



ALAGAPPA UNIVERSITY

[Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle
and Graded as Category-I University by MHRD-UGC]

KARAIKUDI – 630 003

DIRECTORATE OF DISTANCE EDUCATION



**B.B.A.
104 24**



COST ACCOUNTING

II - Semester



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(A State University Established by the Government of Tamil Nadu)

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COST ACCOUNTING

Author

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Units (1-14)

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SYLLABI-BOOK MAPPING TABLE

Cost Accounting

Syllabi	Mapping in Book
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INTRODUCTION

Cost Accounting provides financial information concerning the activities of an enterprise to a diverse group of people such as shareholders, managers, creditors, tax authorities, etc. Compared with financial accounting, cost accounting is a relatively recent development. Modern cost accounting developed only during the nineteenth century. In fact, cost accounting started as a branch of financial accounting, but it is now regarded as an accounting system in its own right. The vital importance that cost accounting has acquired in the modern age is because of the increasing complexity of the modern industry.

This book, *Cost Accounting*, provides a framework of cost accounting, explaining its basic concepts, cost classifications, costing techniques, elements of cost, overheads etc. It gives students a thorough grounding in cost concepts, cost behaviour and costing methods. Each unit deals with a distinct aspect of cost accounting. Theoretical discussion is well supported by numerical illustrations and diagrams to help students grasp the subject.

This book, *Cost Accounting*, is written with the distance learning student in mind. It is presented in a user-friendly format using a clear, lucid language. Each unit contains an Introduction and a list of Objectives to prepare the student for what to expect in the text. At the end of each unit are a Summary and a list of Key Words, to aid in recollection of concepts learnt. All units contain Self-Assessment Questions and Exercises, and strategically placed Check Your Progress questions so the student can keep track of what has been discussed.

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BLOCK - I
COST ACCOUNTING FEATURES AND FUNCTIONS

**UNIT 1 AN OVERVIEW OF COST
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1.0 INTRODUCTION

Cost Accounting is concerned with ascertainment of cost of products/services. Cost accounting has primarily developed to help managers understand the costs of running a business. Profit and loss account and balance sheet are presented to the management by the financial accountant. But modern management needs much more detailed information than those supplied by these financial statements. Cost accounting provides detailed cost information to various levels of management for efficient performance of their functions. The information supplied by cost accounting acts as a management tool for decision making, to optimize the utilization of scarce resources and ultimately add to the profitability of business by controlling expenditure under various heads. In this unit, you will learn about the concept of cost accounting, costing, cost accountancy, and the main elements and types of costs.

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1.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning features and scope of cost accounting
- Describe the importance and limitations of cost accounting
- Explain the objectives and functions of cost accounting
- Differentiate cost accounting system with financial accounting system
- Examine the main elements and types of cost
- Recollect the methods and techniques of costing

1.2 COST ACCOUNTING: MEANING, FEATURES AND SCOPE

The importance of accounting information for the successful operation of a business has been long recognised. Accounting is used to classify and record business transactions and provide financial information concerning the activities of an enterprise to a diverse group of people such as shareholders, managers, creditors, tax authorities, etc. On the basis of the purpose for which this information is used, accounting is divided into three parts—financial accounting, cost accounting and management accounting.

Financial Accounting

Financial accounting is mainly concerned with recording the business transactions in the books of account for the purpose of presenting final accounts to the management, shareholders and tax authorities, etc. It is defined as '*the art of recording, classifying and summarizing in a significant manner and in terms of money, transactions and events, which are in part at least, of a financial character and interpreting the results thereof.*'

Cost Accounting

Compared with financial accounting, cost accounting is a relatively recent development. Modern cost accounting developed only during the nineteenth century. In fact, cost accounting started as a branch of financial accounting, but it is now regarded as an accounting system in its own right. The vital importance that cost accounting has acquired in the modern age is because of the increasing complexity of the modern industry.

Management Accounting

Management accounting is the modern concept of accounts as a tool of management. It is concerned with all such accounting information that is useful to management.

In other words, the term management accounting is applied to the provision of accounting information for management activities such as decision making, planning and controlling, etc. Thus, any form of accounting, which enables a business to be conducted more efficiently, can be regarded as management accounting. The Chartered Institute of Management Accountants (CIMA), London has defined management accounting as *'the presentation of accounting information in such a way as to assist management in the creation of policy and in the day-to-day operations of an undertaking.'*

The Chartered Institute of Management Accountants (CIMA), London has defined costing as, *'the techniques and processes of ascertaining costs.'* Wheldon has defined costing as, *'the proper allocation of expenditure and involves the collection of costs for every order, job, process, service or unit.'* Thus, costing simply means cost finding by any process or technique. It consists of principles and rules which are used for determining:

- (a) the cost of manufacturing a product, e.g., motor car, furniture, chemical, steel and paper and
- (b) the cost of providing a service, e.g., electricity, transport and education.

The terms *'costing'* and *'cost accounting'* are often used interchangeably. Cost accounting is a formal system of accounting for costs in the books of account, by means of which, costs of products and services are ascertained and controlled. According to L C Cropper, *'cost accounting means a specialized application of the general principles of accounting, in order to ascertain the cost of producing and marketing any unit of manufacture or of carrying out any particular job or contract.'* An authoritative definition of cost accounting has been given by CIMA, London as follows: *'Cost accounting is the process of accounting for costs from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with cost centres and cost units. In its widest usage, it embraces the preparation of statistical data, the application of cost control methods and ascertainment of profitability of activities carried out or planned.'*

1.2.1 Costing and Cost Accountancy

Though the terms *'costing'* and *'cost accounting'* are interchangeably used, there is a difference between the two. Costing is simply the method of determining costs by using any method like arithmetic process, memorandum statements, etc. Cost accounting, on the other hand, denotes the formal accounting mechanism, by means of which costs are ascertained by recording them in the books of account. In simple words, costing means finding out the cost of products or services by any technique or method, while cost accounting means costing using the double entry system.

Cost Accountancy: Cost accountancy is a very wide term. It means and includes the principles, conventions, techniques and systems which are employed in a business

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to plan and control the utilization of its resources. It is defined by CIMA, London 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 therefrom for the purposes of managerial decision making.*’

Cost accountancy is thus the *science, art and practice* of a cost accountant. It is a *science* in the sense that it is a body of systematic knowledge, which a cost accountant should possess for the proper discharge of his duties and responsibilities. It is an *art* as it requires the ability and skill on the part of a cost accountant, in applying the principles of cost accountancy to various managerial problems, like price fixation, cost control, etc. *Practice* refers to constant efforts on the part of cost accountant, in the field of cost accountancy. Theoretical knowledge alone would not enable a cost accountant to deal with the various intricacies involved. He should, thus, have sufficient practical training, and exposure to real life costing dilemmas.

Scope of Cost Accounting

Cost accounting is generally considered as being applicable only to manufacturing concerns. This is not so. Its applications are in fact much wider. All types of activities, manufacturing and non-manufacturing, in which monetary value is involved, should consider the use of cost accounting. Wholesale and retail businesses, banking and insurance companies, railways, airways, shipping and road transport companies, hotels, hospitals, schools, colleges, universities, farming and cinema houses, all may employ cost accounting techniques to operate efficiently. It is only a matter of recognition by the management of the applicability of these costing concepts and techniques in their own fields of endeavour.

1.2.2 Objectives and Functions of Cost Accounting

The main objectives of cost accounting are as follows:

1. **Ascertainment of cost:** This is the primary objective of cost accounting. In cost accounting, cost of each unit of production, job, process or department, etc., is ascertained. Not only actual costs incurred are ascertained but costs are also predetermined for various purposes. For cost ascertainment, various methods and techniques are employed under different situations.
2. **Cost control and cost reduction:** Cost accounting aims at improving profitability by controlling and reducing costs. For this purpose, various specialized techniques, like standard costing, budgetary control, inventory control, value analysis, etc., are used. This objective of cost control and cost reduction is becoming increasingly important in the present scenario because of growing competition in the business world.

3. **Guide to business policy:** Cost accounting aims at serving the needs of the management in conducting the business with utmost efficiency. Cost data provide guidelines for various managerial decisions, like making or buying, selling below cost, utilization of idle plant capacity, introduction of a new product, etc.
4. **Determination of selling price:** Cost accounting provides cost information on the basis of which selling prices of products or services may be fixed. In periods of depression, cost accounting guides the firms in deciding the extent to which the selling prices may be reduced to meet the situation.

In order to realize these objectives, the data provided by cost accounting may have to be re-classified, re-organized and supplemented by other relevant business data from outside the formal cost accounting system.

1.2.3 Differences and Similarities of Cost Accounting System with Financial Accounting System

Both cost accounting and financial accounting are concerned with systematic recording and presentation of financial data. The two systems rest on the same principles concerning debit and credit and have the same sources of recording the transactions. But cost accounting is much more detailed than financial accounting. This is because in financial accounting, profit or loss is ascertained for the business as a whole whereas in cost accounting, detailed cost and profit data for various parts of business, like departments, products, etc., are shown. This is explained in the following illustration.

Differences between cost accounting and financial accounting are explained below:

Table 1.1 Differences between Financial and Cost Accounting

<i>Basis</i>	<i>Financial Accounting</i>	<i>Cost Accounting</i>
1. Purpose	Its main purpose is to prepare profit & loss account and balance sheet for reporting to owners or shareholders and other outside agencies, <i>i.e.</i> , external users.	The main purpose of cost accounting is to provide detailed cost information to management, <i>i.e.</i> , internal users.
2. Statutory requirements	These accounts have to be prepared according to the legal requirements of Companies Act and Income Tax Act.	Maintenance of these accounts is voluntary, except in certain specified industries where it has been made obligatory to keep cost records under the Companies Act.
3. Analysis of cost and profit	Financial accounts reveal the profit or loss of the business as a whole for a particular period. It does not show the figures of cost and profit for individual products, departments and processes.	Cost accounts show the detailed cost and profit data for each product line, department, process, etc.
4. Periodicity of reporting	Financial reports (profit and loss account and balance sheet) are prepared periodically, usually on an annual basis.	Cost reporting is a continuous process and may be done on a daily, weekly, monthly, etc., basis

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5. Control aspect	It lays emphasis on the recording of financial transactions and does not attach any importance to the control aspect.	It provides for a detailed system of controls with the help of certain special techniques like standard costing and inventory control, etc.
6. Historical and predetermined costs	It is concerned almost exclusively with historical records. The historical nature of financial accounting can be easily understood in the context of the purposes for which it was designed.	It is concerned not only with historical costs but also with predetermined costs. This is because cost accounting does not end with what has happened in the past. It extends to plans and policies to improve performance in the future.
7. Format of presenting information	Financial accounting has a single uniform format of presenting information, <i>i.e.</i> , profit and loss account, balance sheet and cash flow statement.	Cost accounting has varied forms of presenting cost information, which are tailored to meet the needs of management and thus, lacks a uniform format.
8. Types of transactions recorded	Financial accounting records only external transactions, like sales, purchases, receipts, etc., with outside parties.	Cost accounting records not only external transactions but also internal or inter-departmental transactions like issue of materials by store keeper to production departments.
9. Types of statements prepared	Financial accounting prepares general purpose statements like profit and loss account and balance sheet. That is to say, financial accounting must produce information that is used by many classes of people, none of whom have explicitly defined informational needs.	Cost accounting generates special purpose statements and reports like report on loss of materials, idle time report, variance report, etc. It identifies the user, discusses his problems and needs and provides tailored information.

1.2.4 Importance and Limitations of Cost Accounting

The deficiencies of financial accounting may be re-stated as the advantages of cost accounting because the latter has emerged to overcome the limitations of the former. However, the extent of the advantages obtained will depend upon the efficiency with which the cost system is installed and also the extent to which the management is prepared to accept the system.

The importance of cost accounting through its advantages is discussed in this section. The principal advantages of cost accounting are discussed in the following sections.

Advantages to Management

1. **Reveals profitable and unprofitable activities:** A system of cost accounting reveals profitable and unprofitable activities. On this information, management may take steps to reduce or eliminate wastages and inefficiencies occurring in any form, such as idle time, under-utilization of plant capacity and spoilage of materials.
2. **Helps in cost control:** Cost accounting helps in controlling costs with special techniques, like standard costing and budgetary control.

3. **Helps in decision making:** It supplies suitable cost data and other related information for managerial decision making, such as introduction of a new product line, replacement of old machinery with an automatic plant, make or buy.
4. **Guides in fixing selling prices:** Cost is one of the most important factors to be considered while fixing prices. A system of cost accounting guides the management in the fixation of selling prices, particularly during a depression period when prices may have to be fixed below cost.
5. **Helps in inventory control:** Perpetual inventory system, which is an integral part of cost accounting, helps in the preparation of interim profit and loss account. Other inventory control techniques, like ABC analysis, level setting, etc., are also used in cost accounting.
6. **Aids in formulating policies:** Costing provides information that enables the management to formulate production and pricing policies and preparing estimates of contracts and tenders.
7. **Helps in cost reduction:** It helps in the introduction of a cost reduction programme and finding out new and improved ways to reduce costs.
8. **Reveals idle capacity:** A concern may not be working to full capacity due to reasons, such as shortage of demand, machine breakdown or other bottlenecks in production. A cost accounting system can easily work out the cost of idle capacity so that the management may take immediate steps to remedy the position.
9. **Checks the accuracy of financial accounts:** Cost accounting provides a reliable check on the accuracy of financial accounts with the help of reconciliation between the two at the end of the accounting period.
10. **Prevents frauds and manipulation:** Cost audit system, which is a part of cost accountancy, helps in preventing manipulation and frauds and thus reliable cost data can be furnished to the management and others.

Advantages to Workers

Workers are benefited by introduction of incentive plans which are an integral part of a cost system. This results not only in higher productivity but also higher earnings for them.

Advantages to Society

An efficient cost system is bound to lower the cost of production, the benefit of which is passed on to the public at large, in the form of lower prices of products or services.

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Advantages to Government Agencies and Others

A cost system produces ready figures for use by government, wage tribunals, chambers of commerce and industry trade unions, etc., for use in problems like price fixing, wage level fixing, settlement of industrial disputes, policy matters, etc.

Limitations or Objections Against Cost Accounting

Despite the fact that the development of cost accounting is one of the most significant steps to improve performance, certain objections are raised against its introduction. These are as follows:

1. **It is unnecessary:** It is argued that maintenance of cost records is not necessary and involves duplication of work. It is based on the premise that a good number of concerns are functioning prosperously without any system of costing. This may be true, but in the present world of competition, to conduct a business with utmost efficiency, the management needs detailed cost information for correct decision making. Only a cost accounting system can serve this need of the management and thus help in the efficient conduct of a business.
2. **It is expensive:** It is pointed out that installation of a costing system is quite expensive which only large concerns can afford. It is also argued that installation of the system will involve additional expenditure which will lead to a diminution of profits. In this respect, it may be said that a costing system should be treated as an investment and the benefits derived from the system must exceed the amount spent on it. It should not prove a burden on the finances of the company. For an economical operation of the system, the maintenance of the records should be kept to the minimum, taking into account the need and use of each record.
3. **It is inapplicable:** Another argument sometimes put forward is that modern methods of costing are not applicable to many types of industry. This plea is hardly tenable, given the complexities of operating any enterprise today. The fault lies in an attempt to introduce a readymade costing system in an industry. A costing system must be specially designed to meet the needs of a business. Only then will the system work successfully and achieve the objectives for which it was introduced. In fact, applications of costing are very wide. All types of activities, manufacturing and non-manufacturing, should consider the use of cost accounting.
4. **It is a failure:** The failure of a costing system in some concerns is quoted as an argument against its introduction in other undertakings. This is a very fallacious argument. If a system does not produce the desired results, it is wrong to jump to the conclusion that the system is at fault. The reasons for its failure should be probed. Often it is discovered that employees were opposed to the introduction of a costing system because they might have looked with suspicion at the introduction of any method which was not known to them or to which they were not accustomed. Thus, to make the

system a success, the utility of the system should be explained to the management and the cooperation of the employees should be sought by convincing them that the system is for the betterment of all.

Check Your Progress

1. Define cost accountancy.
2. Why is cost accounting called much more detailed than financial accounting?
3. What prevents the manipulation and frauds in cost accounting?

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1.3 COST CONCEPTS

The term 'cost' does not have a definite meaning and its scope is extremely broad and general. It is, therefore, not easy to define or explain this term without leaving any doubt concerning its meaning. Cost accountants, economists and others develop the concept of cost according to their needs because one complete description of 'cost' to suit all situations is not possible.

According to Cambridge International Dictionary of English, cost means '*the amount of money needed to buy, do or make something.*' However, some authoritative definitions of cost are given below:

1. *Cost is 'the amount of expenditure (actual or notional), incurred or attributable to a given thing.'* (CIMA, London)
2. *'A cost is the value of economic resources used as a result of producing or doing the things costed.'* (W M Harper)
3. *'Cost is a measurement, in monetary terms, of the amount of resources used for the purpose of production of goods or rendering of services.'*
CAS-I of ICAI

In fact, in order to assign a definite meaning to the term 'cost', it should be used with a modifier or an adjective, according to the specific purpose for its use. For example, direct cost, fixed cost, variable cost, controllable cost, material cost, selling cost, prime cost, marginal cost, differential cost, standard cost, estimated cost, actual cost, joint cost, conversion cost, etc., have specific meanings.

Cost vs Expense and Loss

Often the terms 'cost' and 'expense' are used interchangeably. But cost should be distinguished from expense and loss.

Expense: Expense is defined as '*an expired cost resulting from a productive usage of an asset.*' It is that cost which has been applied against revenue of a particular accounting period, in accordance with the principle of matching costs to revenue. In other words, an expense is that portion of the revenue-earning potential of an asset which has been consumed in the generation of revenue. Unexpired or unconsumed part of the cost is recorded as an asset in the balance

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sheet. Such an unexpired cost is converted into an expense when it expires while helping to earn revenue. For example, when a plant is purchased, depreciation on plant (expired cost) is charged to the profit and loss account as an expense and cost of plant remaining after providing depreciation (unexpired cost) is shown as an asset in the balance sheet. Every year, depreciation on plant, representing expense, is debited to profit and loss account and depreciated value representing unexpired cost is shown in the balance sheet. Pre-paid insurance is also an example of unexpired cost which is shown in the balance sheet as an asset.

Loss: Loss is defined as '*reduction in a firm's equity, other than from withdrawals of capital for which no compensating value has been received.*' A loss is an expired cost resulting from the decline in the service potential of an asset that generated no benefit to the firm. Obsolescence or destruction of stock by fire are examples of loss.

1.3.1 Cost Centre and Profit Centres

For the purpose of ascertaining cost, the whole organization is divided into small parts or sections. Each small section is treated as a cost centre of which cost is ascertained. A cost centre is defined by CIMA, London as '*a location, person, or item of equipment (or group of these), for which costs may be ascertained and used for the purpose of control.*' Thus, a cost centre refers to a section of the business to which costs can be charged. It may be a location (a department, a sales area), an item of equipment (a machine, a delivery van), a person (a salesman, a machine operator) or a group of these (two automatic machines operated by one workman). The main purpose of ascertaining the cost of a cost centre is control of cost.

Cost centres are primarily of two types:

- (a) **Personal cost centre**—which consists of a person or a group of persons.
- (b) **Impersonal cost centre**—which consists of a location or an item of equipment or group of these.

From a *functional* point of view, cost centres may be of the following two types:

- (a) **Production cost centre:** These are those cost centres where actual production work takes place. Examples are, weaving department in a textile mill, melting shop in a steel mill and cane crushing shop in a sugar mill.
- (b) **Service cost centre:** These are those cost centres which are ancillary to and render services to production cost centres. Examples of service cost centres are power house, tool room, stores department, repair shop and canteen.

A cost accountant sets up cost centres to enable himself to ascertain the costs he needs to know. A cost centre is charged with all the costs that relate to it,

e.g., if a cost centre is a machine, it will be charged with the costs of power, light, depreciation and its share of rent, etc. The purpose of ascertaining the cost of a cost centre is cost control. The person in charge of a cost centre is held responsible for the control of cost of that centre.

Profit Center

A profit center is a section of a company treated as a separate business. Thus profits or losses for a profit center are calculated separately.

Business organizations may be organized in terms of profit centers where the profit center's revenues and expenses are held separate from the main company's in order to determine their profitability. Usually different profit centers are separated for accounting purposes so that the management can follow how much profit each center makes and compare their relative efficiency and profit. Examples of typical profit centers are a store, a sales organization and a consulting organization whose profitability can be measured.

A profit center manager is held accountable for both revenues, and costs (expenses), and therefore, profits. What this means in terms of managerial responsibilities is that the manager has to drive the sales revenue generating activities which leads to cash inflows and at the same time control the cost (cash outflows) causing activities.

This makes the profit center management more challenging than cost center management. Profit center management is equivalent to running an independent business because a profit center business unit or department is treated as a distinct entity enabling revenues and expenses to be determined and its profitability to be measured.

Peter Drucker originally coined the term profit center around 1945. He later recanted, calling it 'One of the biggest mistakes I have made.' He later asserted that there are only cost centers within a business, and 'The only profit center is a customer whose cheque hasn't bounced.'

Cost Unit

"Cost unit is a form of measurement of volume of production or service. This unit is generally adopted on the basis of convenience and practice in the industry concerned." CAS-I.

A cost unit is defined by CIMA, London as a '*unit of product or service in relation to which costs are ascertained.*' For example, in a sugar mill, the cost per tonne of sugar may be ascertained, in a textile mill the cost per metre of cloth may be ascertained. Thus 'a tonne' of sugar and 'a metre' of cloth are cost units. In short, cost unit is unit of measurement of cost.

All sorts of cost units are adopted, the criterion for adoption being the applicability of a particular cost unit to the circumstances under consideration. Broadly, cost units may be of two types as explained below:

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- (i) **Units of production**, e.g., a ream of paper, a tonne of steel or a metre of cable.
- (ii) **Units of service**, e.g., passenger miles, cinema seats or consulting hours.

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The cost units and cost centres should be those which are natural to the business and which are readily understood and accepted by all concerned.

Cost Object

Cost object may be defined as ‘*anything for which a separate measurement of cost may be desired.*’ A cost accountant may want to know the cost of a particular ‘thing’ and such a ‘thing’ is called a cost object. A cost object may be a product, service, activity, department or process, etc.

1.3.2 Methods and Techniques of Costing

The methods or types of costing refer to the techniques and processes employed in the ascertainment of costs. Several methods have been designed to suit the needs of different industries. The method of costing to be applied in a particular concern depends upon the type and nature of manufacturing activity. Basically, there are two methods of costing:

1. Job costing or job order costing
2. Process costing

All other methods are variations of either job costing or process costing.

1. **Job order costing:** This method ‘*applies where work is undertaken to customers’ special requirements.*’ Cost unit in job order costing is taken to be a job or work order for which costs are separately collected and computed. A job, big or small, comprises a specific quantity of a product or service to be provided as per customer’s specifications. Industries where this method is used include printing repair shops, interior decoration and painting.
2. **Contract costing or terminal costing:** This is a variation of job costing and, therefore, principles of job costing apply to this method. The difference between job and contract is that job is small and contract is big. It is well said that *a contract is a big job and a job is a small contract.* The cost unit here is a ‘contract’ which is of a long duration and may continue over more than one financial year. Contract costing is most suited to construction of buildings, dams, bridges and roads, shipbuilding, etc.
3. **Batch costing:** Like contract costing, this is also a variation of job costing. In this method, the cost of a batch or group of identical products is ascertained and therefore each batch of products is a cost unit for which costs are ascertained. This method is used in companies engaged in the production of readymade garments, toys, shoes, tyres and tubes, component parts, bakery, etc.

4. **Process costing:** As distinct from job costing, this method is used in mass production industries manufacturing standardized products in continuous processes of manufacturing. Costs are accumulated for each process or department. Here raw material has to pass through a number of processes in a particular sequence to the completion stage. In order to arrive at cost per unit, the total cost of a process is divided by the number of units produced. The finished product of one process is passed on to the next process as raw material. Textile mills, chemical works, sugar mills, refineries, soap manufacturing, etc., may be cited as examples of industries which employ this method.
5. **Operation costing:** This is nothing but a refinement and a more detailed application of process costing. A process may consist of a number of operations and operation costing involves cost ascertainment for each operation instead of a process where distinctly separate operations are involved in a process, cost of each operation is found for effective control mechanism.
6. **Single, output or unit costing:** This method of cost ascertainment is used when production is uniform and consists of a single or two or three varieties of the same product. Where the product is produced in different grades, costs are ascertained grade-wise. As the units of output are identical, the cost per unit is found by dividing the total cost by the number of units produced. This method is applied in mines, quarries, brick kilns, steel production, flour mills, etc.
7. **Operating or service costing:** This method should not be confused with operation costing. It is used in undertakings which provide services instead of manufacturing products. For example, transport undertakings (road transport, railways, airlines, shipping companies), electricity companies, hotels, hospitals and cinemas, use this method. The cost units are passenger-kilometre or tonne-kilometre, kilowatt hours, a room per day in a hotel, a seat per show in a cinema hall, etc. This method is a variation of process costing.
8. **Multiple or composite costing:** It is an application of more than one method of cost ascertainment with respect to the same product. This method is used in industries where a number of components are separately manufactured and then assembled into a final product. For example, in a television set manufacturing company, manufacture of different component parts may require different production methods and thus different methods of costing may have to be used. Assembly of these components into final product requires yet another method of costing. Other examples of industries which make use of this method are air-conditioners, refrigerators, scooters, cars and locomotives.

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Techniques of Costing

It is the type of industry that determines which of the eight methods of costing discussed above will be used in a particular enterprise. However, in addition to these methods, there are certain techniques of costing which are not alternatives to the methods discussed above. These techniques may be used for special purpose of control and policy in any business irrespective of the method of costing being used there. These techniques have been briefly explained below:

1. **Standard costing:** This is a very valuable technique of controlling cost. In this technique, standard cost is predetermined as target of performance, and actual performance is measured against the standard. The difference between standard and actual costs are analysed to know the reasons for the difference so that corrective actions may be taken.
2. **Budgetary control:** Closely allied to standard costing is the technique of budgetary control. A budget is an expression of a firm's business plan in financial form and budgetary control is a technique applied to the control of total expenditure on materials, wages and overheads by comparing actual performance with planned performance. Thus, in addition to its use in planning, the budget is also used for control and co-ordination of business operations.
3. **Marginal costing:** In this technique, separation of costs into fixed and variable (marginal) is of special interest and importance. This is so because marginal costing regards only variable costs as the cost of the products. Fixed cost is treated as period cost and no attempt is made to allocate or apportion this cost to individual cost centres or cost units. It is transferred to costing profit and loss account of the period. This technique is used to study the effect on profit of changes in volume or type of output.
4. **Total absorption costing:** It is a traditional method of costing whereby total costs (fixed and variable) are charged to products. This is in complete contrast to marginal costing where only variable costs are charged to products. Although until recently, this was the only technique employed by cost accountants, but now a days it is considered to have only a limited application.
5. **Uniform costing:** This is not a separate technique or method of costing like standard costing or process costing. It simply denotes a situation in which a number of firms adopt a uniform set of costing principles. It has been defined by CIMA, London as '*the use by several undertakings of the same costing principles and/or practices.*' This helps to compare the performance of one firm with that of other firms and thus, to derive the benefit of anyone's better experience and performance.

Costing Methods and Techniques are Tools

Methods and techniques of costing described above should be regarded as tools of a cost accountant and it should not be construed that a particular method or technique is superior to any other. Just as a skilled workman uses different tools for different tasks, similarly, a cost accountant should use these methods and techniques appropriately either individually or in combination. For example, standard costing may be combined with process costing to give 'standard process costing', or standard costing may be combined with marginal costing as well as process costing to give 'standard marginal process costing'. Although this may appear confusing, yet if principles involved in each method or technique are clearly understood, there should not be any difficulty in making the best use of these methods and techniques.

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Cost Ascertainment and Cost Estimation

Cost Ascertainment: Cost ascertainment is concerned with computation of actual costs incurred. It refers to the methods and processes employed in ascertaining costs. It has been seen earlier that in different types of industries, different methods are employed for ascertaining cost.

Cost Estimation: As against ascertainment of actual costs, costs may also be predetermined. Cost estimation is the process of predetermining costs of goods or services. The costs are determined in advance of production and precede the operations. Estimated costs are definitely the future costs and are based on the average of past actual costs adjusted for anticipated changes in future.

1.3.3 Types of Cost

Classification is the process of grouping costs according to their common characteristics. It is a systematic placement of like items together according to their common features.

There are various ways of classifying costs as given below. Each classification serves a different purpose:

1. Classification into Direct and Indirect Costs

Costs are classified into direct costs and indirect costs on the basis of their identifiability with cost units or jobs or processes or cost centres.

Direct costs: These are those costs which are incurred for and easily identified with a particular cost object. Cost of raw materials used and wages of a machine operator are common examples of direct costs. To be specific, cost of steel used in manufacturing a machine can be easily known. It is, therefore, a direct cost. Similarly, wages paid to a tailor in a readymade garments company for stitching a pair of trousers is a direct cost because it can be easily identified in the cost of that garment.

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Indirect costs: These are general costs and are incurred for the benefit of a number of cost object. These costs cannot be easily identified with a particular cost object. Depreciation of machinery, insurance, lighting, power, rent, managerial salaries, materials used in repairs, etc., are common examples of indirect costs. For example, depreciation of machine for stitching a pair of trousers cannot be known and thus it is an indirect cost.

Costs are not traced or identified directly with a cost object for one of the following three reasons:

1. It is impossible to do so; *e.g.*, rent of building.
2. It is not convenient or feasible to do so; *e.g.*, nails used in furniture or sewing thread.
3. Management chooses not to do so; *i.e.*, many companies classify certain items of cost as indirect because it is customary in the industry to do so; *e.g.*, carriage inward may be treated as an indirect expense (alternatively, it may be treated as a part of the cost of materials purchased).

The terms 'direct' and 'indirect' should be used in relation to the object of costing. An item of cost may be a direct cost in one case and the same may be indirect in another case. It is the nature of business and the cost unit chosen that will determine whether a particular cost is direct or indirect. For example, depreciation of asphalt mixing plant used by a road building contractor at site is a direct cost, whereas depreciation of plant used in a factory is an indirect cost. It is because in the factory, plant would probably benefit more than one cost unit and it may not be convenient to allocate depreciation to various cost units with any degree of accuracy.

This classification is important from the point of view of accurate ascertainment of cost. Direct costs of a product can be conveniently determined while the indirect costs have to be arbitrarily apportioned to various cost units. For example, in readymade garments, the cost of cloth and wages of tailor are accurately ascertained without any difficulty and are thus direct costs. But the rent of factory building, managerial salaries, etc., which are indirect costs, have to be apportioned to various cost units on some arbitrary basis and cannot be accurately ascertained.

2. Classification into Fixed and Variable Costs

Costs behave differently when level of production rises or falls. Certain costs change in accordance with production level while other costs remain unchanged. As such on the basis of behaviour or variability, costs are classified into fixed, variable and semi-variable.

- (i) **Fixed costs:** These costs remain constant in 'total' amount over a specific range of activity for a specified period of time, *i.e.*, these do not increase or decrease when the volume of production changes. For example, building rent and managerial salaries remain constant and do not change with change in output level and thus are fixed costs. But fixed cost 'per unit' decreases

when volume of production increases and vice versa, fixed cost per unit increases when volume of production decreases.

Relevant range – Fixed cost remains fixed only in relation to a given range of output and for a given time span. If the output is to be increased beyond the range, the fixed cost will also increase. Relevant range refers to the band of activity or volume in which specific relationship between the level of activity and the fixed cost in question is valid.

The characteristics of fixed cost are:

- (a) fixed total cost within a relevant range of output;
 - (b) increase or decrease in per unit fixed cost when quantity of production changes;
 - (c) apportioned to departments on some arbitrary basis;
 - (d) such cost can be controlled mostly by top level management.
- (ii) **Variable costs:** These costs tend to vary in direct proportion to the volume of output. In other words, when volume of output increases, total variable cost also increases and vice versa, when volume of output decreases, total variable cost also decreases, but the variable cost per unit remains fixed.

Thus, in general, variable costs show the following characteristics:

- (a) variability of the total cost in direct proportion to the volume of output;
 - (b) fixed cost per unit in the face of changing volume;
 - (c) easy and reasonably accurate distribution of cost to departments;
 - (d) such costs can be controlled by functional managers.
- (iii) **Semi-variable or semi-fixed costs (mixed costs):** These costs include both a fixed and a variable component, *i.e.* these are partly fixed and partly variable. A semi-variable cost has a fixed cost element which needs to be incurred irrespective of the level of activity achieved. On the other hand, the variable element in semi-variable costs changes either at a constant rate or in lumps.

3. Classification into Committed and Discretionary Costs

It is explained above that costs may be classified into fixed and variable. Fixed costs are further classified into committed costs and discretionary (or programmed) costs. This classification is based on the degree to which a firm is locked into an asset or service that is generating the fixed cost.

Committed costs: These are those costs that are incurred in maintaining physical facilities and managerial set up. Such costs are committed in the sense that once the decision to incur them has been made, they are unavoidable and invariant in the short run. For example, salary of the managing director may represent a *committed cost* if, by policy, the managing director is not to be relieved unless the

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firm is liquidated. Similarly, depreciation of plant and equipment is *committed* because these facilities cannot be easily changed in the short run.

Discretionary costs: These are those costs which can be avoided by management decisions. Such costs are not permanent. Advertising, research and development cost and salaries of low level managers are examples of discretionary costs because these costs may be avoided or reduced in the short run, if so desired by the management.

This classification into committed and discretionary costs is important from the point of view of cost control and decision making.

4. Classification into Product Costs and Period Costs

Product costs: These costs include all such costs that are involved in acquiring or making a product. For a trader, product cost includes purchase cost plus freight inwards. For a manufacturer, these consist of direct materials, direct labour and factory overheads. Product costs are 'absorbed by' or 'attached to' the units produced. These are called *inventoriable costs* because these are included in the cost of product as work-in-progress, finished goods or cost of sales.

Period costs: These are those costs which are not necessary for production and are incurred even if there is no production. These are written off as expenses in the period in which these are incurred. Such costs are incurred for a time period and are charged to the profit and loss account of the period. Showroom rent, salary of company executives and travel expenses are examples of period costs. These costs are not inventoried, *i.e.*, these are not included in the value of stocks. Administration and selling expenses are generally treated as period costs.

Classification into product and period cost is important from the point of view of profit determination. This is so because product cost is carried forward to the next accounting period as part of the unsold finished stock, whereas period cost is written off in the accounting period in which it is incurred.

5. Classification into Controllable and Non-controllable Costs

From the point of view of controllability, costs are classified into controllable costs and non-controllable costs.

Controllable costs: These are the costs which may be directly regulated at a given level of management authority. In other words, controllable costs are those costs which are subject to the discretion of the manager and hence can be kept within predefined limits. Variable costs are generally controllable by department heads. For example, cost of raw material may be controlled by purchasing in larger quantities.

Non-controllable costs: These are those costs which cannot be influenced by the action of a specified member of an enterprise. For example, it is very difficult to control costs like factory rent, managerial salaries, etc.

Two important points should be noted regarding this classification. First, controllable costs cannot be distinguished from non-controllable costs without specifying the level and scope of management authority. In other words, a cost which is uncontrollable at one level of management may be controllable at another level of management. For example, a departmental manager may have no control over the number of supervisors employed in his department, but this decision may have to be taken by the production manager. Thus, supervision cost will be non-controllable at the departmental manager's level, but it will be controllable at the level of production manager. Secondly, all costs are controllable in the long run at some appropriate management level.

It is a misconception that variable costs are controllable and fixed costs are non-controllable. However, variable costs are more prone to control than fixed costs.

6. Classification into Historical Costs and Predetermined Costs

On the basis of time of computation, costs are classified into historical costs and predetermined costs.

Historical costs: These are the costs which are ascertained after these have been incurred. Historical costs are thus, nothing but *actual costs*. These costs are not available until after the completion of the manufacturing operations.

Predetermined costs: These are future costs which are ascertained in advance of production, on the basis of a specification of all the factors affecting cost. These costs are extensively used for the purpose of planning and control.

7. Classification into Normal and Abnormal Costs

Normal cost may be defined as a cost which is normally incurred on expected lines at a given level of output. This cost is a part of cost of production. *Abnormal cost* is that which "is an unusual or a typical cost whose occurrence is usually irregular and unexpected and due to some abnormal situation of the production." Such cost is over and above the normal cost and is not treated as a part of the cost of production. It is charged to costing profit and loss account.

Special Costs for Management Decision Making

There are certain costs which are specially computed for use by the management for the purpose of decision making. These costs may not be recorded in the books of account. These includes relevant and irrelevant costs, sunk cost, differential cost, marginal cost, imputed cost, opportunity cost, replacement cost, future cost, conversion cost, etc.

1.3.4 Elements of Cost

A cost is composed of three elements, *i.e.*, material, labour and expense. Each of these elements may be direct or indirect. This is shown below:

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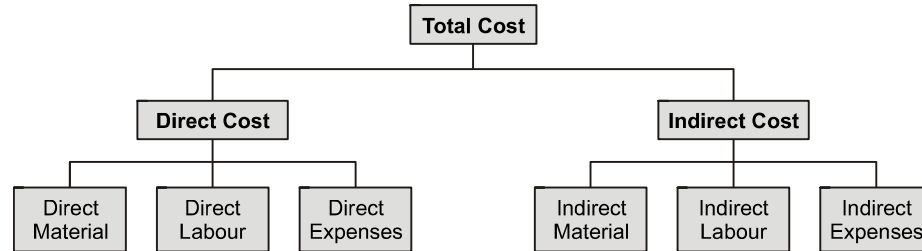


Fig. 1.1 Primary Elements of Cost

Material Cost

According to CIMA, London, material cost is ‘the cost of commodities supplied to an undertaking.’ Material cost includes cost of procurement, freight inwards, taxes, insurance, etc., directly attributable to the acquisition. Trade discounts, rebates, duty drawbacks, refund on account of modvat, sales tax, etc., are deducted in determining the cost of material. Materials may be direct or indirect.

