kg × ₹20 =	90,000
B	1,500 kg × ₹10 =	15,000
C	1,500 kg × ₹ 5 =	7,500
	7,500	1,12,500

Standard cost of material, if it had been used in standard proportion (Standard Proportion × Standard Rate) *(₹)*

A	50%	3,750 kg × ₹20 =	75,000
B	30%	2,250 kg × ₹10 =	22,500
C	20%	1,500 kg × ₹ 5 =	7,500
		7,500	1,05,000

Standard cost of production (SQ for actual production × SR)

Standard cost of output for 100 kg: *(₹)*

A	62.50 kg × ₹20 =	1,250
B	37.50 kg × ₹10 =	375
C	25.00 kg × ₹ 5 =	125
	125.00	1,750

Standard cost for output of 5,600 kg.

$$= \frac{1,750}{100} \text{kg} \times 5,600 \text{ kg.} = ₹\ 98,000$$

Material Price Variance = Standard cost of actual material used – Actual cost of actual material used = ₹1,12,500 – ₹1,15,500 = ₹ 3,000 (A)

Material Usage Variance = Standard cost of production – Standard cost of actual material used = ₹ 98,000 – ₹1,12,500 = ₹14,500 (A)

Note: Material Price Variance can be calculated at the time of purchase as well. In that case, material variance will be as follows:

Actual cost of material used

A	5,000 kg × ₹21	= ₹	1,05,000
B	2,000 kg × ₹ 8	= ₹	16,000

C	1,200 kg × ₹ 6	= ₹	7,200
			1,28,200

Standard cost of material used

A	5,000 kg × ₹20	= ₹	1,00,000
B	2,000 kg × ₹10	= ₹	20,000
C	1,200 kg × ₹ 5	= ₹	6,000
			1,26,000

Material Price variance (if calculated at the time of purchase)

= Standard cost of actual material used – Actual cost of actual material used

= ₹1,26,000 – ₹1,28,200 = ₹ 2,200 (A)

11.9 Preparation of Operating Statement under Standard Costing – Reporting of Variances

Computation of variances and their reporting is not the final step towards the control of various elements of cost. It demands an analysis of variances from the side of the executives, to ascertain the correct reasons for their occurrence.

After knowing the exact reasons, it becomes their responsibility to take necessary steps so as to stop the reoccurrence of adverse variances in future.

To enhance the utility of such a reporting system it is necessary that such a system of reporting should not only be prompt but should also facilitate the concerned managerial level to take necessary steps. Variance reports should be prepared after keeping in view its ultimate use and its periodicity.

Such reports should highlight the essential cost deviations and possibilities for their improvements. The variance reports should give due regard to the following points:-

(i) The concerned executives should be informed about what the cost performance should have been.

(ii) How close the actual cost performance is with reference to standard cost performance.

(iii) The analysis and causes of variances.

(iv) Reporting should be based on the principle of management by exception.

(v) The magnitude of variances should also be stated.

Standard cost reports: Standard cost reports showing the details of the variances are prepared for control purposes. Two such reports are illustrated below:

Standard Costing Profit and Loss Report Month _____20_____

Particulars		Total(₹)	Dept. A (₹)	Dept.B (₹)	Dept. C (₹)
Sales value					
***Less*:** Standard cost of sales					
Standard profit					
Add / Deduct variances:					
Materials :	Price				
	Usage				
Labour :	Rate of pay				
	Efficiency				
Overhead :	Expense				
	Production volume				
Actual profit					

(a) Standard Costing Profit & Loss statement: A standard costing profit and loss statement will show the variance of each type under each element of cost department wise and is illustrated as below:

The adverse variance may be shown in red or in parenthesis.

The following case study shall help you understand the mechanics of a standard costing system.

11.10 Accounting Procedure For Standard Cost

The standard cost operations can be recorded in the books of account. Two important accounting procedures for standard costs are:-

(i) Single Plan: The main purpose of standard costing is cost control. To achieve this purpose, the variances should be analysed according to their causes.

Analysis should be timely so that much time is not lost in taking corrective action wherever needed. In the partial plan, variances are analysed at the end of period.

The single plan system envisages the posting of all items in the debit side of the work-in-progress account at the standard cost leaving the credit side to represent the standard cost of finished production and work-in-progress.

This system enables the ascertainment of variances as and when the transaction is posted to work-in-progress account. In other words, the analysis of variances is done from the original documents like invoices, labour sheets, etc., and this method of analysis is known as analysis at source.

Since, the single plan system contemplates the analysis of variances at source, the installation of this system requires more planning so that effective documentation at each stage is introduced for proper recording and analysis of variance.

Thus for example, the issue of bill of materials to the stores enables the storekeeper to calculate the standard value of materials. If any material is requisitioned beyond the standard, he can mark the same for material usage variance account. In the production department, as and when the finished output is recorded, the standard waste and actual waste can be compared and necessary entries can be made by the shop supervisors for posting the excessive usage to appropriate variance accounts.

Scheme of entries: So far as materials are concerned, material price variances are recorded at the time of receipt of the material and the material quantity variances are recorded as far as possible when excess materials are used. The entries will be as illustrated below:

1. Dr. Material Control A/c

   Dr. or Cr. Material Price Variance A/c

   Cr. Creditors A/c.

   This entry enables the firm to debit the material control account with the actual purchases at standard cost and credit the creditor's account at the actual cost of actual prices thereby transferring the variances to price variance account.

2. Dr. Work-in-progress Control A/c

   Dr. or Cr. Material Usage Variances A/c

   Cr. Material Control A/c

   This entry charges the work-in-progress control account with the standard cost of standard quantity and credit the material control account at the standard cost of actual issue, the variance being transferred to usage variance account.

3. Dr. Wages Control A/c

   Dr./Cr. Labour Rate Variances A/c

   Cr. Cash A/c

   This entry is passed to record the wages at standard rate thereby transferring rate variances to the appropriate account.

4. Dr. Work-in-progress Control A/c

   Dr. or Cr. Overhead Expense Variances A/c

   Cr. Overhead Expense Control A/c.

(ii) Partial plan: This system uses current standards in which the inventory will be valued at current standard cost figure.

Under this method the work-in-progress account is charged at the actual cost of production for the month and is credited with the standard cost of the month's production of finished product.

The closing balance of work-in-progress is also shown at standard cost. The balance after making the credit entries represent the variance from standard for the month. The analysis of the variance is done after the end of the month. This method is simple in operation because variances are analysed after the end of month but may present difficulties if the firm makes a variety of products.

Recapitulation :

(1) Current standards are used in both the systems.

(2) Under the partial plan, material stocks are carried at actual cost whereas the same are carried out at standard cost under the single plan.

(3) The work-in-progress and finished goods are valued at standard cost under both the methods.

(4) ***Computation of variances :***

   (a) In partial plan, material price variance is computed on material used in finished goods and work-in-progress whereas in single plan it is computed on the material quantity purchased.

   (b) The partial plan is suitable where simple analysis of variance is sufficient at the end of the period whereas the single plan is preferred if frequent detailed analysis of variance is desired, as (a) the comparison of actual with standard cost of each operation or operator or (b) the daily reporting of standard cost of excess material used.

11.11 Disposition of Variances

There is no unanimity of opinion in regard to disposition of variances. The following are the various methods:–

(a) Write off all variances to profit and loss account or cost of sales every month.

(b) Distribute the variance pro-rata to cost of sales, work-in-progress and finished good stocks.

(c) Write off quantity variance to profit and loss account but the price variances may be spread over cost of sales, work-in-progress and finished goods stocks. The reason behind apportioning price variances to inventories and cost of sales is that they represent cost although they are described as variance.

11.12 Advantages and Criticism of Standard Costing

11.12.1 Advantages of Standard Costing: Following are the advantages of standard costing.

(i) It serves as a basis for measuring operating performance and cost control. By setting standards, proper classification and determination of variances, is possible. This serves as a signal for prompt corrective action. This system provides for reporting on the principle of exception. The basis of this principle is that only matters which are not proceeding according to plan are reported upon. This enables the managers to concentrate upon essential matters and leave the non-essentials to take care of themselves. By using special forms, any excessive time taken, extra material used or additional services consumed can be brought to light as part of the ordinary routine. In other words, if the variances are negligible, it means that the performance is more or less in accordance with the standards. Significant variances which warrant the attention of the manager are brought to his knowledge.

(ii) It aids price fixing. Standard costing can be used to predict costs. Although actual cost may vary from day to day, standard costs will remain stable over a period of time and, where demand for a product is elastic, this information can be used as a basis for fixing the selling price.

(iii) Introduction of standard costing facilitates evaluation of jobs and introduction of incentives. Job values can be determined by the use of evaluation and scale of wages fixed according to the responsibility involved in each job.

(iv) Standard costing facilitates the estimation of the cost of new products with greater accuracy.

(v) It serves as a basis for inventory valuation. Standard costs are used for inventory valuation because actual costs are not typical and less clerical work is involved in carrying standard value into inventory records than actual value. A further advantage of this procedure is that material stock can be recorded in terms of quantities only.

(vi) Standard costing is also used for the measurement of profits. The question of correct approach of calculating profit is very much related to stock valuation and to the methods of dealing with the absorption of fixed overheads. Standard costing will eliminate any variations in profit due to changes in the values of stock holding from period to period and will thus provide a true basis for the measurement of profit.

(vii) Standard costing greatly aids business planning, budgeting and managerial decision making. Standard costs being pre-determined costs, are particularly useful in planning and budgeting.

(viii) Standard costing aids in standardisation of products, operations and processes. Since standards are laid down for each product, its components, materials, operations, processes etc., it improves the overall production efficiency and reduces costs.

(ix) It provides objectives and targets to be achieved by each level of management and defines the responsibilities of departmental managers. Standard costs are pre-determined on the basis of reasonable and achievable level of output. The departmental head, therefore, comes to know what is expected of him and his level of performance in comparison to the targets can be seen from the variance reports. Thus the system serves as an incentive to the departmental head to achieve the targets set by the company.

(x) Standard costing sets a uniform basis for comparison of all elements of costs. Since care is taken in setting standards, the standards become unchanging units of comparison. The standard hour may be used as a basic unit to compare dissimilar products or processes.

(xi) The maximum use of working capital, plant facilities and current assets is assured because wastage of materials and loss due to idle time are closely controlled.

11.12.2 Criticism of Standard Costing

The following are some of the criticism which may be leveled against the standard costing system. The arguments have been suitably answered as stated against each by advocates of the standard costing and hence they do not invalidate the usefulness of the system to business enterprises.

(i) *Variation in price:* One of the chief problem faced in the operation of the standard costing system is the precise estimation of likely prices or rate to be paid. The variability of prices is so great that even actual prices are not necessarily adequately representative of cost. But the use of sophisticated forecasting techniques should be able to cover the price fluctuation to some extent. Besides this, the system provides for isolating uncontrollable variances arising from variations to be dealt with separately.

(ii) *Varying levels of output:* If the standard level of output set for pre-determination of standard costs is not achieved, the standard costs are said to be not realised. However, the statement that the capacity utilisation cannot be precisely estimated for absorption of overheads may be true only in some industries of jobbing type. In vast majority of industries, use of forecasting techniques, market research, etc., help to estimate the output with reasonable accuracy and thus the variation is unlikely to be very large. Prime cost will not be affected by such variation and, moreover, variance analysis helps to measure the effects of idle time.

(iii) *Changing standard of technology:* In case of industries that have frequent technological changes affecting the conditions of production, standard costing may not be suitable. This criticism does not affect the system of standard costing. Cost reduction and cost control is a cardinal feature of standard costing because standards once set do not always remain stable. They have to be revised.

(iv) *Attitude of technical people:* Technical people are accustomed to think of standards as physical standards and, therefore, they will be misled by standard costs. Since technical people can be educated to adopt themselves to the system through orientation courses, it is not an insurmountable difficulty.

(v) *Mix of products:* Standard costing presupposes a pre-determined combination of products both in variety and quantity. The mixture of materials used to manufacture the products may vary in the long run but since standard costs are set normally for a short period, such changes can be taken care of by revision of standards.

(vi) *Level of Performance:* Standards may be either too strict or too liberal because they may be based on (a) theoretical maximum efficiency, (b) attainable good performance or (c) average past performance. To overcome this difficulty the management should give thought to the selection of a suitable type of standard. The type of standard most effective in the control of costs is one which represents an attainable level of good performance.

(vii) *Standard costs cannot possibly reflect the true value in exchange.* If previous historical costs are amended roughly to arrive at estimates for ad hoc purposes, they are not standard costs in the strict sense of the term and hence they cannot also reflect true value in exchange. In arriving at standard costs, however, the economic and technical factors, internal and external, are brought together and analysed to arrive at quantities and prices which reflect optimum operations. The resulting costs, therefore, become realistic measures of the sacrifices involved.

(viii) *Fixation of standards may be costly*: It may require high order of skill and competency. Small concerns, therefore, feel difficulty in the operation of such system.

11.13 Summary

- ***Standard Costing:*** A technique which uses standards for costs and revenues for the purposes of control through variance analysis.
- ***Standard Price****:* A predetermined price fixed on the basis of a specification of a product or service and of all factors affecting that price.
- ***Standard Time****:* The total time in which task should be completed at standard performance.

- ***Variance**:* A divergence from the predetermined rates, expressed ultimately in money value, generally used in standard costing and budgetary control systems.
- ***Variance Analysis**:* The analysis of variances arising in standard costing system into their constituent parts.
- ***Revision Variance**:* It is the difference between the original standard cost and the revised standard cost of actual production.
- ***Basic Standard**:* A standard fixed for a fairly long period.
- ***Current Standard**:* A standard fixed for a short period.
- ***Estimated Cost** :* An estimate of what the cost is likely to be during a given period of time.
- ***Ideal Cost :*** A cost which should be incurred during a period under ideal conditions.

Important Formulas

- ***Material Variance :***

  Material Costs Variance = (Std. qty × Std. Price) – (Actual qty × Actual price)

  Material Usage Variance = Std. price (Std. Qty. – Actual qty.)

  Material Price Variance = Actual qty. (Std. price – Actual price)

  Material Cost Variance = Material usage variance + Material price variance

  Material Mix Variance = SP (RSQ – AQ)

  Material Yield Variance = SP (SQ – RSQ)

- ***Labour Variance :***

  Labour Cost Variance = (Std. time × Std. Rate) – (Actual time × Actual rate)

  Labour Efficiency Variance = Std. rate (Std. time – Actual time)

  Labour Rate Variance = Actual time (Std. rate – Actual rate)

  Labour Idle Time Variance = Idle time x Std. rate

  Labour Cost Variance = Labour Efficiency Variance + Labour Rate Variance

  Labour Mix Variance = SR (RSH – AH)

  Labour Yield Variance = SR (SH – RSH)

- ***Fixed Overhead Variances:***

  F.O. Cost Variance = Recovered Overhead – Actual Overhead

  F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead

  F.O. Volume Variance = Recovered Overhead – Budgeted Overhead

  F.O. Efficiency Variance = Recovered Overhead – Standard Overhead

  F.O. Capacity Variance = Standard Overhead – Budgeted Overhead

  F.O. Calendar Variance = SR (Actual no. of working days – Std. no. working days)

- ***Variable Overhead Variances***

  V.O. Cost variance = Recovered Overhead – Actual Overhead

  V.O. Expenditure Variance = Standard Overhead – Actual Overhead

  V.O. Efficiency Variance = Recovered Overhead – Standard Overhead

- ***Sales Variance :***

  Sales Price Variance: Actual Quantity of Sales (Actual price – Budgeted price)

  Sales Volume Variance: Budgeted Price (Actual quantity – Budgeted quantity)

12
Marginal Costing

Learning Objectives

When you have finished studying this chapter, you should be able to

- Understand the difference between absorption costing and marginal costing
- Understand the concept of contribution and contribution to sales ratio.
- Understand the method of computation of break-even point, both mathematically and also with the help of a graph.
- Understand the basic limitations of break even analysis

12.1 Definitions

In order to appreciate the concept of marginal costing, it is necessary to study the definition of marginal costing and certain other terms associated with this technique. The important terms have been defined as follows:

1. ***Marginal Costing:*** The ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs.

2. ***Marginal Cost*****:** The amount at any given volume of output by which aggregate variable costs are changed if the volume of output is increased by one unit. In practice this is measured by the total variable cost attributable to one unit. Marginal cost can precisely be the sum of prime cost and variable overhead.

Marginal Cost = Variable Cost = Direct Labour + Direct Material + Direct Expenses + Variable Overheads

Note: In this context a unit may be a single article, a batch of articles, an order, a stage of production capacity, a process or a department. It relates to the change in output in particular circumstances under consideration.

3. ***Direct Costing*****:** Direct costing is the practice of charging all direct cost to operations, processes or products, leaving all indirect costs to be written off against profits in the period in which they arise. Under direct costing the stocks are valued at direct costs, i.e., costs whether fixed or variable which can be directly attributable to the cost units.

4. ***Differential Cost:*** It may be defined as "the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operations". It represents an increase or decrease in total cost resulting out of:

(a) producing or distributing a few more or few less of the products;

(b) a change in the method of production or of distribution;

(c) an addition or deletion of a product or a territory; and

(d) selection of an additional sales channel.

Differential cost, thus includes fixed and semi-variable expenses. It is the difference between the total costs of two alternatives. It is an *ad-hoc* cost determined for the purpose of choosing between competing alternatives, each with its own combination of income and costs.

5. ***Incremental Cost:*** It is defined as, "the additional costs of a change in the level or nature of activity". As such for all practical purposes there is no difference between incremental cost and differential cost. However, from a conceptual point of view, differential cost refers to both incremental as well as decremental cost. Incremental cost and differential cost calculated from the same data will be the same. In practice, therefore, generally no distinction is made between differential cost and incremental cost. One aspect which is worthy to note is that incremental cost is not the same at all levels. Incremental cost between 50% and 60% level of output may be different from that which is arrived at between 80% and 90% level of output. Differential cost or incremental cost analysis deals with both short-term and long-term problems. This analysis is more useful when various alternatives or various capacity levels are being considered. (will be discussed in the next chapter i.e. Budgets and Budgetary Control)

6. ***Contribution*****:** Contribution or the contributory margin is the difference between sales value and the marginal cost [Contribution (C) = Sales (S) – Variable Cost]. It is obtained by subtracting marginal cost from sales revenue of a given activity. It can also be defined as excess of sales revenue over the variable cost. The contribution concept is based on the theory that the profit and fixed expenses of a business is a 'joint cost' which cannot be equitably apportioned to different segments of the business. In view of this difficulty the contribution serves as a measure of efficiency of operations of various segments of the business. The contribution forms a fund for fixed expenses and profit as illustrated below:

Example:

Variable Cost	= ₹ 50,000, Fixed Cost = ₹ 20,000, Selling Price = ₹ 80,000
Contribution	= Selling Price – Variable Cost
	= ₹ 80,000 – ₹ 50,000 = ₹ 30,000
Profit	= Contribution – Fixed Cost
	= ₹ 30,000 – ₹ 20,000 = ₹ 10,000

Since, contribution exceeds fixed cost; the profit is of the magnitude of ₹ 10,000. Suppose the

fixed cost is ₹ 40,000 then the position shall be:

Contribution – Fixed cost = Profit or, =₹ 30,000 – ₹ 40,000 = -₹ 10,000

The amount of ₹ 10,000 represent extent of loss since the fixed costs are more than the contribution. At the level of fixed cost of ₹ 30,000, there shall be no profit and no loss.

7. ***Key Factor:*** Key factor or Limiting factor is a factor which at a particular time or over a period limits the activities of an undertaking. It may be the level of demand for the products or services or it may be the shortage of one or more of the productive resources, e.g., labour hours, available plant capacity, raw material's availability etc. Examples of Key Factors or Limiting Factors are:

(a) Shortage of raw material.

(b) Shortage of labour.

(c) Plant capacity available.

(d) Sales capacity available.

(e) Cash availability.

12.2 Characteristics of Marginal Costing

The technique of marginal costing is based on the distinction between product costs and period costs. Only the variables costs are regarded as the costs of the products while the fixed costs are treated as period costs which will be incurred during the period regardless of the volume of output. The main characteristics of marginal costing are as follows:

1. All elements of cost are classified into fixed and variable components. Semi-variable costs are also analyzed into fixed and variable elements.
2. The marginal or variable costs (as direct material, direct labour and variable factory overheads) are treated as the cost of product.
3. Under marginal costing, the value of finished goods and work–in–progress is also comprised only of marginal costs. Variable selling and distribution are excluded for valuing these inventories. Fixed costs are not considered for valuation of closing stock of finished goods and closing WIP.
4. Fixed costs are treated as period costs and are charged to profit and loss account for the period for which they are incurred.
5. Prices are determined with reference to marginal costs and contribution margin.
6. Profitability of departments and products is determined with reference to their contribution margin.

12.3 Facts about Marginal Costing

Some of the facts about marginal costing are depicted below

Not a distinct method: Marginal costing is not a distinct method of costing like job costing, process costing, operating costing, etc., but a special technique used for managerial decision making. Marginal costing is used to provide a basis for the interpretation of cost data to measure the profitability of different products, processes and cost centres in the course of decision making. It can, therefore, be used in conjunction with the different methods of costing such as job costing, process costing, etc., or even with other techniques such as standard costing or budgetary control.

Cost Ascertainment: In marginal costing, cost ascertainment is made on the basis of the nature of cost. It gives consideration to behaviour of costs. In other words, the technique has developed from a particular conception and expression of the nature and behaviour of costs and their effect upon the profitability of an undertaking.

Decision Making: In the orthodox or total cost method, as opposed to marginal costing method, the classification of costs is based on functional basis. Under this method the total cost is the sum total of the cost of direct material, direct labour, direct expenses, manufacturing overheads, administration overheads, selling and distribution overheads. In this system, other things being equal, the total cost per unit will remain constant only when the level of output or mixture is the same from period to period. Since these factors are continually fluctuating, the actual total cost will vary from one period to another. Thus, it is possible for the costing department to say one day that an item costs ₹20 and the next day it costs ₹18. This situation arises because of changes in volume of output and the peculiar behaviour of fixed expenses included in the total cost. Such fluctuating manufacturing activity, and consequently the variations in the total cost from period to period or even from day to day, poses a serious problem to the management in taking sound decisions. Hence, the application of marginal costing has been given wide recognition in the field of decision making.

12.4 Distinction between Marginal and Absorption Costing

The distinctions in these two techniques are illustrated by the following diagrams:

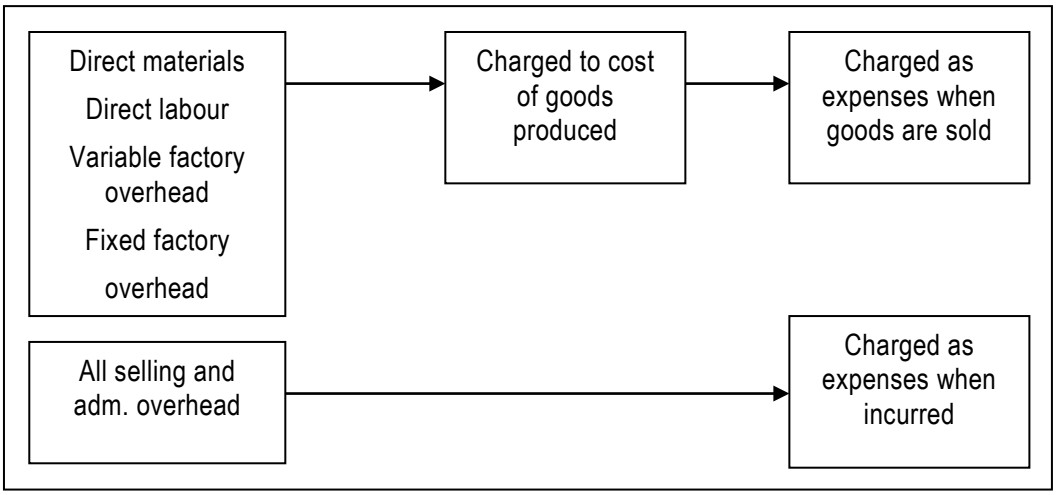


Fig. 12.1 Absorption Costing Approach

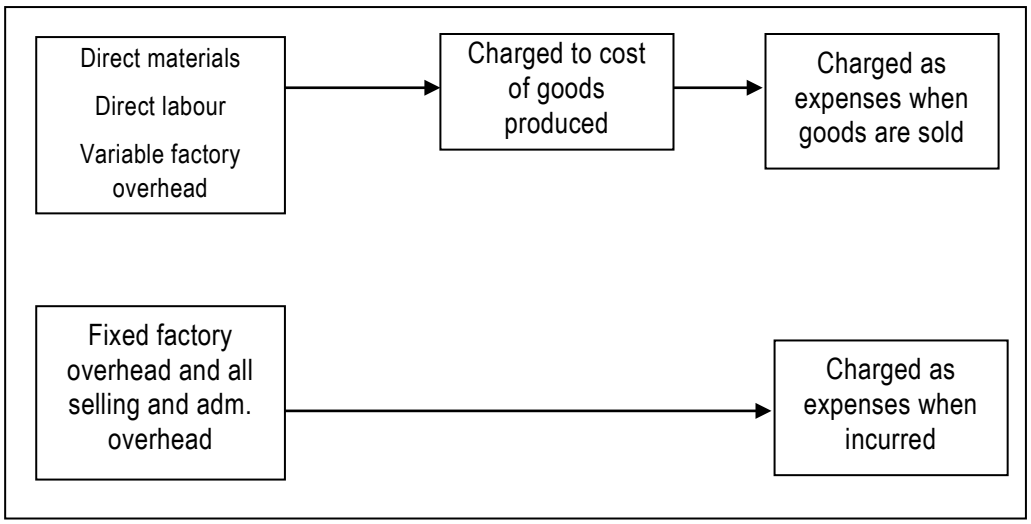


Fig. .2 Marginal Costing Approach

12.4.1 The main points of distinction between marginal costing and absorption costing are as below:

	Marginal costing	Absorption costing
1.	Only variable costs are considered for product costing and inventory valuation.	Both fixed and variable costs are considered for product costing and inventory valuation.
2.	Fixed costs are regarded as period costs. The Profitability of different products is judged by their P/V ratio.	Fixed costs are charged to the cost of production. Each product bears a reasonable share of fixed cost and thus the profitability of a product is influenced by the apportionment of fixed costs.
3.	Cost data presented highlight the total contribution of each product.	Cost data are presented in conventional pattern. Net profit of each product is determined after subtracting fixed cost along with their variable costs.
4.	The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.	The difference in the magnitude of opening stock and closing stock affects the unit cost of production due to the impact of related fixed cost.
5.	In case of marginal costing the cost per unit remains the same, irrespective of the production as it is valued at variable cost	In case of absorption costing the cost per unit reduces, as the production increases as it is fixed cost which reduces, whereas, the variable cost remains the same per unit.

12.4.2 Difference in profit under Marginal and Absorption costing: The above two approaches will compute the different profit because of the difference in the stock valuation. This difference is explained as follows in different circumstances.

1. **No opening and closing stock:** In this case, profit / loss under absorption and marginal costing will be equal.
2. **When opening stock is equal to closing stock:** In this case, profit / loss under two approaches will be equal provided the fixed cost element in both the stocks is same amount.
3. **When closing stock is more than opening stock:** In other words, when production during a period is more than sales, then profit as per absorption approach will be more than that by marginal approach. The reason behind this difference is that a part of fixed overhead included in closing stock value is carried forward to next accounting period.
4. **When opening stock is more than the closing stock:** In other words when production is less than the sales, profit shown by marginal costing will be more than that shown by

absorption costing. This is because a part of fixed cost from the preceding period is added to the current year's cost of goods sold in the form of opening stock.

12.4.3 Comparison between Direct Costing and Marginal Costing: In general, the terms marginal costing and direct costing are used as synonymous. However, direct costing differs from marginal costing in that some fixed costs considered direct are charged to operations, processes or products, whereas in marginal costing only variable costs are considered. Marginal costing is mainly concerned with providing of information to management to assist in decision making and for exercising control. Marginal costing is considered to be a technique with a broader meaning than direct costing. Marginal costing is also known as 'variable costing' or 'out of pocket costing'.

12.4.4 Absorption Costing:

- In absorption costing the classification of expenses is based on functional basis whereas in marginal costing it is based on the nature of expenses.
- In absorption costing, the fixed expenses are distributed over products on absorption costing basis that is, based on a pre-determined level of output. Since fixed expenses are constant, such a method of recovery will lead to over or under-recovery of expenses depending on the actual output being greater or lesser than the estimate used for recovery. This difficulty will not arise in marginal costing because the contribution is used as a fund for meeting fixed expenses.

The presentation of information to management under the two costing techniques is as under:

Income Statement (Absorption costing)

		(₹)
Sales		*XXXXX*
Production Costs:		
	Direct material consumed	*XXXXX*
	Direct labour cost	*XXXXX*
	Variable manufacturing overhead	*XXXXX*
	Fixed manufacturing overhead	*XXXXX*
	Cost of Production	*XXXXX*
Add:	*Opening stock of finished goods*	*XXXXX*
	(Value at cost of previous period's production)	
		XXXXX
Less:	*Closing stock of finished goods*	*XXXXX*
	(Value at production cost of current period)	____.
	Cost of Goods Sold	*XXXXX*

Add:	*(or less) Under (or over) absorption of fixed*		
	Manufacturing overhead		*XXXXX*
Add:	*Selling and distribution costs*	*XXXXX*	
	Administration costs	*XXXXX*	*XXXXX*
	Total Cost		*XXXXX*
	Profit (Sales – Total cost)		*XXXXX*

Income Statement (Marginal costing)

		(₹)
Sales		*XXXXX*
Variable manufacturing costs:		
	– Direct material consumed	*XXXXX*
	– Direct labour	*XXXXX*
	– Variable manufacturing overhead	*XXXXX*
	Cost of Goods Produced	*XXXXX*
Add:	*Opening stock of finished goods*	*XXXXX*
	(Value at cost of previous period)	
Less:	*Closing stock of finished goods (Value at current variable cost)*	
	Cost of Goods Sold	*XXXXX*
Add:	*Variable administration, selling and dist. overhead*	*XXXXX*
	Total Variable Cost	*XXXXX*
Add:	*Selling and distribution costs*	
	Contribution (Sales – Total variable costs)	*XXXXX*
Less:	*Fixed costs (Production, adm., selling and dist.)*	*XXXXX*
	Net Profit	*XXXXX*

It is evident from the above that under marginal costing technique the contributions of various products are pooled together and the fixed overheads are met out of such total contribution. The total contribution is also known as gross margin. The contribution minus fixed expenses yields net profit. In absorption costing technique cost includes fixed overheads as well.

Illustration 1 (Calculation of profit under marginal costing and absorption costing)

WONDER LTD. manufactures a single product, ZEST. The following figures relate to ZEST for a one-year period:

Activity Level	*50%*	*100%*
Sales and production (units)	*400*	*800*

	₹ lakhs	₹ lakhs
Sales	*8.00*	*16.00*
Production costs:		
Variable	*3.20*	*6.40*
Fixed	*1.60*	*1.60*
Selling and administration costs:		
Variable	*1.60*	*3.20*
Fixed	*2.40*	*2.40*

The normal level of activity for the year is 800 units. Fixed costs are incurred evenly throughout the year, and actual fixed costs are the same as budgeted. There were no stocks of ZEST at the beginning of the year.

In the first quarter, 220 units were produced and 160 units were sold.

Required:

(a) What would be the fixed production costs absorbed by ZEST if absorption costing is used?

(b) What would be the under/over-recovery of overheads during the period?

(c) What would be the profit using absorption costing?

(d) What would be the profit using marginal costing?

Solution

(a)	***Fixed production costs absorbed:***		***(₹)***
	Budgeted fixed production costs		1,60,000
	Budgeted output (normal level of activity 800 units)		
	Therefore, the absorption rate :1,60,000/800 = ₹ 200 per unit		
	During the first quarter, the fixed production		
	cost absorbed by ZEST would be (220 units × ₹ 200)		44,000
(b)	***Under /over-recovery of overheads during the period:***		***(₹)***
	Actual fixed production overhead		40,000
	(1/4 of ₹ 1,60,000)		
	Absorbed fixed production overhead		44,000
	Over-recovery of overheads		4,000
(c)	***Profit for the Quarter (Absorption Costing)***	***(₹)***	***(₹)***
	Sales revenue (160 units × ₹ 2,000) : (A)		3,20,000
	Less: Production costs		

	Variable (220 units × ₹ 800)	1,76,000	
	Fixed overheads absorbed (220 units × ₹ 200)	44,000	
	Total (220 units × ₹ 1,000)	2,20,000	
	Less: Closing stock (60 units × ₹ 1,000)	(60,000)	
	Production cost of 160 units	1,60,000	
	Variable sales & admn. costs (160 units × ₹ 400)	64,000	
	Fixed selling & admn. costs (1/4 of ₹ 2,40,000)	60,000	
	Total cost of sales of 160 units : (B)		2,84,000
	Unadjusted profit : {(A) – (B)}		36,000
	Add: Overheads over absorbed		4,000
	Actual profit		40,000

(d)	***Profit for the Quarter (Marginal Costing)***	***(₹)***	***(₹)***
	Sales revenue (160 units × ₹ 2,000) : (A)		3,20,000
	Variable production costs (220 units × ₹ 800)	1,76,000	
	Less: Closing stock (60 units × ₹ 800)	(48,000)	
	Variable production cost of 160 units	1,28,000	
	Add: Variable selling & admn. costs	64,000	
	Total variable cost of sales of 160 units : (B)		1,92,000
	Contribution : {(A) – (B)}		1,28,000
	Less: Fixed production cost incurred	40,000	
	Fixed selling & admn. costs incurred	60,000	1,00,000
	Actual profit		28,000

Illustration 2 (Reasons for difference in profit under marginal and absorption costing)

XYZ Ltd. has a production capacity of 2,00,000 units per year. Normal capacity utilisation is reckoned as 90%. Standard variable production costs are ₹11 per unit. The fixed costs are ₹3,60,000 per year. Variable selling costs are ₹3 per unit and fixed selling costs are ₹2,70,000 per year. The unit selling price is ₹20.

In the year just ended on 30th June, 2014, the production was 1,60,000 units and sales were 1,50,000 units. The closing inventory on 30th June was 20,000 units. The actual variable production costs for the year were ₹ 35,000 higher than the standard.

(i) Calculate the profit for the year

(a) by absorption costing method and

(b) by marginal costing method.

(ii) Explain the difference in the profits.

Solution :

Income Statement (Absorption Costing)
for the year ending 30th June 2014

	(₹)	(₹)
Sales (1,50,000 units @ ₹20)		30,00,000
Production Costs :		
Variable (1,60,000 units @ ₹11)	17,60,000	
Add :Increase	35,000	17,95,000
Fixed (1,60,000 units @ ₹2*)		3,20,000
Cost of Goods Produced		21,15,000
Add :Opening stock (10,000 units @ ₹13)*		1,30,000
		22,45,000
Less :Closing stock $\left(\frac{₹\ 21,15,000}{1,60,000\ \text{units}} \times 20,000\ \text{units}\right)$		2,64,375
Cost of Goods Sold		19,80,625
Add :Under absorbed fixed production overhead (3,60,000 – 3,20,000)		40,000
		20,20,625
Add :Non-production costs :		
Variable selling costs (1,50,000 units @ ₹3)		4,50,000
Fixed selling costs		2,70,000
Total cost		27,40,625
Profit (Sales – Total Cost)		2,59,375

*** Working Notes :**

1. Fixed production overhead are absorbed at a pre-determined rate based on normal capacity, i.e. ₹3,60,000 ÷ 1,80,000 units = ₹ 2.
2. Opening stock is 10,000 units, i.e., 1,50,000 units + 20,000 units – 1,60,000 units. It is valued at ₹13 per unit, i.e., ₹11 + ₹2 (Variable + fixed).

Income Statement (Marginal Costing)

for the year ended 30th June, 2014

	(₹)	(₹)
Sales (1,50,000 units @ ₹20)		30,00,000
Variable production cost (1,60,000 units @ ₹11 + ₹35,000)		17,95,000
Variable selling cost (1,50,000 units @ ₹3)		4,50,000
		22,45,000
Add : Opening Stock (10,000 units @ ₹11)		1,10,000
		23,55,000
Less : Closing stock $\left(\frac{₹17,95,000}{1,60,000} \times 20,000 \text{ units}\right)$		2,24,375
Variable cost of goods sold		21,30,625
Contribution (Sales – Variable cost of goods sold)		8,69,375
Less : Fixed cost – Production	3,60,000	
– Selling	2,70,000	6,30,000
Profit		2,39,375

Reasons for Difference in Profit:	(₹)
Profit as per absorption costing	2,59,375
Add :Op. stock under –valued in marginal costing (₹1,30,000 – 1,10,000)	20,000
	2,79,375
Less :Cl. Stock under –valued in marginal closing (₹2,64,375 – 2,24,375)	40,000
Profit as per marginal costing	2,39,375

12.5 Advantages and Limitations of Marginal Costing

Advantages

1. ***Simplified Pricing Policy:*** *The marginal cost remains c*onstant per unit of output whereas the fixed cost remains constant in total. Since marginal cost per unit is constant from period to period within a short span of time, firm decisions on pricing policy can be taken. If fixed cost is included, the unit cost will change from day to day depending upon the volume of output. This will make decision making task difficult.

2. ***Proper recovery of Overheads:*** Overheads are recovered in costing on the basis of pre-determined rates. If fixed overheads are included on the basis of pre-determined rates, there will be under- recovery of overheads if production is less or if overheads are

more. There will be over- recovery of overheads if production is more than the budget or actual expenses are less than the estimate. This creates the problem of treatment of such under or over-recovery of overheads. Marginal costing avoids such under or over recovery of overheads.

3. ***Shows Realistic Profit:*** Advocates of marginal costing argues that under the marginal costing technique, the stock of finished goods and work-in-progress are carried on marginal cost basis and the fixed expenses are written off to profit and loss account as period cost. This shows the true profit of the period.

4. ***How much to produce:*** Marginal costing helps in the preparation of break-even analysis which shows the effect of increasing or decreasing production activity on the profitability of the company.

5. ***More control over expenditure:*** Segregation of expenses as fixed and variable helps the management to exercise control over expenditure. The management can compare the actual variable expenses with the budgeted variable expenses and take corrective action through analysis of variances.

6. ***Helps in Decision Making:*** Marginal costing helps the management in taking a number of business decisions like make or buy, discontinuance of a particular product, replacement of machines, etc.

7. ***Short term profit planning:*** It helps in short term profit planning by B.E.P charts.

Limitations

1. ***Difficulty in classifying fixed and variable elements*:** It is difficult to classify exactly the expenses into fixed and variable category. Most of the expenses are neither totally variable nor wholly fixed. For example, various amenities provided to workers may have no relation either to volume of production or time factor.

2. ***Dependence on key factors:*** Contribution of a product itself is not a guide for optimum profitability unless it is linked with the key factor.

3. ***Scope for Low Profitability:*** Sales staff may mistake marginal cost for total cost and sell at a price; which will result in loss or low profits. Hence, sales staff should be cautioned while giving marginal cost.

4. ***Faulty valuation:*** Overheads of fixed nature cannot altogether be excluded particularly in large contracts, while valuing the work-in- progress. In order to show the correct position fixed overheads have to be included in work-in-progress.

5. ***Unpredictable nature of Cost:*** Some of the assumptions regarding the behaviour of various costs are not necessarily true in a realistic situation. For example, the assumption that fixed cost will remain static throughout is not correct. Fixed cost may change from one period to another. For example salaries bill may go up because of annual increments or due to change in pay rate etc. The variable costs do not remain

constant per unit of output. There may be changes in the prices of raw materials, wage rates etc. after a certain level of output has been reached due to shortage of material, shortage of skilled labour, concessions of bulk purchases etc.

6. ***Marginal costing ignores time factor and investment*:** The marginal cost of two jobs may be the same but the time taken for their completion and the cost of machines used may differ. The true cost of a job which takes longer time and uses costlier machine would be higher. This fact is not disclosed by marginal costing.

7. ***Understating of W-I-P:*** Under marginal costing stocks and work in progress are understated.

12.6 Cost-Volume-Profit Analysis

Meaning: It is a managerial tool showing the relationship between various ingredients of profit planning viz., cost, selling price and volume of activity. As the name suggests, cost volume profit (CVP) analysis is the analysis of three variables cost, volume and profit. Such an analysis explores the relationship between costs, revenue, activity levels and the resulting profit. It aims at measuring variations in cost and volume.

Assumptions:

1. Changes in the levels of revenues and costs arise only because of changes in the number of product (or service) units produced and sold – for example, the number of television sets produced and sold by Sony Corporation or the number of packages delivered by Overnight Express. The number of output units is the only revenue driver and the only cost driver. Just as a cost driver is any factor that affects costs, a revenue driver is a variable, such as volume, that causally affects revenues.
2. Total costs can be separated into two components; a fixed component that does not vary with output level and a variable component that changes with respect to output level. Furthermore, variable costs include both direct variable costs and indirect variable costs of a product. Similarly, fixed costs include both direct fixed costs and indirect fixed costs of a product
3. When represented graphically, the behaviours of total revenues and total costs are linear (meaning they can be represented as a straight line) in relation to output level within a relevant range (and time period).
4. Selling price, variable cost per unit, and total fixed costs (within a relevant range and time period) are known and constant.
5. The analysis either covers a single product or assumes that the proportion of different products when multiple products are sold will remain constant as the level of total units sold changes.

6. All revenues and costs can be added, subtracted, and compared without taking into account the time value of money. (Refer to the FM study material for a clear understanding of time value of money).

Importance

It provides the information about the following matters:

1. The behavior of cost in relation to volume.
2. Volume of production or sales, where the business will break-even.
3. Sensitivity of profits due to variation in output.
4. Amount of profit for a projected sales volume.
5. Quantity of production and sales for a target profit level.

Impact of various changes on profit:

An understanding of CVP analysis is extremely useful to management in budgeting and profit planning. It elucidates the impact of the following on the net profit:

(i) Changes in selling prices,

(ii) Changes in volume of sales,

(iii) Changes in variable cost,

(iv) Changes in fixed cost.

12.6.1 Marginal Cost Equation: The contribution theory explains the relationship between the variable cost and selling price. It tells us that selling price minus variable cost of the units sold is the contribution towards fixed expenses and profit. If the contribution is equal to fixed expenses, there will be no profit or loss and if it is less than fixed expenses, loss is incurred. Since the variable cost varies in direct proportion to output, therefore if the firm does not produce any unit, the loss will be there to the extent of fixed expenses. These points can be described with the help of following marginal cost equation: $S - V = C = F \pm P$

Where,

S = Selling price per unit, V = Variable cost per unit, C – Contribution, F = Fixed Cost,

P = Profit/Loss

Marginal Cost Statement	(₹)
Sales	xxxx
Less: Variable Cost	xxxx
Contribution	xxxx
Less: Fixed Cost	xxxx
Profit	xxxx

12.6.2 Contribution to Sales Ratio (Profit Volume Ratio or P/V ratio)

This ratio is usually expressed in percentage.

$$P/V\ Ratio = \frac{Contribution}{Sales} \times 100 \quad or, \quad P/V\ Ratio = \frac{Change\ in\ contribution\ /\ Profit}{Change\ in\ sales} \times 100$$

A higher contribution to sales ratio implies that the rate of growth of contribution is faster than that of sales. This is because, once the breakeven point is reached, profits shall grow at a faster rate when compared to a product with a lesser contribution to sales ratio.

By transposition, we have derived the following equations:

(i) $C = S \times P/V\ ratio$

(ii) $S = \frac{C}{P/V\ Ratio}$

12.6.3 Break-Even Analysis: Break-even analysis is a generally used method to study the CVP analysis. This technique can be explained in two ways:

(i) In narrow sense it is concerned with computing the break-even point. At this point of production level and sales there will be no profit and loss i.e. total cost is equal to total sales revenue.