Direct materials: Direct material cost is that which can be easily identified with and allocated to cost units. Direct materials generally become a part of the finished product. For example, cotton used in a textile mill is a direct material. However, in many cases, though a material forms a part of the finished product, yet, it is not treated as direct material; e.g., nails used in furniture, thread used in stitching garments, etc. This is because value of such materials is so small that it is quite difficult and futile to measure it. Such materials are treated as indirect materials.

Indirect materials: These are those materials which cannot be conveniently identified with individual cost units. These are minor in importance, such as (i) small and relatively inexpensive items which may become a part of the finished product, e.g., pins, screws, nuts and bolts, thread, etc., (ii) those items which do not physically become a part of the finished products, e.g., coal, lubricating oil and grease, sand paper used in polishing, soap, etc.

Labour Cost

“Labour cost means the payment made to the employees, permanent or temporary, for their services.” CAS-I of ICAI. It includes salaries, wages, commission and all fringe benefits like P.F. contribution, gratuity, ESI, overtime, incentive bonus, wages for holidays, idle time, etc.

Direct labour: Direct labour cost consists of wages paid to workers directly engaged in converting raw materials into finished products. These wages can be conveniently identified with a particular product, job or process. Wages paid to a machine operator is a case of direct wages.

Indirect labour: It is of general character and cannot be conveniently identified with a particular cost unit. In other words, indirect labour is not directly engaged in the production operations but only to assist or help in production operations.

Expenses

All costs other than material and labour are termed as expenses. It is defined as 'the cost of services provided to an undertaking and the notional cost of the use of owned assets' (CIMA).

Direct expenses: According to CIMA, London, 'direct expenses are those expenses which can be identified with and allocated to cost centres or units.' These are those expenses which are specifically incurred in connection with a particular job or cost unit. Direct expenses are also known as *chargeable expenses*.

Indirect expenses: All indirect costs, other than indirect materials and indirect labour costs, are termed as indirect expenses. These cannot be directly identified with a particular job, process or work order and are common to cost units or cost centres.

Prime Cost

This is the aggregate of direct material cost, direct labour cost and direct expenses. Thus,

$$\text{Direct material} + \text{Direct labour} + \text{Direct expenses} = \text{Prime Cost}$$

Overheads

These are the aggregate of indirect material cost, indirect labour cost and indirect expenses. Thus,

$$\text{Indirect material} + \text{Indirect labour} + \text{Indirect expenses} = \text{Overheads}$$

Overheads are divided into three groups as follows:

1. **Production overheads:** Also known as factory overheads, works overheads or manufacturing overheads, these are those overheads which are concerned with the production function. They include indirect materials, indirect wages and indirect expenses in producing goods or services.

(a) *Indirect material*—Examples: Coal, oil, grease, etc.; stationery in factory office, cotton waste, brush and sweeping broom.

(b) *Indirect labour*—Examples: Works manager's salary, salary of factory office staff, salary of inspector and supervisor, wages of factory sweeper and wages of factory watchman.

(c) *Indirect expenses*—Examples: Factory rent, depreciation of plant, repair and maintenance of plant, insurance of factory building, factory lighting and power and internal transport expenses.

2. **Office and administration overheads:** These are the indirect expenditures incurred in general administrative function, *i.e.*, in formulating policies, planning and controlling the functions, directing and motivating the personnel of an organization in the attainment of its objectives.

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These overheads are of general character and have no direct connection with production or sales activities. This category of overheads is also classified into indirect material, indirect labour and indirect expenses.

- (a) *Indirect material*—Examples: Stationery used in general administrative office, postage, sweeping broom and brush.
- (b) *Indirect labour*—Examples: Salary of office staff, salary of managing director, remuneration of directors of the company.
- (c) *Indirect expenses*—Examples: Rent of office building, legal expenses, office lighting and power, telephone expenses, depreciation of office furniture and equipments, office air-conditioning and sundry office expenses.

3. Selling and distribution overheads: Selling overheads are the costs of promoting sales and retaining customers. They are defined as ‘*the cost of seeking to create and stimulate demand and of securing orders.*’ Examples are advertisements, samples and free gifts and salaries of salesmen.

Distribution cost includes all expenditure incurred from the time the product is completed until it reaches its destination. It is defined as ‘*the cost of sequence of operations which begins with making the packed product available for dispatch and ends with making the reconditioned returned empty packages if any, available for reuse.*’ Examples are carriage outwards, insurance of goods in transit, upkeep of delivery vans and warehousing.

Selling and distribution overheads are also grouped into indirect material, indirect labour and indirect expenses.

- (a) *Indirect material*—Examples: Packing material; stationery used in sales office, cost of samples, price list; catalogues, oil, grease etc., for delivery vans, etc.
- (b) *Indirect labour*—Examples: Salary of sales manager, salary of sales office staff, salary of warehouse staff and salary of drivers of delivery vans.
- (c) *Indirect expenses*—Examples: Advertising, travelling expenses, showroom expenses, carriage outwards, rent of warehouse, bad debts and insurance of goods in transit.

Illustration 1.1: A manufacturer has shown an amount of ₹ 19,310 in his books as ‘Establishment’ which really include the following expenses:

Interest on debentures	1,200
Agents’ commission	6,750
Warehouse wages	1,800
Warehouse repairs	1,500
Lighting of office	70
Office salaries	1,130
Director’s remuneration	1,400

Travelling expenses of salesmen	1,760
Rent, rates and insurance of warehouse	310
Rent, rates and insurance of office	230
Lighting of warehouse	270
Printing and stationery	1,500
Trade magazine	70
Donations	150
Bank charges	100
Cash discount allowed	770
Bad debts	300

From the information prepare a statement showing total:

- (a) Selling expenses
- (c) Administration expenses
- (b) Distribution expenses
- (d) Expenses which you would exclude from costs

(Adapted)

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Solution:

(a) <i>Selling Expenses:</i>	
Agents' commission	6,750
Travelling expenses of salesmen	1,760
Bad debts	300
Total	8,810
(b) <i>Distribution Expenses:</i>	
Warehousing wages	1,800
Warehouse repairs	1,500
Rent, rates and insurance of warehouse	310
Lighting of warehouse	270
Total	3,880
(c) <i>Administration Expenses:</i>	
Office salaries	1,130
Office lighting	70
Director's remuneration	1,400
Rent, rates and insurance of office	230
Printing and stationery	1,500
Trade magazine	70
Total	4,400

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(d) <i>Items not included in costs:</i>	
Donations	150
Cash discount allowed	770
Bank charges	100
Interest on debentures	1,200
	<hr/>
Total	2,220
	<hr/>

Note: For details of items not included in cost, refer to chapter 5 – Output or Unit Costing. Cost Sheet has been discussed in detail in chapter 5.

Components of Total Cost— Elements of cost may be grouped as follows:

- (i) **Prime Cost** = Direct material + Direct labour + Direct expenses
- (ii) **Works Cost or Factory Cost** = Prime cost + Factory overheads
- (iii) **Cost of Production** = Works cost + Administration overheads
- (iv) **Total Cost or Cost of Sales** = Cost of production + Selling and distribution overheads

Cost Sheet (Cost Statement)

It is a statement which is prepared periodically to provide detailed cost of a cost centre or cost unit. A cost sheet not only shows the total cost but also the various components of the total cost. Period covered by a cost sheet may be a year, a month or a week, etc.

Check Your Progress

4. Give some examples of service cost centres.
5. Name the type of costing most suitable to companies involved in construction of buildings, dams, bridges and roads, shipbuilding, etc.
6. Which type of costing is in complete contrast to marginal costing?
7. What is prime cost?

1.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Cost accountancy means and includes the principles, conventions, techniques and systems which are employed in a business to plan and control the utilization of its resources.
2. Cost accounting is called much more detailed than financial accounting because in financial accounting profit or loss is ascertained for the business as a whole whereas in cost accounting, detailed costs and profit data for various parts of business, like departments, products, etc., are shown.

3. Cost audit system, under cost accounting, is a part of cost accountancy, which helps in preventing manipulation and frauds and thus reliable cost data can be furnished to the management and others.
4. Examples of service cost centres include power house, tool room, stores department, repair shop and canteen.
5. The type of costing most suitable to companies involved in construction of buildings, dams, bridges and roads, shipbuilding, etc., is contract or terminal costing.
6. Total absorption costing is in total contrast to marginal costing.
7. Prime cost is the aggregate of direct material cost, direct labour cost and direct expenses.

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1.5 SUMMARY

- On the basis of the purpose for which this information is used, accounting is divided into three parts—financial accounting, cost accounting and management accounting.
- Financial accounting is mainly concerned with recording the business transactions in the books of account for the purpose of presenting final accounts to the management, shareholders and tax authorities, etc.
- Cost accounting provides detailed cost information to various levels of management for efficient performance of their functions.
- The term management accounting is applied to the provision of accounting information for management activities such as decision making, planning and controlling, etc. Thus, any form of accounting, which enables a business to be conducted more efficiently, can be regarded as management accounting.
- Costing as, ‘the techniques and processes of ascertaining costs.’ Wheldon has defined costing as, ‘the proper allocation of expenditure and involves the collection of costs for every order, job, process, service or unit.’
- Cost accounting is a formal system of accounting for costs in the books of account, by means of which, costs of products and services are ascertained and controlled.
- Both cost accounting and financial accounting are concerned with systematic recording and presentation of financial data. The two systems rest on the same principles concerning debit and credit and have the same sources of recording the transactions. But cost accounting is much more detailed than financial accounting. This is because in financial accounting, profit or loss is ascertained for the business as a whole whereas in cost accounting, detailed cost and profit data for various parts of business, like departments, products, etc., are shown.

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- A cost centre is defined by CIMA, London as ‘a location, person, or item of equipment (or group of these), for which costs may be ascertained and used for the purpose of control.’ Thus, a cost centre refers to a section of the business to which costs can be charged.
- The method of costing to be applied in a particular concern depends upon the type and nature of manufacturing activity. Basically, there are two methods of costing:
 1. Job costing or job order costing
 2. Process costingAll other methods are variations of either job costing or process costing.
- Techniques of costing include: standard costing, budgetary control, marginal costing, total absorption costing and uniform costing.
- Types of costs include the following: direct costs and indirect costs, fixed and variable costs, committed and discretionary costs, product and period costs, controllable and non-controllable costs, historical and predetermined costs and normal and abnormal costs.
- Elements of cost include: Direct cost and indirect cost

1.6 KEY WORDS

- **Cost Accounting:** It is a specialized branch of accounting, which is concerned with ‘the techniques and processes of ascertaining costs’ of products and services.
- **Cost:** It is defined as a measurement, in monetary terms, of the amount of resources used for the purpose of production of goods or rendering of services.
- **Cost centre:** It is a section of the organization, like a person, an equipment, a department, etc., for which costs may be ascertained and used for the purpose of control.

1.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is cost accounting? Discuss briefly its objectives.
2. State and explain the main differences between cost accounting and financial accounting.
3. What are cost and profit centres?

4. Classify the following items of cost into: (a) Prime cost, (b) Factory overhead, (c) Office overhead and (d) Selling and distribution overhead
 - i. Factory rent
 - ii. Works expenses
 - iii. Raw materials
 - iv. Productive wages
 - v. Unproductive wages
 - vi. Plant depreciation
 - vii. Salary of foreman
 - viii. Price lists and catalogues
 - ix. Travelling expenses of salesman
 - x. Depreciation of delivery vans
5. Mention the different techniques of costing.
6. Distinguish between 'cost', 'expense' and 'loss'.

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Long Answer Questions

1. Discuss the advantages of cost accounting.
2. 'Limitations of financial accounting have made the management realize the importance of cost accounting.' Comment.
3. Discuss the different methods of costing.
4. Describe the varied ways of classifying costs.

1.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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- Shillinglow, G. 1982. *Managerial Costing Accounting*. Homewood: Richard D. Irwin.
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UNIT 2 MATERIAL CONTROL

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Structure

- 2.0 Introduction
- 2.1 Objectives
- 2.2 Meaning and Objectives of Material Control
- 2.3 Techniques of Inventory Control
 - 2.3.1 Stock Levels or Fixation of Inventory Levels
 - 2.3.2 Economic Order Quantity Analysis (EOQ)
- 2.4 Material Purchase Procedure
- 2.5 Methods of Pricing Material Issues
- 2.6 Material Losses, Wastage of Materials and its Main Types
- 2.7 Answers to Check Your Progress Questions
- 2.8 Summary
- 2.9 Key Words
- 2.10 Self Assessment Questions and Exercises
- 2.11 Further Readings

2.0 INTRODUCTION

The term 'material' refers to all commodities that are consumed in the process of manufacture. It is defined as '*anything that can be stored, stacked or stockpiled.*' Materials are classified into 'direct' materials and 'indirect' materials.

"Direct material cost is the cost of material which can be directly allocated to a cost centre or a cost object in an economically feasible way." CAS - I of ICAI. Direct materials include not only the raw materials entering at the start of the production but all of the following:

- (a) Component parts used in a product, *e.g.*, tyres and tubes in a car or picture tube in a television set.
- (b) Any material used in production but wholly consumed in the production process, *e.g.*, fertilizer used in growing plants.
- (c) Any primary packing material, *i.e.*, any container sold with the final product, *e.g.*, cans for tinned food and drink, bottles for beer, etc.

Indirect materials are those which cannot be easily identified with a particular cost centre or cost object. Examples are coal, grease and oil, soap and sandpaper.

The term '*inventory*' is used to cover the stocks of raw materials, components, work-in-progress and finished goods. It has been defined by the Accounting Principles Board as '*the aggregate of those items of tangible personal property which (i) are held for sale in the ordinary course of business; (ii) are in the process of production for such sales; or (iii) are to be currently consumed in the production of goods or services to be available for sale.*'

In this unit, you will learn about the elements related to material control.

2.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and importance of material control
- Explain the various techniques used in material control
- Describe how stock levels are set to keep them at optimum level
- Examine the steps in the procedure of purchasing materials

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2.2 MEANING AND OBJECTIVES OF MATERIAL CONTROL

No cost accounting system can become effective without proper and efficient control of materials. This is so because quite often material is the single largest element of cost and as such, an efficient system of material control leads to a significant economy in the total cost. Material is as much cash as cash itself and any theft, waste and excessive use of materials leads to immediate and direct financial losses. Where slack methods exist, it is easy for such losses to pass unnoticed.

Meaning and Definition: Material or inventory control may be defined as *'systematic control and regulation of purchase, storage and usage of materials in such a way so as to maintain an even flow of production, at the same time avoiding excessive investment in inventories. Efficient material control cuts out losses and wastes of materials that otherwise pass unnoticed.'*

Thus an efficient system of material control should be comprehensive enough to cover purchase system, storage system, issue to production and determination of stock levels for each item of material.

Objectives of Material or Inventory Control

The broad objectives of material control are listed below:

1. **No under-stocking:** Under-stocking inevitably leads to materials running out of stock at some time or the other. Shortage of material may arise at a time when they are urgently needed and production may then be held up. The delay or stoppage in production due to non-availability of materials is very costly and results in loss of profits.
2. **No over-stocking:** Investment in materials must be kept as low as possible considering the production requirements and the financial resources of the business. Over-stocking of materials locks up capital and causes high storage costs, thereby resulting in adverse effect on profits. This may also result in loss due to obsolescence.

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3. **Economy in purchasing:** The purchasing of materials is a highly specialized function. By purchasing materials at the most favourable prices, the purchaser is able to make a valuable contribution to the reduction in cost.
4. **Proper quality:** While purchasing materials, due consideration should be given to the quality. It is no use purchasing materials of inferior quality or very superior quality. For each type of product, there is a particular type of quality of material which is needed and that quality alone should be purchased.
5. **Minimum wastage:** In order to minimize the loss of materials, proper storage conditions must be provided to different types of materials. Losses of materials occur due to deterioration, obsolescence, pilferage and theft and evaporation. All round efforts should be made to keep these losses to the minimum.
6. **Information about materials:** Not only should materials be available when required, there should also be a system to give complete and up-to-date accounting information about the availability of materials. Sometimes inadequate information about availability of materials may cause new purchases to be made of materials already in stock.

Techniques of Inventory Control

Various techniques commonly used for inventory control are listed below:

1. ABC technique
2. Stock levels—Minimum, maximum and reorder levels
3. Economic order quantity (EOQ)
4. Proper purchase procedure
5. Proper storage of materials
6. Inventory turnover ratio to review slow and non-moving materials
7. Perpetual inventory system
8. Fixation of material cost standards (Used in Standard Costing)
9. Preparation of material budgets (Used in Budgetary Control)

You will study two major types in the next section.

2.3 TECHNIQUES OF INVENTORY CONTROL

In this section, you will learn about two techniques of inventory control: Stock levels and Economic Order Quantity (EOQ).

2.3.1 Stock Levels or Fixation of Inventory Levels

In order to guard against under-stocking and over-stocking, most of the large companies adopt a scientific approach of fixing stock levels. These levels are:

(i) maximum level; (ii) minimum level; (iii) reorder level; and (iv) reorder quantity. By adhering to these levels, each item of material will automatically be held within appropriate limits of control. These levels are not permanent and must be changed to suit changing circumstances. Thus, changes will take place if consumption of material is increased or decreased or if—in the light of a review of capital available,—it is decided that the overall inventory must be increased or decreased.

Modern inventory management makes use of operations research and statistical techniques in fixing stock levels. However, given below is the description of various levels along with formulae that are commonly used in their computations.

Factors: Some of the factors which influence stock levels are:

1. Anticipated rate of consumption
2. Amount of capital available
3. Availability of storage space
4. Storage/warehousing costs
5. Procurement costs
6. Reliability of suppliers
7. Minimum order quantities imposed by suppliers
8. Risk of loss due to: (a) obsolescence; (b) deterioration; (c) evaporation; and (d) fall in market prices

Maximum Level

This is that level above which stocks should not normally be allowed to rise. The maximum level may, however, be exceeded in certain cases, *e.g.*, when unusually favourable purchasing condition arise. It is computed by the following *formula*:

$$\text{Maximum level} = \text{Reorder level} + \text{Reorder quantity} - \left(\frac{\text{Minimum consumption}}{\text{reorder period}} \times \text{Minimum} \right)$$

The following factors are taken into account in setting this level:

1. Rate of consumption of material
2. Risk of obsolescence and deterioration
3. Storage space available
4. Costs of storage and insurance
5. Availability of funds needed
6. Seasonal considerations, *e.g.*, bulk purchases during off-season at low prices
7. Reorder quantity
8. Restrictions imposed by government or local authority in respect of certain materials in which there are inherent risks of fire, explosion, etc.

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The idea of setting maximum stock level is to ensure that capital is not unnecessarily blocked in stores and also to avoid loss due to obsolescence and deterioration.

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Minimum Level

It is that level below which stock should not normally be allowed to fall. This is essentially a safety stock and is not normally touched. In case of stock falling below this level, there is a risk of stoppage in production and thus top priority should be given to the acquisition of fresh supplies. It is computed by the following formula:

$$\text{Minimum level} = \text{Reorder level} - \left(\text{Normal consumption} \times \text{Normal reorder period} \right)$$

In fixing this level, the following factors are considered:

1. Rate of consumption.
2. The time required to acquire fresh supplies under top priority conditions so that stoppage in production can be avoided.

Reorder Level or Ordering Level

This is that level of material at which purchase requisition is initiated for fresh supplies. This level is fixed somewhere above minimum level. This is fixed in such a way that by reordering when materials fall to this level, then in the normal course of events, new supplies will be received just before the minimum level is reached. Its formula is:

$$\text{Reorder level} = \text{Maximum consumption} \times \text{Maximum reorder period}$$

The following factors are considered in fixing this level:

1. Rate of consumption of the material
2. Minimum level
3. Delivery time—*i.e.*, the time normally taken from the time of initiating a purchase requisition to the receipt of materials. This is also known as lead time
4. Variations in delivery time

Danger Level

Sometimes purchased materials are not received in time and stock level goes below the minimum level. In order to meet such a situation a danger level is fixed. Danger level is a level at which normal issues are stopped and materials are issued for important jobs only. This level is generally fixed somewhat below the minimum level. When stock reaches danger level, urgent action is needed for the replenishment of stock so that stoppage in production can be avoided. Purchasing materials on an urgent basis results in higher purchasing cost. Its formula is:

$$\text{Danger level} = \text{Normal consumption} \times \text{Max. reorder period under emergency conditions}$$

Average Stock Level

This is computed as follows:

$$\text{Average stock level} = \frac{1}{2} (\text{Minimum level} + \text{Maximum level})$$

$$\text{Alternatively, Average stock level} = \text{Minimum level} + \frac{1}{2} (\text{Reorder quantity})$$

Illustration 2.1: Two materials A and B are used as follows:

Minimum usage 50 units per week each

Maximum usage 150 units per week each

Normal usage 100 units per week each

Reorder quantity A—600 units, B—1000 units

Delivery period A—4 to 6 weeks, B—2 to 4 weeks.

Calculate various stock levels.

Solution:

Reorder level = Maximum consumption \times Maximum reorder period

$$A = 150 \text{ units} \times 6 \text{ weeks} = \mathbf{900 \text{ units}}$$

$$B = 150 \text{ units} \times 4 \text{ weeks} = \mathbf{600 \text{ units}}$$

Minimum level = Reorder level $- \left(\text{Normal consumption} \times \text{Normal delivery period} \right)$

$$A = 900 - (100 \text{ units} \times 5 \text{ weeks}) = \mathbf{400 \text{ units}}$$

$$B = 600 - (100 \text{ units} \times 3 \text{ weeks}) = \mathbf{300 \text{ units}}$$

Average reorder period has been taken as normal reorder period.

Maximum level = Reorder level + Reorder quantity $- \left(\text{Minimum consumption} \times \text{Minimum delivery time} \right)$

$$A = 900 \text{ units} + 600 \text{ units} - (50 \text{ units} \times 4 \text{ weeks}) = \mathbf{1,300 \text{ units}}$$

$$B = 600 \text{ units} + 1,000 \text{ units} - (50 \text{ units} \times 2 \text{ weeks}) = \mathbf{1,500 \text{ units}}$$

Average stock level

$$= \frac{1}{2} (\text{Minimum level} + \text{Maximum level})$$

$$A = \frac{1}{2} (400 \text{ units} + 1,300 \text{ units}) = \mathbf{850 \text{ units}}$$

$$B = \frac{1}{2} (300 \text{ units} + 1,500 \text{ units}) = \mathbf{900 \text{ units}}$$

2.3.2 Economic Order Quantity Analysis (EOQ)

Reorder quantity is the quantity for which order is placed when stock reaches reorder level. By fixing this quantity, the purchaser doesn't have to recalculate the quantity to be purchased each time he orders for materials.

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Reorder quantity is known as Economic Order Quantity because it is the quantity which is most economical to order. In other words, economic order quantity is that size of the order which gives maximum economy in purchasing any material and ultimately contributes towards maintaining the material at the optimum level and at minimum cost.

While setting economic order quantity, two types of costs should be taken into account:

1. **Ordering cost:** This is the cost of placing an order with the supplier. Because of so many factors involved, it is quite difficult to quantify this cost. It mainly includes the cost of stationery, salaries of those engaged in receiving and inspection, salaries of those engaged in placing orders, etc.
2. **Cost of carrying stock:** This is the cost of holding the stock in storage. It includes the following:
 - (a) Cost of operating the stores, (salaries, rent, stationery, etc.)
 - (b) The incidence of insurance cost
 - (c) Interest on capital locked up in store
 - (d) Deterioration and wastage of materials

Note: At EOQ, ordering cost and cost of carrying stock are equal, *i.e.*, when the total of the two types of costs is the lowest.

The above two types of costs are of opposing nature. If, for instance, an attempt is made to reduce the costs of carrying stock by keeping stocks as low as possible, the cost of ordering will go up because the number of replenishment orders will automatically rise. On the other hand, if in order to save ordering costs, order is placed for a larger quantity at one time, the stock will remain longer in stores and the cost of carrying stock will go up. The problem is, therefore, to balance these two types of costs and the economic order quantity is fixed at a point where the aggregate cost is the minimum.

Mathematical Formulae of EOQ

The above graphic methods of determining economic order quantity may not provide the most accurate answer. Economic order quantity can also be calculated with the help of a formula as given below:

$$EOQ = \sqrt{\frac{2.A.B}{C.S}}$$

- where
- EOQ = Economic Order Quantity
 - A = Annual consumption in units
 - B = Buying or ordering cost per order
 - C = Cost per unit
 - S = Storage or carrying cost as a percentage of average inventory

$$\text{Alternatively, } EOQ = \sqrt{\frac{2.A.B}{S}}$$

where S = Storage cost per unit per annum

Illustration 2.2:

Estimated requirement for the year	600 units
Cost per unit	₹ 20
Ordering cost (per order)	₹ 12
Carrying cost (% of average inventory)	20%

Solution:

$$EOQ = \sqrt{\frac{2 \times 600 \times 12}{20 \times 20\%}} = 60 \text{ units}$$

In this illustration, if carrying cost is given as ₹ 4 per unit per annum, EOQ will be calculated as follows:

$$EOQ = \sqrt{\frac{2.A.B}{S}} = \sqrt{\frac{2 \times 600 \times 12}{4}} = 60 \text{ units}$$

Tabular Method

Economic order quantity can also be determined with the help of a table prepared for this purpose. This method is particularly used when prices vary according to the quantity to be purchased. A table is prepared to show the various costs for different ordering quantities thus, enabling one to find out the most economic size of the quantity to order, *i.e.*, where the total cost is the least of all. This is illustrated below:

Illustration 2.3: Determine EOQ from the following information using tabular method:

Annual consumption	—	12,000 units
Cost of ordering	—	₹ 15 per order
Cost of material	—	₹ 1.25 per unit
Carrying cost	—	20 per cent of average inventory

Solution: The following table may be prepared to determine the economic order quantity:

No. of orders per year	Units per order	Value per order	Ordering cost	Carrying cost	Total cost
1	12,000	15,000	15	1,500	1,515
2	6,000	7,500	30	750	780
3	4,000	5,000	45	500	545
4	3,000	3,750	60	375	435

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Material Control

5	2,400	3,000	75	300	375
6	2,000	2,500	90	250	340
7	1,714	2,142	105	214	319
8	1,500	1,875	120	188	308
9	1,333	1,667	135	167	302
10	1,200	1,500	150	150	300
11	1,091	1,364	165	136	301
12	1,000	1,250	180	125	305
13	923	1,154	195	115	310
14	857	1,071	210	107	317
15	800	1,000	225	100	325

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The above table shows that 1,200 units is the ideal size of the order because total cost at this level is the least of all. This means the number of orders per year should be ten. Other order quantities (more than or less than 1,200 units) are not so economical because total cost is higher than this level. The result of this table can be verified with the help of mathematical formula as shown below:

$$EOQ = \sqrt{\frac{2 \cdot A \cdot B}{C \cdot S}} = \sqrt{\frac{2 \times 12,000 \times 15}{1.25 \times 20\%}} = \mathbf{1,200 \text{ units}}$$

Check Your Progress

1. What are the aspects that must be covered by an efficient system of material control?
2. State the idea behind setting maximum stock level.
3. Mention the formula for danger level of stock.

2.4 MATERIAL PURCHASE PROCEDURE

Purchasing is the function of buying raw materials, general supplies, tools, office stationery and other items. The essentials of efficient purchasing are right quantity, right quality, right time, right price, right source and delivery at the right place.

Just-in-time (JIT) Purchasing

Just-in-time purchasing is the purchase of materials immediately before these are required for use in production. According to CIMA, London JIT purchasing is '*matching receipts of materials closely with usage so that raw material inventory is reduced to near zero level.*' The purpose of JIT purchasing is to reduce stock levels to the minimum through creating closer relationship with suppliers and arranging frequent deliveries of materials in smaller quantities. It results in enormous savings in storage costs, material handling costs, spoilage, obsolescence etc. An important effect of JIT purchasing is that with frequent purchasing the issue price is likely to be closer to market prices. In order to save on ordering costs, long term agreements may be entered into with suppliers.

Centralized and Decentralized Purchasing

Broadly speaking, purchase function may be organized in two ways, *i.e.*, centralized purchasing and decentralized purchasing.

Centralization: Centralization of purchasing means that all purchases are made by a single purchase department. Head of this department is designated as Purchase Manager or Chief Buyer.

Decentralization: In decentralized purchasing, each branch or department makes its own purchases. If the branches or plants are located at different places, the decentralized purchasing can better meet the situation by making purchases in the local market by plant or branch managers.

Advantages of Centralized Purchasing

1. Specialized and expert purchasing staff can be concentrated in one department.
2. A firm policy can be initiated which may result in favourable terms of purchase, *e.g.*, higher trade discount or easy terms of payment
3. Standardization of quality of raw material is facilitated.
4. Better control over purchasing is possible because reckless buying by various individuals is avoided. Keeping all records of purchase transactions at one place also helps in control.

Disadvantages of Centralized Purchasing

1. The creation and maintenance of a special purchasing department leads to higher administration costs which small concerns may not be in a position to afford.
2. Centralized purchasing is not suitable for plants or branches located at different places which are far apart.

Purchase Procedure

Although the details of a purchase procedure may differ from firm to firm, the important steps in purchasing and receiving of materials are as follows, assuming that purchases are centralized:

1. Purchase Requisition

Purchases of materials are initiated through purchase requisitions. A purchase requisition is a formal request by the head of a department or an authorized officer to the purchase manager to purchase the specified materials.

- (i) *Storekeeper:* When materials reach ordering level, the storekeeper should initiate purchase procedure.
- (ii) *Production planner* for special materials required for the manufacture of a new product.

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(iii) *Plant engineer* for repairs and maintenance materials.

(iv) *Department heads* (e.g., office manager) for any materials required for his department, like filing cabinets, stationery and office sundries.

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Purposes: A purchase requisition serves the following purposes:

1. It initiates the purchase and sets the purchasing process in motion.
2. It provides a written record of details like quantities, specification, etc., of materials to be purchased.
3. It provides dates for reference, e.g., date when materials are required. Dates are particularly important in case responsibility for stoppage in production due to shortage of materials is to be determined.

Generally two copies of purchase requisition are prepared. The *original copy* is sent to the purchasing department and *carbon copy* is retained and filed by the requisitioner for his own reference. (*A note of caution:* Purchase Requisition should not be confused with Stores or Materials Requisition).

2. Selection of Suppliers

When the purchasing department receives a duly authorized purchase requisition, a source of supply has to be selected. The purchase department generally maintains a list of suppliers for each type of material and selects a particular supplier after inviting tenders. The important rule is to buy the best quality materials at the lowest possible price after giving due consideration to delivery dates and other terms of purchases. Purchases should be made from dependable sources of supply and ethical standards should be maintained in dealing with suppliers.

In many industries, long term contracts are entered into with suppliers. For example, a car manufacturer may contract ahead for the supply of tyres and tubes for a year's requirement at a time. Such an arrangement has the advantage of not having to keep large stocks if the continuity of supply can be relied upon. Moreover, the supplier gets a regular customer and may offer favourable terms. Periodic withdrawals against the contract are made by raising a purchase order.

3. Purchase Order and Follow-up

When the supplier has been selected, the most common procedure is the preparation of a purchase order. The purchase order is the form used by the purchasing department authorizing the suppliers to supply the specified materials at the price and terms stated therein. A purchase order should be carefully prepared as it forms a basis of legal contract between the parties concerned. For this reason, authority to sign purchase orders should also be restricted to selected responsible officials.

Large companies generally prepare *five copies* of the purchase order. The *original* is sent to the supplier. *Second copy* is retained by the purchase department for its own file. *Third copy* is sent to the receiving department as an advance

intimation to expect the materials. *Fourth copy* is sent to the cost accounting department for entry in the ordered column of the appropriate stores ledger account. The *last copy* is sent to the department requisitioning the material as an intimation of the order and expected date of receipt of materials.

It is very important to follow up purchase orders so as to ensure timely delivery. Lack of follow-up measures may cause delay in arrival of materials resulting in stoppage in production for want of materials.

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4. Receipt of Materials

All incoming materials should be received by the Receiving Department. This department performs the functions of unpacking the goods received and verifying their quantities and conditions. The quantity is checked against the purchase order copy and the supplier's advice note which is normally received along with the goods.

Full particulars of the goods received are entered in a *Goods Received Note*. *Goods Received Note* serves the following purposes:

1. It informs the storekeeper and the requisitionist of the receipt of materials.
2. It notifies the accounting department that the materials have been received and that a voucher can be prepared.
3. When it includes columns of cost, it can serve as a source of entry in the stores ledger.

Original copy of the *Goods Received Note* is sent to the purchase department to be marked completed. *Second copy* is sent to the storekeeper or the requisitionist along with the goods. *Third copy* is sent to the accounting department for entry in the stores ledger and the *last copy* is retained by the receiving department for its own file.

5. Inspection and Testing of Materials

Goods received should be inspected for quality to ensure that they comply with the specifications stated on the purchase order. Where technical or laboratory inspection is necessary, the goods are passed to a laboratory which will provide a report on the quality of goods.

An inspection report is prepared to show the results of the inspection. In either case, the report is forwarded to the purchasing department.

6. Return of Rejected Materials

Where materials received are damaged or are not in accordance with the specifications, these are usually returned to the supplier along with a *Debit Note*, informing him that his account has been debited with the value of materials concerned. When such a claim is accepted by the supplier, he signifies his acceptance by the issue of a *Credit Note*. The rejected materials may be returned to the supplier immediately or they may be held pending his instructions.

This Debit Note may be prepared by the purchase department on the basis of the inspection report. *Original copy* is sent to the supplier. *One copy* is sent to accounts department for adjustment entry and *one copy* is retained for purchase department file.

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7. Passing Invoices for Payment

When the invoices are received by the purchasing department, the process of assembling the business papers connected with each purchase and preparation of voucher begins. Invoices are numbered serially and entered in the Invoice Register. The following documents are assembled in support of the invoice: (a) Purchase Order; (b) Goods Received Note; (c) Inspection Report, if not incorporated in the Goods Received Note and (d) Debit or Credit Note.

After comparing these documents with the invoice, if it is found that the invoice is in order, the purchase manager will sign it and pass it to the accounts department for payment. All calculations are checked before a voucher authorizing payment is prepared. All related documents like Purchase Order, Goods Received Note are marked with the invoice number to preclude the passing of a possible duplicate invoice.

Purchase Price

The invoice received from the supplier provides a base figure of purchase price. The following adjustments have to be made in this figure to arrive at the real material cost.

Quantity discount: This is an allowance made by the supplier to the purchaser to encourage large orders. The discount often varies according to the size of the order, *i.e.*, the larger the quantity ordered, the higher is the discount, within fixed limits. Quantity discount is allowed by a supplier as a measure of the savings in his cost which arise from the production and distribution on a large scale. Part of these savings enjoyed by the supplier is passed on to the purchaser in the form of quantity discount. The amount of the quantity discount is deducted from the purchase price to arrive at the material cost.

Trade discount: This is an allowance made by the supplier to a purchaser who has to re-sell the material, *e.g.*, discount allowed by the manufacturer to the wholesaler. The idea is to cover the expenses (*e.g.*, storage, re-packing) and profit of the dealer who is providing a service to help the original supplier to distribute his goods. This discount is also deducted from the purchase price to arrive at the material cost.

Cash discount: This discount is allowed by the supplier to a purchaser to encourage prompt payment of invoice, *e.g.*, 2% discount may be allowed if payment is made within 30 days and 4% discount if payment is made within 7 days. As cash discount is a form of interest on capital, its treatment is a subject of debate among cost accountants. Generally, it is considered a financial and non-costing item and thus is not included in cost accounts.

Sales tax and other levies: Items, like sales tax, excise duty, customs duty and octroi, should be added to the purchase price.

Transport charges: These include sea, land and air freight, dock charges, insurance, etc. on materials purchased. Sometimes the purchase price quoted by the supplier includes all these charges, but where the price does not include these charges, these should be added to the purchase price. Where it is impracticable to do so (*e.g.*, where such costs are too small or invoices are received late) these may be charged as factory overheads.

Cost of containers: The supplier may or may not charge separately for containers. If no such charge is made, no adjustment is required in the purchase price. However, if containers are separately charged, all such costs should be included in the purchase price *i.e.* (i) the cost of containers if these are not returnable; and (ii) the difference between the cost of container and the amount refunded when container is returned, where containers are returnable.

NOTES

Check Your Progress

4. What are the essentials of efficient purchasing?
5. What is done when materials received are damaged or are not in accordance with the specifications?

2.5 METHODS OF PRICING MATERIAL ISSUES

When materials are issued from stores to production department, a question arises regarding the price at which materials issued are to be charged. This is because the same type of material may have been purchased in different lots at different times at several different prices. This means that actual cost can take on several different values and some method of pricing the issue of materials must be selected.

It should be noted that methods discussed below are methods of pricing the issue of materials and not the methods of physically issuing materials.

These methods are discussed and illustrated below.

First-in, First-out (FIFO) Method

This method is based on the assumption that materials which are purchased first are issued first. It uses the price of the first batch of materials purchased for all issues until all units from this batch have been issued. After the first batch is fully issued, the price of the next batch received becomes the issue price. Upon this batch also getting fully used, the price of the still next batch is used for pricing and so on. In other words, the materials are issued at the oldest cost price listed in the stores ledger account and thus, the materials in stock are valued at the price of the latest purchases.

Three important effects of using FIFO method are:

- (a) Materials are priced at the actual cost
- (b) Charge to production for material cost is at the oldest prices of materials in stock
- (c) Closing stock is valued at the latest price paid

NOTES

Illustration 2.4: From the following transactions, prepare a Stores Ledger Account using FIFO method:

Year 2010

1 July	Opening stock			500 units @ ` 20 each
4 July	Purchased	GRN	574	400 units @ ` 21 each
6 July	Issued	SR	251	600 units
8 July	Purchased	GRN	578	800 units @ ` 24 each
9 July	Issued	SR	258	500 units
13 July	Issued	SR	262	300 units
24 July	Purchased	GRN	584	500 units @ ` 25 each
28 July	Issued	SR	269	400 units

GRN = Goods Received Notes; SR = Stores Requisition

(These transactions have also been used to illustrate other methods of pricing).