(ii) In broad sense this technique is used to determine the possible profit/loss at any given level of production or sales.

12.7 Methods of Break -Even Analysis

Break even analysis may be conducted by the following two methods:

(i) Algebraic computations

(ii) Graphic presentations

12.8 Algebraic Calculations

12.8.1 Breakeven Point: The word contribution has been given its name because of the fact that it literally contributes towards the recovery of fixed costs and the making of profits. The contribution grows along with the sales revenue till the time it just covers the fixed cost. This point where neither profits nor losses have been made is known as a break-even point. This implies that in order to break even the amount of contribution generated should be exactly equal to the fixed costs incurred. Hence, if we know how much contribution is generated from each unit sold we shall have sufficient information for computing the number of units to be sold in order to break even. Mathematically,

$$\text{Break- even point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

Example 1: of a company (ABC Ltd) manufacturing a single product, incurring variable costs of ₹ 300 per unit and fixed costs of ₹ 2, 00,000 per month. If the product sells for ₹ 500 per unit, the breakeven point shall be calculated as follows;

$$\text{Break- even point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{₹\ 2,00,000}{₹\ 200} = 1,000 \text{ units}$$

$$\text{Break- even points (in Rupees)} = \frac{\text{Total fixed cost}}{\text{Contribution}} \times \text{Sales}$$

$$\textit{Break- even point (in Rupees)} = \frac{\text{Total fixed cost}}{\text{P / V Ratio}}$$

12.8.2 Cash Break-even point: When break-even point is calculated only with those fixed costs which are payable in cash, such a break-even point is known as cash break-even point. This means that depreciation and other non-cash fixed costs are excluded from the fixed costs in computing cash break-even point. Its formula is –

$$\text{Cash break- even point} = \frac{\text{Cash fixed costs}}{\text{Contribution per unit}}$$

Illustration 3 (Calculation of BEP and sales)

You are given the following particulars calculate:

(a) Break-even point

(b) Sales to earn a profit of ₹ 20,000

i. Fixed cost ₹ 1,50,000

ii. Variable cost ₹ 15 per unit

iii. Selling price is ₹ 30 per unit

Solution:

(a) B.E.P = Fixed Cost / Contribution per unit*

= ₹1,50,000 ÷ ₹15 = 10,000 Units

* (Contribution per unit = Sales per unit – Variable cost per unit = ₹ 30 - ₹15)

(b) Sales to earn a Profit of ₹ 20,000 = (FC + Desired Profit)/ Contribution per unit x S.P.

= (₹1,50,000 + ₹20,000) ÷ 15 × 30

= ₹1,70,000 ÷ 15 × 30

$$= ₹\ 3,40,000 \text{ or, } \frac{₹1,70,000}{P/V\ Ratio} = \frac{₹1,70,000}{50\%} = ₹3,40,000$$

$$PV\ Ratio = \frac{Contribution}{Sales} \times 100$$

Illustration 4 (Treatment of commission in computing sales price and calculation of Break Even Point)

A Chinese soft drink company is planning to establish a subsidiary company in India to produce mineral water. Based on the estimated annual sales of 40,000 bottles of the mineral water, cost studies produced the following estimates for the Indian subsidiary:

	Total annual costs	***Percent of Total Annual Cost which is variable***
Material	*2,10,000*	*100%*
Labour	*1,50,000*	*80%*
Factory Overheads	*92,000*	*60%*
Administration Expenses	*40,000*	*35%*

The Indian production will be sold by manufacturer's representatives who will receive a commission of 8% of the sale price. No portion of the Chinese office expenses is to be allocated to the Indian subsidiary. You are required to

(i) Compute the sale price per bottle to enable the management to realize an estimated 10% profit on sale proceeds in India.

(ii) Calculate the break-even point in Rupee sales as also in number of bottles for the Indian subsidiary on the assumption that the sale price is ₹ 14 per bottle.

Solution:

(i) Computation of Sale Price *Per Bottle*

Output: 40,000 Bottles

	(₹)
Variable Cost:	
Material	2,10,000
Labour (₹1,50,000 × 80%)	1,20,000
Factory Overheads (₹92,000 × 60%)	55,200
Administrative Overheads (₹40,000 × 35%)	14,000
Commission (8% on ₹6,00,000) (W.N.-1)	48,000

Fixed Cost:	
Labour (₹1,50,000 × 20%)	30,000
Factory Overheads (₹92,000 × 40%)	36,800
Administrative Overheads (₹40,000 × 65%)	26,000
Total Cost	5,40,000
Profit (W.N.-1)	60,000
Sales Proceeds (W.N.-1)	6,00,000
Sales Price *per bottle* $\left(\frac{₹6,00,000}{40,000 Bottles}\right)$	15

(ii) Calculation of Break-even Point

Sales Price per Bottle = ₹14

Variable Cost per Bottle = $\frac{₹4,44,000 \text{ (W.N.-2)}}{40,000 Bottles}$

= ₹11.10

Contribution per Bottle = ₹14 − ₹11.10

= ₹2.90

Break -even Point

(in number of Bottles) = $\frac{\text{Fixed Costs}}{\text{Contribution per Bottle}}$

= $\frac{₹92,800}{₹2.90}$ = 32,000 Bottles

Break- even Point

(in Sales Value) = 32,000 Bottles × ₹14

= ₹4,48,000

Working Note

W.N.-1

Let the Sales Price be 'x'

Commission = $\frac{8x}{100}$

Profit = $\frac{10x}{100}$

$$x = 4,92,000 + \frac{8x}{100} + \frac{10x}{100}$$

$$100x - 8x - 10x = 4,92,00,000$$

$$82x = 4,92,00,000$$

$$x = 4,92,00,000 / 82 = ₹6,00,000$$

W.N.-2

Total Variable Cost	(₹)
Material	2,10,000
Labour	1,20,000
Factory Overheads	55,200
Administrative Overheads	14,000
Commission [(40,000 Bottles × ₹14) × 8%]	44,800
	4,44,000

Illustration 5 (Calculation of selling price)

If P/V ratio is 60% and the Marginal cost of the product is ₹ 20. What will be the selling price?

Solution:

Variable Cost = 100 – P/V Ratio

= 100 – 60 = 40

If Variable cost is 40, then selling price = 100

If Variable cost is 20, then selling price = (100/40) × 20 = ₹ 50

Illustration 6 (Calculation of capacity sales)

The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are ₹ 90,000. Also compute profit at 75% of the capacity sales.

Solution:

Variable cost to sales = 70%, Contribution to sales = 30%,

Or P/V Ratio 30%

We know that: BES × P/V Ratio = Fixed Cost

BES × 0.30 = ₹ 90,000

Or BES = ₹ 3,00,000

It is given that break-even occurs at 60% capacity.

Capacity sales = ₹ 3,00,000 ÷ 0.60 = ₹ 5,00,000

Computation of profit of 75% Capacity

75% of capacity sales (i.e. ₹ 5,00,000 × 0.75)	= ₹ 3,75,000
Less: Variable cost (i.e. ₹ 3,75,000 × 0.70)	= ₹ 2,62,500
	= ₹ 1,12,500
Less: Fixed Cost	= ₹ 90,000
Profit	= ₹ 22,500

Illustration 7 (Calculation of sales)

A company has a P/V ratio of 40%. By what percentage must sales be increased to offset: 20% reduction in selling price?

Solution

$$\text{Revised Sales Value} = \frac{\text{Desired Contribution}}{\text{Revised P/V Ratio}^*} = \frac{0.40}{0.25} = 1.6$$

This means sales value to be increased by 60% of the existing sales.

$$^*\text{Revised P/V Ratio} = \frac{\text{Revised Contribution}}{\text{Revised Selling Price}} = \frac{0.80 - 0.60}{0.80} = 0.25$$

$$\text{Required Sale Quantity} = \frac{\text{Desired Contribution}}{\text{Revised P/V Ratio}^* \times \text{Revised Selling Price}} = \frac{0.40}{0.25 \times 0.80} = 2$$

Therefore, Sales value to be increased by 60% and sales quantity to be doubled to offset the reduction in selling price.

Proof:

Let selling price per unit is ₹10 and sales quantity is 100 units.

Data before change in selling price:

	(₹)
Sales (₹10 × 100 units)	1,000
Contribution (40% of 1,000)	400
Variable cost (balancing figure)	600

Data after the change in selling price:

Selling price is reduced by 20% that means it became ₹8 per unit. Since, we have to maintain the earlier contribution margin i.e ₹400 by increasing the sales quantity only. Therefore, the target contribution will be ₹400.

The new P/V Ratio will be

	(₹)
Sales	8.00
Variable cost	6.00
Contribution per unit	2.00
P/V Ratio	25%

$$\text{Sales Value} = \frac{\text{Desired Contribution}}{\text{Revised P/V Ratio}} = \frac{₹400}{0.25} = ₹1,600$$

$$\text{Sales quantity} = \frac{\text{Sales value}}{\text{Selling price per unit}} = \frac{₹1,600}{₹8} = 200 \text{ units}$$

Illustration 8 (Calculation of sales, fixed cost and P/V ratio)

PQR Ltd. has furnished the following data for the two years :

	2013	*2014*
Sales	*₹ 8,00,000*	*?*
Profit/Volume Ratio (P/V ratio)	*50%*	*37.5%*
Margin of Safety sales as a % of total sales	*40%*	*21.875%*

There has been substantial savings in the fixed cost in the year 2014 due to the restructuring process. The company could maintain its sales quantity level of 2013 in 2014 by reducing selling price.

You are required to calculate the following:

(i) Sales for 2014 in Rupees,

(ii) Fixed cost for 2014,

(iii) Break-even sales for 2014 in Rupees.

Solution:

In 2013, PV ratio = 50%

Variable cost ratio = 100% - 50% = 50%

Variable cost in 2013 = ₹ 8,00,000 × 50% = ₹ 4,00,000

In 2014, sales quantity has not changed. Thus variable cost in 2014 is ₹ 4,00,000.

In 2014, P/V ratio = 37.50%

Thus, Variable cost ratio = 100% – 37.5% = 62.5%

(i) Thus sales in 2014 = $\frac{4,00,000}{62.5\%}$ = ₹6,40,000

At break-even point, fixed costs is equal to contribution.

In 2014, Break-even sales = 100% – 21.875% = 78.125%

(ii) Break-even sales = 6,40,000 × 78.125% = ₹ 5,00,000

(iii) Fixed cost = B.E. sales × P/V ratio

= 5,00,000 × 37.50% = ₹1,87,500.

Illustration 9 (Calculation of profit and sales)

			(₹)
(i)	*Ascertain profit, when sales*	=	*2,00,000*
	Fixed Cost	=	*40,000*
	BEP	=	*1,60,000*
(ii)	*Ascertain sales, when fixed cost*	=	*20,000*
	Profit	=	*10,000*
	BEP	=	*40,000*

Solution:

(i) We know that: B.E. Sales × P/V Ratio = Fixed Cost

or ₹ 1,60,000 × P/V ratio = ₹ 40,000

P/V ratio = 25%

We also know that Sales × P/V Ratio = Fixed Cost + Profit

or ₹ 2,00,000 × 0.25 = ₹ 40,000 + Profit

or Profit = ₹ 10,000

(ii) Again B.E. Sales × P/V ratio = Fixed Cost

or ₹ 40,000 × P/V Ratio = ₹ 20,000

or P/V ratio = 50%

We also know that: Sales × P/V ratio = Fixed Cost + Profit

or Sales × 0.50 = ₹ 20,000 + ₹ 10,000

or Sales = ₹ 60,000.

Illustration 10 (Calculation of fixed cost and sales)

A company has three factories situated in north, east and south with its Head Office in Mumbai. The management has received the following summary report on the operations of each factory for a period:

(₹ in '000)

	Sales		Profit	
	Actual	Over/(Under) Budget	Actual	Over/(Under) Budget
North	1,100	(400)	135	(180)
East	1,450	150	210	90
South	1,200	(200)	330	(110)

Calculate for each factory and for the company as a whole for the period :

(i) the fixed costs. (ii) break-even sales.

Solution:

Calculation of P/V Ratio (₹'000)

	Sales	Profit
North : Actual	1,100	135
Add : Under budgeted	400	180
Budgeted	1,500	315

$$\text{P/V ratio} = \frac{\text{Diferenece in Profit}}{\text{Difference in Sales}} = \frac{315-135}{1,500-1,100} = \times 100 = \frac{180}{400} \times 100 = 45\%$$

(₹'000)

	Sales	Profit
East : Actual	1,450	210
Less : Over budgeted	(150)	(90)
Budgeted	1,300	120

$$\text{P/V ratio} = \frac{90}{150} \times 100 = 60\%$$

(₹'000)

	Sales	Profit
South : Actual	1,200	330

Add : Under budgeted	200	110
Budgeted	1,400	440

P/V ratio = $\frac{110}{200} \times 100 = 55\%$

(i) Calculation of fixed cost

Fixed Cost	= (Actual sales × P/V ratio) – Profit	
North	= (1,100 × 45%) – 135=	360
East	= (1,450 × 60%) – 210=	660
South	= (1,200 × 55%) – 330=	330
	Total Fixed Cost	1,350

(ii) Calculation of break-even sales (in ₹'000)

B.E. Sales = $\frac{\text{Fixed Cost}}{\text{P/V ratio}}$

North = $\frac{360}{45\%}$ = 800

East = $\frac{660}{60\%}$ = 1,100

South = $\frac{330}{55\%}$ = 600

Total 2,500

Illustration 11 (Calculation of break- even point)

A company sells its product at ₹ 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of ₹ 5 per unit. If the volume is raised to 20,000 units, it earns a profit of ₹ 4 per unit. Calculate break-even point both in terms of rupees as well as in units.

Solution:

We know that S – V = F + P

∴ Suppose variable cost = *x,* Fixed Cost = y

In first situation :

$15 \times 8{,}000 + 8{,}000\ x = y - 40{,}000$ (1)

In second situation :

$15 \times 20{,}000 + 20{,}000\ x = y + 80{,}000$ (2)

or, $1{,}20{,}000 - 8{,}000\ x = y - 40{,}000$ (3)

3,00,000 – 20,000 x = y + 80,000 (4)

From (3) & (4) we get x = ₹ 5, Variable cost per unit = ₹ 5

Putting this value in 3rd equation:

1,20,000 – (8,000 × 5) = y – 40,000

or, y = ₹ 1,20,000

Fixed Cost = ₹ 1,20,000

P/V ratio = $\frac{S-V}{S}=\frac{15-5}{15}\times 100=\frac{200}{3}=66\frac{2}{3}\%$.

Suppose break-even sales = x

15x – 5x = 1,20,000 (at BEP, contribution will be equal to fixed cost)

x = 12,000 units.

or, Break-even sales in units = 12,000, Break-even sales in rupees = 12,000 × 15 = ₹1,80,000.

Illustration 12 (Calculation of break- even point)

The product mix of a Gama Ltd. is as under:

	Products	
	M	***N***
Units	*54,000*	*18,000*
Selling price	*₹ 7.50*	*₹ 15.00*
Variable cost	*₹ 6.00*	*₹ 4.50*

Find the break-even points in units, if the company discontinues product 'M' and replace with product 'O'. The quantity of product 'O' is 9,000 units and its selling price and variable costs respectively are ₹ 18 and ₹ 9. Fixed Cost is ₹ 15,000.

Solution:

N = 18,000 units

O = 9,000 units

Ratio (N : O) = 2:1

Let

t = No. of units of 'O' for BEP

N = 2t No. of units for BEP

Contribution of 'N' = ₹10.5 per unit

Contribution of 'O' = ₹9 per unit

At Break Even Point:

$\Rightarrow$10.5 x (2t) + 9 x t -15,000	=	0
$\Rightarrow$30t	=	15,000
$\Rightarrow$t	=	500 units
BEP of 'N'	=	2t
	=	1,000 units
BEP of 'O'	=	t
	=	500 units

Illustration 13 (Calculation of break- even point and sales)

Mr. X has ₹ 2,00,000 investments in his business firm. He wants a 15 per cent return on his money. From an analysis of recent cost figures, he finds that his variable cost of operating is 60 per cent of sales, his fixed costs are ₹ 80,000 per year. Show computations to answer the following questions:

(i) What sales volume must be obtained to break even?

(ii) What sales volume must be obtained to get 15 per cent return on investment?

(iii) Mr. X estimates that even if he closed the doors of his business, he would incur ₹ 25,000 as expenses per year. At what sales would he be better off by locking his business up?

Solution:

	(₹)
Suppose sales	100
Variable cost	60
Contribution	40
P/V ratio	40%
Fixed cost	= ₹ 80,000

(i)	Break-even point = Fixed Cost ÷ P/V ratio = 80,000 ÷ 40%	or ₹ 2,00,000
(ii)	15% return on ₹ 2,00,000	30,000
	Fixed Cost	80,000
	Contribution required	1,10,000
	Sales volume required = ₹ 1,10,000 ÷ 40% or ₹ 2,75,000	
(iii)	Avoidable fixed cost if business is locked up = ₹80,000 - ₹ 25,000 = ₹55,000	
	Minimum sales required to meet this cost: ₹ 55,000 ÷ 40% or ₹ 1,37,500	

Mr. X will be better off by locking his business up, if the sale is less than ₹ 1,37,500

12.9 Margin of Safety

The margin of safety can be defined as the difference between the expected level of sale and the breakeven sales. The larger the margin of safety, the higher is the chances of making profits. In the Example-1 if the forecast sale is 1,700 units per month, the margin of safety can be calculated as follows,

Margin of Safety= Projected sales – Breakeven sales

= 1,700 units – 1,000 units

= 700 units or 41 % of sales.

The Margin of Safety can also be calculated by identifying the difference between the projected sales and breakeven sales in units multiplied by the contribution per unit. This is possible because, at the breakeven point all the fixed costs are recovered and any further contribution goes into the making of profits. It also can be calculated as

$$\frac{P}{P/V \text{ ratio}}$$

12.10 Variations of Basic Marginal Cost Equation and other formulae

i. Sales – Variable cost = Fixed cost ± Profit/ Loss

By multiplying and dividing L.H.S. by S

ii. $\frac{S(S-V)}{S} = F + P$

iii. S × P/V Ratio = F + P or Contribution $\left(\because \text{P/V Ratio} = \frac{S-V}{S}\right)$

iv BES × P/V Ratio = F $(\because$ at BEP profit is zero$)$

v $\text{BES} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

vi P/V Ratio = $\frac{\text{Fixed cost}}{\text{BES}}$

vii S × P/V Ratio = Contribution (Refer to iii)

viii $\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}}$

ix (BES + MS) × P/V Ratio = contribution (Total sales = BES + MS)

x (BES × P/V Ratio) + (MS × P/V Ratio) = F + P

By deducting (BES × P/V Ratio) from L.H.S. and F from R.H.S. in x we get :

xi M.S. × P/V Ratio = P

xii $\text{P/V Ratio} = \frac{\text{Change in profit}}{\text{Change in sales}}$

xiii $\text{P/V Ratio} = \frac{\text{Change in contribution}}{\text{Change in sales}}$

xiv $\text{Profitability} = \frac{\text{Contribution}}{\text{Key factor}}$

xv Margin of Safety = Total Sales – BES or $\frac{\text{Profit}}{\text{P/V ratio}}$.

xvi BES = Total Sales – MS

$\text{Margin of Safety Ratio} = \frac{\text{Total sales - BES}}{\text{Total sales}}$

Illustration 14 (**Application of marginal cost equation)**

An automobile manufacturing company produces different models of Cars. The budget in respect of model 007 for the month of March, 2015 is as under:

Budgeted Output		*40,000 Units*
	₹ In lakhs	*₹ In lacs*
Net Realisation		*700*
Variable Costs:		
Materials	*264*	
Labour	*52*	
Direct expenses	*124*	*440*
Specific Fixed Costs	*90*	
Allocated Fixed Costs	*112.50*	*202.50*
Total Costs		*642.50*
Profit		*57.50*
Sales		*700.00*

Calculate:

(i) Profit with 10 percent increase in selling price with a 10 percent reduction in sales volume.

(ii) Volume to be achieved to maintain the original profit after a 10 percent rise in material costs, at the originally budgeted selling price per unit.

Solution:

(i) Budgeted selling price = 700 lakhs/ 40,000 units = ₹ 1,750 per unit.

Budgeted variable cost = 440 lakhs/ 40,000 units = ₹ 1,100 per unit.

Increased selling price = 1,750 + 10% = ₹ 1,925 per unit

New volume 40,000 – 10% = 36,000 units

Statement of Calculation of Profit:

	(₹ In lakhs)
Sales 36,000 units at ₹ 1,925 =	693.00
Less: Variable cost: 36,000 × 1,100 =	396.00
Contribution	297.00
Less: fixed costs	202.50
Profit	94.50

(ii) Budgeted Material cost = 264 lakhs/ 40,000 units = ₹ 660 per unit

Increased material cost = 660×110% =	726
Labour cost 52 lakhs/ 40,000 units =	130
Direct expenses, 124 lakhs/ 40,000 units =	310
Variable cost per unit	1,166
Budgeted selling price per unit	1,750
Contribution per unit(1,750 – 1,166)	584

$$\text{Sales volume} = \frac{\text{Fixed costs} + \text{Profit}}{\text{Contribution Per Unit}} = \frac{202.50 \text{ lakhs} + 57.50 \text{ lakhs}}{₹\ 584}$$

= 44,521 units are to be sold to maintain the original profit of ₹ 57.50 lakhs.

Illustration 15 (Calculation of margin of safety)

A company earned a profit of ₹ 30,000 during the year 2014. If the marginal cost and selling price of the product are ₹ 8 and ₹ 10 per unit respectively, find out the amount of margin of safety.

Solution:

P/V ratio $= \frac{S - V}{S} = \frac{10 - 8}{10} = 20\%$

Margin of safety $= \frac{\text{Profit}}{\text{P/V ratio}} = \frac{30,000}{20\%} = ₹\ 1,50,000$

Illustration 16 (Calculation of margin of safety)

A Ltd. Maintains margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to ₹ 5 lakhs.