Solution:

FIFO Method
Stores Ledger Account

Date	Receipts				Issues				Balance		
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹
1 July	—	—	—	—	—	—	—	—	500	20	10,000
4 July	574	400	21	8,400	—	—	—	—	{ 500 400	{ 20 21	{ 10,000 8,400
6 July	—	—	—	—	251	600 { 500 100	{ 20 21	{ 10,000 2,100	300	21	6,300
8 July	578	800	24	19,200	—	—	—	—	{ 300 800	{ 21 24	{ 6,300 19,200
9 July	—	—	—	—	258	500 { 300 200	{ 21 24	{ 6,300 4,800	600	24	14,400
13 July	—	—	—	—	262	300	24	7,200	300	24	7,200
24 July	584	500	25	12,500	—	—	—	—	{ 300 500	{ 24 25	{ 7,200 12,500
28 July	—	—	—	—	269	400 { 300 100	{ 24 25	{ 7,200 2,500	400*	25	10,000

* Closing stock is 400 units @ ` 25 = ` 10,000.

It should be noted that the assumption of FIFO is only for accounting purpose, *i.e.*, the physical flow of materials need not necessarily be in the order of the flow of cost, though normally materials would be expected to move out of stock on a FIFO basis because oldest stocks are usually used up first.

Advantages: The following advantages are claimed for FIFO method:

1. It is based on a realistic assumption that materials are issued in the order of their receipts.
2. Materials are issued at actual cost and thus no unrealized profit/loss arises from the operation of this method.
3. Valuation of closing inventory is at cost as well as at the latest prices paid.
4. This method is easy to understand and simple to operate.

Disadvantages: The main disadvantages of this method are:

1. As materials are charged to production at the old prices, the cost of production may lag behind the current economic values.
2. This method does not permit comparison of the costs of similar jobs or cost units because similar jobs simultaneously started may be charged materials at different prices.
3. When prices are subject to frequent changes, this method involves cumbersome records and calculations.

In *periods of rising prices*, the FIFO method produces higher profits and results in higher tax liability because lower cost is charged to production. Conversely, in *periods of falling prices*, the FIFO method produces lower profits and results in lower taxes because they are derived from a higher cost of goods sold.

Last-in, First-out (LIFO) Method

This method operates in just the reverse order of FIFO method. It is based on the assumption that the last materials purchased are the first materials to be issued. Thus, the price of the last batch of the materials purchased is used first for all issues until all units from this batch have been issued, after which the price of the previous batch of materials purchased is used. It should be noted that physical flow of materials may not conform to LIFO assumption.

Three points should be noted regarding this method:

- (a) Material issues are priced at actual cost
- (b) Charge to production for material cost is at latest prices paid
- (c) Closing stock valuation is at the oldest prices paid and is completely out of line with the current prices

Illustration 2.5: Prepare a Stores Ledger Account, showing pricing of materials on LIFO basis, from the data given in Illustration 2.4.

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Solution:

LIFO Method
Stores Ledger Account

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Date	Receipts				Issues				Balance			
	Ref. GRN	Qty Units	Rate ₹	Amt ₹	Ref. (SR)	Qty Units	Rate ₹	Amt ₹	Qty Units	Rate ₹	Amt ₹	
1 July	—	—	—	—	—	—	—	—	500	20	10,000	
4 July	574	400	21	8,000	—	—	—	—	500	20	10,000	
									400	21	8,400	
6 July	—	—	—	—	251	600	400	21	8,400			
							200	20	4,000	300	20	6,000
8 July	578	800	24	19,200	—	—	—	—	300	20	6,000	
									800	24	19,200	
9 July	—	—	—	—	258	500	24	12,000	300	20	6,000	
									300	24	7,200	
13 July	—	—	—	—	262	300	24	7,200	300	20	6,000	
24 July	584	500	25	12,500	—	—	—	—	300	20	6,000	
									500	25	12,500	
28 July	—	—	—	—	269	400	25	10,000	300	20	6,000	
									100	25	2,500	

* Closing stock is 300 units @ ` 20 = ` 6,000 + 100 units @ ` 25 = ` 2,500.

Total 400 units at ` 8,500.

Advantages: The main advantages of this method are:

1. Materials are charged to production at the latest prices paid. In times of rising prices, quotation of prices for company's product will be safe and profitable.
2. This method, like FIFO, does not result in any unrealized profit or loss.
3. This method is also quite simple to operate, particularly when prices are fairly steady.

Disadvantages: This method suffers from the following disadvantages:

1. This method is not realistic as it does not conform to the physical flow of materials.
2. The closing stock is valued at the old prices and does not represent the current economic values.
3. Like FIFO method, in this method as well, the material cost of similar jobs may differ because materials were issued from different lots and thus, at different prices. This renders comparisons difficult.
4. This method is cumbersome when prices are subject to frequent fluctuations.

In *periods of rising prices*, profit and tax liability under LIFO would be lower than under FIFO method because cost will be charged at current prices which are at higher level. Conversely, in *periods of falling prices*, closing stock is valued at old prices which are at higher level and thus, profit would also be higher resulting in higher tax liability.

2.6 MATERIAL LOSSES, WASTAGE OF MATERIALS AND ITS MAIN TYPES

Losses of materials may arise during handling, storage or during process of manufacture. Such losses or wastages are classified into two categories—normal loss and abnormal loss.

Normal Loss: This is that loss which has necessarily to be incurred and thus is unavoidable. Examples are:

- (i) Loss by evaporation in case of liquid materials.
- (ii) Loss due to loading and unloading of material, say, in case of coal and other materials of such nature.
- (iii) Loss due to breaking the bulk. When materials are purchased in large quantity and issued to production in small lots, some difference is likely to arise.

Normal losses of material cannot be completely eliminated but may be controlled to a limited extent.

Abnormal Loss: This is that loss which arises due to inefficiency in operations, bad luck, mischief, etc. Examples are:

- (i) Theft or pilferage
- (ii) Breakage
- (iii) Fire, accident, flood, etc.
- (iv) Use of inaccurate weighing instruments
- (v) Improper storage resulting in deterioration of materials

Control of Material Losses

The following steps are suggested to control the loss of materials:

1. Proper storage conditions should be provided, particularly in case of perishable materials.
2. The store room should be well guarded and protected to avoid the risks of fire or theft, etc.
3. In order to reduce losses due to obsolescence, materials should be issued on first-in, first-out basis.
4. Accuracy of weighing instruments should be periodically checked.
5. A systematic procedure should be developed regarding movement of materials from one place to another and no unauthorized movement of materials should be permitted.
6. Specialized material handling equipment should be employed so as to minimize losses in materials handling.

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Accounting Treatment

It is a principle of costing that all normal losses which are necessarily to be incurred are treated as a part of the cost and abnormal losses which are really avoidable should not be included in the cost. Therefore, in order to absorb normal material losses in cost, the rates of usable materials in stock are inflated so that such losses are covered. Alternatively, normal material loss is transferred to factory overhead.

Abnormal material losses, such as those due to breakage, theft, fire, flood and abnormal evaporation, are charged to Costing Profit and Loss Account.

Waste, Scrap, Spoilage and Defectives

Material losses may arise in the form of waste, scrap, spoilage or defectives. These are explained below:

Waste

Meaning: Waste has been defined as '*that portion of a basic raw material lost in processing, having no recovery value.*' In fact, waste is a material loss during production or storage due to various factors, such as evaporation, chemical reaction, shrinkage, contamination, unrecoverable residue, which has little or no value. Waste may be visible or invisible. *Visible waste* is that which is physically present, e.g., ash and saw dust. An *invisible waste*, on the other hand, is the disappearance of basic raw material in the form of evaporation, smoke, etc. Waste in certain industries creates problems of disposal. Usually this is disposed of in the easiest and cheapest manner, e.g., liquid wastes may be poured into nearby rivers.

Control of waste: Waste has the effect of reducing the quantity of output. Thus, waste should be reduced to the minimum. Allowance for normal waste should be made on the basis of past experience, technical factors and any special features of the material, product and process, etc. Responsibilities should be assigned for any waste over and above the normal waste.

A Waste Report should be prepared periodically to compare the actual waste with the predetermined level.

Accounting of waste: Waste usually has no realizable value. If waste is a part of the normal process loss, the cost will be absorbed by the good production. On the other hand, if it is a part of the abnormal process loss, it is transferred to Costing Profit and Loss Account.

However, if waste has any sale value at all, then the small amount received should be treated as 'other income'.

Scrap

Meaning: This is defined as '*the incidental residue from certain types of manufacture usually of small amount and low value, recoverable without further processing.*' According to Cost Accounting Standard-6 (CAS-6), issued by ICAI, '*scrap is the "discarded material having some value in a few cases*

and which is usually either disposed of without further treatment (other than reclamation and handling) or re-introduced into the process in place of raw materials.” Scrap has the following features:

- (a) Scrap is incidentally produced from the manufacturing process.
- (b) Scrap is usually of small value.
- (c) No further processing is required to realize its saleable value.
- (d) Scrap may be used in place of raw material, in some cases.
- (e) Unlike waste, scrap is always physically available.

Examples of scrap are trimmings in timber industries; cuttings, pieces, etc., in leather and readymade garments factory and cut pieces of metal sheets.

Control of scrap: Like waste, scrap also increases the cost of production. Although scrap might realize a nominal amount, the sale value will mostly be much lower than the cost of raw materials. Therefore, scrap should be kept as low as possible and a proper control should be exercised on this loss of materials.

Control of scrap is possible by setting standards for scrap, determining the responsibility for scrap and by keeping proper records of scrap. A Scrap Report should be prepared at regular periods whereby a comparison should be made between actual scrap and standard allowance for scrap and remedial measures should be taken for any adverse variances that may be detected.

Accounting of scrap: The problem of scrap is more complex than that of waste. It may be treated in any of the following ways:

- (a) **As other income:** Sales of scrap may simply be treated as ‘other income’ and credited to Profit and Loss Account. This method is particularly suitable when the scrap has a relatively small realisable value, after taking into account the cost of its disposal and marketing.
- (b) **Credit to overheads:** The net value of scrap, *i.e.*, after adjusting selling and distribution costs, may be credited to production overheads of the department producing the scrap. An alternative to this method is that net realisable value is credited to the material cost.
- (c) **Credit to job or process:** The realisable value of scrap may be credited to the job or process which yields the scrap. This method is suitable when scrap is identifiable with a particular job or process and is of significant value.

Spoilage

Meaning: Spoiled work results when materials are damaged in manufacturing operations in such a way that they cannot be rectified and brought back to normal specifications. Spoilage differs from scrap in that scrap unavoidably arises as a result of manufacturing operations, whereas spoilage occurs due to some defect in materials or manufacturing operations which could have been avoided. Spoiled work may have a realisable value and in certain cases, it is sold as ‘seconds’.

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Control of spoilage: Normal spoilage should be determined in advance and it should be periodically compared with actual spoilage in the Spoilage Report. Causes of any abnormal spoilage should be investigated and remedial measures immediately taken.

Accounting of spoilage: For accounting purposes, spoiled work should be divided into normal and abnormal. The cost of normal spoilage should be borne by good production. This can be done by charging the loss due to spoilage to production and spreading it over the good units produced.

Abnormal spoilage, caused due to inefficiency and treated as controllable should be transferred to Costing Profit and Loss Account.

Defectives

Meaning: Defective work may be defined as 'that production which is below standard specifications or quality and can be rectified by incurring additional expenditure (of material, labour, etc.) known as rectification costs.' The main difference between spoilage and defective is that whereas the former cannot be rectified and sold as good units, the latter can be rectified by incurring additional costs and brought back to the level of standard product. Sometimes, when defectives cannot be rectified as standard product, they may be sold as 'seconds'.

Control of defectives: This should cover not only control over the quantity of defective production but also control over rectification costs. On the basis of past experience, standards for defective work and rectification costs should be fixed. Reasons for any defectives over and above the normal or standard defective work should be fully investigated and corrective steps should be taken. If, for example, defective output is due to bad workmanship, suitable incentives may be provided to workers for minimizing the defective work. A report on defective work should be periodically prepared.

Accounting of defective work: The main problem in accounting of defective work is the problem of treatment of rectification or rework costs. Where defective work is easily identifiable with specific jobs, the rectification costs should be debited to the jobs concerned. Where, however, such work cannot be conveniently identified with jobs, the rectification costs may be debited to overheads. In the case of abnormal type of defective work, the rectification costs may be transferred to Costing Profit and Loss Account.

Check Your Progress

6. Why does the question regarding the price at which materials issued are to be charged arises?
7. What is the profit and tax liability under LIFO and FIFO like in periods of rising prices?
8. Define invisible waste.

2.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. An efficient system of material control should be comprehensive enough to cover purchase system, storage system, issue to production and determination of stock levels for each item of material.
2. The idea of setting maximum stock level is to ensure that capital is not unnecessarily blocked in stores and also to avoid loss due to obsolescence and deterioration.
3. The formula for danger level of stock is:

$$\text{Danger level} = \text{Normal Consumption} \times \text{Ma. Reorder period under emergency conditions}$$
4. The essentials of efficient purchasing are right quantity, right quality, right time, right place, right source and delivery at the right place.
5. When materials received are damaged or are not in accordance with the specifications, these are usually returned to the supplier along with a Debit Note, informing him that his account has been debited with the value of materials concerned.
6. The question regarding the price at which materials issued are to be charged arises because the same type of material may have been purchased in different lots at different times at several different prices.
7. In periods of rising prices, profit and tax liability under LIFO would be lower than under FIFO method because cost will be charged at current prices which are at higher level.
8. An invisible waste is the disappearance of basic raw materials in the form of evaporation, smoke, etc.

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2.8 SUMMARY

- The term 'material' refers to all commodities that are consumed in the process of manufacture.
- Material or inventory control may be defined as 'systematic control and regulation of purchase, storage and usage of materials in such a way so as to maintain an even flow of production, at the same time avoiding excessive investment in inventories. Efficient material control cuts out losses and wastes of materials that otherwise pass unnoticed.'
- Various techniques commonly used for inventory control are listed below:
 1. ABC technique
 2. Stock levels—Minimum, maximum and reorder levels

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3. Economic order quantity (EOQ)
 4. Proper purchase procedure
 5. Proper storage of materials
 6. Inventory turnover ratio to review slow and non-moving materials
 7. Perpetual inventory system
 8. Fixation of material cost standards (Used in Standard Costing)
 9. Preparation of material budgets (Used in Budgetary Control)
- In order to guard against under-stocking and over-stocking, most of the large companies adopt a scientific approach of fixing stock levels. These levels are: (i) maximum level; (ii) minimum level; (iii) reorder level; and (iv) reorder quantity.
 - Reorder quantity is the quantity for which order is placed when stock reaches reorder level. By fixing this quantity, the purchaser doesn't have to recalculate the quantity to be purchased each time he orders for materials. Reorder quantity is known as Economic Order Quantity because it is the quantity which is most economical to order.
 - Purchasing is the function of buying raw materials, general supplies, tools, office stationery and other items. The essentials of efficient purchasing are right quantity, right quality, right time, right price, right source and delivery at the right place.
 - The details of a purchase procedure generally includes: purchase requisition, selection of suppliers, purchase order and follow-up, receipt of materials, inspection and testing of materials, return of rejected materials and passing invoices for payment.
 - When materials are issued from stores to production department, a question arises regarding the price at which materials issued are to be charged. This is because the same type of material may have been purchased in different lots at different times at several different prices. This means that actual cost can take on several different values and some method of pricing the issue of materials must be selected. The methods are FIFO or LIFO.
 - Material losses may arise in the form of waste, scrap, spoilage or defectives. Accounting treatment for each form differs.

2.9 KEY WORDS

- **Material:** It refers to tangible items that are consumed in the process of manufacture.
- **Economic order quantity (EOQ):** It is that size of the purchase order which gives maximum economy in purchasing.
- **Waste:** It is that form of material loss whereby 'basic raw material is lost in processing, having no recovery value.'

2.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What do you understand by 'Inventory Control'? State its objects.
2. What are the advantages and disadvantages of centralized storage?
3. What technique would you follow to detect and prevent slow and non-moving materials?
4. Write short notes on any three of the following:
 - (i) Reorder quantity (ii) Reorder level (iii) Maximum level (iv) Minimum level.

Long Answer Questions

1. Explain the terms 'minimum level', maximum level and 'ordering level' with regard to maintenance of stocks. What are the factors to be taken into account in fixing these levels? Discuss the relevance of these concepts in a manufacturing organization.
2. What do you understand by economic order quantities? How are they calculated?
3. Describe the procedure of purchasing materials from outside.
4. Explain the FIFO and LIFO methods of valuing material issues. Discuss the effect of rising prices and falling prices on these two methods of pricing of material issues.
5. Discuss the accounting treatment and control of the following in cost accounts:
 - (a) Waste, (b) Scrap, (c) Defective, (d) Spoilage.

2.11 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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UNIT 3 LABOUR COST CONTROL

NOTES**Structure**

- 3.0 Introduction
 - 3.1 Objectives
 - 3.2 Importance of Labour Cost Control
 - 3.3 Treatment and Control of Labour Turnover
 - 3.4 Methods of Time Keeping and Time Booking
 - 3.5 Idle Time and Overtime
 - 3.6 Systems of Wage Payment Methods of Remuneration
 - 3.6.1 Conventional Methods
 - 3.6.2 Incentive Wage Plans
 - 3.7 Answers to Check Your Progress Questions
 - 3.8 Summary
 - 3.9 Key Words
 - 3.10 Self Assessment Questions and Exercises
 - 3.11 Further Readings
-

3.0 INTRODUCTION

Labour or manpower represents human resources used in production. After material cost, labour cost is the second major element of cost. Despite large scale use of machinery and advanced technologies in manufacturing, the role of labour in production cannot be under-estimated. So significant is the role of labour that productivity of all other resources depends on the productivity of human resources. In other words, higher efficiency of labour helps in lowering the cost per unit of production. There is, therefore, a special need for proper organization for accounting and control of labour cost.

According to Cost Accounting Standard-7 (CAS-7) issued by ICAI, employee cost is *‘the aggregate of all kinds of consideration paid, payable and provision made for future payments, for the services rendered by employees of an enterprise (including temporary, part time and contract employees). Consideration includes wages, salaries, contractual payments and benefits, as applicable, or any payment made on behalf of the employee. This is also known as labour cost.’*

Labour cost is of two kinds:

- (i) Direct labour cost
- (ii) Indirect labour cost

Direct and Indirect Labour Costs

Direct labour cost is ‘the cost of employees which can be attributed to a cost object in an economically feasible way.’ Direct labour is expended in altering the

construction, composition or condition of the product. It is directly engaged in production work and can be conveniently identified or attributed wholly to a particular job, process or cost unit. Wages of a machine operator is a direct labour cost. In a factory of readymade garments, wages paid to a tailor are direct wages. Similarly, in a textile mill, wages paid to a weaver are direct wages.

Indirect labour cost, on the other hand, is the wages paid to those workers who are not directly engaged in converting raw materials into finished products. Such costs cannot be conveniently identified with a particular cost object. Supervisors, inspectors, clerks, instructors, peons, watchmen and cleaners are examples of indirect workers.

Organization for Accounting and Control of Labour Cost

There are mainly five departments in an organization which deal with labour. These are as follows:

Personnel department: This is a service department and is mainly concerned with the proper selection and training of workers and placing them on jobs for which they are best suited.

Engineering department: This department prepares and plans specifications of jobs makes job analysis, conducts time and motion studies, makes provision for safe working conditions and supervises production activities.

Time-keeping department: This department is concerned with recording of workers's time. The recording of time put in by workers is required not only for attendance and wage calculation purpose but also for the purpose of cost analysis and apportionment of labour cost over various jobs.

Payroll department: This department maintains a record of job classification and wage rate of each employee and performs the function of computation of wages payable to them by preparing payroll or wage sheet. It is also responsible for disbursement of wages.

Cost accounting department: This department accumulates and classifies all cost data of which labour is one important element. It analyses the payroll and prepares routine and special labour cost reports for submission to management so that proper control may be exercised on labour cost.

In this unit, you will study the important aspects of these departments for labour cost control.

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3.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and causes of labour turnover and the methods of its measurement
- Explain the various methods of time keeping and time booking

- Describe idle time and overtime and their effect on cost
- Explain time rate and piece rate systems of labour remuneration
- Classify various incentive plans of labour remuneration

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3.2 IMPORTANCE OF LABOUR COST CONTROL

The total costing of a company has an influencing share of the labour costs. These may fluctuate to increase the total cost in case there is a situation of non-productivity of labour, high labour turnover, situations of overtime, excessive idle time, incorrect entries in the wage sheets and other similar factors.

The increasing costs due to rising overhead and material costs is also a result of inefficient working of labour. This is primarily why the labour costs need to be brought down so that the overall cost of production is kept low.

The following are some of the reasons why labour cost control is important to the managers:

- To check the efficiency of workers
- To reduce the overall direct labour costs of different processes, jobs, orders etc., through the correct ascertainment and assignment of labour costs
- To assist with the absorption of overhead through direct labour cost
- To reduce the labour turnover

3.3 TREATMENT AND CONTROL OF LABOUR TURNOVER

The treatment and control labour turnover falls under the purview of personnel department.

In all business organizations, it is a common feature that some workers leave the employment and new workers join in place of those leaving. This change in work force is known as labour turnover. Labour turnover is thus defined as '*the rate of change in the composition of the labour force in an organization.*' Labour turnover varies greatly between different trades and industries. For example, where part-time and seasonal labour is employed, the rate will be higher.

Measurement of Labour Turnover

To facilitate comparisons between different periods and different undertakings, labour turnover may be expressed in a rate.

There are three alternative methods by which this rate is computed. Once a particular method is used, it should be consistently followed for comparative analysis. The methods are:

1. **Separation method:** This method takes into account only those workers who have left during a particular period. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers who have left during a period}}{\text{Average no. of workers during the period}} \times 100^*$$

$$\text{Average Number} = \frac{\text{No. of workers in the beginning} + \text{No. of workers at the end of the period}}{2}$$

*Multiplication by 100 in the given formulae indicates that the rates are in percentage.

2. **Replacement method:** This method takes into account only those new workers who have joined in place of those who have left. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers replaced during the period}}{\text{Average no. of workers during the period}} \times 100$$

If new workers are engaged for expansion programme or any other such purpose, they are not considered for this computation.

3. **Flux method:** This shows the total change in the composition of labour force due to separations and replacement of workers. Its formula is:

$$\text{Labour Turnover Rate} = \frac{\text{No. of workers who left} + \text{No. of workers replaced}}{\text{Average no. of workers}} \times 100$$

Labour Turnover due to New Recruitment: It has been stated above that workers joining the organization on account of opening of new departments or due to any type of expansion programme should be excluded while calculating the labour turnover rate. But these new workers recruited are certainly responsible for a change in the composition of labour force. Therefore, some cost accountants measure turnover rate for these new workers (excluding replacements) by the following method:

$$\text{Labour Turnover Rate} = \frac{\text{No. of new workers joining in the period (excluding replacement)}}{\text{Average no. of workers}} \times 100$$

Total number of workers joining, including replacements, is called accession. The labour turnover rate in such a case may be calculated in respect of workers joining (accession) the organization during the period which includes all workers joining due to replacements and also due to expansion. It is calculated as follows:

$$\text{Labour Turnover Rate} = \frac{\text{No. of accessions during a period}}{\text{Average no. of workers}} \times 100$$

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When labour turnover rate is computed by taking into account the number of accessions, the flux method rate will be calculated as follows:

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$$\text{Labour Turnover Rate (Flux Method)} = \frac{\text{No. of Separations} + \text{No. of replacements} + \text{No. of new workers recruited}}{\text{Average no. of workers}} \times 100$$

or

$$= \frac{\text{No. of Separations} + \text{No. of accessions}}{\text{Average no. of workers}} \times 100$$

Equivalent Annual Labour Turnover Rate: Labour turnover rate, as explained above, may be computed for a month, a quarter or for any period other than a year. It may be converted into an equivalent annual labour turnover rate by using the following formula:

$$\text{Equivalent annual labour turnover rate} = \frac{\text{Turnover rate for the period}}{\text{No. of days in the period}} \times 365 \text{ days}$$

Illustration 3.1: From the following data given by the Personnel Department, calculate the labour turnover rate by applying:

- (a) Separation method
- (b) Replacement method
- (c) Flux method

No. of workers on the payroll:

At the beginning of the month	900
At the end of the month	1,100

During the month, 10 workers left, 40 persons were discharged and 150 workers were recruited. Of these, 25 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme.

(ICWA Inter)

Solution:

$$\begin{aligned} \text{Average no. of workers} &= \frac{900 + 1,100}{2} = 1,000 \\ \text{No. of workers left} &= 10 + 40 = 50 \\ \text{1. Separation Rate} &= \frac{50}{1,000} = 5\% \\ \text{2. Replacement Rate} &= \frac{25}{1,000} \times 100 = 2.5\% \end{aligned}$$

$$3. \text{ Flux Rate} = \frac{50 + 25}{1,000} \times 100 = 7.5\%$$

***Note:** Additional workers engaged on expansion plan have not been considered.

Alternative methods produce the following rates:

$$\text{Labour turnover rate for new workers} = \frac{125}{1,000} \times 100 = \mathbf{12.50\%}$$

(excluding replacements)

$$\text{Labour turnover rate (for accessions)} = \frac{25 + 125}{1,000} \times 100 = \mathbf{15\%}$$

$$\text{Labour turnover rate (Flux Method)} = \frac{50 + 25 + 125}{1,000} \times 100 = \mathbf{20\%}$$

Causes of Labour Turnover

Labour turnover reports should be prepared regularly to be placed before the management, giving a breakdown of the causes as to why the workers left. The causes may be classified in two broad categories: (i) Avoidable causes; and (ii) Unavoidable causes.

Avoidable causes: These include:

1. Low wages and allowances
2. Unhappy relations with co-workers and supervisors
3. Unsatisfactory working conditions
4. Trade union rivalry
5. Lack of medical facilities, transport facilities, etc.
6. Inadequate job security and retirement benefits

Unavoidable causes: These include:

1. Death or retirement
2. Illness or accident
3. Domestic problems
4. Discharge on disciplinary grounds
5. Seasonal nature of business
6. Change in plant location
7. Personal dislike for job or environment
8. Marriage—particularly in the case of women workers
9. Change of job for betterment

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Effect of Labour Turnover

A certain amount of labour turnover will always take place. To a limited extent this may be welcome, particularly at the lower management level as it creates vacancies for internal promotions which acts as motivation for young and ambitious workers. Moreover, new workers bring new ideas and methods of doing work from other organizations.

Labour turnover is expensive and generally it should be minimized because it leads to increased cost of production for reasons stated below.

Cost of Labour Turnover

The cost of labour turnover may be broadly classified into two broad categories: (i) Preventive costs; and (ii) Replacement costs.

Preventive costs: These costs are those which are incurred to keep the work force satisfied and to prevent or discourage them from leaving the organization. These include:

1. Cost of personnel management—only that portion of this cost which can be attributed to the efforts of the personnel department in maintaining good relations between management and workers
2. Cost of welfare activities and services, *e.g.*, canteen meals, co-operative stores, educational and transport facilities and housing schemes
3. Cost of medical services
4. Pensions schemes—to provide security and retirement benefits
5. Extra bonus and other perquisites (in excess of those given by other similar concerns) to discourage their defecting to other undertakings

Replacement costs: These costs include all such losses and wastages arising because of the inexperienced new labour force replacing the existing one as well as the cost of recruitment and training of the new workers. These include:

1. Cost of recruitment and selection of new employees
2. Cost of training of new workers
3. Loss of output due to some time gap in recruiting new workers
4. Loss due to inefficiency of new workers
5. Cost of accidents due to lack of experience of new workers
6. Cost of extra scrap and defective work of new workers
7. Cost of tools and machine breakdown due to faulty handling by new workers

Reduction and Control of Labour Turnover

Labour turnover may be reduced by taking action on the basis of avoidable causes given earlier. The following steps may be taken in this regard:

1. Devising a suitable and satisfactory wage policy
2. Providing working conditions conducive to health and efficiency
3. Impartial and sympathetic attitude of personnel management
4. Introducing financial and non-financial incentive plans
5. Providing promotional opportunities
6. Encouraging labour participation in management
7. Introducing an effective grievance procedure
8. Strengthening the welfare measures

Treatment of Cost of Labour Turnover: The preventive cost of labour turnover should be apportioned to various departments on the basis of number of workers in each department.

Regarding the replacement costs, if the replacement is due to the fault of a particular department, it should be directly charged to that department. If labour turnover is due to the defective management policy, the replacement cost should be apportioned to various departments on the basis of number of workers in each department.

Check Your Progress

1. What are the three methods of calculating rate in labour turnover?
2. What are the avoidable causes of labour turnover?

3.4 METHODS OF TIME KEEPING AND TIME BOOKING

The calculation of time-keeping and time booking falls under the perview of time-keeping department.

The time-keeping department is an important part of a firm's system of accounting and control of labour cost. The main function of this department is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes. Thus it embraces two functions:

- (a) *Time keeping, i.e.*, recording arrival and departure time of workers for attendance purpose and for calculation of wages; and
- (b) *Time booking, i.e.*, recording time spent by workers on different jobs or processes for determining labour cost of jobs/processes.

The purpose of time recording is to provide basic data for:

- (i) Preparation of payroll
- (ii) Attendance records, to meet statutory requirements

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- (iii) Computing labour cost of a job or process
- (iv) Computing overhead cost of jobs, if based on wages or labour hours
- (v) Statistical analysis of labour records for determining productivity and control of labour cost

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Methods of Time Keeping

There are mainly three methods for recording attendance of workers.

1. Attendance register: In this method, attendance of each worker is recorded in the register maintained for this purpose. This register provides sufficient number of columns for attendance of each worker. Entries in the arrival and departure columns may be made by the foreman or the worker himself. If workers are literate, they should be required to sign against their entries to avoid any dispute later on. Separate attendance register may be maintained in each department if the number of workers is large, otherwise one register will serve the purpose.

This method is quite simple and cheap. But it can be used only when the number of workers is small. In such cases, generally there is no need for a separate time keeper as the work is done by the foreman.

2. Token or disc method: Each worker is allotted an identification number is suitably painted or engraved on a round metal token (or disc) with a hole in it. All such tokens are hung in a serial order on a board at the factory gate. As the worker arrives, he removes his token from the board and puts it in a box kept nearby or hangs it on another board which is specially kept for this purpose. After the fixed time, the box or the second board is removed. Those coming late have to hand over their tokens personally at the time office so that exact time of their arrival can be noted.

The time office records attendance on the basis of tokens in the box. The absentees are indicated by the missing tokens. Similar procedure is followed at the departure time in the evening.

This method is not fool-proof as a worker may try to get his absentee friends marked present by dropping their tokens in the box.

3. Time-recording clocks: Unlike the first two methods, this is a mechanical method of recording attendance and proves quite useful when the number of workers is fairly large.

Each worker is allotted a Clock Card which bears his identification number, name, department, etc. These cards are kept in a rack in a serial order. There are usually two racks—an 'In' rack and an 'Out' rack. On arrival, the worker will pick up his card from the 'Out' rack, put it in the slot of the clock, press a button and the exact time is printed on the card. After this the card is put in the 'In' rack. An inspection of the 'Out' racks will reveal absentees.

A similar procedure is followed if workers leave the factory at mid-day for lunch or in the evening at close time. Clocks are adjusted so that late arrivals, early

or late leavings, overtime, etc., are automatically printed in red. The time keeper must take care to ensure that no worker places friend's card in the clock in addition to his own, so as to avoid proxy.

At the end of each week, the cards are sent to the pay office and a fresh set of cards for the ensuing week is placed in the racks.

Advantages: The main advantages of installing time-recording clocks are:

1. The method is quite economical for large concerns as the initial heavy capital expenditure in installing clocks is recovered by savings in operating expenses, *i.e.*, economy in wages of time recording staff
2. Chances of disputes are reduced as clocks provide more authentic records than hand-written documents
3. Work in connection with the preparation of wage sheets becomes easier because clock cards may be utilized for calculation of wages

The main *shortcoming* of this method is that heavy initial capital investment is required which small concerns may find difficult to afford

4. Biometric Time Clock: Biometric time-recording clock is an electronic device to record attendance of employees. It is a new generation technique which is replacing the typical time clock used to track employee attendance. Instead of employees punching a time card or logging their attendance by hand, they simply place their finger on the Fingerprint Reading Sensor or place their hand into the Hand Reader and the rest of the work is done by the machine. This device completely eliminates the time and effort required to monitor the time clock activity at punch in/out times, consequently leading to substantial cost saving and improved productivity.

The main features and advantages of biometric system are that it can:

1. Eliminate time card
2. Automatic payroll processing
3. Eliminate buddy-punching
4. Eliminate early punch hours
5. Eliminate unauthorized overtime
6. Eliminate time spent on payroll calculations
7. Accurately report employee time/attendance to payroll and HR

Time Booking

In addition to recording worker's time of arrival and departure, it is necessary to record the details of work done by the workers and the time spent on each job or process. Recording of worker's time spent on different jobs is known as time booking. The objectives of time booking are:

- (i) to ensure that the time for which a worker is paid is properly utilized;
- (ii) to ascertain the labour cost of work done;

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- (iii) to provide a basis for apportionment of overheads;
- (iv) to ascertain the idle time so as to control it.

Methods of Time-booking

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The following are the common methods of time booking:

1. **Job Ticket:** Job tickets or job cards are very commonly used for recording the time spent on each job. A card is prepared for each job and is allotted to the worker who takes up that particular job. The worker enters in this card the time of starting as well as finishing the job. After finishing the job, the worker submits his work along with his job ticket. He is then issued another job ticket for the next job. Thus, only one job ticket is issued to a worker at a time. Such job tickets also serve the purpose of authorizing the worker to carry out the job stated therein.

However, if there is a loss of time between finishing of one job and beginning of the next job, it should be entered on the idle time card so that the record of his day's activities may be complete and the time lost is not unduly charged against production. Such idle time card should also show the reasons for idle time, like machine breakdown, waiting for instructions or lack of tools or materials.

2. **Combined Time and Job Card:** This card combines the two in one—the clock card and job card, *i.e.*, it records both the attendance time as well as time spent on different jobs. Idle time is automatically revealed as the difference between attendance time and work time.
3. **Daily Time Sheet:** Each worker is daily issued a time sheet in which the time spent on each job during the day is recorded. This sheet must be completed on the same day and handed over to the foreman for signature.

The main drawback of this method is that it needs a lot of paperwork as considerable amount of time will be taken in preparing time sheets and in consolidating these records for purposes of ascertaining labour cost. However, it is suitable where the workers have to frequently change their jobs in a day, *e.g.*, maintenance workers.

4. **Weekly Time Sheet:** Weekly time sheets record almost the same information as the daily time sheet. The main difference is that instead of recording the work done for a day only, record of work carried out is entered on a weekly basis. Thus, weekly time sheets need less paperwork as compared to daily time sheets. This method proves useful where the jobs are big and their number is small, *e.g.*, building and construction work and interior decoration.

The entries in the weekly time sheets may not be accurate as some workers may make entries for two/three days together at one sitting and in the process may forget time spent on certain jobs.

5. **Piece Work Card:** This card is allotted to a worker who is paid on piece basis. This card may be made either for each individual job or for recording the work done on several jobs. If group system of piece work is in vogue, the card may be allotted to each group of workers.

Though piece rate workers are paid on the basis of number of units produced and not on the basis of time taken, recording their time spent on different jobs is essential, particularly where overheads are absorbed on the basis of labour hours. Moreover, it ensures that piece workers do not cause any interruption in production by their late arrival or early departure.

Check Your Progress

3. State the main function of the time-keeping department.
4. What is the main drawback of the daily time sheet?

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3.5 IDLE TIME AND OVERTIME

The calculation of idle and over time falls under the purview of payroll department.

Idle time represents time lost by workers who are paid on time basis. When workers are paid on time basis, some difference between the time for which they are paid and that which they actually spend on production is bound to arise. This difference is known as idle time. Idle time is defined as 'the difference between the time for which employees are paid and the employees' time booked against the cost object.' It represents the time for which they are paid but no production is obtained. For example, time lost between factory gate and the department, time when production is interrupted by machine maintenance, allowable time-offs such as rest intervals, tea breaks, etc.

Causes

Idle time may occur owing to productive, administrative or economic causes.

1. **Productive causes:** The productive causes are those which result in loss of production. These include:
 - (a) Idle time due to machine breakdown
 - (b) Power failures
 - (c) Waiting for tools and/or raw materials
 - (d) Waiting for work
 - (e) Waiting for instructions

Idle time due to productive causes is usually controllable by proper planning, strict supervision and proper maintenance of plant and machinery.

2. **Administrative causes:** Idle time is sometimes caused by administrative decisions. Thus, when there is surplus capacity of plant and machinery,

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which the management decides not to utilize, there may be some idle time due to administrative decisions. This usually happens during depressions when some of the machines have got to work below normal capacity and the regular workers are paid full amount of wages. This is because the management does not want to discharge trained workers temporarily. Such idle time arises out of abnormal situations and is generally not controllable.

3. **Economic causes:** Idle time may also be caused by fall in the demand of products, say due to severe competition, seasonal nature of certain industries like woollen goods, ice-cream, etc., where production cannot be evenly distributed throughout the year. In such cases, it is not possible to get rid of workers during slack season. Such surplus labour force is usually utilized for doing some other jobs and if such complementary jobs cannot be found, there will be some idle time which is beyond control.

Treatment of Idle Time

From the point of view of treatment in cost accounts, idle time is classified as normal and abnormal.

Normal idle time: This is that wastage of labour time which cannot be avoided and has to be borne by the employer. For example:

- (a) The time which elapses between the completion of one job and the commencement of the next.
- (b) The time taken in going from the factory gate to the department in which the worker is engaged.
- (c) Personal needs, tea breaks, rest intervals, etc.
- (d) Time spent in setting machines, etc.

The cost of normal idle time may be treated in one of the following two ways:

- (i) *As overhead cost* it may be charged to factory overheads. For this purpose, idle time is allotted a separate standing order number. This helps in its effective control.
- (ii) *As direct wages* The wage rate may be inflated to make allowance for normal loss of labour time. Thus, if a worker's production time is only 7 hours during an 8 hours day and his hourly rate of pay is ` 20, the inflated wage rate will be:

$$\frac{8 \text{ hrs}}{7 \text{ hrs}} \times ` 20 = ` 22.86 \text{ per hour.}$$

The second method is not considered very desirable as the cost of idle time should be treated separately instead of being absorbed as a part of direct labour cost. In this way, it can prove more helpful for the purpose of controlling and reducing it to the minimum.