Calculate the following:

i. Break-even sales

ii. Total sales

iii. Total variable cost

iv. Current profit

v. New 'margin of safety' if the sales volume is increased by 7 ½ %.

Solution:

(i) We know that: Break Even Sales (BES) x P/V Ratio = Fixed Cost

Break Even Sales (BES) x 40% = ₹ 5,00,000

Break Even Sales (BES) = ₹ 12,50,000

(ii) Total Sales = Break Even Sales + Margin of Safety

S = ₹ 12,50,000 + 0.375S

S – 0.375S = ₹ 12,50,000

S = ₹ 20,00,000

(iii) Contribution to Sales Ratio = 40%

Therefore, Variable cost to Sales Ratio = 60%

Variable cost = 60% of sales

= 60% of 20,00,000

Variable cost = 12,00,000

(iv) Current Profit = Sales – (Variable Cost + Fixed Cost)

= ₹ 20,00,000 – (12,00,000 + 5,00,000) = ₹ 3,00,000

(v) If sales value is increased by 7 ½ %

New Sales value = ₹ 20,00,000 x 1.075 = ₹ 21,50,000

New Margin of Safety = New Sales value – BES

= ₹ 21,50,000 – ₹ 12,50,000 = ₹ 9,00,000

Illustration 17 (Calculation of margin of safety)

You are given the following data :

	Sales	*Profit*
Year 2013	*₹ 1,20,000*	*8,000*
Year 2014	*₹ 1,40,000*	*13,000*

Find out –

(i) P/V ratio,

(ii) B.E. Point,

(iii) Profit when sales are ₹1,80,000,

(iv) Sales required earn a profit of ₹12,000,

(v) Margin of safety in year 2014.

Solution:

	Sales	Profit
Year 2013	₹ 1,20,000	8,000
Year 2014	₹ 1,40,000	13,000
Difference	₹ 20,000	5,000

(i) P/V Ratio = $\frac{\text{Difference in profit}}{\text{Difference in Sales}} \times 100 = \frac{5,000}{20,000} \times 100 = 25\ \%$

	(₹)
Contribution in 2013 (1,20,000 × 25%)	30,000
Less : Profit	8,000
Fixed Cost*	22,000

*Contribution = Fixed cost + Profit

∴ Fixed cost = Contribution - Profit

(ii) Break-even point = $\frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{22,000}{25\%}$ = ₹ 88,000

(iii) Profit when sales are ₹1,80,000

	(₹)
Contribution (₹1,80,000 × 25%)	45,000

Less: Fixed cost	22,000
Profit	23,000

(iv) Sales to earn a profit of ₹12,000

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}} = \frac{22,000 + 12,000}{25\%} = ₹1,36,000$$

(v) Margin of safety in 2014 –

Margin of safety = Actual sales – Break-even sales

= 1,40,000 – 88,000 = ₹ 52,000.

Illustration 18 (Calculation of selling price)

A single product company sells its product at ₹ 60 per unit. In 2013, the company operated at a margin of safety of 40%. The fixed costs amounted to ₹ 3,60,000 and the variable cost ratio to sales was 80%.

In 2014, it is estimated that the variable cost will go up by 10% and the fixed cost will increase by 5%.

(i) Find the selling price required to be fixed in 2014 to earn the same P/V ratio as in 2013.

(ii) Assuming the same selling price of ₹ 60 per unit in 2014, find the number of units required to be produced and sold to earn the same profit as in 2013.

Solution:

(i) Profit earned in 2013:

	(₹)
Total contribution (50,000 × ₹ 12)	6,00,000
Less: Fixed cost	3,60,000
	2,40,000
Selling price to be fixed in 2014:	
Revised variable cost (₹ 48 × 1.10)	52.80
Revised fixed cost (3,60,000 × 1.05)	3,78,000
P/V Ratio (Same as of 2013)	20%
Variable cost ratio to selling price	80%

Therefore revised selling price per unit = ₹ 52.80 ÷ 80% = ₹ 66

(ii) No. of units to be produced and sold in 2014 to earn the same profit:

We know that Fixed Cost plus profit =	Contribution (₹)
Profit in 2013	2,40,000
Fixed cost in 2014	3,78,000
Desired contribution in 2014	6,18,000

Contribution per unit = Selling price per unit – Variable cost per unit.

= ₹ 60 – ₹ 52.80 = ₹ 7.20.

No. of units to be produced in 2014 = ₹ 6,18,000 ÷ ₹ 7.20 = 85,834 units.

Workings:

1. PV Ratio in 2013

	(₹)
Selling price per unit	60
Variable cost (80% of Selling Price)	48
Contribution	12
P/V Ratio	20%

2. No. of units sold in 2013

Break-even point = Fixed cost ÷ Contribution per unit

= ₹ 3,60,000 ÷ ₹ 12 = 30,000 units.

Margin of safety is 40%. Therefore, break-even sales will be 60% of units sold.

No. of units sold = Break-even point in units ÷ 60%

= 30,000 ÷ 60% = 50,000 units.

Illustration 19 (Calculation of margin of safety)

A company has made a profit of ₹ 50,000 during the year 2013-14. If the selling price and marginal cost of the product are ₹ 15 and ₹ 12 per unit respectively, find out the amount of margin of safety.

Solution:

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

= [(15 – 12)/15] x 100

= (3/15) x 100 = 20%

Marginal of Safety = (Profit)/ (P/V Ratio)

= 50,000/20% = ₹ 2,50,000

Illustration 20 (Calculation of break even sales)

(a) If margin of safety is ₹ 2,40,000 (40% of sales) and P/V ratio is 30% of AB Ltd, calculate its (1) Break even sales, and (2) Amount of profit on sales of ₹9,00,000.

(b) X Ltd. has earned a contribution of ₹2,00,000 and net profit of ₹1,50,000 of sales of ₹ 8,00,000. What is its margin of safety?

Solution:

(a) Total Sales = $2,40,000 \times \frac{100}{40}$ = ₹6,00,000

Contribution = 6,00,000 × 30% = ₹1,80,000

Profit = M/S × P/V ratio = 2,40,000 × 30% = ₹72,000

Fixed cost = Contribution – Profit

= 1,80,000 – 72,000 = ₹1,08,000

(1) Break-even Sales = $\frac{\text{Fixed Cost}}{\text{P/V ratio}} = \frac{1,08,000}{30\%}$ = ₹3,60,000

(2) Profit = (Sales × P/V ratio) – Fixed cost

= (9,00,000 × 30%) – 1,08,000 = ₹1,62,000

(b) P/V ratio = $\frac{\text{Contribution}}{\text{Sales}} = \frac{2,00,000}{8,00,000}$ = 25%

Margin of safety = $\frac{\text{Profit}}{\text{P/V ratio}} = \frac{1,50,000}{25\%}$ = ₹ 6,00,000

Alternatively :

Fixed cost = Contribution – Profit

=₹ 2,00,000 – ₹1,50,000 = ₹ 50,000

B.E. Point = ₹ 50,000 ÷ 25% = ₹ 2,00,000

Margin of Safety = Actual sales – B.E. sales

= 8,00,000 – 2,00,000 = 6,00,000

Illustration 21 (Calculation of break even sales and margin of safety)

A company had incurred fixed expenses of ₹ 4,50,000, with sales of ₹ 15,00,000 and earned a profit of ₹ 3,00,000 during the first half year. In the second half, it suffered a loss of

₹ 1,50,000.

Calculate:

(i) The profit-volume ratio, break-even point and margin of safety for the first half year.

(ii) Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.

(iii) The break-even point and margin of safety for the whole year.

Solution:

(i) In the First half year

Contribution = Fixed cost + Profit

= 4,50,000 + 3,00,000 = ₹ 7,50,000

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{7,50,000}{15,00,000} \times 100 = 50\%$$

$$\text{Break-even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{4,50,000}{50\%} \times 100 = ₹\ 9,00,000$$

Margin of safety= Actual sales – Break-even point

= 15,00,000 – 9,00,000 = ₹ 6,00,000

(ii) In the second half year

Contribution = Fixed cost – Loss

= 4,50,000 – 1,50,000 = ₹ 3,00,000

$$\text{Expected sales volume} = \frac{\text{Fixed cost} - \text{Loss}}{\text{P/V ratio}} = \frac{3,00,000}{50\%} = ₹\ 6,00,000$$

(iii) For the whole year

$$\text{B.E. point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{4,50,000 \times 2}{50\%} = ₹18,00,000$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{3,00,000 - 1,50,000}{50\%} = ₹\ 3,00,000.$$

Illustration 22 (Calculation of Break even Sales, Profit and Fixed Cost)

The following information is given by Star Ltd.:

Margin of Safety *₹ 1,87,500*

Total Cost	*₹ 1,93,750*
Margin of Safety	*3,750 units*
Break-even Sales	*1,250 units*

Required:

Calculate Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost.

Solution:

Margin of Safety (%) $= \frac{3,750 \text{ units}}{3,750 \text{ units} + 1,250 \text{ units}}$

$= 75\%$

Total Sales $= \frac{₹1,87,500}{0.75}$

$= ₹2,50,000$

Profit = Total Sales – Total Cost

= ₹2,50,000 – ₹1,93,750

= ₹56,250

P/V Ratio $= \frac{\text{Profit}}{\text{Margin of Safety (₹)}} \times 100$

$= \frac{₹56,250}{₹1,87,500} \times 100$

= 30%

Break-even Sales = Total Sales × [100 – Margin of Safety %]

= ₹ 2,50,000 × 0.25

= ₹ 62,500

Fixed Cost = Sales × P/V Ratio – Profit

= ₹2,50,000 × 0.30 – ₹56,250

= ₹18,750

Illustration 23 (Implication of changes in different variables on P/V ratio)

By noting "P/V will increase or P/V will decrease or P/V will not change", as the case may be, state how the following independent situations will affect the P/V ratio:

(i) An increase in the physical sales volume;

(ii) An increase in the fixed cost;

(iii) A decrease in the variable cost per unit;

(iv) A decrease in the contribution margin;

(v) An increase in selling price per unit;

(vi) A decrease in the fixed cost;

(vii) A 10% increase in both selling price and variable cost per unit;

(viii) A 10% increase in the selling price per unit and 10% decrease in the physical sales volume;

(ix) A 50% increase in the variable cost per unit and 50% decrease in the fixed cost.

(x) An increase in the angle of incidence.

Solution:

Item no.	P/V Ratio	Reason
(i)	Will not change	
(ii)	Will not change	
(iii)	Will increase	
(iv)	Will decrease	
(v)	Will increase	
(vi)	Will not change	
(vii)	Will not change	Reasoning 1
(viii)	Will increase	Reasoning 2
(ix)	Will decrease	Reasoning 3
(x)	Will increase	Reasoning 4

A 10%increase in both selling price and variable cost per unit.

Reasoning 1. Assumptions: a) Variable cost is less than selling price.

b) Selling price ₹100 variable cost ₹ 90 per unit.

c) P/V ratio = $\frac{100-90}{100}$ = 10%

10% increase in S.P. = ₹110

10% increase in variable cost = ₹99

$$\text{P/V ratio} = \frac{110 - 99}{10} = 10\% \text{ i.e. P/v ratio will not change}$$

Reasoning 2. Increase or decrease in physical sales volume will not change P/v ratio. Hence 10% increase in selling price per unit will increase P/V ratio.

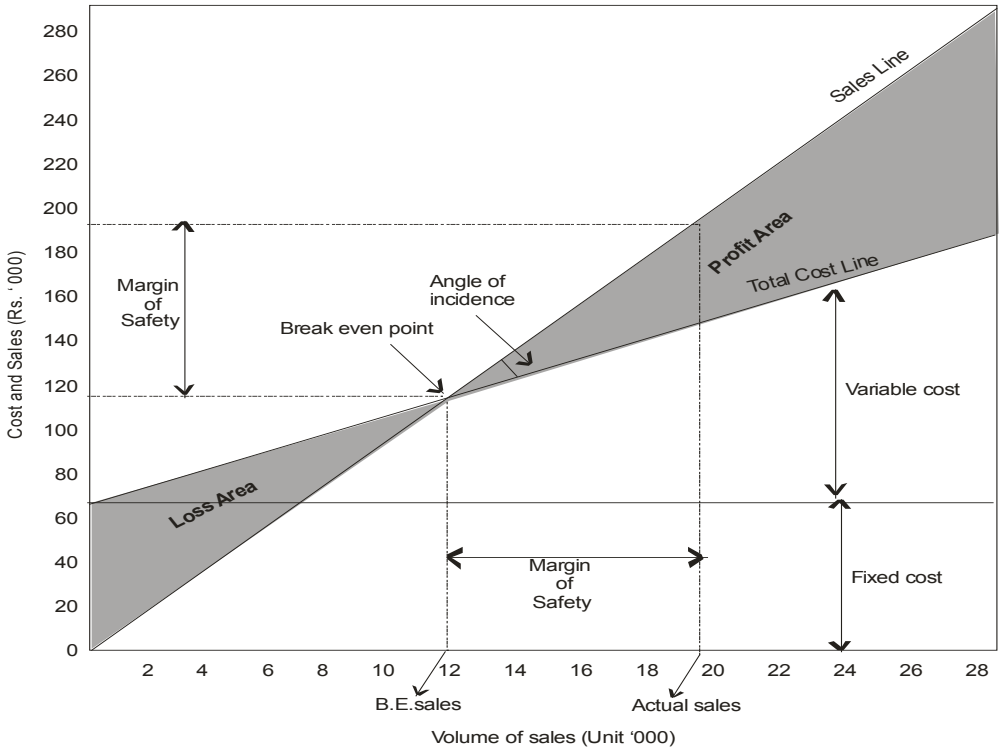
Reasoning 3. Increase or decrease in fixed cost will not change P/V ratio. Hence 50% increase in the variable cost per unit will decrease P/V ratio.

Reasoning 4. Angle of incidence is the angle at which sales line cuts the total cost line. If it is large, it indicates that the profits are being made at higher rate. Hence increase in the angle of incidence will increase the P/V ratio.

12.11 Angle of Incidence

This angle is formed by the intersection of sales line and total cost line at the break-even point. This angle shows the rate at which profits are being earned once the break-even point has been reached. The wider the angle the greater is the rate of earning profits. A large angle of incidence with a high margin of safety indicates extremely favourable position.

The shaded area in the graph given below is representing the angle of incidence. The angle above and below the break-even point shows the rate of earning profitability (loss). Wider angle denotes higher rate of earnings and vice-versa.

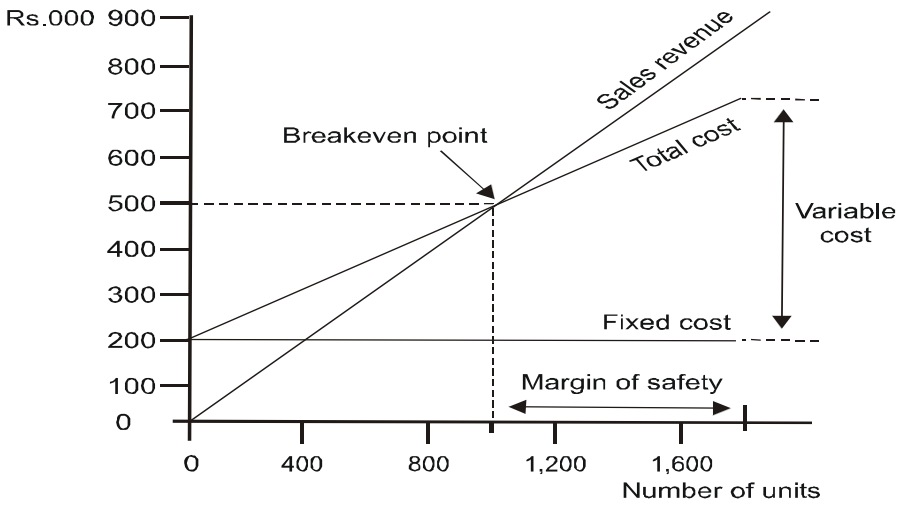


12.12 Graphical Representation of Break Even Chart

12.12.1 Break-even Chart : A breakeven chart records costs and revenues on the vertical axis and the level of activity on the horizontal axis. The making of the breakeven chart would require you to select appropriate axes. Subsequently, you will need to mark costs/revenues on the Y axis whereas the level of activity shall be traced on the X axis. Lines representing (i) Fixed costs (horizontal line at ₹ 2,00,000 for ABC Ltd), (ii) Total costs at maximum level of activity (joined to the Y-axis where the Fixed cost of ₹ 2,00,000 is marked) and (iii) Revenue at maximum level of activity (joined to the origin) shall be drawn next.

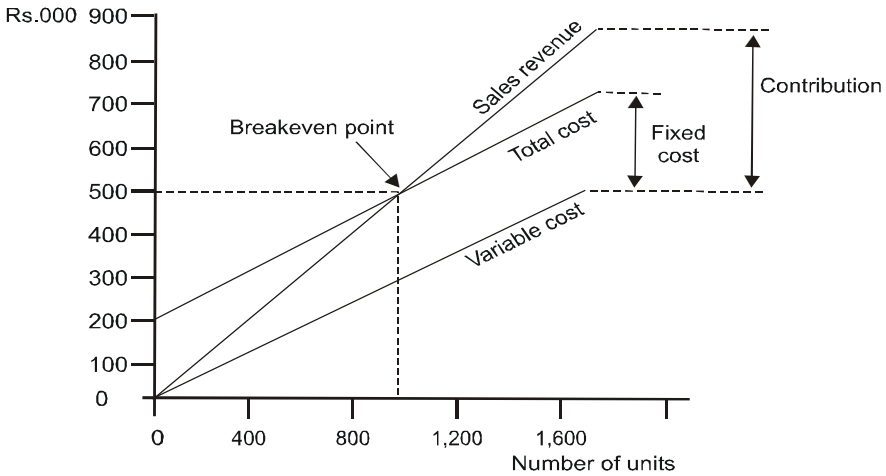
The breakeven point is that point where the sales revenue line intersects the total cost line. Other measures like the margin of safety and profit can also be measured from the chart.

The breakeven chart for ABC Ltd (Example-1) is drawn below.



12.12.2 Contribution Breakeven chart: It is not possible to use a breakeven chart as described above to measure contribution. This is one of its major limitations especially so because contribution analysis is literally the backbone of marginal costing. To overcome such a limitation, accountants frequently resort to the making of a contribution breakeven chart which is based on the same principles as a conventional breakeven chart except for that it shows the variable cost line instead of the fixed cost line. Lines for Total cost and Sales revenue remain the same. The breakeven point and profit can be read off in the same way as with a conventional chart. However it is also possible to read the contribution for any level of activity.

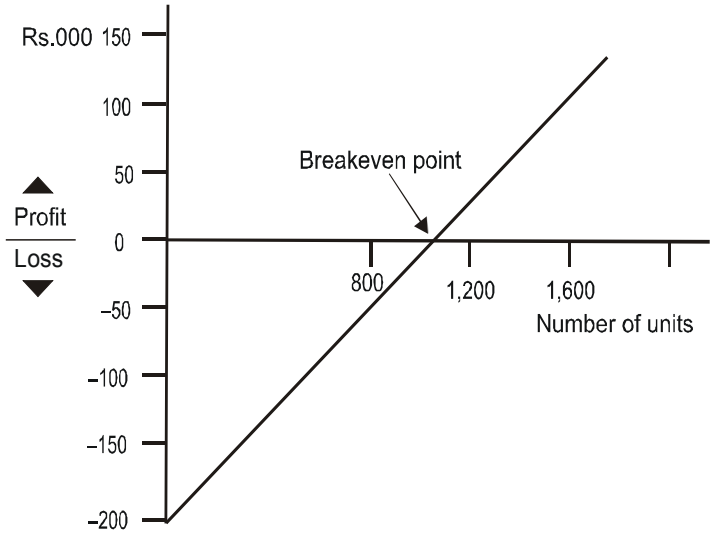
Using the same example of ABC Ltd as for the conventional chart, the total variable cost for an output of 1,700 units is 1,700 × ₹300 = ₹5,10,000. This point can be joined to the origin since the variable cost is nil at zero activity.



The contribution can be read as the difference between the sales revenue line and the variable cost line.

12.12.3 Profit-volume chart: This is also very similar to a breakeven chart. In this chart the vertical axis represents profits and losses and the horizontal axis is drawn at zero profit or loss.

In this chart each level of activity is taken into account and profits marked accordingly. The breakeven point is where this line interacts the horizontal axis. A profit-volume graph for our example (ABC Ltd) will be as follows,



The loss at a nil activity level is equal to ₹ 2,00,000, i.e. the amount of fixed costs. The second point used to draw the line could be the calculated breakeven point or the calculated profit for sales of 1,700 units.

Advantages of the profit-volume chart

1. The biggest advantage of the profit-volume chart is its capability of depicting clearly the effect on profit and breakeven point of any changes in the variables. The following example illustrates this characteristic,

Example 2:

A manufacturing company incurs fixed costs of ₹3,00,000 per annum. It is a single product company with annual sales budgeted to be 70,000 units at a sales price of ₹300 per unit. Variable costs are ₹285 per unit.

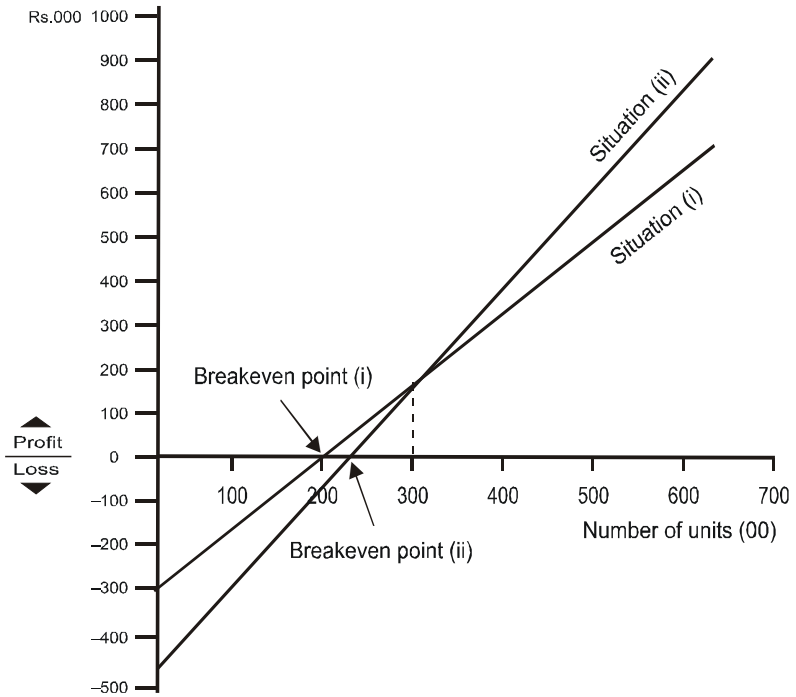
(i) Draw a profit volume graph, and use it to determine the breakeven point.