Abnormal idle time: This is that idle time which arises due to reasons in no way connected with the usual routine of manufacture and for which employer must pay. For example:

- (a) Time lost due to breakdown of machinery
- (b) Strikes and lockouts
- (c) Time lost in waiting for tools and/or raw materials
- (d) Accidents, etc.

Abnormal idle time is attributed to defective planning, inefficiency or bad luck. Payment for such idle time is not included in cost and is transferred to Costing Profit and Loss Account.

Control of Idle Time

From control point of view, idle time should be divided into controllable and uncontrollable. Idle time arising due to controllable causes should be properly analysed and responsibility should be fixed on appropriate individuals. It is advisable to prepare an Idle Time Card showing the analysis of idle time so that action may be taken, where necessary.

The following steps may be taken to control idle time:

- (a) Production should be properly planned so that imbalances in production are avoided or reduced.
- (b) Repairs and maintenance of plant and machinery should be regularly undertaken to avoid breakdown.
- (c) Raw materials, tools and instructions should reach the worker well in time so that no time is wasted in waiting for them.
- (d) Supervision should be tightened.

Overtime

Overtime occurs when a worker works beyond normal working hours. The normal working hours are laid down in the Factories Act. Accordingly, any worker working for more than 9 hours per day or more than 48 hours per week is entitled to overtime payment. The Factories Act also provides for payment of overtime wages at double the normal rates of wages. Overtime is defined '*as the time spent beyond normal working hours, which is usually paid at higher rate than the normal time rate.*' The extra amount beyond normal wages and salaries is called overtime premium. The overtime work is, therefore, a costly affair and should be avoided as far as possible due to the following disadvantages attached to it.

Disadvantages of Overtime

- (a) It leads to excessive labour cost.
- (b) During overtime hours, labour productivity is decreased because of diminishing labour efficiency.

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- (c) It puts an extra strain on plant and machinery.
- (d) It has a bad effect on the health of workers.
- (e) Certain overheads, like lighting cost, increase because of work in the evening.
- (f) Workers may develop a tendency to work in overtime and take overtime wages as a part of their normal earnings.
- (g) If overtime work is not properly distributed among the workers, it may lead to discontent.

Treatment of Overtime

Payment for overtime consists of two elements:

- (a) Normal amount of wages, salaries, etc.
- (b) Additional amount expended on overtime work, *i.e.*, overtime premium. This is over and above the normal amount of wages and salaries.

The normal amount of wages is charged to the cost unit or production order on which the worker is working. The difficulty lies in the treatment of overtime premium. This overtime premium is charged differently, under different circumstances, as follows:

1. **When overtime is job specific:** When overtime is spent on a specific job at the request of a customer due to urgency of work and the customer agrees to the entire charge of overtime premium, it should be charged to the job or work order concerned.
2. **When overtime is due to general pressure:** When a business receives more orders than it can cope with in the normal working hours and there is general pressure of work, it may be treated by one of the following two methods:
 - (i) Treat overtime premium as direct labour cost by inflating the wage rate and charging to different jobs at the inflated/average rate.
 - (ii) Alternatively, it may be treated as indirect wages and included in overheads.
3. **When overtime is due to abnormal reasons:** Overtime arising due to abnormal factors, like accident, power failure, fire and machine breakdown, or due to factors like defective planning or faulty management, it should not be included in the cost of products and it should be charged to costing Profit and Loss Account.

Control of Overtime

In order to keep the overtime premium to the minimum, proper control must be exercised on it. The following steps should be taken for this purpose:

- (a) All overtime work should be duly authorized by the Works Manager.

- (b) Overtime cost should be separately recorded for each department for proper planning in future.
- (c) Total overtime premium should be regularly reported to the Works Manager.
- (d) When overtime becomes a permanent feature, say, due to shortage of plant capacity, steps may be taken to install additional plant and machinery or introduce an additional shift to cope with additional work.

NOTES**Check Your Progress**

- 5. How is payment for abnormal idle time dealt with?
- 6. What are the two elements of payment for overtime?

3.6 SYSTEMS OF WAGE PAYMENT

Labour remuneration is a concept concerned with the cost accounting department.

The term 'remuneration' is used to cover the total monetary earnings of employees. It includes wages according to time or piece basis and other financial incentives.

The efficiency in production can be increased by using improved equipment, by more effective utilization of plant and by adoption of better methods of production, but the most important contribution must come from labour. Accordingly, the methods of remuneration of labour should be so designed as to encourage workers to do their best. Methods of remuneration which allow high wages to be paid have the effect of increasing labour cost but may also result in increased production and productivity, thereby reducing the labour cost per unit. On the other hand, low wages generally result in high labour cost per unit due to lower productivity, high rate of labour turnover, etc.

Requisites of a Satisfactory System of Labour Remuneration

Before deciding on a particular system of labour remuneration, the following factors should be taken into account:

1. The system should be such as will produce the best quality and quantity of work.
2. It should be satisfactory from the point of view of both employer and employee and reward should be related to effort.
3. The scheme should be clearly defined and intelligible to workers. The workers should be able to calculate wages on their own. If the workers do not understand the system, they may view it with suspicion.
4. It should guarantee a minimum living wage to each worker, irrespective of his efficiency.
5. No maximum limit should be placed on the amount of individual earnings.

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6. The earnings of the workers should not be affected by matters beyond their control. They should not, for example, be penalized for production losses due to power failure, machine breakdown, etc., for which they are not responsible.
7. It should reduce labour turnover and labour absenteeism.
8. The system should be flexible so that changes may be introduced as and when necessary.
9. The system should be capable of operation without excessive clerical work. Those methods should be avoided which demand much detailed recording of time, quantity of output, etc.
10. If possible, the system adopted should be one which is in vogue in that particular industry or in that particular locality.

Methods of remuneration

There are two basic methods of labour remuneration:

- (a) Time Rate System
- (b) Piece Rate System

In addition, there are a number of incentive plans to induce workers to work hard so as to produce more and earn more.

3.6.1 Conventional Methods

You will first study the conventional methods.

Time Rate System

Under time rate system, workers are paid according to the time for which they work. Payment may be on hourly basis, daily basis or monthly basis. In this system, no consideration is given to the quantity and quality of work done. When payment is made on hourly basis, total wages payable are calculated as follows:

$$\text{Wages} = \text{No. of hours worked} \times \text{Rate per hour}$$

For example, if a worker is paid at the rate of ₹ 25 per hour, his wages for a day of 8 hours will be: $8 \text{ hours} \times ₹ 25 = ₹ 200$.

Though this is the oldest system of wage payment, it is still commonly used these days.

Suitability: Time wage system is suitable for the following type of situations:

- (i) Where quality of work is more important than quantity, *e.g.*, high class tailoring.
- (ii) Where output cannot be measured in quantitative terms, *e.g.*, in the case of indirect workers, like watchman, cleaners and sweepers

- (iii) Where output is beyond the control of the worker, *e.g.*, in process industries the flow of work is regulated by the speed of conveyor belt or where the work of a worker is dependent on the work of other workers.
- (iv) Where work is being done on a small scale so that close supervision is possible.
- (v) Where the worker is a learner or an apprentice.

Advantages: The main advantages of time rate system are:

1. ***Simplicity:*** The system is simple and calculation of wages is easily understood by the workers.
2. ***Security to workers:*** Workers are assured of a certain amount of wages payable even if there is stoppage of work due to power failure, machine breakdown, etc. This gives a sense of security to workers.
3. ***Quality of work:*** As this method does not give weight to the quantity of work done, workers can concentrate on the quality of goods produced. Thus, the quality of work under this method is better.
4. ***Accepted by trade unions:*** Trade unions mostly favour this method because it treats all workers alike and no distinction is made between efficient and inefficient workers.
5. ***Economical:*** Under this method, no detailed records are required to be maintained regarding the work done by workers. This results in saving of clerical costs. Moreover, workers avoid over-speeding and cause less damage to plant and machinery and also materials. This also results in economy.

Disadvantages: The main disadvantages are:

1. ***No incentive:*** It offers no positive inducement to workers to improve performance as it does not distinguish between efficient and inefficient workers.
2. ***Low quantity:*** When workers are paid on time basis, they tend to be slow in work. This results in lower production quantity.
3. ***Extra supervision costs:*** Under this method, extra supervision is needed so that workers do not waste time. Appointment of additional supervisors increases cost.
4. ***Costing difficulties:*** From costing point of view, it creates difficulties in the calculation of labour cost per unit because the output is constantly, fluctuating.
5. ***Idle time:*** Workers waste a lot of time, resulting in increase in idle time.

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Piece Rate System

Wages under this system are paid according to the quantity of work done. A rate is fixed per unit of production and wages are calculated by the following formula:

$$\text{Wages} = \text{Rate per unit} \times \text{No. of units produced}$$

For instance, if rate per unit is ₹ 17 and during a day a worker has completed 10 units, then his wages will be ₹ 17 × 10 units = ₹ 170.

This method does not give any consideration to the time taken by the worker in completing the work. Only quantity of work is taken into account for calculating wages.

Suitability of piece rate system: Conditions under which piece rates may be usefully employed are:

- (a) Where production is standardized and repetitive in nature
- (b) When the aim is continuous maximum production
- (c) Where the output of workers can be measured
- (d) Where workers continue at the same job for long periods
- (e) Where the standard time required to complete a job can be measured accurately

Advantages: Piece rate system has the following advantages:

1. **Incentive to efficient workers:** As remuneration is in proportion to the worker's effort, the method provides a strong incentive to work more.
2. **Increase in production:** Each worker tries his best to produce more to earn higher wages. This results in increase in production.
3. **Lower cost:** On account of increase in production, fixed cost per unit is reduced resulting in higher profit.
4. **Equitable:** This system is more equitable than time rate system because wages are paid according to the efficiency of each worker.
5. **Decrease in the need for supervision:** Strict supervision is not necessary because the workers are themselves interested in maximizing their earnings through the maximization of output.
6. **Simplifies costing:** As wages are paid at a rate per unit, this method simplifies cost ascertainment because labour cost per unit is known in advance.
7. **Simple and easy:** This method is simple and is easily understood by the workers.

Disadvantages: Piece rate system suffers from the following limitations:

1. **Poor quality of work:** This method lays too much emphasis on quantity of production and ignores quality of work. In order to maximize their wages,

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workers may try to produce more and more without caring for the quality of production.

2. **No security of wages:** This system does not guarantee a minimum wage to a worker. If a worker is not able to complete his day's work, for any reason, he is paid less wages. Thus, earnings of workers are uncertain.
3. **Misuse of materials and equipment:** In the greed to produce more, workers may cause wastage of materials and damage to plant and machinery.
4. **Injurious to health of workers:** In an effort to earn more wages, workers try to work excessively and with speed. This proves injurious to the health of workers.
5. **Opposed by trade unions:** Piece rate system is generally opposed by trade unions because it creates inequality in the wages of workers. Slow and inefficient workers feel jealous of the higher wages of their fellow workers.
6. **Difficulties in fixing piece rate:** Fixing equitable piece rate is quite a difficult task and may require considerable amount of work in the form of time studies.
7. **Unsuitable in certain cases:** This method does not suit where work is of artistic and refined natures.

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3.6.2 Incentive Wage Plans

Both time rate system and piece rate system, discussed above, have their merits and demerits. Incentive plans attempt to combine the good points of both the systems.

The primary purpose of an incentive plan is to induce a worker to produce more to earn a higher wage. Naturally, producing more in the same period of time should result in higher pay for the worker. Because of greater number of units produced, it should also result in a lower cost per unit for fixed factory cost and also for labour cost.

Principles of a Good Incentive Scheme

A good incentive scheme should have the following features:

1. The scheme should be simple and easily understandable by workers so that a worker should be able to calculate his own wage easily.
2. The scheme should be fair to both employer and employee. It should link reward with effort.
3. The cost of operating the scheme should be reasonably low.
4. The standard of performance should be scientifically set and should be within the reasonable reach of an average worker.
5. No upper limit should be put on the earnings of workers.
6. The scheme should have the approval of workers and the union.

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7. No worker should suffer a deduction of earnings for factors beyond his control such as machine breakdown, power failure, etc.
8. The scheme should provide a satisfactory system of supervision and production control.
9. The scheme should be conducive to the setting up of standard costs and budgetary control.
10. Standards once set should not be changed unless there is a change in the method of production or other factors.
11. The scheme must be relatively permanent and should not be frequently changed.
12. Indirect workers should also be included under the incentive scheme.
13. Workers should be properly educated about the scheme and motivated to attain high standards.

A. Types of Individual Plans

1. Halsey Premium Plan

This plan was introduced by F A Halsey in 1891. It is a simple combination of time and piece rate systems. The main *features* of this plan are as follows:

- (a) Workers are paid at a rate per hour for the actual time taken by them.
- (b) A standard time is set for each piece of work, job or operation.
- (c) If a worker takes standard time or more than the standard time to complete his work, he is paid wages for the actual time taken by him at the time rate. In other words, time wages are guaranteed.
- (d) If a worker takes less than the standard time, he is paid a bonus equal to 50% of the time saved at the time rate fixed. Thus, under this system, total earnings of a worker are equal to wages for the actual time taken by him plus a bonus.

The formula for calculating bonus and total earnings is as follows:

$$\text{Bonus} = 50\% \text{ of } [\text{Time saved} \times \text{Time rate}]$$

$$\text{Total earnings} = \text{Time rate} \times \text{Time taken} + 50\% \text{ of } [\text{Time saved} \times \text{Time rate}]$$

Advantages of Halsey Plan

1. It is easy to understand.
2. It guarantees a minimum time wage to all the workers. Thus, slow and relatively inefficient workers have nothing to fear from it.
3. The benefit resulting from savings in time is equally divided between worker and employer.
4. Bonus is separately calculated for each job. Time saved by a worker on one job is not adjusted against excess time taken by him on another job.

Disadvantages of Halsey Plan

1. Workers do not like the idea of sharing the benefit of time saved by them, with the employer.
2. It does not provide the employer with full protection against high rate setting.
3. Extra efficiency of a worker is not fully rewarded.

2. Halsey Weir Plan

This method is precisely the same as Halsey Plan except that in Halsey Weir Plan the bonus is equal to 30% of the time saved.

3. Rowan Plan

This plan is also similar to Halsey Plan except in the calculation of bonus. The main features of Rowan Plan are as follows:

- (a) Wages are paid on time basis for the actual time worked by the workers.
- (b) A standard time is determined for each piece of work or job.
- (c) If a worker completes his work in standard time or in more than the standard time, he is paid wages for the time actually taken by him.
- (d) If a worker completes his work in less than the standard time, he is entitled to a bonus.
- (e) Bonus is that proportion of wages of actual time taken which the time saved bears to the standard time. Its formula is:

$$\text{Bonus} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Time rate}$$

$$\text{Earnings} = (\text{Time taken} \times \text{Time rate}) + \text{Bonus}$$

Advantages of Rowan Plan

1. Like Halsey plan, it provides guaranteed minimum wages to workers.
2. It protects the employer against loose rate setting.
3. It pays a higher bonus than that under the Halsey plan, upto 50 per cent of the standard time saved.
4. The worker is not induced to rush through the work because if time saved is more than 50 per cent of the standard time, the bonus increases at a decreasing rate.
5. It provides good incentive for comparatively slow workers and beginners.

Disadvantages of Rowan Plan

1. Calculation of bonus is complicated and may not be easily understood by workers who may suspect the employer's motives.
2. In case of extra efficient workers, bonus is less than under Halsey Plan. This is so when the time saved is more than the time taken.

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4. Taylor's Differential Piece Rate System

This system was introduced by F W Taylor, the father of scientific management. The main *features* of this incentive plan are as follows:

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- (a) Day wages are not guaranteed, *i.e.*, it does not assure any minimum amount of wages to workers.
- (b) A standard time for each job is set very carefully after time and motion studies.
- (c) Two piece rates are set for each job—the lower rate and the higher rate. The lower piece rate is payable where a worker takes a longer time than the standard time to complete the work. Higher rate is payable when a worker completes the work within the standard time. In other words, lower piece rate is payable to inefficient workers and higher piece rate is payable to efficient workers. Usually, these rates are 83 per cent of the piece work rate for inefficient workers and 175 per cent of the piece work rate for efficient workers.

Advantages and Disadvantages of Taylor's Plan: This plan provides strong incentive to efficient workers. The calculation of wages is also not difficult and can be understood by the workers. However, the system suffers from the following shortcomings:

- (a) It severely penalizes the workers who produce slightly less than the standard output.
- (b) It does not guarantee minimum wages.
- (c) It makes wide discrimination between efficient and inefficient workers and thus creates rivalry. This may weaken their unity.

5. Merrick's Differential Piece Rate System (Multiple Piece Rate System)

This is a modification of Taylor's plan. While Taylor prescribed two rates, Merrick's plan lays down three rates. The lowest rate is for the beginners, the middle rate is for the developing workers and the highest rate is for the highly efficient workers. Efficiency of the workers is determined in terms of percentages. Thus, the rates of remuneration are:

<i>Level of efficiency</i>	<i>Piece rate</i>
Upto 83%	Ordinary piece rate
83% to 100%	110% of ordinary piece rate
Above 100%	120% of ordinary piece rate

Like Taylor's plan, this method also does not guarantee minimum wages. The general criticism levelled against Taylor's plan also applies to it except that it lessens the punitive character of Taylor's plan.

6. Gantt's Task and Bonus Plan

The main *features* of this plan are as follows:

- (a) Day wages on time basis are guaranteed to all workers.
- (b) This plan is a combination of time rate, differential piece rate and bonus.
- (c) A standard is set and remuneration is calculated as follows:
 - (i) When output is below standard—payment at time rate.
 - (ii) When output is at standard—payment at time rate plus 20% bonus.
 - (iii) When output is above standard—payment at high piece rate.

The advantage of Gantt's Task and Bonus Plan is that it provides security for the less efficient and a high incentive for a more efficient worker. Calculation of wages under this plan is also simple to understand.

7. Emerson's Efficiency Plan

This scheme is designed to give encouragement to the slow workers to perform better than before. Time wages are guaranteed. The standard output in this plan is fixed to represent 100% efficiency. A bonus is paid to a worker whose efficiency exceeds 66%. As efficiency increases, the bonus also increases gradually in steps, at a stated rate, so that at 100% efficiency, bonus would rise to 20% of wages. Beyond 100% the bonus increases at 1% of the basic rate for each 1 per cent increase in efficiency. It can thus, be shown as below in a tabular form:

<i>Efficiency</i>	<i>Bonus</i>
(a) Below 66 $\frac{2}{3}$ %	No bonus (Only time wages)
(b) 66 $\frac{2}{3}$ % to 100%	Bonus increases in steps and rises to 20% at 100% efficiency
(c) Over 100%	20% bonus plus 1% bonus for each increase of 1% in efficiency

Advantages

1. It guarantees minimum time wages
2. It is easy to understand and simple to operate
3. It provides an incentive to beginners and even to those who are less proficient.

Disadvantage

The incentive offered is considered too inadequate to motivate efficient and ambitious workers.

8. Bedaux Plan

In this plan, standard time of each job is determined in minutes known as Bedaux points or *B*'s. One *B* unit represents the amount of work which an average worker can do under ordinary conditions in one minute. The standard time is determined by work study and each job is assigned a number of *B*'s.

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Under this system, the worker receives his daily or hourly rate plus 75 per cent of the points saved, multiplied by one sixtieth of his hourly rate. The remaining balance of 25 per cent is paid to supervisors and indirect workers.

Thus:

$$\text{Bonus} = \frac{\text{No. of } B\text{'s saved} \times \text{hourly rate}}{60} \times \frac{75}{100}$$

$$\text{Earnings} = (\text{Hours worked} \times \text{Hourly rate}) + \text{Bonus}$$

Time wages are thus guaranteed to those who are not able to save any points. It may be noted that the Bedaux Plan is not different from the Halsey Plan except that bonus is 75 per cent of the time saved instead of 50 per cent. The system is particularly suitable where output can be measured with greater accuracy and conditions are standardized. To make the system a success, very accurate time study is required for each operation to set standard time in terms of standard minutes.

Advantages

1. It guarantees minimum wages to all workers.
2. Output of workers is measured in terms of common units known as *B*'s. This makes easier the task of recording production of workers and comparing it with standard. Suitable data for production control becomes easily available.
3. As the benefit of 25 per cent of time saved is given to supervisors and indirect workers, Bedaux Plan may be extended to the department as a whole, including indirect workers.

Disadvantages

1. Detailed calculation of '*B*' units for a large number of jobs involves enormous amount of clerical cost. This is because accurate time study is required for every operation. This system is thus comparatively costly.
2. This system is generally not preferred by workers because they do not get the full benefit of the time saved by them.

B. Group Bonus Plans

In the schemes discussed so far, the bonus to be paid has been calculated on the basis of individual worker's performance. But there are certain jobs or operations which are required to be done collectively, by a group of workers. In continuous production, for example, work flows in a sequence or in assembly work for televisions, radios, scooters, etc., a team of workers is engaged on various operations. As such, it becomes necessary to introduce bonus schemes for collective efficiency of the group as a whole. The intention is to create a collective interest in the work. The total bonus determined is distributed among the members of the group on an equitable basis. The following bases of distribution are commonly used:

- (a) Equal distribution, if skill and grade of workers in the group is uniform
- (b) On the basis of time wages of each worker
- (c) In proportion to the time rate of each worker, where each worker has devoted equal time
- (d) In a fixed ratio determined in advance on the basis of merit rating

Suitability: Group bonus schemes may be usefully employed in the following circumstances:

- (a) Where it is not possible to measure the performance of each individual worker
- (b) Where the workers constituting a group possess the same or equal skill and efficiency
- (c) Where the number of workers constituting a group is not very large
- (d) Where production is dependent on the collective effort of a group of workers as a whole

Advantages: The main advantages of group bonus schemes are as follows:

1. They encourage cooperation and team work among the workers.
2. They reduce absenteeism because an absent member weakens the group and most workers do not like to let down their team.
3. The calculation of wages requires less clerical work as it involves recording of the output of the group and not of individual workers.
4. Supervision work is reduced because less efficient workers are taken care of by the efficient ones.
5. Indirect workers can also be included in the scheme by allocating such workers to the groups.

Disadvantages: The main disadvantages of the system are:

1. Group bonus scheme is unfair to efficient and hard working workers of the group because an efficient worker is penalized for inefficiency of other workers in the group.
2. There may be difficulties regarding fixing the amount of bonus and the basis of its distribution among workers in the group.
3. There may be some discontentment when workers in the group are of widely varying skills and efficiencies.

Types of Group Incentive Plans

1. *Priestman Plan*

This plan was first used by M/s Priestman Bros Ltd of Hull in 1917. According to this plan, a standard is set for the output to be achieved weekly by a factory as a whole. This standard may be in terms of units or points (Bedaux Plan). The

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actual output of the factory is compared with the standard and if actual exceeds standard, the employees are paid a bonus in proportion to the increase.

2. *Towne Plan*

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This plan was introduced in 1886 by Towne in the United States of America. Under this plan, actual labour cost is compared with the predetermined standard set for labour cost. If the labour cost is less than the standard so set, 50% of the saving so effected is distributed as bonus to individual workers *prorata* with the wages earned. The supervisory staff also gets a part of this bonus and thus encouragement is provided to reduce cost.

3. *Rucker Plan (Share of Production Plan)*

Under this plan, labour receives a constant proportion of the 'added value'. The term '*added value*' is defined by CIMA as 'the change in market value resulting from an alteration in the form, location or availability of a product or service, excluding the cost of bought-out materials or services.' Value added is not the same thing as conversion cost as it also includes profit. In this plan, ratio of wages to added value is determined and if the ratio of wages reduces because of increase in added value, bonus payment is made to bring the reduced wage ratio in level with the predetermined ratio.

Check Your Progress

7. State two advantages of piece rate system.
8. Name the incentive plan in which three rates are prescribed.

3.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The three methods of calculating rate are:
 - Separation method
 - Replacement method
 - Flux method
2. The avoidable causes of labour turnover are:
 - Low wages and allowances
 - Unhappy relations with co-workers and supervisors
 - Unsatisfactory working conditions
 - Trade union rivalry
 - Lack of medical facilities, transport facilities, etc
 - Inadequate job security and retirement benefits

3. The main function of the time-keeping department is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes.
4. The main drawback of the daily time sheet is that it needs a lot of paperwork as considerable amount of time will be taken in preparing time sheets and in consolidating these records for purposes of ascertaining labour cost.
5. The payment for abnormal idle time is not included in cost and is transferred to Costing Profit and Loss Account.
6. Payment for overtime consists of two elements:
 - (a) Normal amount of wages, salaries, etc.
 - (b) Additional amount expended on overtime work, i.e., overtime premium
7. Two advantages of piece rate system are:
 - **Incentive to efficient workers:** As remuneration is in proportion to the worker's effort, the method provides a strong incentive to work more.
 - **Increase in production:** Each worker tries his best to produce more to earn higher wages. This results in increase in production.
8. It is Merrick's Differential Piece Rate System, in which three rates are prescribed. The lowest rate is for the beginners, the middle rate is for the developing workers and the highest rate is for the highly efficient workers.

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3.8 SUMMARY

- In all business organizations, it is a common feature that some workers leave the employment and new workers join in place of those leaving; this change in workforce is known as labour turnover.
- Total number of workers joining, including replacements, is called accession; the labour turnover rate in such a case may be calculated in respect of workers joining (accession) the organization during the period which includes all workers joining due to replacements and also due to expansion.
- Labour turnover reports should be prepared regularly to be placed before the management, giving a breakdown of the causes as to why the workers left.
- The cost of labour turnover may be broadly classified into two broad categories—(i) Preventive costs, and (ii) Replacement costs.
- The preventive cost of labour turnover should be apportioned to various departments on the basis of number of workers in each department.
- Work measurement is a technique of establishing normal or standard times after standardization of methods and establishment of a measure for the work contents of jobs or operations.

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- Job analysis is the process of determining the tasks which comprise the job and the skills, knowledge, abilities and responsibilities required of the worker for its successful performance.
- The time-keeping department is an important part of a firm's system of accounting and control of labour cost; the main function is to accurately record each worker's time of arrival and departure in the factory and also the time spent on different jobs or processes.
- There are mainly three methods for recording attendance of workers: (i) attendance register, (ii) token or disc method, and (iii) time recording clocks.
- The appointment of casual workers is a very common source of fraud in the payment of wages; it is, therefore, very important to have a proper control over their appointments, their time of work and payment of their wages.
- Idle time due to productive causes is usually controllable by proper planning, strict supervision and proper maintenance of plant and machinery.
- According to the Factories Act, any worker working for more than 9 hours per day or more than 48 hours per week is entitled to overtime payment; the Act also provides for payment of overtime wages at double the normal rates of wages.
- The cost of paid leave cannot be charged to any work order or cost unit since no work is done during this period. It is, therefore, treated as indirect labour cost and charged to overheads.
- The analysis of labour cost is made on a document known as Wages Analysis Sheet or Wages Abstract.
- Methods of remuneration which allow high wages to be paid have the effect of increasing labour cost but may also result in increased production and productivity, thereby reducing the labour cost per unit.
- Under time rate system, workers are paid according to the time for which they work; and payment may be on hourly basis, daily basis or monthly basis.
- Under Halsey Plan and Rowan Plan, earnings per hour of workers keep on increasing.
- To make the Bedaux plan system a success, very accurate time study is required for each operation to set standard time in terms of standard minutes.
- In Rucker plan, ratio of wages to added value is determined and if the ratio of wages reduces because of increase in added value, bonus payment is made to bring the reduced wage ratio in level with the pre-determined ratio.
- A co-partnership scheme may be arranged in conjunction with a profit sharing scheme, whereby the bonus to workers is to be retained as an investment in the company; the investment may be in the form of special shares not carrying voting rights but entitled to a fixed dividend or in the form of a loan carrying higher rate of interest.

- Non-monetary incentives help in attracting better workers, reduce labour turnover and absenteeism, promote better industrial relations, encourage loyalty and keep the workers happy and satisfied.
- The three methods of recording attendance of workers include - attendance register, token or disc method and time recording clocks.

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3.9 KEY WORDS

- **Flux method:** This shows the total change in the composition of labour force due to separations and replacement of workers.
- **Idle time:** It represents time lost by workers who are paid on time basis.
- **Preventive costs:** These costs are incurred to keep the workforce satisfied and to prevent or discourage them from leaving the organization.

3.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. How is labour turnover measured?
2. What are the causes of labour turnover?
3. Distinguish between time keeping and time booking.
4. What is the treatment of overtime?

Long Answer Questions

1. Discuss labour turnover due to new recruitment.
2. Describe the effect, costs, reduction and control of labour turnover.
3. From the following information, calculate the labour turnover rate and labour flux rate:
 - Number of workers at the beginning of the year 3,800
 - Number of workers at the end of the year 4,200

During the year, 40 workers leave while 160 workers are discharged. 600 workers are recruited during the year. Of these, 150 workers are recruited because of leavers and the rest are engaged in accordance with an expansion scheme.
4. Discuss, in detail, the methods of time-booking.
5. Distinguish between time wage system and piece wage system. State their relative merits and demerits.

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6. Examine the concept and treatment of idle time. Explain the following methods of wage payment:
 - Taylor's Different Piece Rate System
 - Rowan Scheme
 - Emerson's Efficiency Plan
7. Explain the methods and records of time keeping. What are the functions of time keeping records?

3.11 FURTHER READINGS

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UNIT 4 OVERHEADS

Structure

- 4.0 Introduction
- 4.1 Objectives
- 4.2 Meaning and Types of Overhead Cost
 - 4.2.1 Classifications of Overhead Costs
 - 4.2.2 Standing Order Numbers (Codification of Overheads)
- 4.3 Overheads Distribution
 - 4.3.1 Collection of Overheads
 - 4.3.2 Allocation and Apportionment Overheads (Production): Main Methods
- 4.4 Absorption of Overheads (Production): Main Methods
 - 4.4.1 Types of Overhead Rates
- 4.5 Administration, Selling and Distribution Overheads
- 4.6 Under-Absorption and Over-Absorption of Overheads
- 4.7 Answers to Check Your Progress Questions
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- 4.9 Key Words
- 4.10 Self Assessment Questions and Exercises
- 4.11 Further Readings

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4.0 INTRODUCTION

Overhead expenses are all costs on the income statement except for direct labour, direct materials and direct expenses. Overhead costs are usually measured in monetary terms, but non-monetary overhead is possible in the form of time required to accomplish tasks.

As per Harper, overheads 'are those costs which do not result from the existence of individual costs units'. Blocker and Weltmer define overhead costs as 'the operating costs of a business enterprise which cannot be traced directly to a particular unit of output.'

Accounting and control of overhead costs is more complex than that of other elements of cost, i.e., direct materials and direct labour. This is because overheads by definition, are indirect costs which cannot be conveniently allocated to cost units. Hence, there arises the knotty problem of apportioning these indirect costs to cost centres and cost units. In this unit, you will study about the classification of overheads, the absorption of overhead and its main methods.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Analyse the classification of overhead costs according to functions, elements and behaviour variability

- Discuss the inclusions of primary and secondary distribution
- Describe the process of the absorption of overheads
- Explain the methods of overhead absorption
- Differentiate between over and under absorption

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4.2 MEANING AND TYPES OF OVERHEAD COST

Total cost may be classified into direct cost and indirect cost. The total of all direct costs (*i.e.*, direct material cost, direct labour cost and direct expenses) is known as *Prime cost* and the total of all indirect costs (*i.e.*, indirect material cost, indirect labour cost and indirect expenses) is termed as *Overhead cost*. Various other names of overheads are: (a) oncost; (b) supplementary cost; (c) burden; (d) non-productive cost, etc.

Thus, overhead cost is the total of all indirect expenditure. It comprises those costs which the cost accountant is either unable or unwilling to allocate to particular cost units.

Accounting and control of overhead costs is more complex than that of other elements of cost, *i.e.*, direct materials and direct labour. This is because overheads by definition, are indirect costs which cannot be conveniently allocated to cost units. Hence, there arises the knotty problem of apportioning these indirect costs to cost centres and cost units.

4.2.1 Classifications of Overhead Costs

Overhead costs may be classified according to:

1. Functions
2. Elements
3. Behaviour

1. Classification according to Functions

The main groups of overheads on the basis of this classification are as follows:

- (a) **Production overheads:** Also termed as factory overheads, works overheads or manufacturing overheads, they are indirect expenditures incurred in connection with production operations. They are the aggregate of factory indirect material cost, indirect wages and indirect expenses. Unlike direct materials and direct labour, production overheads are an invisible part of the finished product. Examples of these overheads are: lubricants, consumable stores, indirect wages, factory power and light, depreciation of plant and machinery, depreciation of factory building, insurance of plant and factory building, storekeeping expenses, repairs and maintenance.
- (b) **Administration overheads:** These overheads are of general nature and consist of all costs incurred in the direction, control and administration

(including secretarial, accounting and financial control) of an undertaking, which are not related directly to production or selling and distribution function. Examples are: general management salaries, audit fees, legal charges, postage and telephone, stationery and printing, office rent and rates, office lighting and salaries of office staff. These overheads are also known as office overheads or general overheads.

- (c) **Selling and distribution overheads:** *Selling overheads* are the cost of seeking to create and stimulate demand or of securing orders. Examples: advertising, salaries and commission of sales personnel, showroom expenses, travelling expenses, bad debts, catalogues and price lists.

Distribution overheads comprise all expenditures incurred from the time product is completed in the factory till it reaches its destination or customer. It includes packing cost, carriage outward, delivery van expenses, warehousing costs, etc.

Selling overheads and distribution overheads are both related to sales function and thus are combined into one category of selling and distribution overheads. These are often referred to as '*after production costs*' because these costs are incurred after production work is over.

2. Element-wise Classification

Under this method, the classification is done according to the nature and sources of the expenditure. This method follows logically from the definition of overhead costs. On this basis, expenses are classified under three main groups given below:

- (a) **Indirect materials:** They are material costs, which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units. Examples are stationery, coal, lubricants and tools for general use.
- (b) **Indirect wages:** Indirect wages are those which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units. Examples are wages of sweeper, idle time wages, maintenance and repair wages, foreman's pay and chowkidar's pay.
- (c) **Indirect expenses:** Expenses which cannot be allocated but which are to be apportioned to or absorbed by cost centres or cost units are indirect expenses. For example, power, depreciation, insurance, taxes and rates and rent.

3. Classification according to Behaviour or Variability

Different overhead costs behave in different ways when volume of production changes. On the basis of behaviour, overheads may be classified into: (a) Fixed overheads; (b) Variable overheads; and (c) Semi-fixed or semi-variable overheads.

Fixed overheads: These overheads remain unaffected or fixed in total amount by fluctuations in volume of output. Examples are rent and rates, managerial salaries, building depreciation, postage, stationery and legal expenses.

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Variable overheads: This is the cost which, in aggregate, tends to vary in direct proportion to changes in the volume of output. Variable overheads per unit remain fixed. Examples are indirect materials, indirect labour, salesmen's commission, power, light, fuel, etc.

Semi-variable overheads: These overheads are partly fixed and partly variable. In other words, semi-variable overhead costs vary in part with the volume of production and in part they are constant, whenever there is a change in volume of production. Examples are supervisory salaries, depreciation, repairs and maintenance, etc.

Segregation of Semi-variable Costs

The main purpose of classifying overhead costs into fixed and variable is to help the management in decision making and control of expenditure. As such, the semi-variable costs may present some problems and thus the cost accountant must split them into fixed and variable components. In other words, the extent to which an item of semi-fixed or semi-variable cost is fixed or variable has to be determined. The following methods are used for this purpose:

1. High and Low Points Method

Under this method, semi-variable costs at various level of output are considered. The difference between the highest and the lowest volume of output and the difference between the corresponding costs are worked out. Then the variable element per unit of output is calculated by applying the following formula:

$$\text{Variable element per unit} = \frac{\text{Difference in semi-variable costs (₹)}}{\text{Difference in output (units)}}$$

Illustration 4.1: Segregation of Semi-variable Costs into fixed and variable elements.

<i>Month</i>	<i>Output (units)</i>	<i>Semi-variable Cost (₹)</i>
January	80	2,200
February	40	1,600
March	120	2,800
April	160	3,400
May	200	4,000
June	140	3,100

Solution: Highest production is 200 units in May and lowest is 40 units in February.

Thus:

	<i>Output Units</i>	<i>Semi-variable cost ₹</i>
May	200	4,000
February	40	1,600
Difference	<u>160</u>	<u>2,400</u>

$$\text{Variable element per unit} = \frac{\text{`2,400}}{160 \text{ units}} = \text{`15 per unit}$$

$$\text{Variable element in February} = 40 \text{ units} \times \text{`15} = \text{`600}$$

$$\begin{aligned} \text{Fixed element in February} &= \text{Semi-variable cost} - \text{Variable cost} \\ &= 1,600 - 600 = \text{`1,000} \end{aligned}$$

Thus, out of a total semi-variable cost of `1,600 in February, fixed element is `1,000 and variable element `600.

In this way fixed and variable contents in semi-variable cost can be calculated for each of the six months.

2. Method of Averages

Under this method, data given is divided into two parts. In the Illustration 4.1, it may be divided into: first part—January to March and second part—April to June. (If data given is for, say, seven months, then the middle month may be ignored). Then average of output and cost is separately computed for these two parts. Variable element in the cost is then calculated by the following method:

$$\text{Variable element per unit} = \frac{\text{Difference in the average costs}}{\text{Difference in average output}}$$

Using data given in Illustration 4.1, calculations are made as follows:

<i>First Average</i> (Jan., Feb., March)		<i>Second Average</i> (April, May, June)	
Output (units)	Semi-variable cost	Output (units)	Semi-variable cost
$(80 + 40 + 120) \div 3 = 80$	$(2,200 + 1,600 + 2,800) \div 3 + 3,100$	$(160 + 200 + 140) \div 3 = 500/3$	$(3,400 + 4,000 + 3,100) \div 3 = \text{`3,500}$
	$= \text{`2,200}$		

$$\text{Variable element per unit} = \frac{\text{`3,500} - \text{2,200}}{500/3 - 80} = \text{`15}$$

$$\text{Variable element in January} = 80 \text{ units} \times \text{`15} = \text{`1,200}$$

$$\text{Fixed element in January} = 2,200 - 1,200 = \text{`1,000}$$

In this way, these may be calculated for each month.

3. Scatter Diagram Method

This is a graphic method. Under this method, the semi-variable costs incurred at levels of output are plotted on a graph, the X-axis of which represents the volume of production and Y-axis, the amount of expenditure. After plotting the points on the graph, a straight line is drawn in such a way as to represent an average of all those points. This is known as the *line of best fit* or *line of regression*. The point where this *line of best fit* intersects the X-axis, marks the fixed cost. A line from this point is drawn which is parallel to X-axis. This is fixed cost line (shown as

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dotted line in Fig. 4.1). The difference between semi-variable cost line and fixed cost line represents variable component.

The following graph is prepared with the data given in Illustration 4.1.

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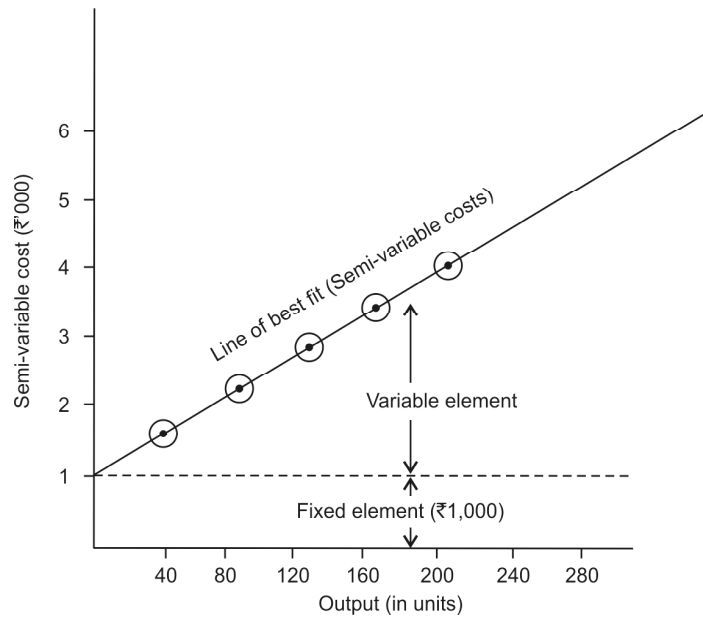


Fig. 4.1 Scatter Diagram

4. Simultaneous Equations Method

In this method, overhead costs are segregated by means of an equation. This equation for a straight line is:

$$Y = mX + c$$

where $Y =$ Total semi-variable cost

$X =$ Volume of output

$c =$ Fixed cost

$m =$ Slope of variable cost line, *i.e.*, variable cost per unit of output.

For the purpose of separating fixed and variable components of the cost, the overhead cost is determined at various levels of output and pairs of values of X and Y are fitted in the above formula in order to compute the values of m and c . For example:

From the data in Illustration 4.1, we take any two months and find out fixed and variable components.

Let us take January and February and make two equations.

$$Y = mX + c$$

$$\text{For January } 2,200 = 80m + c \quad \dots (i)$$

$$\text{For February } 1,600 = 40m + c \quad \dots (ii)$$

Subtracting equation (ii) from (i)

We get $600 = 40m$

$$m = \frac{600}{40} = 15$$

∴ Variable cost per unit = ₹ 15

Put the value of m in equation (i), we get

$$2,200 = 80 \times 15 + c$$

$$c = ₹ 1,000$$

Thus, fixed cost is ₹ 1,000 and variable cost in January is ₹ 1,200 (i.e., $2,200 - 1,000$).

In this way, we can place the value of m in any month's equation and derive the variable and fixed components.

This method provides a simple and accurate means of separating fixed and variable overhead costs.

4.2.2 Standing Order Numbers (Codification of Overheads)

After overheads are classified, it is found useful to allot a number or symbol to each group of expenses so that each such group is easily distinguished from others. Such numbers or symbols are codes for overheads and are called *standing order numbers*. Each standing order number denotes a particular type of expenditure so that items of expenses of similar nature, as and when they are incurred, are appropriately classified into one of these. A schedule or manual is maintained enlisting all standing order numbers. There cannot be a standard list of standing order numbers as the number and type under which overheads may be sub-grouped vary with the: (a) size of the factory; (b) type of expenses; and (c) the extent of control necessary.

Utility

Use of code numbers is preferred to lengthy names of overhead items because of the following reasons:

1. It is convenient to write a code number in place of an overhead item.
2. Use of code numbers helps in maintaining secrecy because item name is not revealed at the time of posting and processing of cost data.
3. Clerical effort is reduced as length in description is minimized.
4. Coding is essential in mechanized accounting.

Check Your Progress

1. What is the other name for production overhead?
2. State the difference between fixed and variable overhead.

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4.3 OVERHEADS DISTRIBUTION

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Direct costs are charged direct to the cost centres or cost units without difficulty. But this is not possible in overhead costs. Distribution of overhead costs to cost units is one of the most complex problems of cost accounting. This is because overhead costs cannot be identified with individual cost units and there are no accounting means of exact distribution. Therefore, such costs are analysed and distributed to various cost centres and cost units on arbitrary basis. For example, it is not possible to exactly calculate the amount of rent that should be charged to a particular cost unit and thus, it has to be distributed on some arbitrary basis. The cost accountant is constantly searching for equitable bases to distribute overhead costs to units and divisions of business enterprise and quite often he needs to exercise his own judgement in this regard. For instance, he may apportion rent to various departments of the factory on the basis of area occupied by each such department. Similarly, labour welfare expenses may be apportioned on the basis of number of workers in each department. The procedure of distribution of overhead costs is discussed below.

Steps in Overheads Distribution

Unlike direct materials and direct wages, overheads cannot be charged to cost units directly. The various steps taken for distribution of overhead costs are as follows:

1. Classification and collection of overheads
2. Allocation and apportionment of overheads to production departments and service departments
3. Re-apportionment of service department costs to production departments
4. Absorption of overheads of each production department in cost units

These steps are explained in detail in the following sections.

In this section, we will only discuss the collection, allocation and apportionment of overhead of the production and service overhead. The absorption will be taken up in next section.

4.3.1 Collection of Overheads

The procedure of classification of production overheads and of assigning standing order (code) numbers has already been discussed. Such classification and codification is pre-requisite for the collection of overheads.

Production overheads should be collected under standing order numbers. The main sources from which overhead costs are collected are as follows:

- (a) *Invoice*—for collection of indirect expenses, like rent, insurance, etc.
- (b) *Stores Requisitions*—for collection of indirect materials.

- (c) *Wages Analysis Sheet*—for collection of indirect wages.
- (d) *Journal entries*—for collection of those overhead items which do not result in current cash outlay and need some adjustment, *e.g.*, depreciation, charge in lieu of rent, outstanding rent, etc.

4.3.2 Allocation and Apportionment Overheads (Production): Main Methods

After overhead costs have been collected under various standing order numbers, the next step is to allocate and apportion the overheads to production and service departments. Such allocation and apportionment is known as departmentalization or primary distribution of overheads.

Departmentalization of overheads is the process of allocation and apportionment of overheads to different departments or cost centres. For smooth and efficient working, a factory is sub-divided into a number of departments, each of which denotes a particular activity of the factory, *e.g.*, purchase department, stores department, time-keeping department, personnel department, crushing department and melting shop. These departments are mainly of two types:

- (a) Production departments; and
- (b) Service departments.

The administration, selling and distribution overhead will be discussed later in the unit.

Objectives of Departmentalization

Departmentalization of overheads serves the following purposes:

1. **Ensures greater accuracy in cost ascertainment:** Departmentalization helps in achieving greater accuracy by proper allocation and apportionment of overheads. For accurate costing of each function or operation, overhead absorption rates should be determined separately for each cost centre. This is possible only with the help of departmentalization.
2. **Control of overhead costs:** Effective control of overhead costs is possible because departmentalization makes the incurrence of costs in a department or cost centre the responsibility of someone who heads the department or the cost centre. Thus, with the help of departmentalization, responsibility accounting can be effectively introduced for control purposes.
3. **Use of different methods of absorption:** Basis of absorption of overheads may be different for different cost centres, *e.g.*, machine hour rate may be suitable for one cost centre whereas direct labour hour rate may be more appropriate for another cost centre. Different basis may be used for different cost centres only when overheads are departmentalized.
4. **Valuation of work-in-progress:** Correct cost of work-in-progress cannot be ascertained unless overheads are departmentalized.

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5. **Cost of service of departments:** Departmentalization helps in ascertaining the cost of various service departments which is useful for making estimates and submitting quotations for those items which make use of the services of various cost centres.
6. **Forecasting and estimating:** Because of greater accuracy in cost ascertainment and cost control, departmentalization ensures more accurate forecasting and estimating and decision making.

Allocation

Certain items of overhead costs can be directly identified with a particular department or cost centre as having been incurred for that cost centre. Allotment of such costs to departments or cost centres is known as allocation. Thus, allocation may be defined as '*the assignment of whole items of cost directly to a cost centre.*' In other words, allocation is charging to a cost centre those overheads that result solely from the existence of that cost centre. A point to be clearly understood is that allocation can be made only when exact amount of overheads incurred in a cost centre is definitely known. For example, rent cannot normally be allocated since rent is payable for the factory as a whole and exact amount of rent for each department cannot be known. Indirect materials, on the other hand, can be easily allocated to various departments in which they are incurred. Other items which are allocated include indirect wages, overtime and idle time cost, power (when sub-metres are installed in departments), depreciation of machinery, supervision, etc.

In brief, in order that an overheads can be allocated, they should meet both of the following conditions:

- (a) The cost centre must have caused the overhead cost to be incurred; and
- (b) The exact amount incurred in a cost centre must be known.

Apportionment

Certain overhead costs cannot be directly charged to a department or cost centre. Such costs are common to a number of cost centres or departments and do not originate from any specific department. Distribution of such overhead costs to various departments is known as apportionment. Thus, apportionment may be defined as '*the distribution of overheads to more than one cost centre, on some equitable basis.*' In other words, it is charging a fair share of an overhead cost to a cost centre. Where an item of overhead cost is common to various cost centres, it is allotted to different cost centres proportionately. Again taking the cases of rent, as it cannot be allocated, it is apportioned to various departments on some equitable basis, *i.e.*, in the ratio of area occupied. Similarly salary of a general manager cannot be allocated wholly to any one department as he attends in general to all the departments. It should, therefore, be apportioned to the required departments on some equitable basis. Other items which generally cannot be allocated but are apportioned include fire insurance, lighting and heating, time keeping expenses, canteen expenses, medical and other welfare expenses, etc.

Distinction between Allocation and Apportionment

The distinction between allocation and apportionment is important to understand. As seen above, the purpose of both cost allocation and cost apportionment is the identification or allotment of items of cost to cost centres or cost units. However, the main difference between the two procedures is that while allocation deals with whole items of costs, apportionment deals with proportions of the items of cost. Allocation is a direct process but apportionment may be made only indirectly and for which suitable bases are to be selected. Whether an item of cost can be allocated or apportioned does not depend upon the nature of cost but upon its relation with the cost centres or cost units to which it is to be charged.

Overheads should always be allocated, as far as possible. If an overhead cost cannot be allocated, it is apportioned. This involves finding some basis of apportionment that will enable the overhead cost to be equitably distributed over various production and service departments.

Production and Service Departments

Departments are classified into production and service departments. A *production department* is one that is engaged in the actual manufacture of the product by changing the shape, form or nature of material worked upon or by assembling the parts into finished product. A *service department*, on the other hand, is one which is rendering a service to production departments. It contributes in an indirect manner to the manufacture of the product but it does not itself change the shape, form or nature of material that is converted into the finished product.

Principles of Apportionment

Apportionment of overheads to various production and service departments is based on the following principles:

1. **Service or use:** This is the most common principle of apportionment of overhead costs. It is based on the theory that greater the amount of service or benefit received by a department, the larger should be the share of the cost to be borne by that department. For example, rent is apportioned to various departments according to the floor space occupied; telephone cost according to the number of extension telephones in each department, and so on.
2. **Survey method:** This method is used for those overhead costs that are not directly related to departments and whose remoteness necessitates an arbitrary distribution. For example, salary of a general manager of a company may be apportioned on the basis of the results of a survey which may reveal that 30% of his salary should be apportioned to sales, 10% to administration and 60% to various producing departments. Similarly, lighting expenses may be apportioned on the basis of a survey of the number of light points, size, estimated hours of use, etc.

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3. **Ability-to-pay method:** This is based on the theory of taxation which holds that those who have the largest income should bear the highest proportion of the tax burden. In overhead cost distribution, those departments which have the largest income may be charged with the largest amount of overheads. This method is generally considered inequitable because it penalizes the efficient and profitable departments to the advantage of inefficient ones.

Illustration 4.2: Mosich Co. Ltd, has three production departments A, B and C and two service departments D and E. The following figures are extracted from the records of the company:

Rent and rates	5,000	General lighting	600
Indirect wages	1,500	Power	1,500
Depreciation of machinery	10,000	Sundry expenses	10,000

The following further details are available:

	Total	A	B	C	D	E
Floor space (Sq. ft)	20,000	4,000	5,000	6,000	4,000	1,000
Light points	120	20	30	40	20	10
Direct wages (₹)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	10	—
Value of machinery (₹)	2,50,000	60,000	80,000	1,00,000	5,000	5,000

Apportion the costs to various departments on the most equitable basis and prepare Overhead Distribution Summary.

Solution:

Overheads Distribution Summary

Item	Basis of apportionment	Total	Producing Deptts			Service Deptts	
			A	B	C	D	E
Direct wages	Actual	2,000	—	—	—	1,500	500
Rent and rates	Floor space	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	1,500	450	300	450	225	75
Power	H.P. of machines	1,500	600	300	500	100	—
Depreciation of machinery	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundry expenses	Direct wages	10,000	3,000	2,000	3,000	1,500	500
Total		30,600	7,550	7,200	9,650	4,625	1,575

Note: It should be noted that direct wages have been charged only for service departments because for service departments, all costs are indirect.

Re-apportionment of Service Department Costs (Secondary Distribution)

Once the overheads have been allocated and apportioned to production and service departments and totalled, the next step is to re-apportion the service department costs to production departments. This is necessary because our ultimate objective is to charge overheads to cost units, and no cost units are produced in service departments. Therefore, the costs of service departments must be charged to production departments which directly come in contact with cost units. This is called secondary distribution.

The method of re-apportionment of service department costs is similar to apportionment of overheads discussed earlier.

Apportionment to Production Departments Only

In this case, cost of each service department is apportioned only to production departments without apportioning it to other service departments.

Illustration 4.3: The following data were obtained from the books of S N Engineering Company for the half-year ended 30 September 2009. Prepare a Departmental Distribution Summary.

	<i>Production Departments</i>			<i>Service Departments</i>	
	<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
Direct wages	7,000	6,000	5,000	1,000	1,000
Direct materials	3,000	2,500	2,000	1,500	1,000
Employees	No. 400	300	300	100	100
Electricity	kWh 8,000	6,000	6,000	2,000	3,000
Light points	No. 10	15	15	5	5
Assets values	50,000	30,000	20,000	10,000	10,000
Area occupied	sq. yds 800	600	600	200	200

The overheads for 6 months were as under:

Stores overheads	400	Depreciation	6,000
Motive power	1,500	Repairs and maintenance	1,200
Electric lighting	200	General overheads	10,000
Labour welfare	3,000	Rent and taxes	600

Apportion the expenses of Department X in the ratio of 4 : 3 : 3 and that of department Y in proportion to direct wages, to departments A, B and C, respectively.

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Solution:**Overheads Distribution Summary****NOTES**

Item	Basis of apportionment	Total ₹	Producing Deptts			Service Deptts	
			A ₹	B ₹	C ₹	X ₹	Y ₹
Direct wages	Actual	2,000	—	—	—	1,000	1,000*
Direct materials	Actual	2,500	—	—	—	1,500	1,000*
Stores overheads	Direct materials	400	120	100	80	60	40
Motive power	kWh	1,500	480	360	360	120	180
Lighting	No. of points	200	40	60	60	20	20
Labour welfare	No. of employees	3,000	1,000	750	750	250	250
Depreciation	Assets value	6,000	2,500	1,500	1,000	500	500
Repairs and maintenance	Assets value	1,200	500	300	200	100	100
General overheads	Direct wages	10,000	3,500	3,000	2,500	500	500
Rent and taxes	Area occupied	600	200	150	150	50	50
Total		27,400	8,340	6,220	5,100	4,100	3,640
Department X	4 : 3 : 3 (Given)		1,640	1,230	1,230	(-) 4,100	
Department Y	Direct wages (7 : 6 : 5)		1,416	1,213	1,011		(-) 3,640
Total		27,400	11,396	8,663	7,341	—	—

*Note: Direct wages and direct materials of service departments are indirect costs.

Apportionment to Production as well as Service Departments

Quite often, a service department renders services not only to production department but also to other service departments. For example, maintenance department looks after not only the plant and machinery of production department but also the equipment of other service departments like power house, material handling, etc. Similarly, power house supplies electricity not only to production departments but also to service departments like canteen, maintenance departments, etc.

This type of inter-service department apportionment may be either on reciprocal basis or non-reciprocal basis.

Apportionment on non-reciprocal basis (Stepladder Method): This method is used when a service department renders services to other service departments but does not receive services of the other service departments, *i.e.*, when service departments are not inter-dependent. In this method, the service departments are arranged in descending order of their serviceability. The cost of the most serviceable department, *i.e.*, the department which serves the largest number of departments is first apportioned to other service departments. The service department which serves the next largest number of departments is taken up next and its cost (including the prorated cost of the first service department) is apportioned to other service and production departments excepting the first service department. In the same way, while apportioning the cost of the third service department in this order, the first two service departments are ignored. This process is continued till the cost of the last service department is apportioned. It should be noted that the cost of the last service department is apportioned only to production departments.

Apportionment on reciprocal basis: This method is used when service departments are mutually dependent. This means a service department not only provides its services to other service departments but also receives services of other service departments. For example, boiler house and pump room are the two service departments. Boiler house has to depend upon pump room for supply of water and pump room has to depend upon the boiler house for supply of steam power for driving the pump. Thus, both boiler house and pump room depend upon each other for their services.

The following methods may be used for apportionment of overhead costs on a reciprocal basis:

1. Simultaneous Equations Method
2. Repeated Distribution Method
3. Trial and Error Method

1. **Simultaneous Equations Method:** In this method, the following algebraic equations help in finding out cost of service departments.

$$X = a + bY$$

$$Y = a + bX$$

This is illustrated below.

Illustration 4.4: The following particulars relate to ADM Manufacturing Company which has three production departments A, B and C and two service departments X and Y.

	<i>Departments</i>				
	<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
Total overheads as per primary distribution	6,300	7,400	2,800	4,500	2,000

The company decided to apportion the service department costs on the following percentages:

	<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
<i>X</i>	40%	30%	20%	—	10%
<i>Y</i>	30%	30%	20%	20%	—

Find the total overheads of production departments using simultaneous equations method.

Solution:

Let X denote the total overheads of service deptt X

Y denote the total overheads of service deptt Y

$$X = a + bY \quad \dots(i)$$

$$Y = a + bX \quad \dots(ii)$$

where a = Overheads of a department before re-apportionment

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b = Share of overheads of one service department to be distributed to the other.

Thus $X = 4,500 + 20\% \text{ of } Y$...*(i)*

$Y = 2,000 + 10\% \text{ of } X$...*(ii)*

or $X = 4,500 + 0.2Y$...*(i)*

$Y = 2,000 + 0.1X$...*(ii)*

To solve the equations, re-arrange these and multiply by 10 to eliminate decimals.

$10X - 2Y = 45,000$...*(i)*

$-X + 10Y = 20,000$...*(ii)*

Again multiplying equation *(ii)* by 10 and adding

$10X - 2Y = 45,000$...*(i)*

$-10X + 100Y = 2,00,000$...*(ii)*

By adding, we get $98Y = 2,45,000$

$$Y = \frac{2,45,000}{98}$$

$$Y = 2,500$$

Putting the value of Y in equation *(i)*, we get

$$X = 4,500 + 20\% \text{ of } 2,500$$

$$X = 5,000$$

Thus, $X = 5,000$, and $Y = 2,500$

These amounts, *i.e.*, `2,500 and `5,000 are then apportioned to production departments in the specified percentages.

Secondary Distribution Summary

	Total	Production Departments		
		A	B	C
Total as per primary summary	16,500	6,300	7,400	2,800
Department X (90% of 5,000)	4,500	2,000	1,500	1,000
Department Y (80% of 2,500)	2,000	750	750	500
Total	23,000	9,050	9,650	4,300

Note: The amount of service deptt X to be distributed to production departments A, B and C is only 90% as the remaining 10% belongs to service deptt Y. Similarly, only 80% of service deptt Y is to be distributed to A, B and C.

This method of simultaneous equations gives accurate results. But when the number of service departments exceeds two, calculations become cumbersome.

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2. Repeated Distribution Method: In this method the following steps are taken to apportion the service departments costs:

1. The costs of the first service department are apportioned in the normal way according to the given percentages. This will close the account of the first servicedepartment.
2. Then apply the given percentages for the apportionment of second service department costs which include their own cost plus amount apportioned from the first service department. This closes the account of the second service department but reopens the account of the first service department.
3. The same procedure should be followed in the case of all other service departments. This completes the first cycle of apportionment.
4. The procedure should be repeated again starting with the first service department whose total now consists only of amounts apportioned from other service departments. In this way, service department costs keep on reducing with each cycle of distribution because each time, a substantial amount is charged to the production departments.
5. This process is continued until the amounts involved become insignificant.

Example: Illustration 4.4 is solved below with Repeated Distribution Method.

Repeated Distribution Method:

Secondary Distribution Summary

Items	Production Deptts			Service Deptts	
	A	B	C	X	Y
Total as per primary distribution	6,300	7,400	2,800	4,500	2,000
Department X	1,800	1,350	900	(-) 4,500	450
Department Y	735	735	490	490	(-) 2,450
Department X	196	147	98	(-) 490	49
Department Y	15	15	10	9	(-) 49
Department X	4	3	2	(-) 9	—
Total	9,050	9,650	4,300	—	—

Working Notes: In the above solution, first of all the cost of service department X is apportioned to A, B, C and Y in the ratio given. Then the cost of service department Y, ` 2,450 (i.e. 2,000 + 450) has been apportioned to department A, B, C and X in the given percentage. The account of department X is again open with ` 490 which is distributed to A, B, C and Y in the given ratio. Then ` 49 allotted to department Y is distributed to departments A, B and C and X. Then ` 9 allotted to department X is distributed to A, B and C. Nothing has been allotted to department Y as the share of department Y is quite negligible. In this way the entire costs of service departments X and Y are apportioned to production departments A, B and C.

It should be noted that unlike Simultaneous Equations Method, this method produces approximate results. But the advantage of this method is that it can be conveniently applied where the number of service departments is more than two.

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3. Trial and Error Method: In this method the cost of first service department is apportioned to other service departments only in the given percentage. The cost of the second service department then is apportioned to the first and other service departments. In this way, when the cost of all service departments has been apportioned, the process is repeated till the service department costs are reduced to negligible amounts. In this way, the total cost of each service department is found out by trial and error.

Example: Taking the figures of Illustration 4.4, Trial and Error Method is applied here.

Computation of Service Department Costs

	Service Departments	
	X	Y
Total as per primary summary	4,500	2,000
Service Deptt X (10% to Y)	—	450
Service Deptt Y (20% of 2,450, i.e., 2,000 + 450)	490	—
Service Deptt X (10% to Y)	—	49
Service Deptt Y (20% to X)	10	—
Service Deptt X (10% to Y)	—	1
Total	5,000	2,500

Thus, the total costs of service departments X and Y are ₹ 5,000 and ₹ 2,500, respectively. Now a Secondary Distribution Summary can be prepared in the same way as was done in Simultaneous Equations Method.

It will be seen that this is a modification of repeated distribution method where production departments are initially ignored for the purpose of redistribution. Like Repeated Distribution Method, this method may also give approximate results.

It is important to note that all the three methods have produced the same result.

Illustration 4.5: A company has three production departments and two service departments. Distribution summary of overheads is as follows:

Production Departments		Service Departments	
A	₹ 3,000	1	₹ 234
B	₹ 2,000	2	₹ 300
C	₹ 1,000		

The expenses of service departments are charged on a percentage basis which is as follows:

	A	B	C	1	2
1.	20%	40%	30%	—	10%
2.	40%	20%	20%	20%	—

Find out the total overheads of production departments using the following methods:

(a) Simultaneous Equations Method (b) Repeated Distribution Method

Solution:

(a) Simultaneous Equations Method

Let x denote total overheads of service department 1

y denote total overheads of service department 2

$$\text{Therefore, } x = 234 + 0.2y \quad \dots(i)$$

$$y = 300 + 0.1x \quad \dots(ii)$$

To solve the equations, re-arrange these and multiply by 10 to eliminate decimals.

$$10x - 2y = 2,340 \quad \dots(i)$$

$$-x + 10y = 3,000 \quad \dots(ii)$$

Multiplying second equation by 10 and adding

$$10x - 2y = 2,340$$

$$-10x + 100y = 30,000$$

$$\hline 98y = 32,340$$

$$y = 32,340 \div 98$$

$$y = 330; \text{ and } x = 300$$

Secondary Distribution Summary

	Total	Production Departments		
		A	B	C
Total as per primary summary	6,000	3,000	2,000	1,000
Service Deptt 1 (90% of 300)	270	60	120	90
Service Deptt 2 (80% of 330)	264	132	66	66
Total	6,534	3,192	2,186	1,156

(b) Repeated Distribution Method

Items	Production Deptts			Service Deptts	
	A	B	C	X	Y
Total as per primary summary	3,000	2,000	1,000	234	300
Service Deptt 1	47	94	70	(-) 234	23
Deptt 2	129	65	65	64	(-) 323
Deptt 1	14	25	19	(-) 64	6
Deptt 2	2	2	—	—	—
Total	3,192	2,186	1,156	—	—

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Check Your Progress

3. State the difference between allocation and apportionment.
4. What is trial and error method?

4.4 ABSORPTION OF OVERHEADS (PRODUCTION): MAIN METHODS

Once departmentalization of overheads has been completed, the total cost of each production department comprises the following:

- (i) Costs allocated and apportioned to production departments.
- (ii) Costs of service departments re-apportioned to production departments.

The total overhead cost pertaining to a production department or cost centre is then charged to or absorbed in the cost of the products or cost units passing through that centre. This is known as absorption.

The absorption of overheads is the last step in the distribution plan of overheads. It is defined as *charging of overheads to cost units*. In other words, overhead absorption is the apportionment of overheads of the cost centres over cost units. Absorption of overheads is also known as *levy, recovery or application* of overheads.

There are two steps in the absorption of overheads:

1. Computation of overheads absorption rate; and
2. Application of these rates to cost units.

1. Computation of Overheads Absorption Rate: Absorption rates are computed for the purpose of absorption of overheads in costs of the cost units. There are mainly six methods for determining absorption rates which have been described later in this unit. In all these methods, the overhead rate is computed by dividing the total amount of overheads of department or cost centre by the number of units in the base, such as number of cost units, machine hours, labour hours, direct labour cost, price cost, etc. This is shown below:

$$\text{Overheads absorption rate} = \frac{\text{Total overheads of cost centre}}{\text{Total units in base}}$$

It should be noted that only one rate is computed for any single group of overheads.

2. Application of rates to cost units: In order to arrive at the overhead cost of each cost unit, the overhead rate is multiplied by the number of units of base in the cost unit. Thus:

$$\text{Overhead absorbed} = \text{No. of units of base in the cost unit} \times \text{Overhead rate}$$

For example, machine hour rate is ₹ 25 and a cost unit has used 12 hours of the machine, overheads absorbed will be = 12 hours × ₹ 25 = ₹ 300.

Methods of Absorption of Production Overheads

Various methods of absorption discussed below are used to determine the overheads absorption rate for production overheads.

1. **Direct Materials Cost Percentage Rate:** Under this method, the amount of overheads to be absorbed by a cost unit is determined by the cost of direct materials consumed in producing it. This rate is computed by dividing the total overheads by the total cost of direct materials consumed in the department. Thus,

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct materials}} \times 100$$

Example: Production overheads ₹ 40,000
Direct materials ₹ 200,000

$$\text{Overhead rate} = \frac{40,000}{200,000} \times 100 = 20\%$$

Thus, if the direct material cost of a job or cost unit is ₹ 1,200, the overheads to be absorbed by it will be ₹ 240, *i.e.*, 20% of ₹ 1,200.

Advantages: The main advantages of this method are:

1. Calculation of this rate is simple because cost of direct materials is readily available and no additional records are required to be maintained for this purpose.
2. This method produces fairly accurate rates where material prices do not fluctuate widely and where output is uniform, *i.e.*, only one type of article is produced using the same raw material.

Disadvantages: The disadvantages of this method are:

1. Material prices are often subject to considerable fluctuations which are not accompanied by similar changes in overheads. This causes misleading results.
2. This method is quite illogical and inaccurate because overheads are in no way related to the cost of materials consumed. The amount of overheads does not change because the work is being done on copper instead of iron. Both metals are quite different in prices and by applying the same percentage for both will obviously be incorrect.
3. This method ignores the importance of time factor that two jobs using the same raw materials would absorb the same amount of overheads even though one may occupy a machine for much longer period than the other.
4. This method does not distinguish between work done by machines and manual labour and also between work done by skilled and unskilled workers.

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2. Direct Labour Cost Percentage Rate: The overhead rate under this method is computed by dividing the production overheads by the direct labour cost.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct labour cost}} \times 100$$

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Example: Production overheads = ₹ 40,000

Direct labour cost = ₹ 1,00,000

$$\text{Overhead rate} = \frac{40,000}{1,00,000} \times 100 = 40\%$$

Thus a job for which direct wages are ₹ 200 will absorb production overheads of ₹ 80, *i.e.*, 40% of ₹ 200.

Advantages: The main advantages of this method are:

1. It gives stable results as labour rates are far more constant than material prices.
2. Automatic consideration is given to the time factor, as higher the charge to a job for wages, the longer will have been the time spent on that job.
3. This method is simple and easy to use as all the data required are easily available without keeping any extra records.
4. This method can be used with advantage where rates of workers are same, where workers are more or less of equal skill and where types of work performed by workers is uniform.

Disadvantages: This method suffers from the following defects:

1. When workers are paid on piece basis, inaccuracies are likely to creep in due to the time factor not being given full consideration. The question of overtime also disturbs the position because higher rates are payable for overtime.
2. No distinction is drawn between work done by skilled and unskilled workers. As unskilled workers take more time and utilize factory facilities for a longer period, their work should bear a higher charge for factory overheads. But reverse happens in the case of this method because work done by skilled workers has to absorb larger amount of overheads as they are paid at a higher rate.
3. It also does not distinguish between production of hand workers and that of machine workers. Machines give rise to certain overheads like depreciation, power, etc., which should be charged only to the work done on machines.

3. Prime Cost Percentage Rate: This method is based on the premise that both materials and labour give rise to factory overheads and thus the total of the two, *i.e.*, prime cost should be taken as the base for absorption of factory overheads. In a way, this is a combination of the material cost and labour cost methods.

Overhead rate in this method is calculated by dividing the production overheads by prime cost.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Prime cost}} \times 100$$

Example: Production overheads = ₹ 40,000
 Prime cost = ₹ 2,50,000
 Overhead rate = $\frac{40,000}{2,50,000} \times 100 = 16\%$

Thus, if prime cost of a job is ₹ 500, production overheads to be absorbed by that job should be ₹ 80, *i.e.*, 16% of ₹ 500.

The advantages and limitations of this method are more or less the same as those of material cost and labour cost methods discussed earlier.

Although overheads are related more to labour cost than material costs, this method gives equal importance to both material and labour. When the cost of materials is predominating item of prime cost, the time factor will be ignored. This is shown below:

	<i>Job I</i>	<i>Job II</i>
	₹	₹
Direct materials	1,000	100
Direct labour @ ₹ 5 per hour	100	1,000
Prime cost	<u>1,100</u>	<u>1,100</u>
Production overhead (40% of prime cost)	440	440
Works cost	<u><u>1,540</u></u>	<u><u>1,540</u></u>

It is seen that although Job II takes much longer time than Job I, the charge to both the jobs for production overheads is the same. The above illustration also shows that this method is likely to degenerate into either material cost method or labour cost method. This is because in Job I direct material is the main constituent of prime cost and in Job II labour cost is the main constituent but the charge to both the jobs is the same.

4. **Direct Labour Hour Rate:** This is a rate per hour and not a percentage rate. It is obtained by dividing the total production overheads by the total number of direct labour hours for the period.

$$\text{Overhead rate} = \frac{\text{Production overheads}}{\text{Direct labour hours}}$$

Example: Production overheads = ₹ 40,000
 Direct labour hours = 50,000 hours

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$$\text{Overhead rate} = \frac{\text{₹ } 40,000}{50,000 \text{ hours}} = 80 \text{ paise per hour}$$

Thus, if a job takes 20 labour hours for production, ₹ 16 (*i.e.*, 20 hours @ 80 paise) will be charged to that job for production overhead.

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Advantages: Direct labour hour rate method has the following advantages:

1. It gives full consideration to time factor.
2. This method gives very satisfactory results in majority of cases, except where machinery represents the predominating factor of production.
3. This is not affected by the method of wage payment, *i.e.*, time rate or piece rate system.

Disadvantages: This method suffers from the following disadvantages:

1. This method necessitates the recording and analysing of time spent on each job by each worker and thus involves additional clerical labour.
2. It does not take into account factors other than labour.

In brief, this is an all round method as it ensures precise costing and affords better opportunities for exercise of control. The use of this method is recommended unless there is a reason for selecting a different one.

In order to eliminate the effect of seasonal fluctuations, it is desirable to calculate the labour hour rate for a period of one full year.

Illustration 4.6: Aggarwal and Co. has three production departments—A, B and C and one service department S. The following particulars are available for one month of 25 working days of 8 hours each. All departments work all days with full attendance.

	Total	Service dept S	Production dept A	Production dept B	Production dept C
Power and lighting	₹ 1,100	240	200	300	360
Supervisor's salary	₹ 2,000	20%	30%	30%	20%
Rent	₹ 500				
Welfare	₹ 600				
Others	₹ 1,200	200	200	400	400
Number of workers		10	30	40	20
Floor area in sq. ft		500	600	800	600
Service rendered by service department to production departments		50%	30%	20%	

Calculate the 'Labour Hour Rate' of each of the departments A, B and C.

Solution:**Computation of Labour Hour Rate**

	Service deptt <i>S</i>	Production deptt <i>A</i>	Production deptt <i>B</i>	Production deptt <i>C</i>
Power and lighting	240	200	300	360
Supervisor's salary	400	600	600	400
Rent (floor area)	100	120	160	120
Welfare (No. of workers)	60	180	240	120
Others	200	200	400	400
Total	1,000	1,300	1,700	1,400
Share of Service deptt	(-) 1000	500	300	200
(A) Total overheads		1,800	2,000	1,600
(B) Labour hours (No of days × Hrs × No. of workers)		6,000	8,000	4,000
Labour Hour Rate (A) ÷ (B)		₹ 0.30	₹ 0.25	₹ 0.40

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5. Machine Hour Rate: Machine hour rate is the overhead cost of running a machine for one hour. This rate is obtained by dividing the amount of factory overheads apportioned to a machine by the number of machine hours for the period under consideration.

$$\begin{aligned} \text{Example: Production overheads of Machine I} &= ₹ 25,000 \\ \text{No. of machine hours} &= 2,000 \end{aligned}$$

$$\text{Machine hour rate} = \frac{\text{Production overheads}}{\text{No. of machine hours}} = \frac{25,000}{2,000} = ₹ 12.50$$

If Machine I has been used for a job for 30 hours, overheads to be absorbed by that job will amount to ₹ 375, i.e., 30 hrs × ₹ 12.50.

Computation of Machine Hour Rate: The following steps are taken for the computation of machine hour rate:

- (i) The factory overheads are first apportioned to production departments as discussed earlier under allocation and apportionment.
- (ii) Overheads of the department are further apportioned to different machines or groups of machines. For this purpose each machine or a group of machines is treated as a cost centre or a small department. Bases of apportionment of different expenses are given here.
- (iii) Specific overheads, like power, depreciation, etc., should be directly allocated to the machine.
- (iv) The overheads relating to the machine should be divided between (a) Fixed or standard charges, and (b) Variable charges. Fixed charges are those which remain constant irrespective of the use of the machine, e.g., rent, supervisor's salary, etc. Variable charges vary with the use of machines, e.g., power, depreciation, etc.

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- (v) The working hours of a machine are estimated for the period.
- (vi) Overheads pertaining to the machine are totalled and divided by the number of effective machine hours. The resultant figure will be machine hour rate. The time required for setting the machine (unless it is treated as producing time) should be deducted from the total working hours to arrive at effective hours.

Treatment of depreciation: Depreciation is a semi-variable item. In the computation of machine hour rate, some accountants treat it as a fixed cost while others treat it as a variable cost. In fact, whether it is to be treated as fixed or variable cost, depends upon the method of computing depreciation. In this chapter, it has been mostly treated as a variable item.

Bases of Apportionment of Different Overheads to Machines

<i>Items of overheads</i>	<i>Basis of apportionment</i>
1. Rent and rates	Ratio of floor area occupied by each machine
2. Insurance	Insured value of each machine
3. Supervision	Estimated time devoted by the supervisor to each machine
4. Lighting	No. of light points used for each machine, or floor area occupied by each machine
5. Depreciation	Capital values/machine hours or multiple of both
6. Repairs and maintenance	Capital values/machine hours
7. Lubricating oil and other consumable stores	Capital values/machine hours

Comprehensive (or composite) machine hour rate: When the direct wages of machine operators are included in machine hour rate, it is known as *comprehensive machine hour rate*. Thus in a comprehensive machine hour rate, overheads and direct wages are absorbed by a single rate.

Advantages: The main advantages of machine hour rate method are:

1. From costing point of view, this is an accurate method of absorption of overheads.
2. It gives due consideration to the time factor and thus produces more equitable results.
3. This is an ideal method of absorption where production is carried out on machines.
4. When separate rates are calculated for fixed and variable overheads, the cost of idle machines can be measured without difficulty.