The company is deliberating upon an increase in the selling price of the product to ₹350 per unit. This shall be required in order to improve the quality of the product. It is anticipated that despite increase in the selling price the sales volume shall remain unaffected, however, the fixed costs shall increase to ₹4,50,000 per annum and the variable costs to ₹330 per unit.

(ii) Draw on the same graph as for part (a) a second profit volume graph and give your comments.

Solution:

Figure showing changes with a profit-volume chart



Working notes (i)

The profit for sales of 70,000 units is ₹ 7,50,000.

	(₹'000)
Contribution 70,000 × (₹300 – ₹285)	1050
Fixed costs	300
Profit	750

This point is joined to the loss at zero activity, ₹ 3,00,000 i.e., the fixed costs.

Working notes (ii)

The profit for sales of 70,000 units is ₹ 9,50,000.

	(₹'000)
Contribution 70,000 × (₹350 – ₹330)	1400
Fixed costs	450
Profit	950

This point is joined to the loss at zero activity, ₹ 4,50,000 i.e., the fixed costs.

Comments:

It is clear from the graph that there are larger profits available from option (ii). It also shows an increase in the break-even point from 20,000 units to 22,500 units, however, the increase of 2,500 units may not be considered large in view of the projected sales volume. It is also possible to see that for sales volumes above 30,000 units the profit achieved will be higher with option (ii). For sales volumes below 30,000 units option (i) will yield higher profits (or lower losses).

Illustration 24 (Drawing of Break-even chart)

You are given the following data for the year 2007 of Rio Co. Ltd:

Variable cost	*60,000*	*60%*
Fixed cost	*30,000*	*30%*
Net profit	*10,000*	*10%*
Sales	*1,00,000*	*100%*

Find out (a) Break-even point, (b) P/V ratio, and (c) Margin of safety. Also draw a break-even chart showing contribution and profit.

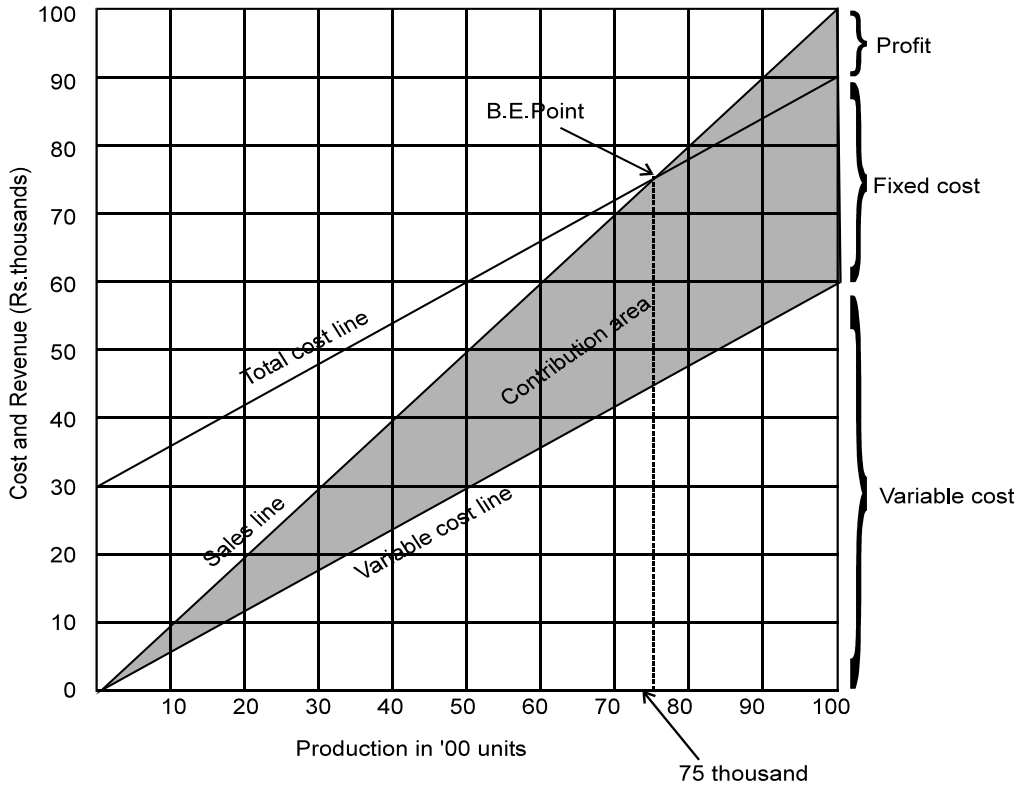
Solution:

$$\text{P/V ratio} = \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} = \frac{1,00,000 - 60,000}{1,00,000} = 40\%$$

$$\text{Break Even Point} = \frac{\text{Fixed Cost}}{\text{P/V ratio}} = \frac{30,000}{40\%} = ₹\,75,000$$

Margin of safety = Actual Sales – BE point = 1,00,000 – 75,000 = ₹ 25,000

Break even chart showing contribution is shown below:



Break-even chart

Illustration 25 (Drawing of Break-even chart)

(a) You are given the following data for the coming year for a factory.

Budgeted output	*8,00,000 units*
Fixed expenses	*40,00,000*
Variable expenses per unit	*₹ 100*
Selling price per unit	*₹ 200*

Draw a break-even chart showing the break-even point.

(b) If price is reduced to ₹ 180, what will be the new break-even point?

Solution:

(a) Contribution = S – V = ₹ 200 – ₹ 100 = ₹ 100 per unit.

$$\text{B.E. Point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{40,00,000}{₹\ 100} = 40,000$$

(b) When selling price is reduced

New selling price = ₹ 180

New Contribution = ₹ 180 – ₹ 100 = ₹ 80 per unit.

$$\text{New B.E. Point} = \frac{₹\ 40,00,000}{₹\ 80} = 50,000 \text{ units.}$$

The break-even chart is shown below:

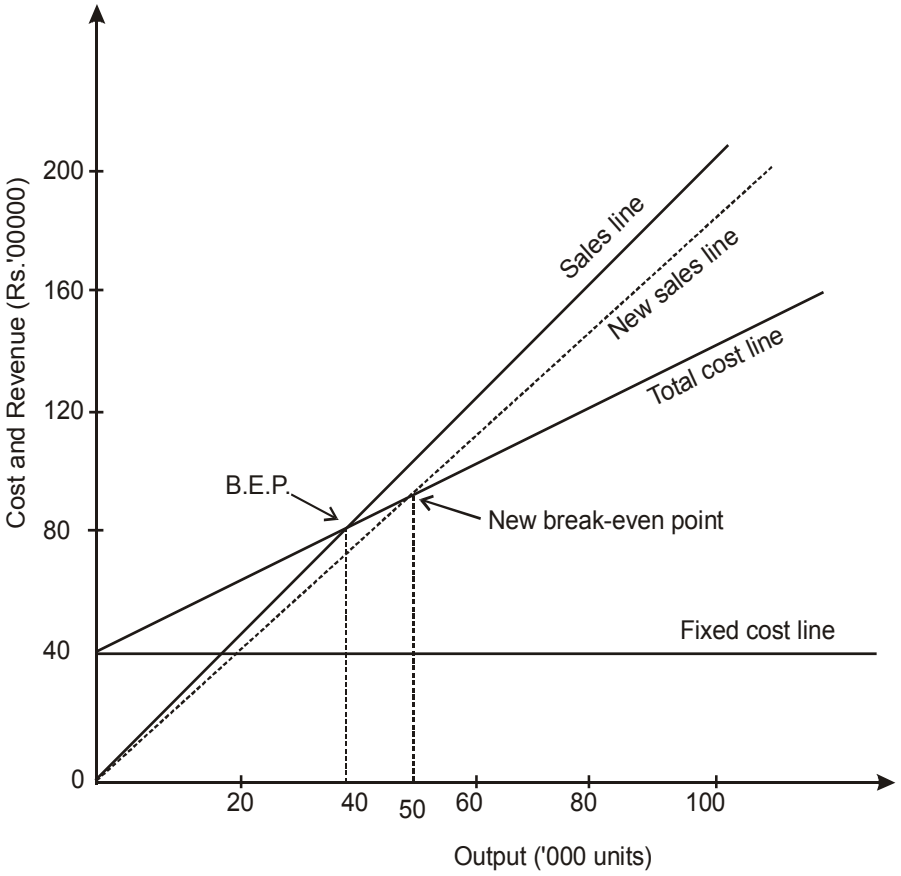


Illustration 26 (Drawing of Profit Graph)

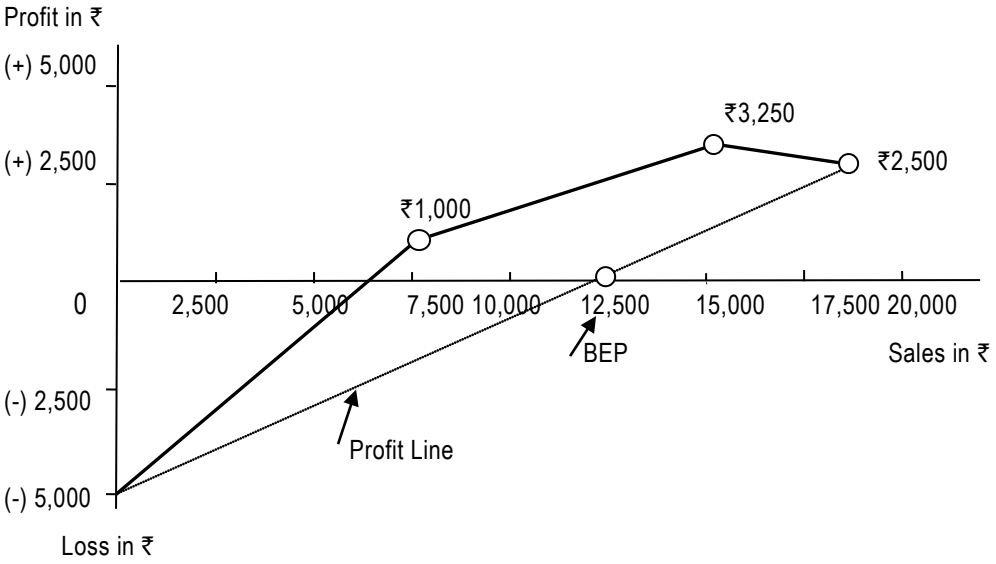
Prepare a profit graph for products A, B and C and find break-even point from the following data:

Products	*A*	*B*	*C*	*Total*
Sales (₹)	*7,500*	*7,500*	*3,750*	*18,750*
Variable cost (₹)	*1,500*	*5,250*	*4,500*	*11,250*
Fixed cost (₹)	---	---	---	*5,000*

Solution:

Statement Showing Cumulative Sales & Profit

Sales	Cumulative Sales		Variable Cost	Contribution	Cumulative Contribution	Cumulative Profit
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
A	7,500	7,500	1,500	6,000	6,000	1,000
B	7,500	15,000	5,250	2,250	8,250	3,250
C	3,750	18,750	4,500	(750)	7,500	2,500



Break Even Point (BEP) = ₹ 12,500

12.13 The Limitations of Breakeven Analysis

The limitations of the practical applicability of breakeven analysis and breakeven charts stem mostly from the assumptions underlying CVP which have been mentioned above. Assumptions like costs behaving in a linear fashion or sales revenue remain constant at different sales levels or the stocks shall remain constant period after period are unrealistic. Similarly, the assumption that the only factor which influences costs is the 'activity level achieved' is erroneous because other factors like inflation also have a bearing on costs.

12.14 Summary

- ***Absorption Costing:*** a method of costing by which all direct cost and applicable overheads are charged to products or cost centers for finding out the total cost of production. Absorbed cost includes production cost as well as administrative and other cost.
- ***Break-even Chart:*** A mathematical or graphical representation, showing approximate profit or loss of an enterprise at different levels of activity within a limited range.
- ***Break-even Point*** the level of activity there is neither a profit nor a loss.

  $$\textbf{Break-even Point in units} = \frac{\textit{Fixed costs}}{\textit{Contribution per unit}}$$

- ***Cash Break Even Point*** the level of activity where there is neither a cash profit nor a cash loss.
- ***Cost Breakeven Point*** the level of activity where the total cost under two alternatives are the same. It is also known as Cost indifference point.
- ***Differential Costing*** a technique used in the preparation of adhoc information in which only cost and income differences in between alternative courses of action are taken into consideration.
- ***Direct Costing*** a principle under which all costs which are directed related are charged to products, processes, operations or services, of which they form an integral part.
- ***Marginal Contribution*** difference between selling price and variable cost of production.
- ***Marginal Cost*** the variable cost of one unit of product or a service**.**
- ***Marginal Cost Equation :*** $\mathbf{S \times U - V \times U = F \pm P}$
- ***Marginal Costing*** a principle whereby variable cost are charged to cost units and fixed cost attributable to the relevant period is written off in full against contribution for that period.
- ***Profit Volume Chart*** a diagram showing the expected relationship between costs, revenue at various volumes with profit being the residual.
- ***Profit Volume Ratio*** the ratio establishing the relationship between the contribution and the sales value.
- ***Margin of Safety*** is the difference between the expected level of sales and the break even sales
- ***Projected Sales –*** Break even sales

13

Budgets and Budgetary Control

Learning Objectives

When you have finished studying this chapter, you should be able to

- Understand the objectives and importance of budgeting and budgetary control
- Understand the Advantages and disadvantages of budgetary control
- Differentiate between various types of budgets.
- Understand the process of preparation of budgets

13.1 Introduction

Budgetary control and standard costing systems are two essential tools frequently used by business executives for the purpose of planning and control. In the case of budgetary control, the entire exercise starts with the setting up of budgets or targets and ends with the taking of an action, in case the actual figures differed with the budgetary ones.

13.2 Meaning of Budget and Budgeting

Budget: CIMA Official Terminology has defined the terms 'budget' as "Quantitative expression of a plan for a defined period of time. It may include planned sales volumes and revenues; resource quantities, costs and expenses; assets, liabilities and cash flows."

Budgeting: It is a means of coordinating the combined intelligence of an entire organisation into a plan of action based on past performance and governed by rational judgment of factors that will influence the course of business in the future.

13.3 Essentials of Budget

Essential elements of a budget are as follows:

1. Organisational structure must be clearly defined and responsibility should be assigned to identifiable units within the organisation.
2. Setting of clear objectives and reasonable targets. Objectives should be in consonance with the long term plan of the organisation.

3. Objectives and degree of responsibility should be clearly stated and communicated to the management or person responsible for.
4. Budgets are prepared for the future periods based on expected course of actions.
5. Budgets are updated for the events that were not kept into the mind while establishing budgets. Hence, budgets should flexible enough for mid- term revision.
6. The entire organisation must be committed to budgeting.
7. Budgets should be quantifiable and master budget should be broken down into various functional budgets.
8. Budgets should be monitored periodically. Variances from the set yardsticks (standards) should be analysed and responsibility should be fixed.
9. Budgetary performance needs to be linked effectively to the reward system.

13.4 Characteristic of Budget

The main characteristics of budget are as follows:

1. A budget is concerned for a definite future period.
2. A budget is a written document.
3. A budget is a detailed plan of all the economic activities of a business.
4. All the departments of a business unit co-operate for the preparation of a business budget.
5. Budget is a mean to achieve business and it is not an end in itself.
6. Budget needs to be updated, corrected and controlled every time when circumstances changes. Therefore it is a continuous process.
7. Budget helps in planning, coordination and control.
8. Different types of budgets are prepared by industries according to business requirements.
9. A budget acts a business barometer.
10. Budget is usually prepared in the light of Past Experience.
11. Budget is a constant endeavour of the Management.

13.5 Objectives of Budgeting

Planning:

The process of budgeting begin with the establishment of specific targets of performance and is followed by executing plans to achieve such desired goals and from time to time comparing actual results with the target goals. These targets include both the overall business targets as well as the specific targets for the individual units within the business. Establishing specific

targets for future operations is part of the planning function of management, while executing actions to meet the goals is the directing function of management. It may be explained as

- Budgets plans are made taking into account the objectives at different level of an organization i.e. Mission, corporate strategy and unit objectives. Individual plans at unit level should take overall organizational plan or objectives.
- Budgets reflect plans and that planning should have taken place before budgets are prepared.
- Budgets plans are quantified and responsibility is assigned to the persons who are responsible for execution of plan.
- Using the budget to communicate these expectations throughout the organization has helped many a companies to reduce expenses during a severe business recession.
- Planning not only motivates employees to attain goals but also improves overall decision making. During the planning phase of the budget process, all viewpoints are considered, options identified, and cost reduction opportunities assessed. This process may reveal opportunities or threats that were not known prior to the budget planning process.

Directing and Coordinating:

- Once the budget plans are in place, they can be used to direct and coordinate operations in order to achieve the stated targets.
- A business, however, is much more complex and requires more formal direction and coordination.
- The budget is one way to direct and coordinate business activities and units to achieve stated targets of performance.
- The budgetary units of an organisation are called responsibility centers. Each responsibility center is led by a manager who has the authority over and responsibility for the unit's performance.
- Objectives and degree of performance expected from a responsibility centres are communicated rapidly.

Controlling:

- As time passes, the actual performance of an operation can be compared against the planned targets. This provides prompt feedback to employees about their performance. If necessary, employees can use such feedback to adjust their activities in the future.
- Feedback received in the form of budget report from the responsibility centre. This report is helpful to know the performance of the concerned unit.
- Any unexpected changes into the conditions which were prevailing at the time of preparing budget are taken into account and budgets are revised to show true performance yardstick.
- Comparing actual results to the plan also helps prevent unplanned expenditures. The budget encourages employees to establish their spending priorities.

The main objective of Budgeting is to help in achieving the overall objective of the organization.

13.6 Meaning of Budgetary Control

CIMA has defined the terms 'budgetary control' as "Budgetary control is the establishment of budgets relating to the responsibilities of executives of a policy and the continuous comparison of the actual with the budgeted results, either to secure by individual action the objective of the policy or to provide a basis for its revision." It is the system of management control and accounting in which all the operations are forecasted and planned in advance to the extent possible and the actual results compared with the forecasted and planned ones.

13.6.1 Budgetary Control Involves:

1. Establishment of budgets
2. Continuous comparison of actual with budgets for achievement of targets
3. Revision of budgets after considering changed circumstances
4. Placing the responsibility for failure to achieve the budget targets.

13.6.2 The salient features of such a system are the following :

1. Determining the objectives to be achieved, over the budget period, and the policy or policies that might be adopted for the achievement of these ends.
2. Determining the variety of activities that should be undertaken for the achievement of the objectives.
3. Drawing up a plan or a scheme of operation in respect of each class of activity, in physical as well as monetary terms for the full budget period and its parts.
4. Laying out a system of comparison of actual performance by each person, section or department with the relevant budget and determination of causes for the discrepancies, if any.
5. Ensuring that corrective action will be taken where the plan is not being achieved and, if that be not possible, for the revision of the plan.

In brief, it is a system to assist management in the allocation of responsibility and authority, to provide it with aid for making, estimating and planning for the future and to facilitate the analysis of the variation between estimated and actual performance.

In order that budgetary control may function effectively, it is necessary that the concern should develop proper basis of measurement or standards with which to evaluate the efficiency of operations, *i.e.,* it should have in operation a system of standard costing.

Beside this, the organisation of the concern should be so integrated that all lines of authority and responsibility are laid, allocated and defined. This is essential since the system of budgetary control postulates separation of functions and division of responsibilities and thus requires that the organisation shall be planned in such a manner that everyone, from the Managing Director down to the Shop Foreman, will have his duties properly defined.

13.6.3 Objectives of Budgetary Control System:

1. Portraying with precision the overall aims of the business and determining targets of performance for each section or department of the business.
2. Laying down the responsibilities of each of the executives and other personnel so that everyone knows what is expected of him and how he will be judged. Budgetary control is one of the few ways in which an objective assessment of executives or department is possible.
3. Providing a basis for the comparison of actual performance with the predetermined targets and investigation of deviation, if any, of actual performance and expenses from the budgeted figures. This naturally helps in adopting corrective measures.
4. Ensuring the best use of all available resources to maximise profit or production, subject to the limiting factors. Since budgets cannot be properly drawn up without considering all aspects usually there is good co-ordination when a system of budgetary control operates.
5. Co-ordinating the various activities of the business, and centralising control and yet enabling management to decentralise responsibility and delegate authority in the overall interest of the business.
6. Engendering a spirit of careful forethought, assessment of what is possible and an attempt at it. It leads to dynamism without recklessness. Of course, much depends on the objectives of the firm and the vigour of its management.
7. Providing a basis for revision of current and future policies.
8. Drawing up long range plans with a fair measure of accuracy.
9. Providing a yardstick against which actual results can be compared.

13.6.4 Working of a budgetary control system:

The responsibility for successfully introducing and implementing a Budgetary Control System rests with the Budget Committee acting through the Budget Officer. The Budget Committee would be composed of all functional heads and a member from the Board to preside over and guide the deliberations.

The main responsibilities of the Budget Officer are:

1. to assist in the preparation of the various budgets by coordinating the work of the accounts department which is normally responsible to compile the budgets—with the relevant functional departments like Sales, Production, Plant maintenance etc.;
2. to forward the budget to the individuals who are responsible to adhere to them, and to guide them in overcoming any practical difficulties in its working;
3. to prepare the periodical budget reports for circulation to the individuals concerned;
4. to follow-up action to be taken on the budget reports;

5. to prepare an overall budget working report for discussion at the Budget Committee meetings and to ensure follow-up on the lines of action suggested by the Committee;
6. to prepare periodical reports for the Board meeting. Comparing the budgeted Profit and Loss Account and the Balance Sheet with the actual results attained.