Disadvantages: This method suffers from the following limitations:

1. This method is not universally applicable and can be used only for those cost centres where machine work is predominant.
2. Certain additional records like details of machine time taken by various jobs have to be maintained which results in additional clerical labour.

3. Correct estimation of the number of machine hours much in advance of production is quite a difficult task. Any wrong estimate in this regard will produce misleading results.

Illustration 4.7: From the following information compute the machine hour rate in respect of machine No. 10 for the month of January:

Cost of machine ₹ 32,000

Estimated scrap value ₹ 2,000

Effective working life 10,000 hours

Repairs and maintenance over the life period of machine ₹ 2,500

Standing charges allocated to this machine for January, ₹ 400

Power consumed by the machine @ ₹ 0.30 per unit, ₹ 600

The machine consumes 10 units of power per hour.

Solution:

Computation of Machine Hour Rate

	₹ per hr
Standing charges (400 ÷ 200*)	2.00
Variable Charges:	
1. Repairs and Maintenance (₹ 2,500 ÷ 10,000 hrs)	0.25
2. Power (10 units @ 30 Paise)	3.00
3. Depreciation $\left(\frac{32,000 - 2,000}{10,000 \text{ hrs}} \right)$	3.00
Machine Hour Rate	8.25

***Working Notes:** No. of machine hours during the month of January is computed below:

No. of power units consumed in January = ₹ 600 ÷ ₹ 0.30 = 2,000 units

No. of machine hours = 2,000 units ÷ 10 units = 200 hours.

4.4.1 Types of Overhead Rates

Overhead rates may be: (i) actual or predetermined; and (ii) blanket or multiple. These are described below.

Actual and Predetermined Rates

Overheads absorption rate may be based on actual figures or estimated figures.

Actual Rate: It is calculated by dividing the actual overheads by actual base.

Thus:

$$\text{Actual overhead rate} = \frac{\text{Actual amount of overheads}}{\text{Actual base}}$$

On account of certain limitations of actual rate, it is not always desirable to use it for the absorption of overheads. These limitations are:

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1. Actual rate cannot be computed until the end of the accounting period. This results in delay in computing cost.
2. When costs are used to calculate the selling prices for quotations and tenders, there is bound to be a considerable delay before the sales department can invoice customers due to delay in information from costing department.
3. Actual rate may vary from period to period due to fluctuations in the amount of overheads, the volume of output and efficiency of operations. This makes comparisons difficult.
4. These rates do not provide any basis for cost control.

Predetermined Rate: This rate is determined in advance of the period in which it is to be used. It is computed by dividing the estimated or budgeted amount of overheads by the budgeted base. Thus:

$$\text{Predetermined rate} = \frac{\text{Budgeted amount of overheads}}{\text{Budgeted base}}$$

As compared to actual rate, a predetermined rate is of greater practical utility. This is because a predetermined rate enables prompt preparation of tenders and quotations and fixation of selling prices. Cost control is also facilitated by comparing the actual overheads with the predetermined overheads recovered. The use of predetermined rates thus, helps in deriving some of the benefits of standard costing and budgetary control.

Blanket and Multiple Rates

A *blanket overhead rate* is a single overhead rate for the entire factory. It is computed as follows.

$$\text{Blanket rate} = \frac{\text{Total overheads for the factory}}{\text{Total number of units of base for the factory}}$$

Blanket overhead rate should not be used except when output is uniform. Otherwise it will result in overcosting or undercosting of certain cost units. Moreover, when a blanket rate is used, performance of individual departments or cost centres cannot be properly assessed and exercise of control becomes difficult. Blanket rate is also known as *Plant-wide* or *Plant-wise* rate.

Multiple rates means a number of separate rates for each department, cost centre, etc. For instance, separate rates may be calculated for each of the following:

- (a) Production department
- (b) Service department
- (c) Cost centre
- (d) Product
- (e) Fixed overheads and variable overheads

The following formula is used to calculate the multiple rates:

$$\text{Overhead rate} = \frac{\text{Overheads of department or cost centre}}{\text{Corresponding base}}$$

Blanket rates have a very limited application and can be usefully employed in (i) small firms, or (ii) when one single product is produced, or (iii) when a firm is producing more than one product and all of these products pass through all the departments and the incidence of overheads is uniform. Except in these situations, use of blanket overhead rate may result in distortion of cost. The main disadvantages of blanket rates are as follows:

1. The use of blanket rate gives misleading and erroneous results, particularly where a firm is producing several products and all of these products pass through a number of production departments or cost centres.
2. When a blanket rate is used, performance of individual departments or cost centres cannot be properly assessed and exercise of control becomes difficult.
3. The use of blanket rate may produce an erroneous work-in-progress valuation because products included in work-in-progress might not have passed through all the departments and if a blanket rate is charged for its valuation, the work-in-progress will be over-valued to the extent of facilities not used in it.

Multiple rates are of more practical utility and should always be preferred over blanket rate for the sake of accuracy and control.

Requisites of a Good Method of Absorption

A satisfactory method of absorption should have the following characteristics:

1. It should be simple and easy to operate.
2. It should give accurate results and provide an equitable basis for overheads absorption.
3. Time factor should be given due consideration.
4. The method should distinguish between work done by skilled and unskilled workers.
5. It should also make a distinction between work done by hand labour and machines.
6. It should be economical in application and should not require maintenance of unnecessary clerical records.
7. Multiple rates should be preferred to blanket rates.

Check Your Progress

5. What are the two steps involved in the absorption of overheads?
6. What is machine hour rate?

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4.5 ADMINISTRATION, SELLING AND DISTRIBUTION OVERHEADS

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Up till now, you have studied the departmentalization of production and service overheads, in this section you will first study administration overheads and then learn about selling and distribution overheads.

Administration Overheads

Office and administration overheads pertain to general management and administration of business. They may be defined as *the indirect expenditures incurred in formulating the policy, directing the organization and controlling the operations of an undertaking*. These overheads are of a general character and are incurred for the business as a whole. They have little or no direct connection with production or sales activities. As production and sales cannot function without some sort of administrative control, these overheads serve the purpose of such a control. Expenses of activities of board of directors, accounting, secretarial, audit, legal, financial, etc., are included in administrative overheads. These overheads are generally constant in nature and are not affected by any fluctuations in the volume of production or sales.

Accounting Treatment

Classification and collection of office and administrative overheads is done in the same way as that of production overheads. Separate standing order numbers are allotted to each item of such an overhead cost, such as legal charges, travelling expenses, office rent, audit fees, etc. These overhead costs are then allocated and apportioned to various administrative departments, like general office, law department, accounts department and secretarial department.

Absorption of Administration Overheads

Office and administrative overheads generally constitute a small portion of the total cost as compared to production overheads. For the purpose of absorption of these overheads, a single (blanket) overhead rate is computed by any one of the following methods:

1. **Percentage of works cost:** Administration overhead cost is generally absorbed as a percentage of works cost. Such a rate is computed by the following formula:

$$\text{Overhead rate} = \frac{\text{Admn. overheads}}{\text{works cost}} \times 100$$

For example, if administration overheads are ₹ 12,000 and works cost is ₹ 2,40,000, the overhead rate is computed as follows:

$$\text{Admn. overhead rate} = \frac{12,000}{2,40,000} = 5\%$$

2. **Percentage of sales:** Sometimes office and administration overheads are absorbed as a percentage of sales. Its formula is:

$$\text{Overhead rate} = \frac{\text{Administration overheads}}{\text{Sales}} \times 100$$

3. **As a percentage of conversion cost:** Conversion cost is the cost of converting raw material into finished goods. It includes cost of direct labour and factory overheads. This method is rarely used.

Overhead rate is calculated by the following formula:

$$\text{Overhead rate} = \frac{\text{Administration overheads}}{\text{Total conversion cost}} \times 100$$

Selling and Distribution Overheads

Selling and distribution costs are usually incurred after the production of products or services is completed, and therefore, such costs are sometimes known as ‘after-production costs.’

Selling cost is *the cost of seeking to create and stimulate demand (sometimes termed marketing) and of securing orders.* These costs are thus incurred for increasing sales to the existing and potential customers. Examples are advertisement, samples and free gifts, show-room expenses, etc.

Distribution cost is *the cost of the sequence of operations which begins with making the packed product available for dispatch and ends with making the reconditioned returned empty packages, if any, available for re-use.* Thus distribution costs are incurred in placing the articles in the possession of the customers. Examples are carriage outwards, insurance of goods-in-transit, maintenance of delivery vans and warehousing.

For costing purposes, selling costs and distribution costs are generally considered together, although in some cases these may be dealt with separately.

Difference between selling overheads and distribution overheads: Selling overheads and distribution overheads differ in their nature and purpose. Selling overheads are incurred for promoting sales and securing orders while distribution overheads are mainly incurred in moving the goods from the company’s godown to customers’ place. The object of selling overheads is to solicit orders and to make efforts to find and retain customers. The object of distribution overheads is the safe delivery of the goods to the customers.

Accounting Treatment

The accounting procedure of selling and distribution cost comprises:

1. Classification, collection and analysis of these expenses
2. Apportionment and allocation to cost centres
3. Absorption by products or product groups

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These three stages are discussed below:

1. **Classification, collection and analysis:** This is the first step and is similar to classification and collection of production overheads. Selling and distribution overheads may be classified on the basis of products, sales territories, channels of distribution, salesmen, etc.

When classification of expenses is complete, expenses are collected under standing order numbers provided for this purpose.

2. **Apportionment and allocation to cost centres:** In this step, selling and distribution overheads are allocated or apportioned to various products, sales territories or other cost centres. Some of the common bases used for distribution of selling and distribution overheads are given below.
3. **Absorption of selling and distribution overheads:** Absorption of selling and distribution overheads means charging of these overheads to various products, jobs or orders.

Methods of Absorption

Various methods for absorption of selling and distribution overheads are as follows:

1. **A rate per unit of sales:** This method is employed when the company is selling one uniform type of product. The total selling and distribution overheads to be absorbed are divided by the number of units sold to arrive at a rate per unit.

For example, a company is manufacturing only one type of TV picture tube. During the month of May, its selling and distribution overheads amounted to ₹ 75,000 and during this period, the number of picture tubes sold is 1,000. The rate per unit for the absorption of selling and distribution overheads will be $\text{₹ } 75,000 \div 1000 = \text{₹ } 75$.

2. **A percentage of selling price:** This method is recommended when the concern is selling more than one type of product. A percentage of selling and distribution overheads to selling price is ascertained from an analysis of past records. Overhead rate is calculated by the following formula:

$$\text{Overhead rate} = \frac{\text{Selling and distribution overheads}}{\text{Sales}} \times 100$$

Example: Selling and distribution overheads	₹ 5,000
Total sales	₹ 1,00,000

$$\text{Overhead rate} = \frac{5,000}{1,00,000} \times 100 = 5\% \text{ of selling price}$$

3. **A percentage of works cost:** In this method, a percentage of selling overheads to works cost is ascertained. This percentage rate is applied for the absorption of selling and distribution overheads.

Overhead rate is calculated as follows:

Overheads

$$\text{Overhead rate} = \frac{\text{Selling and distribution overheads}}{\text{Total works cost}}$$

Example: Selling and distribution overheads	₹ 5,000
Works cost	₹ 40,000

$$\text{Overhead rate} = \frac{5,000}{40,000} \times 100 = 12.50\%$$

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4.6 UNDER-ABSORPTION AND OVER-ABSORPTION OF OVERHEADS

As stated earlier, overheads may be absorbed either on the basis of actual rates or predetermined rates. When actual rates are used, the overheads absorbed should be exactly equal to the overheads incurred. In such a case there is no problem of under- or over-absorption of overheads. But when a predetermined rate is employed, overheads absorbed may not be equal to the amount of actual overheads incurred. Thus, whenever the overheads absorbed are not equal to the amount of actual overheads, it is a case of either under-absorption or over-absorption of overheads.

Under-absorption: When the amount of overheads absorbed is less than the amount of overheads actually incurred, it is called under-absorption or under-recovery. This has the effect of under-stating the cost because the overheads incurred are not fully recovered in the cost of jobs, processes, etc.

Over-absorption: When the amount of overheads absorbed is more than the amount of actual overheads incurred, it is known as over-absorption or over-recovery. It has the effect of over-stating the cost of jobs, processes, etc.

Example: Predetermined overhead rate	= ₹ 5 per machine hour
Actual machine hours	= 1,500
Actual overheads	= ₹ 9,000

Overheads absorbed	= 1,500 hrs × ₹ 5 = ₹ 7,500
Under-absorption	= ₹ 9,000 – ₹ 7,500 = ₹ 1,500

In this example, if the actual machine hours worked were 1,900, then:

Overheads absorbed	= 1,900 hrs × ₹ 5 = ₹ 9,500
Overhead over-absorbed	= ₹ 9,500 – ₹ 9,000 = ₹ 500

Causes of Under or Over-absorption

Under or over-absorption of overheads may arise due to one or more of the following reasons:

1. Faulty estimation of overhead costs

2. Faulty estimation of the quantity of output
3. Seasonal fluctuation in the amount of overheads in certain industries
4. Unforeseen changes in the production capacity
5. Unexpected changes in the method of production affecting changes in the amount of overheads

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Whatever be the reason, under- or over-absorption is caused mainly due to wrong estimation either of the overhead costs or of the base such as machine hours, production quantity, etc.

Accounting Treatment of Under and Over-absorption

Under or over-absorbed amounts of overheads are disposed of in accordance with any of the following methods, depending upon the circumstances:

1. **Use of supplementary rates:** Where the amount of under or over-absorbed overheads is significant, a supplementary overhead absorption rate is calculated to adjust this amount in the cost. However, adjustment is made in the cost of: (i) work-in-progress; (ii) finished stock; and (iii) cost of sales. In the case of under-absorption, the overhead cost is adjusted by a *plus rate* since the amount is to be added, whereas over-absorption is adjusted by a *minus rate* since the amount is to be deducted.

Illustration 4.8: A company absorbs overheads on predetermined rates. For the year ending 31 Dec. 2009, factory overheads absorbed were ₹ 3,66,250. Actual amount of overheads incurred totalled ₹ 4,26,890. The following figures are also derived from the trial balance.

Finished stock	₹ 2,30,732
Cost of goods sold	₹ 8,40,588
Work-in-progress	₹ 1,41,480

How would you dispose of under/over-absorbed overheads by use of supplementary rate method.

Solution:

$$\begin{aligned} \text{Under-absorbed overheads} &= \text{Actual overheads} - \text{Absorbed overheads} \\ &= ₹ 4,26,890 - 3,66,250 = ₹ \mathbf{60,640} \\ \text{Total cost incurred} &= ₹ 230,732 + 840,588 + 1,41,480 \\ &= ₹ 12,12,800 \end{aligned}$$

$$\text{Supplementary Rate} = \frac{\text{Unabsorbed amount}}{\text{Total cost}} \times \frac{60,640}{12,12,800}$$

As there is under-absorption of overheads, it is a plus rate, *i.e.*, the cost of finished goods, work-in-progress and cost of goods sold will be increased by 5% shown as follows:

Finished goods	=	₹ 2,30,732 × 5%	=	₹ 11,536.60
Work-in-progress	=	₹ 1,41,480 × 5%	=	₹ 7,074.00
Cost of goods sold	=	₹ 8,40,588 × 5%	=	₹ 42,029.40
				₹ 60,640.00
		Total		₹ 60,640.00

Overheads

NOTES

2. Writing off to Costing Profit and Loss Account: This method is used when the under or over-absorbed amount is quite negligible and it is not worthwhile to absorb it by supplementary rate. Under-absorption due to abnormal factors, like idle capacity or defective planning, is also transferred to Costing Profit and Loss Account.

This method suffers from the shortcoming that stocks of work-in-progress and finished goods remain under or over-valued and are carried over to the next accounting period at such values.

3. Carry over to the next year: Under this method the under or over-absorbed amount is transferred to Overhead Reserve Account or Suspense Account for carrying over to the next accounting year. This procedure is open to criticism on the ground that it is not logical to carry over the overheads of one year to the subsequent years for absorption. But, this method can be usefully employed where normal business cycle extends over more than one year and overheads are determined on a long-term basis.

Illustration 4.9: During the year ending 31 March 2009, the factory overhead costs of three production departments of an organization are as under—

X	₹ 48,950
Y	₹ 89,200
Z	₹ 64,500

The basis of absorption of overheads is given below:

Department X	₹ 5 per machine hour for 10,000 hours
Y	75% of direct labour cost of ₹ 1,20,000
Z	₹ 4 per piece for 15,000 pieces

Calculate the department-wise under or over-absorption of overheads and present the data in a tabular form.

Solution:

Amount of cost absorbed factory overheads is calculated as follows:

X @ ₹ 5 per machine hour for 10,000 hours	50,000
Y @ 75% of direct labour cost of ₹ 1,20,000	90,000
Z @ ₹ 4 per piece for 15,000 piece	60,000
Total overheads absorbed	₹ 2,00,000

Statement Showing Department-wise Under/Over-absorption

<i>Department</i>	<i>Actual overheads</i>	<i>Absorbed overheads</i>	<i>Under absorption</i>	<i>Over absorption</i>
X	48,950	50,000	—	1,050
Y	89,200	90,000	—	800
Z	64,500	60,000	4,500	—
Total	2,02,650	2,00,000	4,500	1,850

NOTES

Net under-absorption (`) = 4,500 – 1,850 = 2,650

or $2,02,650 - 2,00,000 = \text{ ` } 2,650$

Check Your Progress

7. State the difference between selling and distribution cost.
8. Under what circumstances can under and over absorption of overheads occur?

4.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Production overhead is also known as factory overhead, works overhead or manufacturing overhead.
2. Fixed overheads remain unaffected or fixed in total amount by fluctuations in volume of output. Variable overhead is the cost which, in aggregate, tends to vary in direct proportion to changes in the volume of output. Variable overhead per unit remains fixed.
3. The purpose of both cost allocation and cost apportionment is the identification or allotment of items of cost to cost centres or cost units. However, the main difference between the two procedures is that while allocation deals with whole items of costs, apportionment deals with proportions of items of cost.
4. Under trial and error method, the cost of first service department is apportioned to other service departments only in the given percentage. The cost of the second service department then is apportioned to the first and other service departments.
5. There are two steps in the absorption of overheads: Computation of overhead absorption rate, and Application of these rates to cost units.
6. Machine hour rate is the overhead cost of running a machine for one hour. This rate is obtained by dividing the amount of factory overhead apportioned to a machine by the number of machine hours for the period under consideration.

7. Selling cost is 'the cost of seeking to create and stimulate demand (sometimes termed marketing) and of securing orders.' These costs are thus incurred for increasing sales to the existing and potential customers.' Distribution cost is 'the cost of the sequence of operations which begins with making the packed product available for dispatch and ends with making the re-conditioned returned empty packages, if any, available for re-use.'
8. Under- or over-absorption of overheads may arise due to one or more of the following reasons: Faulty estimation of overhead costs, Faulty estimation of the quantity of output, Seasonal fluctuation in the amount of overheads in certain industries, Unforeseen changes in the production capacity, and Unexpected changes in the method of production affecting changes in the amount of overheads.

NOTES

4.8 SUMMARY

- Total cost may be classified into direct cost and indirect cost. The total of all direct costs is known as Prime cost and the total of all indirect costs is termed as Overhead cost.
- Classifications of overhead costs: functions, elements and behaviour.
- On the basis of functions, overheads may be classified into: (i) production overheads, (ii) administration overheads, and (iii) selling and distribution overheads.
- On the basis of behaviour, overheads may be classified into: (i) fixed overhead, (ii) variable overhead, and (iii) semi-fixed or semi-variable overhead.
- On the basis of behaviour, overheads may be classified into: (i) indirect materials, (ii) indirect wages and (iii) indirect expenses.
- After overhead costs have been collected under various standing order numbers, the next step is to allocate and apportion the overheads to production and service departments.
- 'Allocation' is a direct process, but 'apportionment' may be made only indirectly and for which suitable bases are to be selected.
- Apportionment on reciprocal basis method is used when service departments are mutually dependent.
- The absorption of overheads is the last step in the distribution plan of overheads.
- Overhead rates may be (i) actual or pre-determined; and (ii) blanket or multiple.
- Office and administration overheads pertain to general management and administration of business. They may be defined as the indirect expenditures incurred in formulating the policy, directing the organization and controlling the operations of an undertaking.

NOTES

- Selling overheads are incurred for promoting sales and securing orders while distribution overheads are mainly incurred in moving the goods from the company's godown to customers' place.
- Whenever the overheads absorbed are not equal to the amount of actual overheads, it is a case of either under-absorption or over-absorption of overheads.

4.9 KEY WORDS

- **Allocation:** It is charging to a cost centre those overheads that result solely from the existence of that cost centre.
- **Apportionment:** It is charging a fair share of an overhead to a cost centre.
- **Distribution overhead:** It comprises all expenditure incurred from the time the product is completed in the factory till it reaches its destination or customer; includes packing cost, carriage outward, delivery van expenses, warehousing costs, etc.
- **Idle capacity:** This is the difference between practical capacity and capacity based on sales expectancy or actual capacity.
- **Production overhead:** It is the aggregate of factory indirect material cost, indirect wages and indirect expenses.
- **Selling overhead:** It is the cost of seeking to create and stimulate demand or of securing orders.

4.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What is the advantage of classifying overheads into fixed and variable items?
2. Distinguish between cost classification and cost allocation.
3. State the objectives of departmentalization.
4. What are the principles of apportionment?
5. State the steps involved in the computation of machine hour rate.
6. What are the special features of selling and distribution overhead?

Long Answer Questions

1. What are the different methods of classifying overheads? Indicate the advantages of classifying overheads on the basis of variability.
2. Explain with illustration the classification of 'fixed', 'semi-fixed' and 'variable' expenses.

- 3 What are the bases of apportionment of overhead expenses among departments? Name the overhead for which each basis will be suitable.
4. 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 as follows:

Departments	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	—
Actuals:					
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 overheads 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 No. 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.

[Ans. (i) 125%; Selling price ` 4,660.50;

(ii) Machining dept.— Machine hour rate ` 4.50, Assembly dept.— Direct labour hour rate ` 1.40; Packing dept. Direct labour hour rate ` 2.50,

(iii) ` 4,989.40; (iv) Over/under (–) recovery; Current Method—Machining ` 2,70,000 (–); Assembly ` 2,53,500; Packing ` 22,500 (–) As per recommended method—Machining ` 42,000; Assembly ` 42,000; Packing ` 15,000]

NOTES

4.11 FURTHER READINGS

NOTES

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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Shillinglow, G. 1982. *Managerial Costing Accounting*. Homewood: Richard D. Irwin.

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Lal, Jawahar. 2003. *Cost Accounting*. New Delhi: Tata McGraw Hill.

BLOCK - II
TYPES OF COSTING

**UNIT 5 UNIT AND OUTPUT
COSTING**

NOTES

Structure

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Meaning of Cost Unit and Cost Accumulation, Procedure in Unit Costing, Preparation of Cost Sheet
- 5.3 Answers to Check Your Progress Questions
- 5.4 Summary
- 5.5 Key Words
- 5.6 Self Assessment Questions and Exercises
- 5.7 Further Readings

5.0 INTRODUCTION

A cost sheet shows every expense involved in creating a product. Companies and contractors prepare cost sheets to show clients how much money it costs to provide services, perform repairs or assemble products. Job costs typically involve labour, materials and overhead. Cost sheets show material purchased, labour hours and figures used for arriving at a fair overhead cost. In this unit, you will study the concept of unit costing and the preparation of cost sheet.

5.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and objectives of unit costing
- Explain the meaning and preparation of cost sheet
- Describe the determination of tender price
- Explain the concept of production account

5.2 MEANING AND OBJECTIVES OF UNIT AND OUTPUT COSTING

NOTES

Output costing (or unit costing or single costing) is a method of cost ascertainment which is used in those industries which have the following features :

- (i) Production consists of a single product or a few varieties of the same product with variations in size, shape, quality, etc., and
- (ii) Production is uniform and on continuous basis.

Costing Procedure

In order to ascertain the cost of products, a cost sheet is prepared periodically. As the production is uniform and cost units are identical, the cost per unit is the average cost. It is ascertained by dividing the total cost by the number of units produced. Cost unit may be 1,000 bricks, a barrel of beer, a gallon of milk, a tonne of steel/cement/sugar, etc. The cost sheet is designed to show the total cost as well as cost per unit of output for the given period.

Objectives of Unit Costing

Unit costing serves the following purposes:

1. It reveals the total cost and cost per unit of goods produced.
2. It discloses the break-up of total cost into different elements of cost.
3. It provides a comparative study of the cost of current period with that of the corresponding previous period.
4. It acts as a guide to management in fixation of selling prices and quotation of tenders.

5.2.1 Cost Sheet: Meaning and Performa

Cost sheet is defined as ‘a document which provides for the assembly of the detailed cost of a cost centre or cost unit.’

Thus cost sheet is a periodical statement of cost, designed to show in detail the various elements of cost of goods produced, like prime cost, factory cost, cost of production and total cost. It is prepared at regular intervals, e.g., weekly, monthly, quarterly, yearly, etc. Comparative figures of the previous period may also be shown in the cost sheet so that assessment can be made about the progress of the business.

Though the term *Production Statement* is used interchangeably with Cost Sheet, the former is an expanded form of the latter. In addition to cost elements, a production statement includes items of sales, stocks and profits. When the details of cost sheet or production statement are shown in a T-shape account, it is known as *Production Account*. Other terms used are *Cost Statement* and *Statement of Cost and Profit*.

Specimen of a *simple cost sheet* is given below:

Unit and Output Costing

Cost Sheet (or Statement of Cost) for the period.....

No. of units produced.....

<i>Particulars</i>	<i>Total cost</i>	<i>Cost per unit</i>
Direct Materials		
Direct Labour		
Direct (or Chargeable) Expenses		
Prime Cost		
Works Overheads		
Works Cost		
Office and Administrative Overheads		
Cost of Production		
Selling and Distribution Overheads		
Total Cost or Cost of Sales		
Profit or Loss		
Sales		

NOTES

5.2.2 Preparation of Cost Sheet

In this section, you will study the preparation of cost sheet.

Treatment of Stocks

Stocks may be of the following three types:

- (a) Stocks of raw materials
- (b) Stocks of work-in-progress
- (c) Stocks of finished goods

Stocks of Raw Materials: In order to calculate the value of raw materials consumed during the period, opening stock of raw materials is added to the raw materials purchased and closing stock is subtracted. This is shown below with *assumed* figures:

Opening stock of raw materials	12,000
<i>Add:</i> Purchases	<u>42,000</u>
	54,000
<i>Less:</i> Closing stock of raw materials	<u>9,000</u>
<i>Cost of materials consumed</i>	<u>45,000</u>

Stocks of Work-in-progress: This is the stock of semi-finished goods. In cost sheet, opening stock of work-in-progress is added in prime cost along with factory overhead and closing stock of work-in-progress is subtracted therefrom. Thus opening and closing stocks of work-in-progress are adjusted in works or factory cost as shown below (*with assumed figures*):

NOTES

Prime cost	62,000
<i>Add:</i> Factory overheads	<u>27,000</u>
Current manufacturing cost	89,000
<i>Add:</i> Opening stock of work-in-progress	<u>13,000</u>
Total goods processed during the period	1,02,000
<i>Less:</i> Closing stock of work-in-progress	<u>11,000</u>
<i>Works or factory cost</i>	<u>91,000</u>

Stock of Finished Goods: In cost sheet, finished goods are adjusted after calculating cost of production. Opening stock of finished goods is added to cost of production and closing stock of finished goods is subtracted therefrom. The resultant figure is called *cost of goods sold*. This is illustrated below (*with assumed figures*):

Cost of production	1,15,000
<i>Add:</i> Opening stock of finished goods	<u>17,000</u>
Cost of goods available for sale	1,32,000
<i>Less:</i> Closing stock of finished goods	<u>12,000</u>
<i>Cost of goods sold</i>	<u>1,20,000</u>

The treatment of the above three types of stocks is illustrated in the following specimen cost sheet.

Cost Sheet for the period.....

Production.....units.

<i>Particulars</i>	<i>Total cost</i>	<i>Cost per unit</i>
Opening stock of raw materials	XXX	
<i>Add:</i> Purchases	XXX	
<i>Add:</i> Expenses on purchases	<u>XXX</u>	
	XXX	
<i>Less:</i> Closing stock of raw materials	<u>XXX</u>	
Cost of material consumed		
Direct wages		
Direct expenses		
Prime Cost		
<i>Add:</i> Factory overheads		
<i>Add:</i> Opening stock of work-in-progress		
<i>Less:</i> Closing stock of work-in-progress		
Factory or Works Cost		
<i>Add:</i> Administrative overheads		
Cost of Production		
<i>Add:</i> Opening stock of finished goods		
<i>Less:</i> Closing stock of finished goods		
Cost of Goods Sold		
<i>Add:</i> Selling and distribution overheads		
Cost of Sales		
Profit (or Loss)		
Sales		

Items Excluded from Cost

The following items are of financial nature and are thus not included while preparing a cost sheet:

1. Cash discount
2. Interest paid
3. Preliminary expenses written off
4. Goodwill written off
5. Provision for taxation
6. Provision for bad debts
7. Transfer to reserves
8. Donations
9. Income tax paid
10. Dividend paid
11. Profit/loss on sale of fixed assets
12. Damages payable at law, etc.

NOTES**Treatment of Scrap**

Scrap may be defined *as an unavoidable residue material arising in certain types of manufacturing processes*. Examples of scrap are trimmings, turnings or boring from metals or timber, on which operations are performed. Scrap usually has a small realizable value. Such realizable value of scrap is deducted from either factory overheads or factory cost while preparing a cost sheet.

Illustrative Cost Sheet (Detailed)

<i>Particulars</i>	Units produced.....	
	<i>Total cost</i>	<i>Cost per unit</i>
Opening Stock of Raw Materials		
<i>Add:</i> Purchases
<i>Add:</i> Carriage Inward
<i>Add:</i> Octroi and Customs Duty
<i>Less:</i> Closing Stock of Raw Materials
<i>Cost of Direct Materials Consumed</i>
Direct or Productive Wages
Direct (or Chargeable) Expenses
Prime Cost
<i>Add: Works or Factory Overheads:</i>	...	
Indirect Materials	...	
Indirect Wages	...	
Leave Wages	...	
Overtime Premium	...	
Fuel and Power	...	
Rent and Taxes	...	
Insurance	...	
Factory Lighting	...	
Supervision	...	
Works Stationery	...	
Canteen and Welfare Expenses	...	
Repairs	...	

Unit and Output Costing

NOTES

Haulage	...	
Works Salaries	...	
Depreciation of Plant & Machinery	...	
Works Expenses	...	
Gas and Water	...	
Drawing Office Salaries	...	
Technical Director's Fees	...	
Laboratory Expenses	...	
Works Telephone Expenses	...	
Internal Transport Expenses	...	
<i>Less:</i> Sale of Scrap	...	
<i>Add:</i> Operating Stock of Work-in-progress	...	
<i>Less:</i> Closing Stock of Work-in-progress	...	
Works Cost	...	
<i>Add: Office and Administrative Overheads:</i>	...	
Office Salaries	.....
Director's Fees	.....
Office Rent and Rates	.....
Office Stationery and Printing	.....
Sundry Office Expenses	.....
Depreciation of Office Furniture	.....
Subscription to Trade Journals	.....
Office Lighting	.....
Establishment Charges	.....
Director's Travelling Expenses	.....
Postage	.....
Legal Charges	.....
Audit Fees	.....
Depreciation and Repair of Office Equipment	.....
Cost of Production	.....
<i>Add:</i> Opening Stock of Finished Goods	.....
<i>Less:</i> Closing Stock of Finished Goods	.....
Cost of Goods Sold	.....	.....
<i>Add: Selling and Distribution Overheads:</i>	.....
Advertising	.....
Showroom Expenses	.....
Bad Debts	.....
Salesmen's Salaries and Expenses	.....
Packing Expenses	.....
Carriage Outward	.....
Commission of Sales Agents	.....
Counting House Salaries	.....
Cost of Catalogues	.....
Expenses of Delivery Vans	.....
Collection Charges	.....
Travelling Expenses	.....
Cost of Tenders	.....
Warehouse Expenses	.....
Cost of Mailing Literature	.....
Sales Manager's Salaries	.....
Sales Director's Fees	.....
Showroom Expenses	.....
Sales Office Expenses	.....
Depreciation and Repairs of Delivery Vans	.....
Expenses of Sales Branches	.....
Cost of Sales (or Total Cost)	.....
PROFIT	.....
Sales	.....

Illustration 5.1: The following particulars have been extracted from the books of J K Production Co. Ltd, for the year ended 31 March 2010.

Stock of materials as on 1 April 2009	47,000
Stock of materials as on 31 March 2010	45,000
Materials purchased	2,08,000
Drawing office salaries	9,600
Counting house salaries	14,000
Carriage inwards	8,200
Carriage outwards	5,100
Donations to relief fund	4,300
Sales	4,87,000
Bad debts written off	4,700
Repairs of plant, machinery and tools	8,600
Rent, rates, taxes and insurance (factory)	3,000
Rent, rates, taxes and insurance (office)	1,000
Travelling expenses	3,700
Travelling salaries and commission	7,800
Production wages	1,45,000
Depreciation written off on machinery, plant and tools	9,100
Depreciation written off on office furniture	600
Director's fees	6,000
Gas and water charges (factory)	1,000
Gas and water charges (office)	300
General charges	5,000
Manager's salary	18,000

NOTES

Out of 48 working hours in a week, the time devoted by the manager to the factory and office was on an average 30 hours and 18 hours, respectively, throughout the accounting year. Prepare a cost sheet showing different elements of cost.

Solution:**Cost Sheet for the year ending 31 March 2010**

Opening stock of raw materials	47,000	
Add: Purchases	2,08,000	
Add: Carriage inwards	8,200	
	<u>2,63,200</u>	
Less: Closing stock	45,000	
Cost of materials consumed		2,18,200
Production wages		<u>1,45,000</u>
	Prime Cost	3,63,200
Factory overheads:		
Rent and rates	3,000	
Drawing office salaries	9,600	
Depreciation of plant	9,100	
Repairs of plant	8,600	
Factory gas and water	1,000	
Manager's salary $\left(18,000 \times \frac{30}{48}\right)$	<u>11,250</u>	<u>42,550</u>
	Factory Cost	4,05,750

NOTES

Administration overheads:			
Office rent and rates		1,000	
Depreciation on furniture		600	
Director's fees		6,000	
Gas and water		300	
General charges		5,000	
Manager's salary $\left(18,000 \times \frac{18}{48}\right)$		<u>6,750</u>	<u>19,650</u>
	Cost of production		4,25,400
Selling and distribution overheads:			
Counting house salaries		14,000	
Carriage outwards		5,100	
Bad debts		4,700	
Travelling expenses		3,700	
Travelling salaries		<u>7,800</u>	<u>35,300</u>
	Cost of Sales		4,60,700
	PROFIT		26,300
Sales			<u>4,87,000</u>

Note: Donation to relief fund is not included in cost.

5.2.3 Production Account

When information shown in a cost sheet is presented in the form of a T-shape account, it is known as Production Account. In this account, debit side shows the various item of cost while credit side shows the sales of finished goods. Opening stock is written on the debit side while closing stock is written on the credit side.

Alternatively, closing stock may be shown as a deduction from the items in debit side. In this way this account shows the total cost. The balance in this account shows profit or loss, as the case may be.

Illustration 5.2: Prepare a Production Account from the information extracted from the books of J K Production Co. Ltd as given in Illustration 5.1.

Solution:

Production Account
for the year ending 31 March 2010

To Opening stock of raw materials	47,000	By Prime cost c/d	3,63,200
Add: Purchases	2,08,000		
Add: Carriage inwards	<u>8,200</u>		
	2,63,200		
Less: Closing stock	<u>45,000</u>		
Cost of materials consumed	2,18,200		
To Production wages	<u>1,45,000</u>		
	<u>3,63,200</u>		<u>3,63,200</u>
To Prime Cost b/d	3,63,200	By Factory cost c/d	4,05,750
To Factory overheads:			
Rent and rates	3,000		
Drawing office salaries	9,600		
Depreciation of plant	9,100		
Repairs of plant	8,600		
Factory gas and water	1,000		

Manager's salary (18,000 × 30/48)	11,250		4,05,750
	<u>4,05,750</u>		<u>4,05,750</u>
To Factory Cost b/d	4,05,750	By Cost of production c/d	4,25,400
To Administration overheads:			
Office rent and rates	1,000		
Depreciation on furniture	600		
Director's fees	6,000		
Gas and water	300		
General charges	5,000		
Manager's salary (18,000 × 18/48)	6,750		
	<u>4,25,400</u>		<u>4,25,400</u>
To Cost of Production b/d	4,25,400	By Cost of sales c/d	4,60,700
To Selling and dist. overheads:			
Counting house salaries	14,000		
Carriage outwards	5,100		
Bad debts	4,700		
Travelling expenses	3,700		
Travelling salaries, etc.	7,800		
	<u>4,60,700</u>		<u>4,60,700</u>
To Cost of Sales b/d	4,60,700	By Sales	4,87,000
To Profit	26,300		
	<u>4,87,000</u>		<u>4,87,000</u>

NOTES**5.2.4 Determination of Tender Price**

Quite often the management has to quote prices of its products in advance or has to submit tenders for goods to be supplied. For this purpose an estimated cost sheet has to be prepared. Such an estimated cost sheet is prepared to show the estimated cost of products to be manufactured. In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level. Overheads are absorbed on the basis of a suitable method of absorption like percentage of direct materials, or wages or machine hour rate, etc. These methods were discussed in the overhead chapter.