It is necessary that every budget should be thoroughly discussed with the functional head before it is finalised.

It is the duty of the Budget Officer to see that the periodical budget reports are supplied to the recipients at frequent intervals as far as possible.

The efficiency of the Budget Officer, and through him of the Budget Committee, will be judged more by the smooth working of the system and the agreement between the actual figures and the budgeted figures.

Budgets are primarily an incentive and a challenge for better performance; it is up to the Budget Officer to see that attention of the different functional heads is drawn to it to face the challenge in a successful manner.

13.6.5 Advantages of Budgetary Control System:

Points	*Description*
1. Efficiency	The use of budgetary control system enables the management of a business concern to conduct its business activities in the efficient manner.
2. Control on expenditure	It is a powerful instrument used by business houses for the control of their expenditure. It in fact provides a yardstick for measuring and evaluating the performance of individuals and their departments.
3. Finding deviations	It reveals the deviations to management, from the budgeted figures after making a comparison with actual figures.
4. Effective utilisation of resources	Effective utilisation of various resources like—men, material, machinery and money—is made possible, as the production is planned after taking them into account.
5. Revision of plans	It helps in the review of current trends and framing of future policies.
6. Implementation of Standard Costing system	It creates suitable conditions for the implementation of standard costing system in a business organisation.
7. Cost Consciousness	Budgets are studied by outside fund providers also such as banking and financial institutions, realising that management encourages cost consciousness and maximum utilisation of available resources.

8. Credit Rating	Management which have developed a well ordered budget plans and which operate accordingly, receive greater favour from credit agencies.

13.6.6 Limitations of Budgetary Control System:

Points	*Description*
1. Based on Estimates	Budgets are based on series of estimates which are based on the conditions prevailed or expected at the time budget is established. It requires revision in plan if conditions change.
2. Time factor	Budgets cannot be executed automatically. Some preliminary steps are required to be accomplished before budgets are implemented. It requires proper attention and time of management. Management must not expect too much during the development period.
3. Co-operation Required	Staff co-operation is usually not available during budgetary control exercise. In a decentralised organisation each unit has its own objective and these units enjoy some degree of discretion. In this type of organisation structure coordination among different units are required. The success of the budgetary control depends upon willing co-operation and teamwork,
4. Expensive	Its implementation is quite expensive. For successful implementation of the budgetary control proper organisation structure with responsibility is prerequisite. Budgeting process start from the collection of requirements to budget and performance analysis. It consumes valuable resources for these purpose, hence, it is an expensive process.
5. Not a substitute for management	Budget is only a managerial tool and must be applied correctly for management to get benefited. Budgets are not a substitute for management.
6. Rigid document	Budgets are considered as rigid document. But in reality, an organisation is exposed to various uncertain internal and external factors. Budget should be flexible enough to incorporate ongoing developments in the internal and external factors affecting the very purpose of the budget.

13.6.7 Components of Budgetary Control System:

The policy of a business for a defined period is represented by the master budget the details of which are given in a number of individual budgets called *functional budgets.* These functional budgets are broadly grouped under the following heads:

1. *Physical budgets*: Those budgets which contain information in terms of physical units about sales, production etc. for example, quantity of sales, quantity of production, inventories, and manpower budgets are physical budgets.

2. *Cost budgets*: Budgets which provides cost information in respect of manufacturing, selling, administration etc. for example, manufacturing costs, selling costs, administration cost, and research and development cost budgets are cost budgets.

3. *Profit budgets*: A budget which enables in the ascertainment of profit, for example, sales budget, profit and loss budget, etc.

4. *Financial budgets*: A budget which facilitates in ascertaining the financial position of a concern, for example, cash budgets, capital expenditure budget, budgeted balance sheet etc.

13.7 Preparation of Budgets

1. **Definition of objectives**: A budget being a plan for the achievement of certain operational objectives, it is desirable that the same are defined precisely. The objectives should be written out; the areas of control demarcated; and items of revenue and expenditure to be covered by the budget stated. This will give a clear understanding of the plan and its scope to all those who must cooperate to make it a success.

2. **Location of the key (or budget) factor**: There is usually one factor (sometimes there may be more than one) which sets a limit to the total activity. For instance, in India today sometimes non-availability of power does not allow production to increase inspite of heavy demand. Similarly, lack of demand may limit production. Such a factor is known as key factor. For proper budgeting, it must be located and estimated properly.

3. **Appointment of controller**: Formulation of a budget usually required whole time services of a senior executive; he must be assisted in this work by a Budget Committee, consisting of all the heads of department along with the Managing Director as the Chairman. The Controller is responsible for coordinating and development of budget programmes and preparing the manual of instruction, known as Budget manual.

4. **Budget Manual:** Effective budgetary planning relies on the provision of adequate information to the individuals involved in the planning process. Many of these information needs are contained in the budget manual. A budget manual is a collection of documents

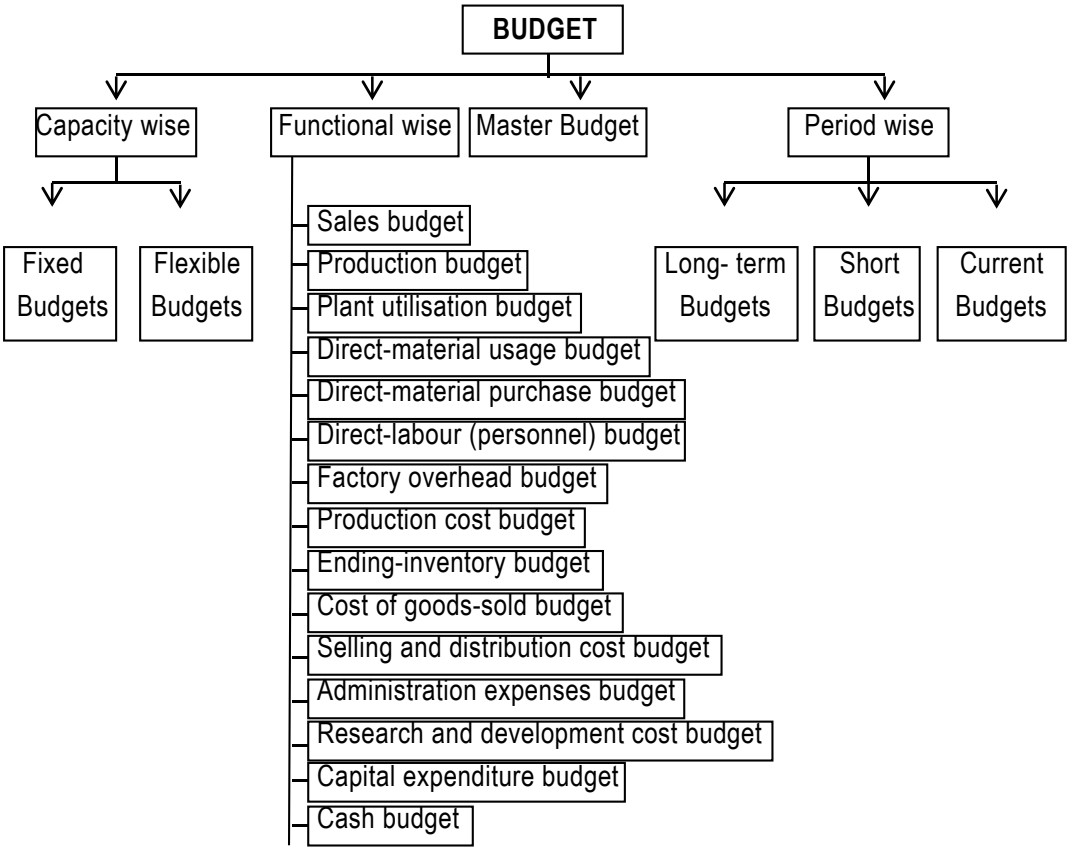
that contains key information for those involved in the planning process. Typical contents could include the following:

- An introductory explanation of the budgetary planning and control process, including a statement of the budgetary objective and desired results.
- A form of organisation chart to show who is responsible for the preparation of each functional budget and the way in which the budgets are interrelated.
- A timetable for the preparation of each budget. This will prevent the formation of a 'bottleneck' with the late preparation of one budget holding up the preparation of all others.
- Copies of all forms to be completed by those responsible for preparing budgets, with explanations concerning their completion.
- A list of the organization's account codes, with full explanations of how to use them.
- Information concerning key assumptions to be made by managers in their budgets, for example the rate of inflation, key exchange rates, etc.

5. **Budget period**: The period covered by a budget is known as budget period. There is no general rule governing the selection of the budget period. In practice the Budget Committee determines the length of the budget period suitable for the business. Normally, a calendar year or a period co-terminus with the financial year is adopted. The budget period is then sub-divided into shorter periods; it may be months or quarters or such periods as coincide with period of trading activity.
6. **Standard of activity or output**: For preparing budgets for the future, past statistics cannot be completely relied upon, for the past usually represents a combination of good and bad factors. Therefore, though results of the past should be studied but these should only be applied when there is a likelihood of similar conditions repeating in the future. Also, while setting the targets for the future, it must be remembered that in a progressive business, the achievement of a year must exceed those of earlier years. Therefore what was good in the past is only fair for the current year.

In budgeting, fixing the budget of sales and of capital expenditure is most important since these budgets determine the extent of development activity. For budgeting sales, one must consider the trend of economic activity of the country, reactions of salesmen, customers and employees, effect of price changes on sales, the provision for advertisement campaign plan capacity etc.

13.8 Different Types of Budgets



13.8.1 Classification on the basis of Capacity or Flexibility:

These types of budgets are prepared on the basis of activity level or utilization of capacity. These are also known as "Budgets on the basis of flexibility".

(i)

Fixed Budget : According to CIMA, "a fixed budget, is a budget designed to remain unchanged irrespective of the level of activity actually attained".

A fixed budget shows the expected results of a responsibility center for only one activity level.

Once the budget has been determined, it is not changed, even if the activity changes. Fixed budgeting is used by many service companies and for some administrative functions of manufacturing companies, such as purchasing, engineering, and accounting. Fixed Budget is used as an effective tool of cost control. In case, the level of activity attained is different from the level of activity for budgeting purposes, the fixed budget becomes ineffective. Such a budget is quite suitable for fixed expenses. It is also known as a static budget.

Essential conditions:

1. When the nature of business is not seasonal.
2. There is no impact of external factors on the business activities
3. The demand of the product is certain and stable.
4. Supply orders are issued regularly.
5. The market of the product should be domestic rather than foreign.
6. There is no need of special labour or material in the production of the products.
7. Supply of production inputs is regular.
8. There is a trend of price stability.

Generally, all above conditions are not found in practice. Hence Fixed budget is not important in business concerns.

Merits and Demerits of fixed budgets are tabulated below:

Merits	*Demerits*
1. Very simple to understand 2. Less time consuming	1. It is misleading. A poor performance may remain undetected and a good performance may go unrealised. 2. It is not suitable for long period. 3. It is also found unsuitable particularly when the business conditions are changing constantly. 4. Accurate estimates are not possible.

(ii) Flexible Budget: According to CIMA, "a flexible budget is defined as a budget which, by recognizing the difference between fixed, semi-variable and variable costs is designed to change in relation to the level of activity attained." Unlike static (fixed) budgets, flexible budgets show the expected results of a responsibility center for different activity levels.

You can think of a flexible budget as a series of static budgets for different levels of activity. Such budgets are especially useful in estimating and controlling factory costs and operating expenses. It is more realistic and practicable because it gives due consideration to cost behaviour at different levels of activity. While preparing a flexible budget the expenses are classified into three categories *viz.*

(i) Fixed,
(ii) Variable, and
(iii) Semi-variable.

Semi-variable expenses are further segregated into fixed and variable expenses. Flexible budgeting may be resorted to under following situations:

(i) In the case of new business venture due to its typical nature it may be difficult to forecast the demand of a product accurately.

(ii) Where the business is dependent upon the mercy of nature e.g., a person dealing in wool trade may have enough market if temperature goes below the freezing point.

(iii) In the case of labour intensive industry where the production of the concern is dependent upon the availability of labour.

Merits and Demerits of flexible budgets are tabulated below:

Merits	*Demerits*
1. With the help of flexible budget, the sales, costs and profit may be calculated easily by the business at various levels of production capacity. 2. In flexible budget, adjustment is very simple according to change in business conditions. 3. It also helps in determination of production level as it shows budgeted costs with classification at various levels of activity along with sales. Hence the management can easily select the level of production which shows the profit predetermined by the owners of the business. 4. It also shows the quantity of product to be produced to earn determined profit.	1. The formulation of flexible budget is possible only when there is proper accounting system maintained, perfect knowledge about the factors of production and various business circumstances is available. 2. Flexible Budget also requires the system of standard costing in business. 3. It is very expensive and labour oriented.

Suitability for flexible budget:

1. Seasonal fluctuations in sales and/or production, for example in soft drinks industry;
2. a company which keeps on introducing new products or makes changes in the design of its products frequently;
3. industries engaged in make-to-order business like ship building;
4. an industry which is influenced by changes in fashion; and
5. general changes in sales.

Difference between Fixed and Flexible Budgets:

Sl. no.	Fixed Budget	Flexible Budget
1.	It does not change with actual volume of activity achieved. Thus it is known as rigid or inflexible budget	It can be re-casted on the basis of activity level to be achieved. Thus it is not rigid.
2.	It operates on one level of activity and under one set of conditions. It assumes that there will be no change in the prevailing conditions, which is unrealistic.	It consists of various budgets for different levels of activity
3.	Here as all costs like - fixed, variable and semi-variable are related to only one level of activity so variance analysis does not give useful information.	Here analysis of variance provides useful information as each cost is analysed according to its behaviour.
4.	If the budgeted and actual activity levels differ significantly, then the aspects like cost ascertainment and price fixation do not give a correct picture.	Flexible budgeting at different levels of activity facilitates the ascertainment of cost, fixation of selling price and tendering of quotations.
5.	Comparison of actual performance with budgeted targets will be meaningless specially when there is a difference between the two activity levels.	It provides a meaningful basis of comparison of the actual performance with the budgeted targets.

Illustration-1: (Calculation of Recovery rate per hour)

A factory which expects to operate 7,000 hours, i.e., at 70% level of activity, furnishes details of expenses as under:

Variable expenses	*₹ 1,260*
Semi-variable expenses	*₹ 1,200*
Fixed expenses	*₹ 1,800*

The semi-variable expenses go up by 10% between 85% and 95% activity and by 20% above 95% activity. Construct a flexible budget for 80, 90 and 100 per cent activities.

Solution:

Head of Account	Control basis	70%	80%	90%	100%
Budgeted hours		7,000	8,000	9,000	10,000
		(₹)	*(₹)*	*(₹)*	*(₹)*
Variable expenses	V	1,260	1,440	1,620	1,800
Semi-variable expenses	SV	1,200	1,200	1,320	1,440
Fixed expenses	F	1,800	1,800	1,800	1,800

Total expenses	4,260	4,440	4,740	5,040
Recovery rate per hour	0.61	0.55	0.53	0.50

Conclusion:

We notice that the recovery rate at 70% activity is ₹ 0.61 per hour. If in a particular month the factory works 8,000 hours, it will be incorrect to estimate the allowance as ₹ 4,880 @ ₹ 0.61. The correct allowance will be ₹ 4,440 as shown in the table. If the actual expenses are ₹ 4,500 for this level of activity, the company has not saved any money but has over-spent by ₹ 60 (₹ 4,500 – ₹ 4,440).

Illustration 2: (Preparation of flexible budget)

A department of Company X attains sale of ₹ 6,00,000 at 80 per cent of its normal capacity and its expenses are given below :

Administration costs:	*(₹)*
Office salaries	*90,000*
General expenses	*2 per cent of sales*
Depreciation	*7,500*
Rates and taxes	*8,750*
Selling costs :	
Salaries	*8 per cent of sales*
Travelling expenses	*2 per cent of sales*
Sales office expenses	*1 per cent of sales*
General expenses	*1 per cent of sales*
Distribution costs :	
Wages	*15,000*
Rent	*1 per cent of sales*
Other expenses	*4 per cent of sales*

Draw up flexible administration, selling and distribution costs budget, operating at 90 per cent, 100 per cent and 110 per cent of normal capacity.

Solution:

Flexible Budget of Department....of Company 'X'

	80% (₹)	90% (₹)	100%(₹)	110%(₹)
Sales	6,00,000	6,75,000	7,50,000	8,25,000
Administration Costs:				

Office Salaries (fixed)	90,000	90,000	90,000	90,000
General expenses (2% of Sales)	12,000	13,500	15,000	16,500
Depreciation (fixed)	7,500	7,500	7,500	7,500
Rent and rates (fixed)	8,750	8,750	8,750	8,750
(A) Total Adm. Costs	1,18,250	1,19,750	1,21,250	1,22,750
Selling Costs :				
Salaries (8% of sales)	48,000	54,000	60,000	66,000
Travelling expenses (2% of sales)	12,000	13,500	15,000	16,500
Sales office (1% of sales)	6,000	6,750	7,500	8,250
General expenses (1% of sales)	6,000	6,750	7,500	8,250
(B) Total Selling Costs	72,000	81,000	90,000	99,000
Distribution Costs :				
Wages (fixed)	15,000	15,000	15,000	15,000
Rent (1% of sales)	6,000	6,750	7,500	8,250
Other expenses (4% of sales)	24,000	27,000	30,000	33,000
(C) Total Distribution Costs	45,000	48,750	52,500	56,250
Total Costs (A + B + C)	2,35,250	2,49,500	2,63,750	2,78,000

Note: In the absence of information it has been assumed that office salaries, depreciation, rates and taxes and wages remain the same at 110% level of activity also. However, in practice some of these costs may change if present capacity is exceeded.

Illustration 3: (Preparation of flexible budget and deviation from the planned budget)

Action Plan Manufacturers normally produce 8,000 units of their product in a month, in their Machine Shop. For the month of January, they had planned for a production of 10,000 units. Owing to a sudden cancellation of a contract in the middle of January, they could only produce 6,000 units in January.

Indirect manufacturing costs are carefully planned and monitored in the Machine Shop and the Foreman of the shop is paid a 10% of the savings as bonus when in any month the indirect manufacturing cost incurred is less than the budgeted provision.

The Foreman has put in a claim that he should be paid a bonus of ₹ 88.50 for the month of January. The Works Manager wonders how anyone can claim a bonus when the Company has lost a sizeable contract. The relevant figures are as under:

Indirect manufacturing	*Expenses for a normal month*	*Planned for January*	*Actual in costs January*
	(₹)	*(₹)*	*(₹)*
Salary of foreman	*1,000*	*1,000*	*1,000*
Indirect labour	*720*	*900*	*600*
Indirect material	*800*	*1,000*	*700*
Repairs and maintenance	*600*	*650*	*600*
Power	*800*	*875*	*740*
Tools consumed	*320*	*400*	*300*
Rates and taxes	*150*	*150*	*150*
Depreciation	*800*	*800*	*800*
Insurance	*100*	*100*	*100*
	5,290	*5,875*	*4,990*

Do you agree with the Works Manager? Is the Foreman entitled to any bonus for the performance in January? Substantiate your answer with facts and figures.

Solution:

Flexible Budget of "Action Plan Manufacturers"
(for the month of January)

Indirect manufacturing cost	Nature of cost	Expenses for a normal month	Planned expenses	Expenses as per flexible budget	Actual expenses	Difference
		(₹)	(₹)	(₹)	(₹)	(₹)
	(1)	(2)	(3)	(4)	(5)	(6)=(5)–(4)
Salary of foreman	Fixed	1,000	1,000	1,000	1,000	Nil
Indirect labour (WN 1)	Variable	720	900	540	600	60
Indirect material (WN 2)	Variable	800	1,000	600	700	100
Repair and maintenance	Semi-variable	600	650	550	600	50

(WN 3)						
Power (WN 4)	Semi-variable	800	875	725	740	15
Tools consumed (WN 5)	Variable	320	400	240	300	60
Rates and taxes	Fixed	150	150	150	150	Nil
Depreciation	Fixed	800	800	800	800	Nil
Insurance	Fixed	100	100	100	100	Nil
		5,290	5,875	4,705	4,990	285

Conclusion : The above statement of flexible budget shows that the concern's expenses in the month of January have increased by ₹285 as compared to flexible budget. Under such circumstances assuming the expenses are controllable and based on the financial perspective the Foreman of the company may not be entitled for any performance bonus for the month of January.

Working notes :

1. Indirect labour cost per unit $\frac{₹\ 720}{8,000}$ =0.09 P.

   Indirect labour for 6,000 units = 6,000 × 0.09 P = ₹ 540.

2. Indirect material cost per unit $\frac{₹\ 800}{8,000}$ = 0.10 P

   Indirect material for 6,000 units = 6,000 × 0.10P = ₹ 600

3. According to high and low point method of segregating semi-variable cost into fixed and variable components, following formulae may be used.

   Variable cost of repair and maintenance per unit $= \frac{\text{Change in expense level}}{\text{Change in output level}}$

   $= \frac{₹\ 650 - ₹\ 600}{2,000} = 0.025$ P.

   For 8,000 units

   Total Variable cost of repair and maintenance = ₹ 200

   Fixed repair & maintenance cost = ₹ 400

   Hence at 6,000 units output level, total cost of repair and maintenance should be

   = ₹ 400 + ₹ 0.025 × 6,000 units = ₹ 400 + ₹ 150 = ₹ 550

4. Variable cost of power per unit = $\frac{₹\ 875 - ₹\ 800}{2,000 \text{ units}} = 0.0375$

For 8,000 units

Total variable cost of power = ₹ 300

Fixed cost = ₹ 500

Hence, at 6,000 units output level, total cost of power should be

= ₹ 500 + ₹ 0.0375 × 6,000 units = ₹ 500 + ₹ 225 = ₹ 725

5. Tools consumed cost for 8,000 units = ₹ 320

Hence, tools consumed cost for 6,000 units = (₹ 320/8,000 units) × 6,000 units

= ₹ 240

Illustration- 4 (Preparation of flexible budget under incremental price)

ABC Ltd. is currently operating at 75% of its capacity. In the past two years, the levels of operations were 55% and 65% respectively. Presently, the production is 75,000 units. The company is planning for 85% capacity level during 20X3-20X4. The cost details are as follows:

	55% (₹)	*65%* (₹)	*75%* (₹)
Direct Materials	*11,00,000*	*13,00,000*	*15,00,000*
Direct Labour	*5,50,000*	*6,50,000*	*7,50,000*
Factory Overheads	*3,10,000*	*3,30,000*	*3,50,000*
Selling Overheads	*3,20,000*	*3,60,000*	*4,00,000*
Administrative Overheads	*1,60,000*	*1,60,000*	*1,60,000*
	24,40,000	*28,00,000*	*31,60,000*

Profit is estimated @ 20% on sales.

The following increases in costs are expected during the year :

	In percentage
Direct Materials	*8*
Direct Labour	*5*
Variable Factory Overheads	*5*
Variable Selling Overheads	*8*
Fixed Factory Overheads	*10*
Fixed Selling Overheads	*15*
Administrative Overheads	*10*

Prepare flexible budget for the period 20X3-20X4 at 85% level of capacity. Also ascertain profit and contribution.

Solution:

ABC Ltd.

Budget for 85% capacity level for the period 20X3-X4

Budgeted production (units)		**85,000**
	Per Unit (₹)	**Amount (₹)**
Direct Material (note 1)	21.60	18,36,000
Direct Labour (note 2)	10.50	8,92,500
Variable factory overhead (note 3)	2.10	1,78,500
Variable selling overhead (note 4)	4.32	3,67,200
Variable cost	38.52	32,74,200
Fixed factory overhead (note 3)		2,20,000
Fixed selling overhead (note 4)		1,15,000
Administrative overhead		1,76,000
Fixed cost		5,11,000
Total cost		37,85,200
Add : Profit 20% on sales or 25% on total cost		9,46,300
Sales		47,31,500
Contribution (Sales – Variable cost)		14,57,300

Working Notes :

1. Direct Materials :

75% Capacity	₹ 15,00,000	65% Capacity	₹ 13,00,000
65% Capacity	₹ 13,00,000	55% Capacity	₹ 11,00,000
10% change in capacity	2,00,000	10% change in capacity	2,00,000

For 10% increase in capacity, i.e., for increase by 10,000 units, the total direct material cost regularly changes by ₹ 2,00,000

Direct material cost (variable) = ₹ 2,00,000 ÷ 10,000 = ₹ 20

After 8% increase in price, direct material cost per unit = ₹ 20 × 1.08 = ₹ 21.60

Direct material cost for 85,000 budgeted units = 85,000 × ₹ 21.60 = ₹ 18,36,000

2. Direct Labour :

75% Capacity	₹ 7,50,000	65% Capacity	₹ 6,50,000
65% Capacity	₹ 6,50,000	55% Capacity	₹ 5,50,000
10% change in capacity	1,00,000	10% change in capacity	1,00,000

For 10% increase in capacity, direct labour cost regularly changes by ₹ 1,00,000.

Direct labour cost per unit = ₹ 1,00,000 ÷ 10,000 = ₹ 10

After 5% increase in price, direct labour cost per unit = ₹ 10 × 1.05 = ₹ 10.50

Direct labour for 85,000 units = 85,000 units × ₹ 10.50 = ₹ 8,92,500.

3. Factory overheads are semi-variable overheads:

75% Capacity	₹ 3,50,000	65% Capacity	₹ 3,30,000
65% Capacity	₹ 3,30,000	55% Capacity	₹ 3,10,000
10% change in capacity	20,000	10% change in capacity	20,000

Variable factory overhead = ₹ 20,000 ÷ 10,000 = ₹ 2

Variable factory overhead for 75,000 units = 75,000 × ₹ 2 = ₹ 1,50,000

Fixed factory overhead = ₹ 3,50,000 – ₹ 1,50,000 = ₹ 2,00,000.

Variable factory overhead after 5% increase = ₹ 2 × 1.05 = ₹ 2.10

Fixed factory overhead after 10% increase = ₹ 2,00,000 × 1.10 = ₹ 2,20,000.

4. Selling overhead is semi-variable overhead :

75% Capacity	₹ 4,00,000	65% Capacity	₹ 3,60,000
65% Capacity	₹ 3,60,000	55% Capacity	₹ 3,20,000
10% change in capacity	40,000	10% change in capacity	40,000

Variable selling overhead = ₹ 40,000 ÷ 10,000 units = ₹ 4

Variable selling overhead for 75,000 units = 75,000 × ₹ 4 = ₹ 3,00,000.

Fixed selling overhead = ₹ 4,00,000 – ₹ 3,00,000 = ₹ 1,00,000

Variable selling overhead after 8% increase = ₹ 4 × 1.08 = ₹ 4.32

Fixed selling overhead after 15% increase = ₹ 1,00,000 × 1.15 = ₹ 1,15,000

5. Administrative overhead is fixed :

After 10% increase = ₹ 1,60,000 × 1.10 = ₹ 1,76,000

13.8.2 Classification on the basis of Function:-

A functional budget is one which is related to function of the business as for example, production budget relating to the manufacturing function. Functional budgets are prepared for each function and they are subsidiary to the master budget of the business.

The various types of functional budgets to be prepared will vary according to the size and nature of the business.

The various commonly used functional budgets are:

(i) Sales budget

(ii) Production budget

(iii) Plant utilisation budget

(iv) Direct-material usage budget

(v) Direct-material purchase budget

(vi) Direct-labour (personnel) budget

(vii) Factory overhead budget

(viii) Production cost budget

(ix) Ending-inventory budget

(x) Cost-of-goods-sold budget

(xi) Selling and distribution cost budget

(xii) Administration expenses budget

(xiii) Research and development cost budget

(xiv) Capital expenditure budget

(xv) Cash budget

The important functional budgets (also known as schedules to master budget) and the master budget are discussed and illustrated below:

(i) Sales Budget :

- Sales forecast is the commencement of budgeting and hence sales budget assumes primary importance. The quantity which can be sold may be the principal budget factor in many business undertakings. In any case in order to chalk out a realistic budget programme, there must be an accurate sales forecast.
- The sales budget indicates for each product :
  1. the quantity of estimated sales and
  2. the expected unit selling price. These data are often reported by regions or by sales representatives.
- In estimating the quantity of sales for each product, past sales volumes are often used as a starting point. These amounts are revised for factors that are expected to affect future sales, such as the factors listed below.
  (i) backlog of unfilled sales orders
  (ii) planned advertising and promotion

(iii) expected industry and general economic conditions

(iv) productive capacity

(v) projected pricing

(vi) findings of market research studies

(vii) relative product profitability.

(viii) competition.

- Once an estimate of the sales volume is obtained, the expected sales revenue can be determined by multiplying the volume by the expected unit sales price. The sales budget represents the total sales in physical quantities and values for a future budget period. Sales managers are constantly faced with problem like anticipation of customer requirements, new product needs, competitor strategies and various changes in distribution methods or promotional techniques.
- The purposes of sales budget is not to attempt to estimate or guess what the actual sales will be, but rather to develop a plan with clearly defined objectives towards which the operational effort is directed in order to attain or exceed the objective. Hence, sales budget is not merely a sales forecast. A budget is a planning and control document which shows what the management intends to accomplish. Thus, the sales budget is active rather than passive.
- A sales forecast, however, is a projection or estimate of the available customer demand. A forecast reflects the environmental or competitive situation facing the company whereas the sales budget shows how the management intends to react to this environmental and competitive situation.
- A good budget hinges on aggressive management control rather than on passive acceptance of what the market appears to offer. If the company fails to make this distinction, the budget will remain more a figure-work exercise than a working tool of dynamic management control.
- **The sales budget may be prepared under the following classification or combination of classifications :**

1. Products or groups of products.
2. Areas, towns, salesmen and agents.
3. Types of customers as for example: (i) Government, (ii) Export, (iii) Home sales, (iv) Retail depots.
4. Period—months, weeks, etc.

The illustrative format of a sales budget is as under :

	Last Year Total		*Budgeted Year Total*		*Northern Region*		*Southern Region*		*Central Region*	
	Qty.	*Value*	*Qty.*	*Value*	*Qty.*	*Value*	*Qty.*	*Value*	*Qty.*	*Value*
Product X										
1st Qtr.										
2nd Qtr.										
3rd Qtr.										
4th Qtr.										
Product Y										
1st Qtr.										
:										
Total										

Example of sales budget:

XYZ COMPANY
Sales Budget for the year ending March, 20....

	Units	*Selling price Per unit (₹)*	*Total (₹)*
Product A	**5,000**	**75**	**3,75,000**
Product B	**10,000**	**80**	**8,00,000**
			11,75,000

(ii) ***Production Budget*** **:**

Production budget shows the production for the budget period based upon :

1. Sales budget,
2. Production capacity of the factory,
3. Planned increase or decrease in finished stocks, and
4. Policy governing outside purchase.

Production budget is normally stated in units of output. Production should be carefully coordinated with the sales budget to ensure that production and sales are kept in balance during the period. The number of units to be manufactured to meet budgeted sales and inventory needs for each product is set forth in the *production budget*

The production facility available and the sales budget will be compared and coordinated to determine the production budget. If production facilities are not sufficient, consideration may be

given to such factors as working overtime, introducing shift working, sub-contracting or purchasing of additional plant and machinery. If, however, the production facilities are surplus, consideration should be given to promote advertising, reduction of prices to increase the sales, sub-contracting of surplus capacity, etc.

One of the conditions to be considered in all the compilation of production budget is the level of stock to be maintained.

- **The level of stocks will depend upon three factors *viz.* :**

1. seasonal industries in which stocks have to be built up during off season to cater to the peak season,
2. a steady and uniform level of production to utilise the plant fully and to avoid retrenchment or lay-off of the workers, and
3. to produce in such a way that minimum stocks are maintained at any time to avoid locking up of funds in inventory.

- **Production budget can, therefore, show :**

1. stabilised production every month, say, the maximum possible production or
2. stabilised minimum quantity of stocks which will reduce inventory costs.
3. In the case of stabilised production, the production facility will be fully utilised but the inventory carrying costs will vary according to stocks held. In the case of stabilised stocks method, however, the inventory carrying will be the lowest but there may be under-utilisation of capacity.

Example of production budget:

XYZ COMPANY
Production budget in units for the year ending March 31, 20....

	Products	
	A	***B***
Budgeted sales	**5,000**	**10,000**
***Add* : Desired closing stock**	**500**	**1,000**
Total quantity required	**5,500**	**11,000**
***Less :* Opening stock**	**1,500**	**2,000**
Units to be produced	**4,000**	**9,000**

(iii) Plant Utilisation Budget:

Plant utilisation budget represents, in terms of working hours, weight or other convenient units of plant facilities required to carry out the programme laid down in the production budget.

The main purposes of this budget are :

1. To determine the load on each process, cost or groups of machines for the budget period.
2. To indicate the processes or cost centres which are overloaded so that corrective action may be taken such as: (i) working overtime (ii) sub-contracting (iii) expansion of production facility, etc.
3. To dovetail the sales production budgets where it is not possible to increase the capacity of any of the overloaded processes.
4. Where surplus capacity is available in any of the processes, to make effort to boost sales to utilise the surplus capacity.

(iv) Direct Material usage Budget:

The steps involved in the compilation of direct materials usage budget are as under:

1. The quality standards for each item of material have to be specified. In this connection, standardisation of size, quality, colour, etc., may be considered.
2. Standard requirement of each item of materials required should also be set. While setting the standard quality consideration should be given to normal loss in process. The standard allowance for normal loss may be given on the basis of past performance, test runs, technical estimates etc.
3. Standard prices for each item of materials should be set after giving consideration to stock and contracts entered into.

After setting standards for quality, quantity and prices, the direct materials budget can be prepared by multiplying each item of material required for the production by the standard price.

Example of direct material usage budget is as under:

XYZ COMPANY
Direct material usage in units and in amount
for the year ending March 31, 20...

Direct Materials

Type of material	Product A (4,000 units)	Product B (9,000 units)	Total direct material usage (Units)	Material cost per unit (₹)	Total cost of material used (₹)
X (12 units per finished product)	48,000	1,08,000	1,56,000	1.50	2,34,000
Y (4 units per product A & 2 units per product B)	16,000	18,000	34,000	2.50	85,000
				Total	3,19,000

(v) Purchase Budget:

- The production budget is the starting point for determining the estimated quantities of direct materials to be purchased.
- Multiplying these quantities by the expected unit purchase price determines the total cost of direct materials to be purchased.

  Two important considerations that govern purchase budgets are as follows:

  (i) Economic order quantity.

  (ii) Re-order point with safety stocks to cover fluctuations in demand.
- The direct material purchases budget helps management maintain inventory levels within reasonable limits, For this purpose, the timing of the direct materials purchases should he coordinated between the purchasing and production departments.

An example of material purchase budget is as under :

XYZ Company
Direct material purchase budget
for the year ending March 31, 20.....

	Material X	*Material Y*	*Total*
Desired closing stock (units)	**3,000**	**500**	
Units required for production	**1,56,000**	**34,000**	
Add **:**			
Total needs	**1,59,000**	**34,500**	
Less: **Opening stock (units)**	**4,000**	**300**	
Units to be purchased	**1,55,000**	**34,200**	
Unit price (₹)	**1.50**	**2.50**	
Purchase cost (₹)	**2,32,500**	**85,500**	**3,18,000**

(vi) Personnel (or Labour cost) Budget:

- Once sales budget and Production budget are compiled and thereafter plant utilisation budget is settled, detailed amount of the various machine operations involved and services required can be arrived at. This will facilitate preparation of an estimate of different grades of labour required.

From this the standard hours required to be worked can be prepared. The total labour complement thus budgeted can be divided into direct and indirect. Standard rates of wages for each grade of labour can be introduced and then the direct and indirect labour cost budget can be prepared.

M*erits/advantages*:

1. It defines the direct and indirect labour force required.
2. It enables the personnel department to plan ahead in recruitment and training of workers so that labour turnover can be reduced to the minimum.
3. It reveals the labour cost to be incurred in the manufacture, to facilitate preparation of manufacturing cost budgets and cash budgets for financing the wage bill.

Example of direct-labour cost budget:

XYZ COMPANY
Direct-labour cost budget
for the year ending March 31, 20...

	Units to be produced	*Direct labour hour, per unit*	*Total hours*	*Total budget cost (₹) @ ₹ 2 per hour*
Product A	**4,000**	**7**	**28,000**	**56,000**
Product B	**9,000**	**10**	**90,000**	**1,80,000**
			1,18,000	**2,36,000**

(vii) Production or Factory overhead Budget:

- Production overheads consist of all items such as indirect materials, indirect labour and indirect expenses. Indirect expenses include power, fuel, fringe benefits, depreciation etc. These estimated factory overhead costs necessary for production make up the factory overhead cost budget.
- This budget usually includes the total estimated cost for each item of factory overhead.
- The production overhead budget is useful for working out the pre-determined overhead recovery rates.
- A business may prepare supporting departmental schedules, in which the factory overhead costs are separated into their fixed and variable cost elements. Such schedules enable department managers to direct their attention to those costs for which they are responsible and to evaluate performance
- A careful study and determination of the behaviour of different types of costs will be essential in preparation of overhead budget.
- A few examples are given below to show how the expenses are estimated.
    1. Fixed expenses are policy cost and hence they are based on policy matters.
    2. For estimating indirect labour, work study is resorted to and a flexible estimate

of number of indirect workers required for each level of direct workers employed is made—for example, one supervisor for every twenty direct workers.

3. In regard to the estimate of consumption of indirect materials, the age and condition of the plant and machinery are taken into consideration.

Example of factory overhead budget :

XYZ COMPANY
Factory overhead budget for the year ending March 31, 20....
(Anticipated activity of 1,18,000 direct labour hours)

	(₹)	(₹)
Supplies	**12,000**	
Indirect labour	**30,000**	
Cost of fringe benefits	**10,000**	
Power (variable portion)	**22,000**	
Maintenance cost (variable portion)	**15,000**	
Total variable overheads		**89,000**
Depreciation	**10,000**	
Property taxes	**2,000**	
Property insurance	**1,000**	
Supervision	**12,000**	
Power (Fixed portion)	**800**	
Maintenance (Fixed portion)	**3,200**	
Total fixed overheads		**29,000**
Total factory overheads		**1,18,000**

Factory overhead recovery rate is :

$$\frac{₹\ 1,18,000}{1,18,000 \text{ labour hour}} = ₹\ 1 \text{ per direct labour hour}$$

(viii) Production Cost Budget:

Production cost budget covers direct material cost, direct labour cost and manufacturing expenses. After preparing direct material, direct labour and production overhead cost budget, one can prepare production cost budget.

(ix) Ending Inventory Budget:

This budget shows the cost of closing stock of raw materials and finished goods, etc. This

information is required to prepare cost-of-goods-sold budget and budgeted financial statements *i.e.,* budgeted income statement and budgeted balance sheet.

Example of ending inventory budget :

XYZ Company ending-inventory budget March 31, 20....

	Units	*Unit cost (₹)*	*Amount (₹)*	*Total (₹)*
Direct material				
X	**3,000**	**1.50**	**4,500**	
Y	**500**	**2.50**	**1,250**	**5,750**
Finished goods				
A	**500**	**49.00***	**24,500**	
B	**1,000**	**53.00***	**53,000**	**77,500**
Total				**83,250**

*** Unit cost of finished goods have been computed as below :**

	Unit cost	*Product A*		*Product B*	
	of input (₹)	*Units*	*Amount (₹)*	*Units*	*Amount (₹)*
Material X	**1.50**	**12**	**18.00**	**12.00**	**18.00**
Material Y	**2.50**	**4**	**10.00**	**2.00**	**5.00**
Direct labour	**2.00**	**7**	**14.00**	**10.00**	**20.00**
Factory overhead	**1.00**	**7**	**7.00**	**10.00**	**10.00**
			49.00		**53.00**

(x) Cost of Goods Sold Budget:

This budget covers direct material cost, direct labour cost, manufacturing expenses and cost of ending inventory of finished products.

We present below the cost-of-goods-sold budget on the basis of the data taken from the various budgets already illustrated:

XYZ Company cost-of-goods-sold budget for the year ending March 31, 20....

	Amount (₹)
Direct materials used	**3,19,000**
Direct labour	**2,36,000**

Factory overhead	**1,18,000**
Total manufacturing costs	**6,73,000**
***Add* : Finished goods (opening)**	**1,79,500***
	8,52,500
***Less* : Finished goods (closing)**	**77,500***
Total cost of goods sold	**7,75,000**

Assumed figure

In the above budget if adjustments for opening and closing inventory of finished goods are not shown. The budget will be called production cost budget.

(xi) Selling and Distribution Cost Budget:

- Selling and distribution are indispensable aspects of the profit earning function. At the same time, the pre-determination of these costs is also very difficult.
- Selling cost is defined as the cost of seeking to create and stimulate demand and of securing orders. These costs are, therefore, incurred to maintain and increase the level of sales. All expenses connected with advertising, sales promotion, sales office, salesmen, credit collection, market research, after sales service, etc. are generally grouped together to form part of the responsibility of the sales manager.
- While making a budget, selling costs are divided into fixed and variable. Semi-variable costs should also be separated into variable and fixed elements.
- The problems faced in the preparation of selling cost budgets are :
  1. Heavy expenditure on selling and sales promotion may have to be incurred when the volume of sales is falling off. This will increase the percentage of such costs to total sales, and
  2. Sometimes intensive sales and promotion efforts are called for in one year and the benefit of such efforts accrue in the subsequent years. This makes it difficult to establish a proportion of selling cost to sales.
  3. In spite of these problems, some relationship between selling cost and volume of sales has to be established and it is the duty of the Budget Controller to determine the amount of selling costs to be incurred to achieve the desired level of sales volume.

  Using the past experience as a guide, consideration should be given to the future trend of sales, possible changes in competition etc., in pre-determination of selling costs.
- Distribution cost has been defined as the cost of the sequence of operations which begins with making the packet of product available for despatch and ends with making the re-conditioned return of empty package, if any available for re-use. It includes

transport cost, storage and warehousing costs, etc.

- Preparation of the advertising cost budget is the responsibility of the sales manager or advertisement manager. When preparing the advertisement cost budget consideration should be given to the following factors :

  1. The best method of advertisement must be selected; costs will vary according to the method selected.
  2. The maximum amount to be spent in a period, say one year, has to be decided.
  3. Advertising and sales should be co-ordinated. It means that money should be spent on advertisement only when sufficient quantities of the product advertised are ready for sale.
  4. An effective control over advertisement expenditure should be exercised and the effectiveness of the advertisement should be measured.
  5. The choice of the method of advertising a product is based on the effectiveness of the money spent on advertisement in increasing or maintaining sales. If the output sold increases, the production cost will come down because of the economies of large scale production.

- The amount to be spent on advertisement appropriation may be settled on the basis of the following factors:

  1. A percentage on the total sales value of the budget period or on the expected profit may be fixed on the basis of past experience.
  2. A sum which is expected to be incurred by the competitors may be fixed to be spent during the budget period.
  3. A fixed sum per unit of output can be fixed and added to cost.
  4. An amount is fixed on the basis of the ability of the company to spend on advertising.
  5. An advertisement plan is decided upon and the amount to be spent is determined.

- Depending upon the nature of the product and the effectiveness of the media of the advertising the company prepares a schedule of various methods of advertisement, to be used for effective sales promotion. The number of advertisements (insertions) are determined and the cost calculated as per the rates applicable to each of the media selected. This is a sound method.