Calculation of profit: After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price. In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

Example 1:

Given: Total cost = ₹ 50,000
Profit = 20% of cost
Suppose cost = ₹ 100
Profit = 100 × 20% = ₹ 20
∴ When cost is ₹ 50,000:

$$\text{Profit} = 50,000 \times \frac{20}{100} = ₹ 10,000$$

Example 2:

Given: Total cost = ₹ 50,000

Profit = 20% of selling price

Suppose selling price = ₹ 100

Profit = $100 \times 20\% = ₹ 20$

Cost = Selling price – Profit

= $100 - 20 = ₹ 80$

So when profit is 20% or $1/5$ of selling price, it is $20/80 = 1/4$ or 25% of cost. When total cost is ₹ 50,000, the profit will be calculated as follows:

Profit = $50,000 \times 25\% = ₹ 12,500$

Example 3:

Given: Selling price = ₹ 50,000

Profit = 20% of cost

Suppose cost = ₹ 100

Profit = $100 \times 20\% = ₹ 20$

Selling price = Cost + Profit

$100 + 20 = ₹ 120$

So profit of 20% of cost is equal to $20/120$ or $1/6$ of selling price. Thus, the profit will be calculated as follows:

Profit = $₹ 50,000 \times 1/6 = ₹ 8333.33$

NOTES**Check Your Progress**

1. In which type of industries is output costing used?
2. What are the three types of stocks?
3. What are the inclusions of the estimated cost sheet for quotations?
4. How is profit calculated for the estimated cost sheet?

5.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Output costing is used the industries having the following features:
 - Production consists of a single product or a few varieties of the same product with variations in size, shape, quality, etc., and
 - Production is uniform and on continuous basis.
2. The three types of stocks include:
 - Stocks of raw materials
 - Stocks of work-in-progress
 - Stocks of finished goods

3. An estimated cost sheet is prepared to show the estimated cost of products to be manufactured. In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level.
4. After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price. In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

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5.4 SUMMARY

- In order to ascertain the cost of products, a cost sheet is prepared periodically. As the production is uniform and cost units are identical, the cost per unit is the average cost. It is ascertained by dividing the total cost by the number of units produced.
- Cost sheet is defined as ‘a document which provides for the assembly of the detailed cost of a cost centre or cost unit’.
- Though the term production statement is used interchangeably with cost sheet, the former is an expanded form of the latter. In addition to cost elements, a production statement includes items of sales, stocks and profits.
- Scrap may be defined as an unavoidable residue material arising in certain types of manufacturing processes. Examples of scrap are trimmings, turnings or boring from metals or timber, on which operations are performed.
- Scrap usually has a small realizable value. Such realizable value of scrap is deducted from either factory overheads or factory cost while preparing a cost sheet.
- When information shown in a cost sheet is presented in the form of a T-shape account, it is known as production account. In this account, debit side shows the various item of cost while credit side shows the sales of finished goods.
- Opening stock is written on the debit side while closing stock is written on the credit side.
- Alternatively, closing stock may be shown as a deduction from the items in debit side. In this way this account shows the total cost. The balance in this account shows profit or loss, as the case may be.
- Quite often the management has to quote prices of its products in advance or has to submit tenders for goods to be supplied. For this purpose an estimated cost sheet has to be prepared. Such an estimated cost sheet is prepared to show the estimated cost of products to be manufactured.

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- In this cost sheet, cost of direct materials, direct wages and various types of overheads are predetermined on the basis of past costs after taking into account the present conditions and also the anticipated changes in the future price level.
- Overheads are absorbed on the basis of a suitable method of absorption like percentage of direct materials, or wages or machine hour rate, etc.
- After the total cost has been estimated, a desired percentage of profit is added to arrive at the price to be quoted. Such profit may be given as a percentage of cost or percentage of selling price.
- In order to calculate the amount of profit, it is easy to assume that figure as 100 on which profit percentage is given and then calculate the amount of profit.

5.5 KEY WORDS

- **Output costing:** Output costing is a method of cost ascertainment, which is used in those industries in which production consists of a single product or a few varieties of the same product, like cement industry, steel mills, paper mills and sugar mills.
- **Cost sheet:** Cost sheet is a periodical statement of cost, designed to show in detail, the various elements of cost of goods produced like prime cost, factory cost, cost of production and total cost.
- **Estimated cost sheet:** In estimated cost sheet, a fixed percentage of profit is added in the estimated total cost to arrive at the selling price to be quoted.

5.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the treatment of stocks.
2. What items are excluded from the cost sheet. Give relevant examples.

Long Answer Questions

1. What is unit or output costing? In what industries is it used?
2. What is a cost sheet? Explain the purposes served by it.
3. The following data relate to the manufacturing of a standard product during the four weeks ending on 31 March 2010:

Raw materials consumed	₹ 20,000
Direct wages	₹ 12,000

Machine-hours worked	1,000 hours
Machine-hour rate	₹ 2 per hour
Office overhead	20% on works cost
Selling overheads	₹ 0.40 per unit
Units produced	20,000 units
Units sold at ₹ 3 each	18,000 units

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Prepare a Cost Sheet and show the profit.

4. A factory produces a standard product. The following information is given to you from which you are required to prepare a 'Cost Sheet' for the period ended 31 July 2010:

Consumable materials:	
Opening stock	10,000
Purchases	85,000
Closing stock	4,000
Direct wages	20,000
Other direct expenses	10,000
Factory overheads	100% of direct labour
Office overheads	10% of works cost
Selling and distribution expenses	₹ 2 per unit sold
Units of finished product:	
In hand at the beginning of the period	Units 1,000 (value ₹ 16,000)
Produced during the period	10,000 units
In hand at the end of the period	2,000 units

Also, find out the selling price per unit on the basis that profit mark-up is uniformly made to yield a profit of 20% of the selling price. There was no work-in-progress either at the beginning or at the end of the period.

5.7 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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UNIT 6 RECONCILIATION OF COST AND FINAL ACCOUNTS

NOTES

Structure

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Reconciliation of Cost Financial Accounts: Meaning
 - 6.2.1 Objectives for Reconciliation
- 6.3 Procedure of Reconciliation of Cost and Final Accounts
- 6.4 Answers to Check Your Progress Questions
- 6.5 Summary
- 6.6 Key Words
- 6.7 Self Assessment Questions and Exercises
- 6.8 Further Readings

6.0 INTRODUCTION

In business concern where non-integrated accounting system is followed, cost and financial accounts are maintained separately. The difference between the end result of these two is required to be reconciled. Reconciliation of cost and financial accounts means tallying the profit or loss revealed by both sets of accounts. The chief aim is to find out the reasons for the difference between the results shown by cost accounts and financial accounts. In this unit, you will learn about the accounting process of reconciliation of cost and financial accounts.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning of reconciliation of cost and financial accounts
- Recall the objectives of reconciliation of cost and financial accounts
- Describe the procedure involved in the reconciliation of the accounts

6.2 RECONCILIATION OF COST FINANCIAL ACCOUNTS: MEANING

When cost accounts and financial accounts are maintained separately in two different sets of books, two profit and loss accounts will be prepared—one for costing books and the other for financial books. The profit or loss shown by costing books may not agree with that shown by financial books. Therefore, it becomes necessary that profit or loss shown by the two sets of accounts is reconciled.

It is important to note that the question of reconciliation of cost financial accounts arises only under non-integral system. However, under the integral accounts, since cost and financial accounts are integrated into one set of books and only one Profit and Loss Account is prepared, the problem of reconciliation does not arise.

6.2.1 Objectives for Reconciliation

The objectives for reconciliation can be understood through the needs it serves for the accountants and managers:

1. Reconciliation reveals the reasons for difference in profit or loss between cost and financial accounts.
2. It also helps in checking the arithmetic accuracy of the costing data. In other words, reconciliation enables to test the reliability of cost accounts.
3. It promotes coordination and cooperation between cost accounting and financial accounting departments.

Reasons for Disagreement in Profit/Loss

Difference in profit or loss between cost and financial accounts may arise due to the following reasons:

1. **Items shown only in financial accounts:** There are a number of items which appear in financial accounts and not in cost accounts. While reconciling, any items under this category must be considered. These items are classified into three categories as under:

(a) **Purely financial charges**—Examples:

- (i) Loss on the sale of capital assets
- (ii) Discount on bonds, debentures, etc.
- (iii) Losses on investments
- (iv) Expenses of company's transfer office
- (v) Interest on bank loans and mortgages
- (vi) Fines and penalties
- (vii) Provision for bad and doubtful debts
- (viii) Damages payable at law
- (ix) Amounts written off, goodwill, discount on debentures, preliminary expenses
- (x) Loss due to theft, pilferage, etc.

(b) **Purely financial incomes**—Examples:

- (i) Profit arising from the sale of capital assets
- (ii) Rent receivable

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(iii) Dividend and interest received on investments

(iv) Interest received on bank deposits

(v) Transfer fees received

(vi) Income tax refund

(c) **Appropriations of profit**—Examples:

(i) Dividends paid

(ii) Transfer to reserves

(iii) Charitable donations

(iv) Income-tax

(v) Any other items which appears in Profit and Loss Appropriation Account

2. Items shown only in cost accounts: There are a few items which are included in cost accounts and not in financial accounts. Examples:

(a) Notional rent, *i.e.*, charge in lieu of rent when premises are owned and no rent is payable

(b) Interest on capital employed but not actually paid, *i.e.*, the notional cost of employing capital

(c) Notional salaries

(d) Depreciation on fully depreciated assets still in use

3. Under-absorption or over-absorption of overheads: In cost accounts, overheads are recovered at a predetermined rate whereas in financial accounts these are recorded at actual cost. This may give rise to a difference between overheads absorbed in cost and actual overhead cost incurred. Such differences should be written off to Costing Profit and Loss Account.

However, when under or over-absorbed overheads are not written off to Costing Profit and Loss Account, it results in the amount recovered in cost accounts being different from the actual amount shown in financial accounts. In such a case, it becomes necessary to take into account this under/over-absorption while reconciling the two accounts.

4. Different bases of stock valuation: In cost accounts stocks are valued according to the method adopted in stores accounts, *e.g.* FIFO, LIFO, etc. On the other hand, valuation of stock in financial accounts is invariably based on the principle of cost or market price, whichever is less. Different stock values result in some difference in profit or loss as shown by the two sets of account books.

5. Different charges for depreciation: The rates and methods of charging depreciation may be different in cost and financial accounts. The financial accounts may follow straight line or diminishing balance method, etc., whereas in cost accounts machine hour rate, production unit method, etc., may be adopted. This will also cause a difference in the profit/loss figures.

6.3 PROCEDURE OF RECONCILIATION OF COST AND FINAL ACCOUNTS

*Reconciliation of Cost
and Final Accounts*

The cost and financial accounts are reconciled by preparing a Reconciliation Statement or a Memorandum Reconciliation Account. The following procedure is recommended for preparing a Reconciliation Statement:

1. Ascertain the points of difference between cost accounts and financial accounts.
2. Start with the profit as per cost accounts.
3. (a) *Regarding items of expenses and losses:*
Add: Items over-charged in cost accounts
Deduct: Items under-charged in cost accounts
For example, depreciation in cost accounts is ₹ 2,500 and that in financial accounts is ₹ 2,700. This has the effect of increasing costing profit by ₹ 200 as compared to financial profit. Then in order to reconcile, ₹ 200 will be deducted from costing profit.
- (b) *Regarding items of incomes and gains:*
Add: Items under-recorded or not recorded in cost accounts
Deduct: Items over-recorded in cost accounts
For example, interest on investments received amounting to ₹ 1,500 is not recorded in cost accounts. This will have the effect of reducing profit as per cost books. Thus, in order to reconcile, this amount of ₹ 1,500 for interest should be added in the costing profit.
- (c) *Regarding valuation of stock:*
 - (i) Opening Stock— *Add:* Amount of over-valuation in cost accounts
Deduct: Amount of under-valuation in cost accounts
 - (ii) Closing Stock— *Add:* Amount of under-valuation in cost accounts
Deduct: Amount of over-valuation in cost accounts
4. After making all the above additions and deductions in costing profit, the resulting figure shall be the profit as per financial books.
5. The above treatment of items will be reversed when the starting point in the Reconciliation Statement is the profit as per financial accounts or loss as per cost accounts.

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Pro forma of Reconciliation Statement

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Profit as per cost accounts			
<i>Add:</i>	1. Over-absorption of overheads		
	2. Financial incomes not recorded in cost books		
	3. Items charged only in cost accounts (Notional rent and interest on capital, etc.)		
	4. Over-valuation of opening stocks in cost books		
	5. Under-valuation of closing stock in cost books		
<i>Less:</i>	1. Under-absorption of overheads		
	2. Purely financial charges		
	3. Under-valuation of opening stock in cost books		
	4. Over-valuation of closing stock in cost books		
Profit as per financial accounts			

Memorandum Reconciliation Account

This is an alternative to Reconciliation Statement. The only difference is that the information shown above in the pro forma reconciliation statement is shown in the form of an account. The profit as per cost accounts is the starting point and is shown on the credit side of this account. All items which are added to costing profit for reconciliation are also shown on credit side. The items to be 'deducted' from costing profit for reconciliation are shown on the debit side. The balance figure is the profit as per financial accounts.

It is only a memorandum account and does not form part of the double entry books of account.

Pro forma of Memorandum Reconciliation Account

To (Item to be deducted)	—	By Profit as per cost accounts	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To (Item to be deducted)	—	By (Item to be added)	—
To Profit as per financial accounts (balancing figure)	—	By (Item to be added)	—

Example 1: From the following figures, prepare a Reconciliation Statement:

Net profit as per financial books	63,780
Net profit as per costing books	66,760
Factory overheads under-recovered in costing	5,700
Administration overheads recovered in excess	4,250
Depreciation charged in financial books	3,660
Depreciation recovered in costing	3,950
Interest received but not included in costing	450
Income-tax provided in financial books	600
Bank interest credited in financial books	230
Stores adjustment (credited in financial books)	420
Depreciation of stock charged in financial accounts	860
Dividends appropriate in financial accounts	1,200
Loss due to theft and pilferage provided only in financial books	260

Solution:

Reconciliation Statement

Profit as per costing books		66,760
<i>Add:</i> 1. Adm. overheads recovered in excess	4,250	
2. Depreciation overcharged in cost books (3,950 – 3,660)	290	
3. Interest received but not included in costing	450	
4. Bank interest credited in financial books only	230	
5. Stores adjustment credited in financial books	<u>420</u>	<u>5,640</u>
		72,400
<i>Less:</i> 1. Factory overheads under-recovered	5,700	
2. Income tax provided in financial books	600	
3. Dividends appropriated	1,200	
4. Depreciation of stock in financial books	860	
5. Loss due to theft and pilferage not shown in cost books	<u>260</u>	<u>8,620</u>
Profit as per financial books		63,780

NOTES

Check Your Progress

1. Give some examples of purely financial incomes.
2. What is the alternative to reconciliation account?
3. How is the opening and closing stock calculated?

6.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Some examples of purely financial incomes are: profit arising from the sale of capital assets, rent receivable, dividend and interest received on investments, interest received on bank deposits, transfer fees received and income tax refund.
2. Memorandum reconciliation account is an alternative to reconciliation statement. The only difference is that the information shown above in the pro forma reconciliation statement is shown in the form of an account.
3. Opening and closing stock is calculated as:
 Opening Stock— Add: Amount of over-valuation in cost accounts.
 Deduct: Amount of under-valuation in cost accounts.
 Closing Stock— Add: Amount of under-valuation in cost accounts.
 Deduct: Amount of over-valuation in cost accounts.

6.5 SUMMARY

- When cost accounts and financial accounts are separately maintained in two different sets of books, two profit and loss accounts will be prepared—one for costing books and the other for financial books.

NOTES

- It is important to note that the question of reconciliation of cost financial accounts arises only under non-integral system.
- However, under the integral accounts, since cost and financial accounts are integrated into one set of books and only one Profit and Loss Account is prepared, the problem of reconciliation does not arise.
- There are a number of items which appear in financial accounts and not in cost accounts. While reconciling, any items under this category must be considered.
- In cost accounts overheads are recovered at a predetermined rate whereas in financial accounts these are recorded at actual cost. This may give rise to a difference between overheads absorbed in cost and actual overhead cost incurred. Such differences should be written off to Costing Profit and Loss Account.
- In cost accounts stocks are valued according to the method adopted in stores accounts, e.g. FIFO, LIFO etc. On the other hand, valuation of stock in financial accounts is invariably based on the principle of cost or market price, whichever is less.
- The cost and financial accounts are reconciled by preparing a Reconciliation Statement or a Memorandum Reconciliation Account.

6.6 KEY WORDS

- **Integral accounts:** It is a system of accounting under which only one set of account books is maintained to record both the Cost and Financial transactions.
- **Financial accounts:** This refer to the type of accounting in which actual transactions of a company are recorded to show the financial position
- **Costing accounts:** This refer to the type of accounting in which actual transactions as well as estimation of costs of a company are recorded of accurate decision making

6.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What do you understand by reconciliation of cost and financial accounts?
2. List out 10 items, either debit or credit, which appear in financial accounts but do not appear in cost accounts.
3. What is Memorandum Reconciliation Account?

Long Answer Questions

1. Indicate the reasons why it is necessary for the cost and financial accounts of an organization to be reconciled and explain the main reasons of difference which enter into such accounts.
2. The profit disclosed by company's cost accounts for the year was ` 30,114 whilst the net profit shown by the financial accounts amounted to ` 19,760. On reconciling the figures the following differences are brought to light:
 - (a) Overheads in the cost accounts were estimated at ` 7,500. The charge for the year shown by the financial accounts was ` 6,932.
 - (b) Director's fees not charged in the cost accounts amounted to ` 750.
 - (c) The company has allocated ` 600 to general provision for bad debts.
 - (d) Work was commenced during the year on a new factory and expenditure of ` 12,000 was incurred. Depreciation of 5% was provided for in the financial accounts.
 - (e) Transfer fees received amounted to ` 28.
 - (f) The amount charged for Income Tax ` 9,000.

Prepare a statement reconciling the figure shown by cost and financial accounts.

3. A manufacturing company disclosed a net loss of ` 3,47,000 as per their cost accounts for the year ended 31 March 2010. The financial accounts however disclosed a net loss of ` 5,10,000 for the same period. The following information was revealed as a result of scrutiny of the figure of both the sets of accounts:

(i) Factory overheads under-absorbed	40,000
(ii) Administration overheads over-absorbed	60,000
(iii) Depreciation charged in financial accounts	3,25,000
(iv) Depreciation charged in cost accounts	2,75,000
(v) Interest on investment not included in cost accounts	96,000
(vi) Income-tax provided	54,000
(vii) Interest on loan funds in financial accounts	2,45,000
(viii) Transfer fess (credit in financial books)	24,000
(ix) Store adjustment (credit in financial books)	14,000
(x) Dividend received	32,000

Prepare a Reconciliation Statement.

NOTES

6.8 FURTHER READINGS

NOTES

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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UNIT 7 PROCESS COSTING - I

Structure

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Process Costing: Meaning and Applications
 - 7.2.1 Preparation of Process Accounts
 - 7.2.2 Treatment of Normal Wastage, Abnormal Effectiveness
- 7.3 Answers to Check Your Progress Questions
- 7.4 Summary
- 7.5 Key Words
- 7.6 Self Assessment Questions and Exercises
- 7.7 Further Readings

NOTES

7.0 INTRODUCTION

Industries seldom work on single products. They are mostly involved in the mass production of several different products. On this account, companies find it hard to differentiate the per unit cost of the different outputs and so the cost of one is assumed to be the same as other. This is known as process costing. Under this, the companies record the production costs for a certain period, summarizes them and then allocates them to the all the units produced for a consistent time. In this unit, you will study the aspects associated with process costing.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and uses of process costing
- Explain the preparation of process account
- Describe the treatment of normal, abnormal wastage and abnormal effectiveness

7.2 PROCESS COSTING: MEANING AND APPLICATIONS

Process costing is probably the most widely used method of cost ascertainment. It is used in mass production industries producing standard products, like steel, sugar and chemicals. In all such industries, goods produced are identical and all factory processes are standardized. Goods are produced without waiting for any instructions or orders from customers and are put into warehouse for sale. Raw

materials move down the production line through a number of processes in a particular sequence and costs are compiled for each process or department by preparing a separate account for each process.

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Process costing is applicable in industries like:

- Textiles mills
- Chemical works
- Oil refining
- Cement manufacture
- Paper manufacture
- Food processing
- Steel mills
- Paint manufacture
- Soap making
- Sugar works
- Confectionaries
- Plastic manufacture, etc

Essential Characteristics of Process Costing

1. The production is continuous and the final product is the result of a sequence of processes.
2. Costs are accumulated process-wise.
3. The products are standardized and homogeneous.
4. The cost per unit produced is the average cost which is calculated by dividing the total process cost by the number of units produced.
5. The finished product of each but last process becomes the raw material for the next process in sequence and that of the last process is transferred to the finished goods stock.
6. The sequence of operations or processes is specific and predetermined.
7. Some loss of materials in processes (due to chemical action, evaporation, etc.) is unavoidable.
8. Processing of a raw materials may give rise to the production of several products. These several products produced from the same raw material may be termed as joint products or by-products.

Process Costing and Job Costing—A Comparison

A comparison of process and job costing methods will help in the better understanding of process costing system.

Process costing	Job costing
1. Costs are compiled process-wise and cost per unit is the average cost, <i>i.e.</i> , the total cost of the process divided by the number of units produced.	1. Costs are separately ascertained for each job, which is cost unit.
2. Production is of standardized products and cost units are identical.	2. Production is of non-standard items with specifications and instructions from the customers.
3. Production is for stocks.	3. Production is against orders from customers.
4. Costs are computed at the end of a specific period.	4. Costs are calculated when a job is completed.
5. The cost of one process is transferred to the next process in the sequence.	5. Cost of a job is not transferred to another job but to finished stock account.
6. On account of continuous nature of production, work-in-progress in the beginning and end of the accounting period is a regular feature.	6. There may or may not be work-in-progress in the beginning and end of the accounting period.
7. Cost control is comparatively easier. This is because factory processes and products are standardized.	7. Cost control is comparatively more difficult because each cost unit or job needs individual attention.

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7.2.1 Preparation of Process Accounts

The essential stages in process costing procedure are:

1. The factory is divided into a number of processes and an account is maintained for each process.
2. Each process account is debited with material cost, labour cost, direct expenses and overheads allocated or apportioned to the process.
3. The output of a process is transferred to the next process in the sequence. In other words, finished output of one process becomes input of the next process.
4. The finished output of the last process (*i.e.*, the final product) is transferred to the Finished Goods Account.

Illustration 7.1: A product passes through three distinct processes to completion. These processes are numbered respectively, 1, 2 and 3. During the week ended 31 January, 1,000 units are produced. The following information is obtained:

	<i>Process 1</i>	<i>Process 2</i>	<i>Process 3</i>
Materials	6,000	13,000	2,000
Labour	5,000	4,000	5,000
Direct expenses	1,000	200	1,000

The indirect expenses for the period were ₹ 2,800, apportioned to the processes on the basis of labour cost.

Prepare process accounts showing total cost and cost per unit.

Solution:

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Process 1 Account

Output: 1,000 units

Particulars	Per unit	Total	Particulars	Per unit	Total
To Materials	6	6,000	By Output transferred to Process 2	13	13,000
To Labour	5	5,000			
To Direct expenses	1	1,000			
To Indirect expenses*	1	1,000			
	13	13,000		13	13,000

$$\begin{aligned}
 \text{*Indirect expenses as a \% of labour} &= \frac{2,800}{5,000 + 4,000 + 5,000} \times 100 \\
 &= \frac{2,800}{1,4000} \times 100 = 20\%
 \end{aligned}$$

Process 2 Account

Output: 1,000 units

Particulars	Per unit	Total	Particulars	Per unit	Total
To Process I (Transfer)	13.00	13,000	By Output transferred to Process 3	21.00	21,000
To Materials	3.00	3,000			
To Labour	4.00	4,000			
To Direct expenses	0.20	200			
To Indirect expenses	0.80	800			
	21.00	21,000		21.00	21,000

Process 3 Account

Output: 1,000 units

Particulars	Per unit	Total	Particulars	Per unit	Total
To Process 2	21	21,000	By Output transferred to finished stock	30	30,000
To Materials	2	2,000			
To Labour	5	5,000			
To Direct expenses	1	1,000			
To Indirect expenses	1	1,000			
	30	30,000		30	30,000

Finished Stock Account

Units		
To Process 3	1,000	30,000

7.2.2 Treatment of Normal Wastage, Abnormal Effectiveness

There are certain accounting adjustments which are peculiar to process costing and accordingly, this is broadly divided into three sections:

- (i) Process losses and wastages

(ii) Valuation of work-in-progress—Equivalent Production

(iii) Inter-process profits

In this unit, you will only study the first section related to process losses and wastages. The valuation of work-in-progress and inter-process profits will be discussed in the next unit.

NOTES

Process Losses and Wastages

In industries which employ process costing, a certain amount of loss occurs at various stages of production. Such a loss may arise due to chemical reaction, evaporation, inefficiency, etc. It is, therefore, necessary to keep accurate records of both input and output. Where loss occurs at a late stage in manufacture, it is apparent that financial loss is greater. This is because more and more costs are incurred in processes as products move towards completion stage.

Process losses may be classified into (a) normal, and (b) abnormal.

Normal Process Loss

That amount of loss which cannot be avoided because of the nature of material or process is normal process loss. Such a loss is quite expected under normal conditions. It is caused by factors, like chemical change, evaporation, withdrawals for tests or sampling and unavoidable spoiled quantities.

Abnormal Process Loss

This type of loss consists of loss due to carelessness, machine breakdown, accident, use of defective materials, etc. Thus, it arises due to abnormal factors and represents a loss which is over and above the normal loss.

Accounting procedure for normal and abnormal loss differs.

Accounting Treatment of Normal Loss

It is a fundamental costing principle that the cost of normal losses should be borne by the good production. Normal loss is generally determined as a percentage of input. Sometimes such a loss is due to loss of weight, say, due to evaporation or chemical action. Since such a wastage is not physically present, obviously it cannot have any value.

However, when normal loss is physically present in the form of scrap, it may have some value, i.e., it may be sold at some price. Whenever scrapped material has any value, it is credited to the Process Account. This is illustrated below.

Illustration 7.2: The following information is given in respect of process A.

Material	1,000 kgs @ ` 6 per kg
Labour	` 5,000
Direct expenses	` 1,000
Indirect expenses allocated to Process A	` 1,000
Normal wastage	10% of input

Prepare Process A Account when:

- (a) Scrap value of normal loss is nil
- (b) Scrap arising out of normal has a sale value of ` 1 per unit

NOTES

Solution:

(a) When scrap value of normal loss is nil:

Process A Account

<i>Particulars</i>	<i>Kgs</i>	`	<i>Particulars</i>	<i>Kgs</i>	`
To Material	1,000	6,000	By Normal loss	100	—
To Labour		5,000	By Transfer to		
To Direct exp.		1,000	Process 2	900	13,000
To Indirect exp.		1,000			
	1,000	13,000		1,000	13,000

Cost per unit = ` 13,000 ÷ 900 units
= ` **14.44**

The normal loss is absorbed by good production and as a result the cost per unit of good production inflates. When there is no loss, the cost per unit produced is ` 13 (*i.e.*, 13,000 ÷ 1,000 units). But when there is a normal loss, the cost per unit is higher at ` 14.44.

(b) When scrap of normal loss has a sale value of ` 1 per unit.

Process A Account

<i>Particulars</i>	<i>Kgs</i>	`	<i>Particulars</i>	<i>Kgs</i>	`
To Material	1,000	6,000	By Normal loss	100	100
To Labour		5,000	By Transfer to Process 2	900	12,900
To Direct exp.		1,000			
To Indirect exp.		1,000			
	1,000	13,000		1,000	13,000

Cost per unit = ` 12,900 ÷ 900 units
= ` **14.33**

Whenever any value is realized from the sale of normal wastage, it reduces the cost to that extent.

Accounting Treatment of Abnormal Process Loss

It has been stated earlier that abnormal loss is due to carelessness, accidents, machine breakdown and other abnormal reasons. Unlike normal loss, abnormal loss is not absorbed by good production, rather it is transferred to Costing Profit and Loss Account. This is because if the cost of abnormal loss were to fall upon the good production, the cost thereof will fluctuate and the information provided would be misleading. In order to overcome this and also to disclose the cost of abnormal loss, the following procedure may be adopted:

- (a) Allow for normal loss in the manner described earlier.
- (b) After considering normal loss, find out the cost per unit in that process. This is done by the following formula:

$$\text{Cost per unit} = \frac{\text{Total cost} - \text{Value of normal loss}}{\text{Units introduced} - \text{Normal loss units}}$$

- (c) Multiply the cost per unit (calculated as above) by the number of units of abnormal loss. This gives the total value of abnormal loss.
- (d) Credit the relevant Process Account with the quantity and value of abnormal loss.
- (e) The balance figure in the Process Account is the cost of good units produced in the process. This can also be found by multiplying cost per unit with the number of good units produced.
- (f) Open 'Abnormal Loss Account' and debit it with the quantity and value of abnormal loss shown in the Process Account. Sale proceeds from abnormal loss are credited to Abnormal Loss Account. Any balance left in this account is net loss and transferred to Costing Profit and Loss Account.

NOTES

Illustration 7.3: Fifty units are introduced into a process at a cost of rupee one each. The total additional expenditure incurred by the Process is ` 30. Of the units introduced, 10% are normally spoiled in the course of manufacture, these possess a scrap value of ` 0.25 each. Owing to an accident, only 40 units are produced. You are required to prepare (i) Process Account, and (ii) Abnormal Loss Account.

Solution:**Process Account**

Particulars	Units	`	Particulars	Units	`
To Materials	50	50.00	By Normal loss	5	1.25
To Expenses	—	30.00	By Abnormal loss	5	8.75*
			By Transfer to next process (B/F)	40	70.00
	<u>50</u>	<u>80.00</u>		<u>50</u>	<u>80.00</u>

*Cost of abnormal loss is calculated as follows:

$$\text{Cost per unit} = \frac{\text{Total cost} - \text{Value of normal loss}}{\text{Input} - \text{Normal loss (in units)}} = \frac{\text{` 80} - 1.25}{\text{Units } 50 - 5} = \frac{78.75}{45} = \text{Rs } 1.75$$

$$\begin{aligned} \text{Cost of abnormal loss} &= \text{Abnormal loss units} \times \text{Cost per unit} \\ &= 5 \times \text{` 1.75} = \text{` 8.75} \end{aligned}$$

Abnormal Loss Account

Particulars	Units	`	Particulars	Units	`
To Process A/c	5	8.75	By Sales	5	1.25
			By Profit and Loss A/c (Balanced figure)		7.50
	<u>5</u>	<u>8.75</u>		<u>5</u>	<u>8.75</u>

Abnormal Gain or Effectiveness

The normal process loss represents the loss that would be expected under normal conditions. It is an estimated figure. The actual loss may be greater or less than the normal loss. If the actual loss is greater than normal loss, it is known as abnormal loss. But if actual loss is less than normal loss, a gain is obtained which is termed as *abnormal gain or effectiveness*. The value of abnormal gain is calculated in a manner similar to abnormal loss. It is shown on the debit side of the Process Account and credit side of the Abnormal Gain Account. Like abnormal loss, it is ultimately transferred to Costing Profit and Loss Account. This is illustrated below.

NOTES

Example: Using the figures of Illustration 7.3, except that output is 47 units, show how the process account will be prepared. Also prepare Abnormal Gain Account.

Solution: When normal output is 45 units and actual output is 47 units, there is an abnormal gain of 2 units. This is shown in the following account.

Process Account					
Particulars	Units	`	Particulars	Units	`
To Material	50	50	By Normal loss	5	1.25
To Expenses		30	By Transfer to next		
To Abnormal gain*	2	3.50	process	47	82.25
	52	83.50		52	83.50

*The value of abnormal gain is calculated as follows:

$$\frac{80 - 1.25}{50 - 5 \text{ units}} \times 2 \text{ units} = 3.50$$

It should be noted that the method of valuation of abnormal gain is the same as that of abnormal loss.

Abnormal Gain Account					
Particulars	Units	`	Particulars	Units	`
To Normal loss A/c (Shortfall in the sale of normal loss)	2	0.50	By Process A/c	2	3.50
To Profit & Loss A/c (B.F.)		3.00			
	2	3.50		2	3.50

Illustration 7.4: A product passes through three processes A, B and C. The normal wastage of each process is as follows: Process A – 3 per cent, Process B – 5 per cent, and Process C – 8 per cent. Wastage of Process A was sold at 25 p. per unit, that of Process B at 50 p. per unit and that of Process C at 1 p. per unit.

10,000 units were issued to Process A in the beginning of October 2005 at a cost of 1 p. per unit. The other expenses were as follows:

	Process A	Process B	Process C
Sundry materials	₹ 1,000	₹ 1,500	₹ 500
Labour	5,000	8,000	6,500
Direct expenses	1,050	1,188	2,009
Actual output	9,500 units	9,100 units	8,100 units

NOTES

Prepare the Process Accounts, assuming that there were no opening or closing stocks. Also give the Abnormal Wastage and Abnormal Gain Accounts.

Solution:**Process A Account**

Particulars	Units	₹	Particulars	Units	₹
To Units introduced	10,000	10,000	By Normal wastage	300	75
To Sundry materials		1,000	(3% of 10,000)		
To Labour		5,000	By Abnormal wastage	200	350*
To Direct expenses		1,050	By Process B (transfer)	9,500	16,625
	10,000	17,050		10,000	17,050

$$\text{*Value of abnormal wastage} = \frac{₹ 17,050 - ₹ 75}{10,000 - 300 \text{ units}} \times 200 \text{ units} = ₹ 350$$

Process B Account

Particulars	Units	₹	Particulars	Units	₹
To Process A	9,500	16,625	By Normal wastage	475	238
To Sundry materials		1,500	(5% of 9,500)		
To Labour		8,000	By Process C (transfer)	9,100	27,300
To Direct exp.		1,118			
To Abnormal gain	75	225*			
	9,575	27,538		9,575	27,538

$$\text{*Abnormal gain} = \frac{₹ 27,313 - ₹ 238}{9,500 - 475 \text{ units}} \text{ units} = ₹ 225$$

Process C Account

Particulars	Units	₹	Particulars	Units	₹
To Process B (transfer)	9,100	27,300	By Normal wastage	728	728
To Sundry materials		500	8% of 9,100)		
To Labour		6,500	By Abnormal wastage	272	1,156*
To Direct expenses		2,009	By Finished goods (transfer)	8,100	34,425
	9,100	36,309		9,100	36,309

$$\text{*Abnormal wastage} = \frac{₹ 36,309 - ₹ 728}{9,100 - 728 \text{ units}} \times 272 \text{ units} = ₹ 1,156$$

Abnormal Wastage Account

Particulars	Units	₹	Particulars	Units	₹
To Process A	200	350	By Sales of scrap in		
To Process B	272	1,156	Process A @ ₹ 0.25	200	50
			Process C @ ₹ 1	272	272
			By Profit and Loss A/c (B/F)		1,184
	472	1,506		472	1,506

NOTES

Abnormal Gain Account

<i>Particulars</i>	<i>Units</i>	<i>₹</i>	<i>Particulars</i>	<i>Units</i>	<i>₹</i>
To Normal wastage A/c shortfall in the sale of normal wastage @ ₹ 0.50 per unit)	75	38	By Process B	75	225
To Profit & Loss A/c (B.F.)		187			
	75	225		75	225

When the Output of a Process is Partly Sold and Partly Transferred to the Next Process

Sometimes the output of a process may be partly sold and partly transferred to the next process for further processing. For example, in a textile mill, part of the output of a spinning process may be sold and the remaining output is passed on to the weaving process for further processing. A part of the output so sold will contain an element of profit or loss which will be revealed in the Process Account. But when a part of the output is sent to warehouse for sale, it is at cost and does not contain an element of profit or loss.

Illustration 7.5: XYZ Ltd manufactures and sells three chemicals produced by consecutive processes known as X, Y and Z. In each process 2% of the total weight put in is lost and 10% is scrap, which from processes X and Y realized ₹ 100 a tonne and from Z ₹ 200 a tonne. The products of the three processes are dealt with as follows:

	X	Y	Z
Sent to warehouse for sale	25%	50%	100%
Passed on the next process	75%	50%	—
The following particulars relate to the month of May:			
Materials used (tonnes)	1,000	140	1,348
Cost per tonne of materials (₹)	120	200	80
Mfg. expenses (₹)	30,800	25,760	18,100

Prepare an account for each process, showing the cost per tonne of each product.

Solution:

Process X Account

<i>Particulars</i>	<i>Tonnes</i>	<i>₹</i>	<i>Particulars</i>	<i>Tonnes</i>	<i>₹</i>
To Materials (@ ₹ 120)	1,000	1,20,000	By Loss in weight (2% of 1,000)	20	—
To Mfg. exp.		30,800	By Scrap (10% of 1,000)	100	10,000
			By Warehouse (25% of 880)	220	35,200
			By Process Y (transfer)	660	1,05,600
	1,000	1,50,800		1,000	1,50,800

Working Notes:

$$1. \text{ Transfer to warehouse} = \frac{\text{₹}1,50,800 - \text{₹}10,000}{880 \text{ tonnes}} \times 220 \text{ tonnes} = \text{₹}35,200.$$

Similar calculation has been made in Process Y.

2. As the question is silent about the nature of loss, it is presumed that both weight loss and scrap are normal.

NOTES**Process Y Account**

Particulars	Tonnes	₹	Particulars	Tonnes	₹
To Process X (transfer)	660	1,05,600	By Loss in weight (2% of 800)	16	—
To Materials	140	28,000	By Scrap	80	8,000
To Mfg. exp.	—	25,760	By Warehouse	352	75,680
			By Process Z (transfer)	352	75,680
	800	1,59,360		800	1,59,360

Process Z Account

Particulars	Tonnes	₹	Particulars	Tonnes	₹
To Process Y (transfer)	352	75,680	By Loss in Weight (2% of 1700)	34	—
To Materials	1,348	1,07,840	By Scrap	170	34,000
To Mfg. exp.	—	18,100	By Warehouse (transfer)	1,496	1,67,620
	1,700	2,01,620		1,700	2,01,620

Check Your Progress

1. State any four areas where process costing is applicable.
2. How is the finished output of the last process treated?
3. What is normal process loss?

7.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Process costing is applicable in:
 - Textile mills
 - Chemical works
 - Oil refining
 - Cement manufacture
2. The finished output of the last process that is the final product is transferred to the finished goods account.
3. That amount of loss which cannot be avoided because of the nature of material or process is normal process loss. Such a loss is quite expected under normal conditions.