Example of selling and distribution cost budget:

XYZ Company selling and distribution cost budget for the year ending March 31, 20....	
	Amount (₹)
Direct selling expenses:	
Salesmen's salaries	14,500
Salesmen's commission	7,000
Travelling expenses	19,000
	40,500
Distribution expenses:	
Warehouse wages	6,000
Warehouse rent, rates, electricity	4,500
Lorry expenses	11,000
	21,500
Sales office expenses:	
Salaries	16,000
Rent, rates, electricity	12,000
Depreciation	2,000
Stationery, postage and telephone	12,500
General expenses	3,000
	45,500
Advertising:	
Press	4,500
Radio and television	18,500
Shop window displays	4,000
	27,000
Total	1,34,500

(xii) Administrative expenses Budget:

The administrative expenses are mostly policy costs and are, therefore, fixed in nature. The most practical method to follow in preparing estimate of these expenses is to follow the past experience with due regard to anticipated changes either in general policy or the volume of business. To bring such expenses under control, it is necessary to review them frequently and to determine at regular intervals whether or not these expenses continue to be adjusted. Examples of such expenses are : audit fees, depreciation of office equipment, insurance, subscriptions, postage, stationery, telephone, telegrams, office supplies, etc.

XYZ Company administrative expenses budget for the year ending March 31, 20...	
	(₹)
Salaries of clerical staff	28,000
Executives salaries	8,000
Audit fee	600
Depreciation on office equipment	800
Insurance	250
Stationery	1,250
Postage and telegrams	950
Telephones	850
Miscellaneous	5,300
Total administrative expenses	46,000

(xiii) Research and Development expense Budget:

Research is required in order to develop and/or improve products and methods. When research results in definite benefit to the company, development function begins. After development, formal production can commence on commercial scale and then production function starts. Since the areas of research and development cannot be precisely defined, the costs incurred under both the functions are clubbed together as research and development costs. Research and Development (R & D) plays a vital role in maintaining the business. For example, automobile manufacturers, and those who produce drugs, spend considerable sums on R & D to improve the products.

Research may be either pure research or applied research. Pure research increases knowledge whereas applied research aims at producing definite results like improved methods of production, etc.

Research and development expenses should be controlled carefully and hence a limit on the spending is placed, *i.e.,* the amount to be spent is carefully determined or allocated.

- The following are the methods of allocation of R & D expenses.
  1. A percentage based on total sales value. This method is good if sales value is steady from year to year.
  2. A percentage based on net profit.
  3. A total sum is estimated on the basis of past experience and future R & D plans and policies.
  4. A sum is fixed on the basis of cash resources available with the company.

  All factors which affect the importance of R & D are considered. For example, factors like demand for existing products, competition, economic conditions, etc., are considered carefully and a sum is set as R & D budget.

(xiv) Capital expenditure Budget:

The capital expenditure budget represents the planned outlay on fixed assets like land, building, plant and machinery, etc. during the budget period. This budget is subject to strict management control because it entails large amount of expenditure. The budget is prepared to cover a long period of years and it projects the capital costs over the period in which the expenditure is to be incurred and the expected earnings.

- **The preparation of this budget is based on the following considerations :**
  1. Overhead on production facilities of certain departments as indicated by the plant utilisation budget.
  2. Future development plans to increase output by expansion of plant facilities.
  3. Replacement requests from the concerned departments
  4. Factors like sales potential to absorb the increased output, possibility of price reductions, increased costs of advertising and sales promotion to absorb increased output, etc.

Merits/Advantages

1. It outlines the capital development programme and estimated capital expenditure during the budget period.
2. It enables the company to establish a system of priorities. When there is a shortage of funds, capital rationing becomes necessary.
3. It serves as a tool for controlling expenditure.
4. It provides the amount of expenditure to be incorporated in the future budget summaries for calculation of estimated return on capital employed.
5. This enables the cash budget to be completed. With other cash commitments capital expenditure commitment should also be considered for the completion of the budget.
6. It facilitates cost reduction programme, particularly when modernisation and renovation is covered by this budget.

Illustration 5: (Preparation of production budget)

A single product company estimated its sales for the next year quarter-wise as under :

Quarter	*Sales (Units)*
I	*30,000*
II	*37,500*
III	*41,250*
IV	*45,000*

The opening stock of finished goods is 10,000 units and the company expects to maintain the closing stock of finished goods at 16,250 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the

sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 10,000 kg. and the closing stock at the end of the year is required to be maintained at 5,000 kg. Each unit of finished output requires 2 kg. of raw materials.

The company proposes to purchase the entire annual requirement of raw materials in the first three quarters in the proportion and at the prices given below :

Quarter	Purchase of raw materials % to total annual requirement in quantity	Price per kg. (₹)
I	30%	2
II	50%	3
III	20%	4

The value of the opening stock of raw materials in the beginning of the year is ₹ 20,000. You are required to present the following for the next year, quarter wise :

(i) Production budget (in units).

(ii) Raw material consumption budget (in quantity).

(iii) Raw material purchase budget (in quantity and value).

(iv) Priced stores ledger card of the raw material using First in First out method.

Solution

Working Note : Total Annual Production (in units)

Sales in 4 quarters	1,53,750	units
Add : Closing balance	16,250	units
	1,70,000	units
Less : Opening balance	10,000	units
Total number of units to be produced in the next year	1,60,000	

(i) **Production Budget (in units)**

	Quarters				
	I Units	II Units	III Units	IV Units	Total Units
Sales	30,000	37,500	41,250	45,000	1,53,750
Production in current quarter *(80% of the sale of current quarter)*	24,000	30,000	33,000	36,000	
Production for next quarter *(20% of the sale of next quarter)*	7,500	8,250	9,000	12,250*	
Total production	31,500	38,250	42,000	48,250	1,60,000

* Difference figure.

(ii) **Raw material consumption budget in quantity**

	Quarters				Total
	I	*II*	*III*	*IV*	
Units to be produced in each quarter: (A)	31,500	38,250	42,000	48,250	1,60,000
Raw material consumption p.u. (kg.): (B)	2	2	2	2	
Total raw material consumption (Kg.) : (A × B)	63,000	76,500	84,000	96,500	3,20,000

(iii) **Raw material purchase budget (in quantity)**

Raw material required for production (kg.)	3,20,000
Add : Closing balance of raw material (kg.)	5,000
	3,25,000
Less : Opening balance (kg.)	10,000
Material to be purchased (kg.)	3,15,000

Raw material purchase budget (in value)

Quarters	*% of annual requirement (Qty.) for purchasing raw material (kg.)*	*Quantity of raw material to be purchased*	*Rate per kg.*	*Amount*
			(₹)	*(₹)*
(1)	*(2)*	*(3)*	*(4)*	*(5) = (3) × (4)*
I	30	94,500 (3,15,000 kg. × 30%)	2	1,89,000
II	50	1,57,500 (3,15,000 kg. × 50%)	3	4,72,500
III	20	63,000 (3,15,000 kg. × 20%)	4	2,52,000
Total :		3,15,000		9,13,500

(iv) **Priced Stores Ledger Card**
(of the raw material using FIFO method)

	Quarters											
	I			II			III			IV		
	Kg.	Rate (₹)	Value (₹)	Kg.	Rate (₹)	Value (₹)	Kg.	Rate (₹)	Value (₹)	Kg.	Rate (₹)	Value (₹)
Opening balance	10,000	2	20,000	41,500	2	83,000	1,22,500	3	3,67,500	38,500	3	1,15,500
(A)										63,000	4	2,52,000
Purchases : (B)	94,500	2	1,89,000	1,57,500	3	4,72,500	63,000	4	2,52,000	–	–	–
Consumption : (C)	63,000	2	1,26,000	41,500	2	83,000	84,000	3	2,52,000	38,500	3	1,15,500
				35,000	3	1,05,000				58,000	4	2,32,000
Balance : (D)	41,500	2	83,000	1,22,500	3	3,67,500	38,500	3	1,15,500	5,000	4	20,000
(D) = (A) + (B)–(C)							63,000	4	2,52,000			

Illustration 6: (Preparation of production and personnel budget)

A company is engaged in the manufacture of specialised sub-assemblies required for certain electronic equipments. The company envisages that in the forthcoming month, December, 20X2, the sales will take a pattern in the ratio of 3 : 4 : 2 respectively of sub-assemblies, ACB, MCB and DP.

The following is the schedule of components required for manufacture:

			Component requirements		
Sub-assembly	**Selling price**	**Base board**	**IC08**	**IC12**	**IC26**
ACB	520	1	8	4	2
MCB	500	1	2	10	6
DP	350	1	2	4	8
Purchase price (₹)		60	20	12	8

The direct labour time and variable overheads required for each of the sub-assemblies are:

	Labour hours per sub-assembly		
	Grade A	**Grade B**	**Variable overheads per sub-assembly (₹)**
ACB	8	16	36
MCB	6	12	24
DP	4	8	24
Direct wage rate per hour (₹)	5	4	—

The labourers work 8 hours a day for 25 days a month.

The opening stocks of sub-assemblies and components for December, 20X2 are as under:

Sub-assemblies		**Components**	
ACB	800	Base Board	1,600
MCB	1,200	IC08	1,200
DP	2,800	IC12	6,000
		IC26	4,000

Fixed overheads amount to ₹ 7,57,200 for the month and a monthly profit target of ₹ 12 lacs has been set.

The company is eager for a reduction of closing inventories for December, 20X2 of sub-assemblies and components by 10% of quantity as compared to the opening stock. Prepare the following budgets for December 20X2 :

(i) Sales budget in quantity and value.

(ii) Production budget in quantity

(iii) Component usage budget in quantity.

(iv) Component purchase budget in quantity and value.

(v) Manpower budget showing the number of workers and the amount of wages payable.

Solution:

Working Note :

1. *Statement showing contribution*:

Sub assemblies	***ABC***	***MCB***	***DP***	***Total***
	(₹)	***(₹)***	***(₹)***	***(₹)***
Selling price per unit (p.u.) : (A)	520	500	350	
Marginal Cost p.u.				
Components				
Base board	60	60	60	
IC08	160	40	40	
IC12	48	120	48	
IC26	16	48	64	
Labour				
Grade A	40	30	20	
Grade B	64	48	32	
Variable production overhead	36	24	24	
Total marginal cost p.u. : (B)	424	370	288	
Contribution p.u. : (C) = (A) – (B)	96	130	62	
Sales ratio : (D)	3	4	2	
Contribution × Sales ratio : [(E) = (C) × (D)]	288	520	124	932

2. *Desired Contribution for the forthcoming month December, 20X2*

	(₹)
Fixed overheads	7,57,200
Desired profit	12,00,000
Desired contribution	19,57,200

3. *Sales mix required i.e. number of batches for the forthcoming month December, 20X2*

Sales mix required =Desired contribution/contribution × Sales ratio

=₹ 19,57,200/ 932 (*Refer to Working notes 1 and 2*)

= 2,100 batches

Budgets for December, 20X2

(i) Sales budget in quantity and value

Sub-assemblies	*ACB*	*MCB*	*DP*	*Total*
Sales (quantity) (2,100 × 3:4:2)	6,300	8,400	4,200	
(*Refer to working note 3*)				
Selling price p.u. (₹)	520	500	350	
Sales value (₹)	32,76,000	42,00,000	14,70,000	89,46,000

(ii) Production budget in quantity

Sub-assemblies	*ACB*	*MCB*	*DP*
Sales	6,300	8,400	4,200
Add : Closing stock	720	1,080	2,520
(Opening stock less 10%)	____	____	____
Total quantity required	7,020	9,480	6,720
Less : Opening stock	800	1,200	2,800
Production	6,220	8,280	3,920

(iii) Component usage budget in quantity

Sub-assemblies	*ACB*	*MCB*	*DP*	*Total*
Production	6,220	8,280	3,920	—
Base board (1 each)	6,220	8,280	3,920	18,420
Component IC08 (8 : 2 : 2)	49,760	16,560	7,840	74,160
	(6,220 × 8)	*(8,280 × 2)*	*(3,920 × 2)*	
Component IC12 (4 : 10 : 4)	24,880	82,800	15,680	1,23,360
	(6,220 × 4)	*(8,280 × 10)*	*(3,920 × 4)*	
Component IC26 (2 : 6 : 8)	12,440	49,680	31,360	93,480
	(6,220× 2)	*(8,280 × 6)*	*(3,920 × 8)*	

(iv) Component Purchase budget in quantity and value

Sub-assemblies	*Base board*	*IC08*	*IC12*	*IC26*	*Total*
Usage in production	18,420	74,160	1,23,360	93,480	
Add : Closing stock	1,440	1,080	5,400	3,600	
(Opening stock less 10%)					
	19,860	75,240	1,28,760	97,080	
Less : Opening stock	1,600	1,200	6,000	4,000	

Purchase (Quantity)	18,260	74,040	1,22,760	93,080	
Purchase price (₹)	60	20	12	8	
Purchase value (₹)	10,95,600	14,80,8 00	14,73,120	7,44,640	47,94,160

(v) Manpower budget showing the number of workers and the amount of wages payable

		Direct labour				
		Grade A		*Grade B*		
Sub-Assemblies	*Budgeted Production*	*Hours per Unit*	*Total Hours*	*Hours per Unit*	*Total Hours*	*Total*
ACB	6,220	8	49,760	16	99,520	
MCB	8,280	6	49,680	12	99,360	
DP	3,920	4	15,680	8	31,360	
(A) Total hours			1,15,120		2,30,240	
(B) Hours per man per month			200		200	
(C) Number of workers per month : (A/B)			576		1,152	
(D) Wage rate per month (₹)			1,000		800	
(E) Wages payable (₹) : (C × D)			5,76,000		9,21,600	14,97,600

(xv) Cash Budget :

- Cash budget represents the cash requirements of the business during the budget period. It is the plan of receipts and payments of cash for the budget period, analysed to show the monthly flow of cash drawn up in such a way that the balance can be forecasted at regular intervals.
- The cash budget is one of the most important elements of the budgeted balance sheet. Information from the various operating budgets, such as the sales budget, the direct materials purchases budget, and the selling and administrative expenses budget, affects the cash budget.
- In addition, the capital expenditures budget, dividend policies, and plans for equity or long-term debt financing also affect the cash budget.

13.8.3 Master Budget

- When all the necessary functional budgets have been prepared, the budget officer will prepare the master budget which may consist of budgeted profit and loss account and budgeted balance sheet. These are in fact the budget summaries.
- When the master budget is approved by the board of directors, it represents a standard for the achievement of which all the departments will work.

- On the basis of the various budgets (schedules) prepared earlier in this study, we prepare below budgeted income statement and budgeted balance sheet.

Example of budgeted income statement:

XYZ Company Budgeted Income Statement
For the Year Ending March 31, 20....

		Amount
	(₹)	*(₹)*
Sales		**11,75,000**
***Less* : Cost of goods sold**		**7,75,000**
Gross margin		**4,00,000**
***Less* : Selling and distribution expenses**	**1,36,500**	
***Less* : Administrative expenses**	**46,000**	**1,82,500**
Profit before interest and taxes		**2,17,500**
Interest expenses (assumed)		**50,000**
Profit before tax		**1,67,500**
Income-tax (50% assumed)		**83,750**
Net profit		**83,750**

Example of budgeted balance sheet :

XYZ Company Budgeted Balance Sheet
March 31, 20....

	(₹)	*(₹)*	*(₹)*
Share capital	**3,50,000**		
Retained income	**1,29,000**		**4,79,000**
Represented by :			
Plant and machinery	**3,40,000**		
***Less* : Provision for depreciation**	**60,000**		**2,80,000**
Raw materials	**5,750**		
Finished goods	**77,500**		
Debtors	**1,10,000**		
Cash	**37,750**	**2,31,000**	
***Less:* Creditors**		**32,000**	**1,99,000**
			4,79,000

Note : ***Information not available in respect of share capital, opening balance of retained earnings, current assets and current liabilities, etc., has been assumed to complete the above balance sheet.***

Illustration 7: (Preparation of Master Budget)

Floatglass Manufacturing Company requires you to present the Master budget for the next year from the following information:

Sales :	
Toughened Glass	*₹ 6,00,000*
Bent Glass	*₹ 2,00,000*
Direct material cost	*60% of sales*
Direct wages	*20 workers @ ₹ 150 per month*
Factory overheads :	
Indirect labour –	
Works manager	*₹ 500 per month*
Foreman	*₹ 400 per month*
Stores and spares	*2.5% on sales*
Depreciation on machinery	*₹ 12,600*
Light and power	*₹ 3,000*
Repairs and maintenance	*₹ 8,000*
Others sundries	*10% on direct wages*
Administration, selling and distribution expenses	*₹ 36,000 per year*

Solution:

Master Budget for the year ending

Sales :			(₹)
Toughened Glass			6,00,000
Bent Glass			2,00,000
Total Sales			8,00,000
Less : Cost of production :			
Direct materials (60% of ₹ 8,00,000)		4,80,000	
Direct wages (20 workers × ₹ 150 × 12 months)		36,000	
Prime Cost		5,16,000	
Fixed Factory Overhead :			
Works manager's salary (500 × 12)	6,000		
Foreman's salary (400 × 12)	4,800		
Depreciation	12,600		

Light and power (assumed fixed)	3,000	26,400	
Variable Factory Overhead :			
Stores and spares	20,000		
Repairs and maintenance	8,000		
Sundry expenses	3,600	31,600	
Works Cost			5,74,000
Gross Profit (Sales – Works cost)			2,26,000
Less: Adm., selling and distribution expenses			36,000
Net Profit			1,90,000

Illustration 8: (Preparation of Budget comparison of two periods)

The cost accountant of manufacturing company provides you the following details for year 20X2 :

	(₹)		(₹)
Direct materials	*1,75,000*	*Other variable costs*	*80,000*
Direct Wages	*1,00,000*	*Other fixed costs*	*80,000*
Fixed factory overheads	*1,00,000*	*Profit*	*1,15,000*
Variable factory overheads	*1,00,000*	*Sales*	*7,50,000*

During the year, the company manufactured two products A and B and the output and costs were :

	A	B
Output (units)	*2,00,000*	*1,00,000*
Selling price per unit	*₹ 2.00*	*₹ 3.50*
Direct materials per unit	*₹ 0.50*	*₹ 0.75*
Direct wages per unit	*₹ 0.25*	*₹ 0.50*

Variable factory overhead are absorbed as a percentage of direct wages. Other variable costs have been computed as : Product A ₹ 0.25 per unit; and B ₹ 0.30 per unit.

During 20X3, it is expected that the demand for product A will fall by 25 % and for B by 50%. It is decided to manufacture a further product C, the cost for which are estimated as follows :

	Product C
Output (units)	*2,00,000*
Selling price per unit	*₹ 1.75*
Direct materials per unit	*₹ 0.40*
Direct wages per unit	*₹ 0.25*

It is anticipated that the other variable costs per unit will be the same as for product A.

Prepare a budget to present to the management, showing the current position and the position for 20X3. Comment on the comparative results.

Solution: Budget Showing Current Position and Position for 20X3

	Position for 20X2			Position for 20X3			
	A	B	Total (A+B)	A	B	C	Total (A+B+C)
Sales (units)	2,00,000	1,00,000	–	1,50,000	50,000	2,00,000	–
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
(A) Sales (₹)	4,00,000	3,50,000	7,50,000	3,00,000	1,75,000	3,50,000	8,25,000
Direct Material	1,00,000	75,000	1,75,000	75,000	37,500	80,000	1,92,500
Direct wages	50,000	50,000	1,00,000	37,500	25,000	50,000	1,12,500
Factory overhead (variable)	50,000	50,000	1,00,000	37,500	25,000	50,000	1,12,500
Other variable costs	50,000	30,000	80,000	37,500	15,000	50,000	1,02,500
(B) Marginal Cost	2,50,000	2,05,000	4,55,000	1,87,500	1,02,500	2,30,000	5,20,000
(C) Contribution (A-B)	1,50,000	1,45,000	2,95,000	1,12,500	72,500	1,20,000	3,05,000
Fixed costs – Factory			1,00,000				1,00,000
– Others			80,000				80,000
(D) Total fixed cost			1,80,000				1,80,000
Profit (C – D)			1,15,000				1,25,000

Comments: Introduction of Product C is likely to increase profit by ₹ 10,000 (i.e. from ₹ 1,15,000 to ₹ 1,25,000) in 20X3 as compared to 20X2. Therefore, introduction of product C is recommended.

13.8.4 Classification on the basis of Period:

These types of Budgets are classified on the basis of time periods. These types of budgets reflect the planning period of the organization.

1. **Long term Budget: -** The Budgets are prepared to depict long term planning of the business. The period of long term Budgets varies between three to ten years. These budgets are useful for those industries where gestation period is long i.e., machinery, electricity etc.
2. **Short term Budget: -** These budgets are generally for one or two years and are in the form of monetary terms. The consumer's good industries like Sugar, Cotton, and textile use short term budgets.
3. **Current Budgets: -** The period of current budgets is generally of months and weeks. These budgets relate to the current activities of the business. According to CIMA London "Current budget is a budget which is created which is established for use over a short period of time and is related to current conditions".

13.9 Summary

- ***Budget:*** *It is statement of an estimated performance to be achieved in given time, expressed in currency value or quantity or both.*
- ***Budget Centre:*** *A section of an organization for which separate budget can be prepared and control exercised.*
- ***Budgetary Control:*** *Guiding and regulating activities with a view to attaining predetermined objectives, effectively and efficiently.*
- ***Budget Manual:*** *The Budget manual is a schedule, document or booklet which shows, in written forms the budgeting organisation and procedures.*
- ***Budget Period:*** *The period of time for which a budget is prepared and used. It may be a year, quarter or a month.*
- ***Components of Budgetary Control System*** *are Physical budgets, Cost budgets, Profit budgets and Financial budgets*
- ***Objectives of budgeting*** *are Planning, Directing and Controlling*
- ***Classification of Budgets :***

  Nature based *- Fixed and Flexible*

  Content based *- Monetary and Physical*

  Functional based *- Purchase, Sale, Production Cost, Administrative, Selling & Distribution, Research & Development, Plant Capital Expenditure, Cash, Plant Utilization*

INTERMEDIATE (IPC) COURSE
STUDY MATERIAL

PAPER : 3

COST ACCOUNTING AND FINANCIAL MANAGEMENT

Part – 1 : Cost Accounting

MODULE – 2

BOARD OF STUDIES
THE INSTITUTE OF CHARTERED ACCOUNTANTS OF INDIA

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