NOTES

7.4 SUMMARY

- Process costing is the most widely used method of cost ascertainment. It is used in mass production industries producing standard products, like steel, sugar and chemicals.
- In all such industries, goods produced are identical and all factory processes are standardized. Goods are produced without waiting for any instructions or orders from customers and are put into warehouse for sale.
- In industries which employ process costing, a certain amount of loss occurs at various stages of production. Such a loss may arise due to chemical reaction, evaporation, inefficiency, etc. It is, therefore, necessary to keep accurate records of both input and output. Where loss occurs at a late stage in manufacture, it is apparent that financial loss is greater.
- It is a fundamental costing principle that the cost of normal losses should be borne by the good production. Normal loss is generally determined as a percentage of input. Sometimes such a loss is due to loss of weight, say, due to evaporation or chemical action. Since such a wastage is not physically present, obviously it cannot have any value.
- The normal process loss represents the loss that would be expected under normal conditions. It is an estimated figure. The actual loss may be greater or less than the normal loss. If the actual loss is greater than normal loss, it is known as abnormal loss. But if actual loss is less than normal loss, a gain is obtained which is termed as abnormal gain or effectiveness.

7.5 KEY WORDS

- **Process costing:** Process costing is the methodology used to allocate the total costs of production to homogenous units produced via a continuous process that usually involves multiple steps or departments.
- **Abnormal loss:** Abnormal loss is a controllable loss and thus can be avoided if corrective measures are taken. Therefore, abnormal loss is also called an avoidable loss.
- **FIFO:** FIFO stands for first-in, first-out, meaning that the oldest inventory items are recorded as sold first but do not necessarily mean that the exact oldest physical object has been tracked and sold.

7.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. State the essential characteristics of process costing.
2. How are normal and abnormal losses treated in the calculation of equivalent production?

Long Answer Questions

1. In a manufacturing unit, the raw material passes through four processes I, II, III and IV and the output of each process is the input of the subsequent process. The loss in the four processes I, II, III and IV are respectively 25%, 20%, 20% and of the input. If the end product at the end of process IV is 40,000 kgs, what is the quantity of raw materials required along with its cost to be fed at the beginning of Process I when the cost of the same is ₹ 5 per kg.

2. From the following particulars, prepare Process X account showing the cost per tonne of output:

Materials in tonnes	1,000	Manufacturing expenses	₹ 10,000
Cost of material per tonne	₹ 125		
Wages	₹ 26,000	Output in tonnes	830

It is ascertained that in the process normally 5% of the total weight is lost and 10% is scrap which realizes ₹ 80 per tonne. There was no stock or work-in-progress.

3. A product passes through two processes. The output of Process I becomes the input of Process II and the output of Process II is transferred to warehouse. The quantity of raw materials introduced into Process I is 20,000 kgs at ₹ 10 per kg. The cost and output data for the month under review are as under:

	<i>Process I</i>	<i>Process II</i>
Direct materials	₹ 60,000	₹ 40,000
Direct labour	₹ 40,000	₹ 30,000
Production overheads	₹ 39,000	₹ 40,250
Normal loss	8%	5%
Output	₹ 18,000	₹ 17,400
Loss realization of ₹/unit	2.00	3.00

NOTES

The company's policy is to fix the selling price of the end product in such a way as to yield a profit of 20% on selling price.

Required:

NOTES

- (i) Prepare the Process Accounts
- (ii) Determine the selling price per unit of the end product.

7.7 FURTHER READINGS

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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UNIT 8 PROCESS COSTING - II

Structure

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Work-in-Progress (Equivalent Production)
- 8.3 Internal Process Profits (Inter-Process Profits)
- 8.4 Joint Products and By-Products
- 8.5 Answers to Check Your Progress Questions
- 8.6 Summary
- 8.7 Key Words
- 8.8 Self Assessment Questions and Exercises
- 8.9 Further Readings

NOTES

8.0 INTRODUCTION

In the previous unit, you studied the basics of process costing, its essential features and the industries in which it is used. You also studied the manner of preparation of process account. It was mentioned in the previous unit that there are certain adjustments that are unique to the process costing. Under this concept, you studied the process losses and wastages and its types. Taking the discussion forward, in this unit, you will learn the other accounting adjustments including: valuation of work-in-progress and inter-process profits.

In most of the industries in which process costing is used, two or more products are unavoidably produced from the same process and same raw materials. These products are produced in natural proportions which cannot be changed at the will of the management. For example, in an oil refinery, when crude oil is processed, many products are simultaneously produced from the same set of inputs. Examples of these products are petrol, kerosene oil, diesel, grease and lubricating oils. Such products are known as joint products or by-products. In this unit, you will also learn accounting treatment of such products.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the accounting process of valuation of work-in-progress
- Explain the adjustments of inter-process profits
- Describe the meaning and apportionment of joint and by-products

8.2 WORK-IN-PROGRESS (EQUIVALENT PRODUCTION)

NOTES

Process costing mainly deals with continuous type of production. At the end of the accounting period, there may be some work-in-progress, i.e., semi-finished goods may be in the pipeline. The valuation of such work-in-progress is done in terms of equivalent or effective production.

Equivalent Production

Equivalent production represents the production of a process in terms of completed units. Work-in-progress at the end of an accounting period are converted into equivalent completed units. This is done by the following formula:

$$\text{Equivalent production} = \text{Completed units} + \left(\text{No. of units of work in progress} \right) \times \left(\text{Degree of completion in \%} \right)$$

For example, if there are 50 units in work-in-progress and these are estimated to be 60% complete, then their equivalent production is $50 \text{ units} \times 60\% = 30 \text{ units}$.

In each process, an estimate is made of the degree of completion of work-in-progress in terms of percentage. Such an estimate must be accurate because any error in such estimation will lead to erroneous valuation of work-in-progress stock which enters into final accounts.

Evaluation of Equivalent Production

After work-in-progress has been converted into equivalent completed units, the following steps are taken to evaluate it:

- (i) Find out the total cost (net) for each element of cost, i.e., material, labour and overheads. Scrap value of normal loss is deducted from the material cost.
- (ii) Ascertain the cost per unit of equivalent production separately for each element of cost. This is done by dividing the total cost of each element by the respective number of equivalent units.
- (iii) At this rate of cost per unit, ascertain the value of finished production and work-in-progress.

For the purpose of computation of equivalent production and its evaluation, the following three statements are generally prepared:

- (a) Statement of equivalent production
- (b) Statement of cost (per unit)
- (c) Statement of evaluation

These three statements may also be combined in one comprehensive statement called 'Statement of Production, Cost and Evaluation.'

For clear understanding, illustrations on equivalent production are classified into the following two categories.

- (a) *When there is no opening stock*, i.e., when there is only closing stock of work-in-progress. In such a situation there may or may not be process losses.
- (b) *When there is opening as well as closing stock*—Here also, there may or may not be process losses.

When there is no opening stock and no process loss

In such a case, valuation of work-in-progress in terms of equivalent production is comparatively simple. Procedure followed in this type of situation is shown in the following illustration.

Illustration 8.1: In process A, on 1 March, there was no work-in-progress. During the month of March, 2,000 units of material were issued at a cost of ₹ 18,000. Labour and overheads totalled ₹ 9,000 and ₹ 6,600 respectively. On 31 March, 1,500 units were completed and transferred to the next process. On the remaining 500 units, which were incomplete, degree of completion was as follows:

Materials	100%
Labour	60%
Overheads	30%

- Prepare: (a) Statement of Equivalent Production
(b) Statement of Cost
(c) Statement of Evaluation
(d) Process Account

Solution:

(a) **Statement of Equivalent Production**

Input Units	Output		Equivalent units					
	Items	Units	Material		Labour		Overheads	
			Qty	%	Qty	%	Qty	%
2,000	Finished output	1,500	1,500	100	1,500	100	1,500	100
	Work-in-progress	500	500	100	300	60	150	30
2,000	Total	2,000	2,000	—	1,800	—	1,650	—

(b) **Statement of Cost**

Element of cost	Cost units (B)	Equivalent (A ÷ B)	Cost per units
(A)			
Material	18,000	2,000	9
Labour	9,000	1,800	5
Overheads	6,600	1,650	4
			Total 18

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(c) **Statement of Evaluation**

Finished goods	(1,500 × ₹18)		27,000
Value of work-in-progress:			
Materials	500 units @ ₹9 per unit	4,500	
Labour	300 units @ ₹5 per unit	1,500	
Overheads	150 units @ ₹4 per unit	600	6,600

(d) **Process A Account**

<i>Particulars</i>	<i>Units</i>		<i>Particulars</i>	<i>Units</i>	
Tot Materials	2,000	18,000	By Next process A/c	1,500	27,000
To Labour		9,000	By Work-in-progress c/d	500	6,600
To Overheads		6,600			
	2,000	33,600		2,000	33,600

When there is no opening stock of work-in-progress but there are process losses—as discussed earlier, losses are inherent in process operations. Normal and abnormal process losses are treated differently in the calculation of equivalent production.

Normal Loss—Equivalent units of normal loss are taken as nil. In other words, normal loss is not added in the equivalent production. However, realizable value of normal scrap is deducted from the cost of material so as to calculate the net material cost. This net material cost becomes the basis of calculating the material cost per unit in the statement of cost.

Abnormal Loss—This is treated as if this were good production lost. Abnormal loss, thus, is added to equivalent production with due consideration to its degree of completion. Unless the degree of completion is specified, it may be assumed that abnormal loss units are 100% complete in respect of all elements of cost.

Abnormal Gain—Units of abnormal gain are represented by good finished production. It is therefore, always taken as 100% complete in respect of all elements of cost, i.e., material, labour and overheads. Abnormal gain is deducted to obtain equivalent production.

Illustration 8.2: During a month, 2,000 units were introduced into Process I. The normal loss was estimated at 5% on input. At the end of the month 1,400 units had been produced and transferred to next process, 460 units were uncompleted and 140 units had been scrapped. It was estimated that uncompleted units had reached a stage in production as follows:

Material	75% completed
Labour	50% completed
Overheads	50% completed

The cost of 2,000 units introduced was ₹5,800.

Direct materials introduced during the process amounted to ₹1,440.

Production overheads incurred were ` 1,670. Direct labour ` 3,340.

Units scrapped realized ` 1 each.

The units scrapped have passed through the process, so were 100% completed as regards material, labour and overheads.

You are required to: (a) prepare a Statement of Equivalent Production; (b) evaluate the cost of abnormal loss, finished goods and closing stock; and (c) prepare the Process I Account and Abnormal Loss Account.

(ICWA Inter, Adapted)

NOTES

Solution:

Statement of Equivalent Production

Input Units	Output	Units	Equivalent units						
			Material		Labour		Overheads		
			Qty	%	Qty	%	Qty	%	
2,000	Normal loss	100	—	—	—	—	—	—	—
	Abnormal loss	40	40	100	40	100	40	100	100
	Finished production	1,400	1,400	100	1,400	100	1,400	100	100
	Work-in-progress	460	345	75	230	50	230	50	50
2,000	Total	2,000							
Equivalent Production			1,785		1,670		1,670		

Statements of Cost

Element of cost (units) (B)	Cost production (A ÷ B)	Equivalent unit	Cost per (A)
<i>Materials:</i>			
Units introduced	5,800		
Direct materials	<u>1,440</u>		
	7,240		
Less: Scrap value of loss (normal)	<u>100</u>		
Material cost	7,140	1,785	4
Direct labour	3,340	1,670	2
Overheads	<u>1,670</u>	1,670	1
Total	<u>12,150</u>		7

Statement of Evaluation

Particulars cost	Element of production	Equivalent unit	Cost per ,	Cost ,	Total cost
Abnormal Loss:	Material	40	4	160	
	Labour	40	2	80	
	Overheads	40	1	<u>40</u>	280
Finished Production:	Material	1,400	4	5,600	
	Labour	1,400	2	2,800	
	Overheads	1,400	1	<u>1,400</u>	9,800
Work-in-progress:	Material	345	4	1,380	
	Labour	230	2	460	
	Overheads	230	1	<u>230</u>	<u>2,070</u>
					<u>12,150</u>

NOTES

Process I Account

<i>Particulars</i>	<i>Units</i>		<i>Particulars</i>	<i>Units</i>	
To Units introduced	2,000	5,800	By Normal loss	100	100
To Direct material		1,440	By Abnormal loss	40	280
To Direct wages		3,340	By Finished production		
To Production overheads		1,670	transferred to Process II	1,400	9,800
			By Balance c/d		
			(work-in-progress)	460	2,070
	2,000	12,250		2,000	12,250

Abnormal Loss Account

<i>Particulars</i>	<i>Units</i>		<i>Particulars</i>	<i>Units</i>	
To Process I	40	280	By Sale of scrap	40	40
			By Costing P&L A/c		240
	40	280		40	280

When there is opening as well as closing stock of work-in-progress

In such a case there are two methods of calculating equivalent production:

- (i) FIFO Method, and (ii) Average Cost Method.

These methods have been discussed in detail, further.

FIFO (First-in, First out) Method

This method is based on the assumption that work-in-progress moves on a first-in-first out basis. This means that unfinished work on the opening stock is completed first, before work on any new units is taken up. Thus no units from opening work-in-progress will be left incomplete and none of these find a place in the closing work-in-progress. In other words, closing stock will be calculated out of the materials introduced during the current period and will be valued at the current cost. The costs incurred during the current period will be distributed over opening stock of work-in-progress (for its completion), units introduced and completed during the period and closing stock of work-in-progress. This is done by dividing the costs incurred by the relevant equivalent production so as to arrive at the per unit cost of equivalent production.

FIFO method gives satisfactory results when prices of materials, rates of wages and overheads are relatively stable.

Computation of Equivalent Production under FIFO Method. The following steps are taken in the computation of equivalent production:

- (i) State the opening stock of work-in-progress in equivalent completed units. This is done by applying the percentage of work needed to complete the unfinished work of the previous period. For example, if there are 200 units of opening work-in-progress which are 70% complete, then the equivalent

units of this will be $200 \times 30\%$ (work required to complete the incomplete portion) = 60 units.

- (ii) Ascertain the number of units introduced into the process and deduct the number of units of closing work-in-progress. This gives the number of units started and completed during the period. Add these units to the opening stock of work-in-progress calculated in (i) above.
- (iii) Add to the above the equivalent completed unit of closing work-in-progress. This can be determined by applying the percentage of work done on the finished units at the end of the period.

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Illustration 8.3: A company follows process costing and manufactures a product in one process. The work-in-progress at the end of each month is valued according to FIFO method.

At the beginning of the month of January, the inventory of work-in-progress showed the 400 units, 40% completed, valued as follows:

Materials	3,600
Labour	3,400
Overheads	<u>1,000</u>
	<u>8,000</u>

In the month of January, materials were purchased for ₹ 75,000. Wages and overheads in the month amounted to ₹ 79,800 and ₹ 21,280, respectively. Actual issue of materials to production was ₹ 68,500. Finished production taken into stock in the month was 2,500 units. There was no loss in the process.

At the end of the month, the work-in-progress inventory was 500 units, 80% complete as regards materials and 60% complete, as regards labour and overheads.

You are required to compute equivalent production and prepare process account. (ICWA Inter)

Solution:

Statement of Production

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			Qty	%	Qty	%	Qty	%
400	Opening stock of WIP	400	240	60*	240	60*	240	60*
2,600	Completely processed during the period	2,100	2,100	100	2,100	100	2,100	100
	Closing stock of WIP	500	400	80	300	60	300	60
3,000		3,000						
	Equivalent units		2,740		2,640		2,640	

* Opening stock is only 40% complete, it requires the remaining 60% material, labour and overhead for completion.

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Statement of Cost

	Total cost (A)	Equivalent units (B)	Per unit (a ÷ b)
Materials	68,500	2,740	25.00
Labour	79,800	2,640	30.23
Overhead	21,280	2,640	<u>8.06</u>
Total			63.29

Statement of Evaluation

Items	Cost element	Equivalent units	Rate	Amount
Opening WIP	Material	240	25.00	6,000
	Labour	240	30.23	7,252
	Overheads	240	8.06	<u>1,934</u>
				<u>15,186</u>
Introduced and completed	Material	2,100	25.00	52,500
	Labour	2,100	30.23	63,483
	Overheads	2,100	8.06	<u>16,926</u>
				<u>1,32,909</u>
Closing WIP	Materials	400	25.00	10,000
	Labour	300	30.23	9,068
	Overheads	300	8.06	<u>2,417</u>
				<u>21,485</u>

Process Account

Particulars	Units	Particulars	Units
To Opening WIP	400	By Finished stock	2,500
To Material	2,600	By Closing WIP	500
To Labour			
To Overheads			
	<u>3,000</u>		<u>3,000</u>
	1,77,580		1,56,095*
			21,485

* **Note:** Cost of finished goods of 2,500 units comprises as follows:

Opening stock (400 units)	8,000 + 15,186	23,186
Introduced and completed (2,100 units)		<u>1,32,909</u>
Total		<u>1,56,095</u>

Average Cost Method

In this method, the cost of opening work-in-progress is not kept separately but is averaged with the additional costs incurred during the period. This method thus combines the cost of opening work-in-progress and new production. Information relating to degree of completion of opening WIP is not required.

In order to find out the cost per unit of equivalent production, the cost of each element (material, labour and overheads) applicable to the opening work-in-progress is added to the cost incurred in the current period for that element. A

single cumulative total and unit cost is obtained. Units completed and transferred as well as closing work-in-progress will be valued at this average unit cost. The use of average method is illustrated below.

Illustration 8.4: The following figures related to single industrial process:

Opening stock (10,000 units):		
Material		2,250
Wages		650
Overheads	400	3,300
Units introduced (40,000 units):		
Material		9,250
Labour		4,600
Overheads		3,100

During the period 30,000 units were completed and 20,000 units remained in process.

The degree of completion of closing stock or WIP was as under:

Materials	100%
Labour	25%
Overheads	25%

Make the necessary computations and prepare Process Account by using average method.

Solution:

Statement of Equivalent Production

Input units	Particulars	Output units	Equivalent production	
			Material	Labour & overheads
10,000	Opening work-in-progress	10,000	10,000	10,000
40,000	Units started and finished (40,000 – 20,000)	20,000	20,000	20,000
	Closing work-in-progress (Material 100% complete, labour and overheads 25%)	20,000	20,000	5,000
50,000		50,000		
	Equivalent Units		50,000	35,000

Statement of Cost

Cost element	(A) Opening put in	(B) Cost (A + B)	(C) Total cost production units	(D) Equivalent per unit	(C ÷ D) Cost
Materials	2,250	9,250	11,500	50,000	0.23
Wages	650	4,600	5,250	35,000	0.15
Overheads	400	3,100	3,500	35,000	<u>0.10</u>
Total					0.48

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Statement of Evaluation

Cost of finished goods	30,000 units @ ` 0.48	=	` 14,400
Closing work-in-progress:			
Materials (100% complete)	20,000 × ` 0.23	=	` 4,600
Labour (25% complete)	5,000 × ` 0.15	=	` 750
Overheads (25% complete)	5,000 × ` 0.10	=	` 500
Cost of closing WIP		=	<u>` 5,850</u>

Process Account

<i>Particulars</i>	<i>Units</i>	<i>`</i>	<i>Particulars</i>	<i>Units</i>	<i>`</i>
To Opening WIP	10,000	3,300	By Completed		
To Material	40,000	9,250	and transferred	30,000	14,400
To Wages	—	4,600	By Closing		
To Overheads	—	3,100	work-in-process	20,000	5,850
	<u>50,000</u>	<u>20,250</u>		<u>50,000</u>	<u>20,250</u>

Process Account

<i>Particulars</i>	<i>Units</i>	<i>`</i>	<i>Particulars</i>	<i>Units</i>	<i>`</i>
To Opening WIP	10,000	3,300	By Completed		
To Material	40,000	9,250	and transferred	30,000	14,400
To Wages	—	4,600	By Closing		
To Overheads	—	3,100	work-in-process	20,000	5,850
	<u>50,000</u>	<u>20,250</u>		<u>50,000</u>	<u>20,250</u>

FIFO Method vs Average Cost Method

Both FIFO and average methods have certain advantages and it cannot be said that one method is either simpler or more accurate than the other. The main difference between these two methods is regarding the treatment of the opening stock-in-progress.

In FIFO method, opening stock of work-in-progress is kept as a separate figure. Costs incurred to complete this opening work-in-progress are added to the opening work-in-progress cost and the sum of these two costs is the total cost of completed units of opening work-in-progress at which it is transferred to the next process. The units which are introduced in the process and finished during the same period have their own cost per unit which may be different from the completed cost per unit of opening work-in-progress.

In average cost method, on the other hand, the cost of opening work-in-progress is added to material, labour and overhead costs incurred during the period. The cost per unit is computed by dividing the total of these costs by equivalent units.

How to choose between FIFO and Average Method

Both FIFO and Average methods have advantages and disadvantages. If one were to choose between these methods in an examination question, the following rules may be followed:

1. **Use FIFO** – If the cost of the opening work-in-progress in one lump sum figure and the stage of completion is given. For Example:

Given:	Opening work-in-progress	1,000 units
	Cost	₹ 18,000
	Stage of completion:	
	Materials	100%
	Labour	60%
	Overheads	60%

2. **Use Average** – If the cost of opening work-in-progress is given in terms of materials, labour and overhead but the stage of completion is not given. For example:

Given:	Opening work-in-progress	1,000 units
	Cost—Materials	₹ 10,000
	Labour	₹ 4,000
	Overheads	₹ 4,000

3. **FIFO or Average—Your Choice** – If the degree of completion and the cost in terms of materials, labour and overheads of the opening work-in-progress are given, then one has a choice between FIFO and Average methods.

For example:

Given:	Opening work-in-progress	1,000 units
	Degree of completion and cost:	
	Material (100% Complete)	₹ 10,000
	Labour (60% Complete)	₹ 4,000
	Overhead (60% Complete)	₹ 4,000

4. Where the question specifies a method to be followed, then that method must be followed.

8.3 INTERNAL PROCESS PROFITS (INTER-PROCESS PROFITS)

In some businesses, it is a practice to charge the output of each process to the next process not at cost but at a price showing profit to the transferor process. The transfer price may be either the current market price or cost plus a fixed percentage. Thus each process is charged with its input at current price and no process obtains the benefits of saving or has to bear the losses caused by the efficiency or inefficiency of the earlier processes. In brief, the objects of such internal process profit are:

- (a) To show whether the cost in each process competes with the market prices.

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- (b) To make each process stand on its own efficiency and economy.
- (c) To assist in making decisions, such as to buy a partly-processed material rather than to process work internally or to sell a partly-processed product or to process it further.

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Internal process profits have the disadvantage of complicating the costing records. The complications brought into the accounts arise from the fact that inter-process profit, so introduced, remains included in the price of process stocks, finished stocks and work-in-progress. For balance sheet purposes, such stocks have to be reduced to actual cost because a firm cannot make profits by trading with itself.

The inclusion of inter-process profits should be best avoided unless the benefits outweigh the added complications. However, the object of internal process profits can also be achieved by making separate cost analysis and reports outside the costing records or by adopting a standard costing system where standard should be set for each process.

The procedure involved in inter-process profits is demonstrated in the following illustration.

Illustration 8.5: 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 2010:

<i>Particulars</i>	<i>Processes</i>		<i>Finished Stock</i>
	<i>I</i>	<i>II</i>	
Opening stock	₹ 7500	₹ 9000	₹ 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. Stocks in processes are valued at prime cost. Finished stock is valued at the price at which it is received from Process II. Sales during the period is ₹ 1,40,000.

Required: Process Cost Accounts and Finished Stock Account showing the profit element at each stage.
(CA Inter)

Process Costing - II

Solution:

Process I Account							
	Cost	Profit	Total		Cost	Profit	Total
To Opening stock	7,500	—	7,500	By Process II	40,500	13,500	54,000
To Direct material	15,000	—	15,000				
To Direct wages	<u>11,200</u>	<u>—</u>	<u>11,200</u>				
	33,700		33,700				
Less: Closing stock	<u>3,700</u>		<u>3,700</u>				
	30,000	—	30,000				
To Factory overheads	<u>10,500</u>	<u>—</u>	<u>10,500</u>				
	40,500	—	40,500				
To Profit	<u>—</u>	<u>13,500</u>	<u>13,500</u>				
	40,500	13,500	54,000		40,500	13,500	54,000

Process II Account							
	Cost	Profit	Total		Cost	Profit	Total
To Opening stock	7,500	1,500	9,000	By Finished stock a/c	75,750	36,750	1,12,500
To Process I	40,500	13,500	54,000				
To Direct material	15,750	—	15,750				
To Direct wages	<u>11,250</u>	<u>—</u>	<u>11,250</u>				
	75,000	15,000	90,000				
Less: Closing stock	<u>3,750</u>	<u>750</u>	<u>4,500</u>				
	71,250	14,250	85,500				
To Factory overheads	<u>4,500</u>	<u>—</u>	<u>4,500</u>				
	75,750	14,250	90,000				
To Profit	<u>—</u>	<u>22,500</u>	<u>22,500</u>				
	75,750	36,750	1,12,500		75,750	36,750	1,12,500

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Finished Stock Account

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	Cost	Profit	Total		Cost	Profit	Total
To Opening stock	14,250	8,250	22,500	By Sales	82,500	57,500	1,40,000
To Process II	<u>75,750</u>	<u>36,750</u>	<u>1,12,500</u>				
	90,000	45,000	1,35,000				
Less: Closing stock	<u>7,500</u>	<u>3,750</u>	<u>11,250</u>				
	82,500	41,250	1,23,750				
To Profit	<u>—</u>	<u>16,250</u>	<u>16,250</u>		<u>—</u>	<u>—</u>	<u>—</u>
	82,500	57,500	1,40,000		82,500	57,500	1,40,000

Working Notes:

1. Reserve for unrealized profit in closing stock

Process I: Nil

Process II:

$$\text{Cost of stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{75,000}{90,000} \times 4,500 = \text{` } 3,750$$

$$\text{Profit} = \text{Total} - \text{Cost} = 4,500 - 3,750 = \text{` } 750$$

Finished Stock

$$\text{Cost of stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{90,000}{1,35,000} \times 11,250 = \text{` } 7,500$$

$$\text{Profit} = \text{Total} - \text{Cost} = 11,250 - 7,500 = \text{` } 3,750$$

2. Profit for the month

Process I:	...	...	...	...	13,500
Process II:	...	...	...	22,500	
Add: Unrealized profit in opening stock	...	...	...	<u>1,500</u>	
				24,000	
Less: Unrealized profit in closing stock	...	...	...	<u>750</u>	23,250
Finished stock	...	...	...	16,250	
Add: Unrealized profit in opening stock	...	...	...	<u>8,250</u>	
				24,500	
Less: Unrealized profit in closing stock	...	...	...	3,750	<u>20,750</u>
				Total profit	<u>57,500</u>

Check Your Progress

1. Name the three statements that are generally prepared for the purpose of computation of equivalent production and its evaluation.
2. What happens to abnormal loss in case of equivalent production?
3. State the disadvantage of internal process profits.

8.4 JOINT PRODUCTS AND BY-PRODUCTS

The term joint products is used for two or more products of almost equal economic value, which are simultaneously produced from the same manufacturing process and the same raw material. Joint products thus represent two or more products separated in the course of processing, each product being in such proportion and of such economic significance that no single one of them can be regarded as the main product.

Characteristics: Characteristics of joint products are:

- (a) Joint products are produced from the same raw material in natural proportions
- (b) They are produced simultaneously by a common process
- (c) They are comparatively of almost equal value
- (d) Joint products may be saleable after separation or may be further processed by incurring additional costs to make them saleable or an improved product

A classic example of joint products, as given above, is found in oil refining, where items like petrol, diesel, naphtha and kerosene are produced from the crude oil. Other examples are in flour mill, where joint products are white flour, brown flour, animal feeding stuff; in meat canning where joint products are hides, canned meat, fertilizers, etc. The term joint product is also used to describe various qualities of the same product, as for example, many grades of coal which may be produced in coal mining.

Joint Products and Co-products

Joint products should be distinguished from co-products. Co-products refer to more than one product being manufactured by a company but need not necessarily arise from the same raw material and manufacturing process and the quantity of each co-product can be changed by the management. For example, in a bakery the various co-products are bread, cake, biscuits, etc. and the quantity of each such product may be changed by the management as per needs. On the other hand, in joint products like meat and hides produced in meat industry, the quantity of any of these products cannot be changed at will without changing the quantity of other products.

Examples of Joint Products

<i>Industry</i>	<i>Joint Products</i>
1. Oil refining	Petrol, diesel, kerosene, grease, lubricating oils, etc.
2. Dairy	Skimmed milk, butter
3. Meat processing	Meat, hides
4. Mining	Several metals from the same ore, e.g., copper, silver, zinc, etc.

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Joint Costs and Subsequent Costs

Joint costs are those costs which are incurred before that stage in manufacture at which the products get separated. It comprises raw material, labour and overheads.

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Subsequent (or attributable) costs, on the other hand, are those costs which are incurred after the separation or split-off point. These are separately incurred for individual joint or by-products and thus are identifiable with each product. Subsequent costs are also known as 'after separation costs' or 'after split-off costs'.

The distinction between joint costs and subsequent costs is important because when accounting for products, the joint costs are the main problem. This is because joint costs cannot be traced to individual products and the cost accountant is faced with the problem of apportioning the joint costs incurred to various joint products produced.

Subsequent costs, on the other hand, pose no accounting problem because such costs relate to individual products. These are, therefore, charged to the appropriate product and not regarded as joint. It should be noted and remembered that selling and distribution costs are virtually always subsequent costs.

Accounting for Joint Products

Accounting for joint products means the apportionment of joint cost to each of the joint product. Such apportionment serves the following objectives:

- (a) To determine the cost per unit of products
- (b) To help in inventory valuation
- (c) To determine the profit or loss on each line of product
- (d) To determine the price of each product

The various methods of apportionment of joint costs (discussed below) are based mainly on individual opinion and tend to produce only approximate results. This is because no perfectly logical basis exists for the apportionment of joint costs to products and most of the methods are arbitrary. Therefore, while selecting a particular method it should be kept in mind that the method should be logical, appropriate and reliable and should be consistently followed. Following are the main methods of apportionment of joint costs over joint products:

1. **Sales Value Method:** Under this method, joint costs are apportioned to various joint products on the basis of sales value of each such product. The sales value method has the following variants:

(a) *On the basis of unit prices:* In this method, the selling prices per unit of various joint products is taken as the basis for apportionment of joint costs. In other words, joint cost is apportioned to various joint products in the ratio of selling prices of individual joint products without any regard to the quantities. It is

thus suitable when the number of units of production of all the products are equal. It is illustrated below with assumed figures.

Example: Joint cost ₹ 9,000

Products per unit	Selling price (Ratio 12 : 8 : 4)	Apportioned cost
A	12	4,500
B	8	3,000
C	4	1,500
Joint cost		₹ 9,000

NOTES

(b) *On the basis of sales value:* In this method, the apportionment is done on the basis of weighted sales value, i.e., number of units produced and sold × selling price per unit. This method thus gives due consideration to the quantities of various joint products produced. The difference between the method based on unit selling prices discussed earlier and this method is that while the former gives no consideration to the quantities of joint products produced, the latter gives due importance to the quantities. This method will give satisfactory results even when number of units of different joint products are widely different. The method is illustrated below with assumed figures:

Example: Joint cost ₹ 9,000

Products per unit	Selling price units (a)	Production quantities (a) × (b) (24 : 48 : 28) (b)	Sales value joint cost (c)	Apportioned (d)
A	12	200	2,400	2,160
B	8	600	4,800	4,320
C	4	700	2,800	2,520
Total			10,000	9,000

2. Reverse Cost Method: (Net realisable value method) In this method, the joint cost is apportioned on the basis of net value of each product. The net realisable value is calculated by deducting the following from the sales value.

- (a) Estimated profit margin
- (b) Selling and distribution costs, if any
- (c) After split off processing costs

The net realisable values of individual products so obtained are taken as the basis for apportioning joint costs. This is known as reverse cost method because net realisable values are calculated by working backwards from sales values. This method is particularly used when products are not sold at their stage at split off point but require further processing. Operation of this method is illustrated as follows.

Illustration 8.6: In processing a basic raw material, three joint products 'X', 'Y' and 'Z' are produced. The joint expenses of manufacturing are: Materials ₹ 10,000; Labour ₹ 8,000; Overheads ₹ 9,000 (Total ₹ 27,000). Subsequent expenses are as follows:

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	X	Y	Z
Material	2,000	1,600	1,800
Labour	2,500	1,400	1,700
Overheads	2,500	1,000	1,500
Total	7,000	4,000	5,000
Sales Value	42,000	20,000	18,000
Estimated profit on sales	50%	50%	33½%

Show how you would apportion the joint costs of manufacture by Reverse Cost Method.

Solution:

Statement of Apportionment of Joint Costs

	X	Y	Z
Sales value	42,000	20,000	18,000
Less: Estimated profit on sales	21,000	10,000	6,000
Estimate total cost	21,000	10,000	12,000
Less: Subsequent costs (total)	7,000	4,000	5,000
Joint costs (₹ 27,000) apportioned	14,000	6,000	7,000

3. Physical Units Method: Under this method, the joint cost is apportioned on the basis of relative weight, volume or quantity, etc., of each product, obtained at the point where the split-off occurs. For the method to be suitable, the unit of measurement should be applicable for all products, e.g., usually gases, liquids and solids cannot be taken together. However, where joint products cannot be measured by the same measurement unit, the joint products must be converted to a denominator common to all the units produced. For instance in the manufacture of coke, products such as coke, coal tar, benzol, sulphate of ammonia, gas, etc., are measured in different units. The yield of these recovered units is measured on the basis of quantity of product extracted per tonne of coal. This is illustrated below.

Illustration 8.7: The following data have been extracted from the books of Coke Co. Ltd:

<i>Joint products</i>	<i>Yield (in lbs) of recovered products per tonne of coal</i>
Coke	1,420
Coal tar	120
Benzol	22
Sulphate of ammonia	26
Gas	412
	2,000

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The price of coal is ₹ 80 per tonne. The direct labour and overhead costs to the point of split-off are ₹ 40 and ₹ 60, respectively, per tonne of coal.

Calculate the material, labour and total cost of each product on the basis of weight.

Solution:**Statement of Apportionment of Joint Cost**

<i>in lbs</i>	<i>Yield total</i>	<i>% of</i>	<i>Apportionment of Cost</i>			<i>Total</i>
			<i>Coal labour</i>	<i>Direct</i>	<i>Overheads</i>	
Coke	1,420	71.0	56.80	28.40	42.60	127.80
Coal tar	120	6.0	4.80	2.40	3.60	10.80
Benzol	22	1.1	0.88	0.44	0.66	1.98
Sulphate of ammonia	26	1.3	1.04	0.52	0.78	2.34
Gas	412	20.6	16.48	8.24	12.36	37.08
Total	2,000	100	80.00	40.00	60.00	180.00

4. Average Unit Cost Method: In this method, the joint cost is apportioned by using the average unit cost which is obtained by dividing the total joint cost by the total number of units produced of all the products. The average cost per unit of each product is the same. The procedure is illustrated as follows.

Illustration 8.8: From the following particulars, find out the cost of joint products A, B and C under the average unit cost method.

(a) Pre-separation point cost ₹ 30,000

(b) Other production data:

<i>Product</i>	<i>Units produced</i>
X	1,000
Y	400
Z	600
	2,000

Solution:

$$\begin{aligned} \text{Average unit cost} &= \frac{\text{Joint cost}}{\text{Total no. of units produced}} \\ &= \frac{\text{₹ } 30,000}{2,000 \text{ units}} = \text{₹ } 15 \text{ per unit} \end{aligned}$$

NOTES**Statement of Apportionment of Joint Cost**

<i>Product</i>	<i>Units produced (A)</i>	<i>Average cost (B)</i>	<i>Apportioned cost (C) A × B = C</i>
X	1,000	15	15,000
Y	400	15	6,000
Z	600	15	9,000
Total	2,000		30,000

5. Survey Method: This method apportions the joint cost to various products, on the basis of the results of a survey or technical evaluation. In this survey, various factors, like volume, selling price, marketing process, etc., are studied and points or weights are assigned to each product. Costs are apportioned on the basis of such weights or points.

Illustration 8.9: X, Y and Z are the three joint products in a factory. Their joint cost is ₹ 30,000. Quantities produced are as follows:

X	1,000
Y	400
Z	600

On the basis of technical evaluation, points allotted to X, Y and Z products are 3.2, 5 and 8 per unit, respectively. Apportion the joint cost.

Solution:**Statement of Apportionment of Joint Cost**

<i>Product</i>	<i>Units produced (a)</i>	<i>Points assigned (b)</i>	<i>Weighted units (c) = (a) × (b)</i>	<i>*Cost per weighted unit (d)</i>	<i>Apportioned cost (32 : 20 : 48) (e)</i>
X	1,000	3.2	3,200	3.00	9,600
Y	400	5.0	2,000	3.00	6,000
Z	600	8.0	4,800	3.00	14,400
Total			10,000	3.00	30,000

$$* \frac{\text{Joint cost}}{\text{Total number of weighted units}} = \frac{\text{₹ } 30,000}{10,000} = \text{₹ } 3 \text{ per unit.}$$

By-Products

By-products are products of relatively small value which are incidentally and unavoidably produced in the course of manufacturing the main product. For example, in sugar mills, the main product is sugar. But baggasse and molasses of comparatively smaller value are incidentally produced and thus are by-products. Other examples of by-products are oil cake produced in the extraction of edible oil; cotton seed produced in cotton textile industry, etc. These by-products are unavoidably produced and are of secondary value. The sales value of these by-products is much less as compared to the main product. For example, sales value of by-products bagasse and molasses is much less than that of the main product sugar.

By-products may be:

- (a) Those sold in their original form without further processing
- (b) Those which require further processing in order to be saleable

Examples of By-products

<i>Industry</i>	<i>By-products</i>
1. Sugar	Bagasse, Molasses
2. Cotton textile	Cotton seed
3. Edible oil	Oil cake
4. Meat	Bones
5. Rice mills	Husk

Distinction between Joint Products and By-products

There are no hard and fast rules to distinguish between joint products and by-products. A product may be treated as a joint product in one business and the same product may be treated as a by-product in another business. However, the following factors should be considered to determine if a product is a joint product or by-product.

- (a) **Relative sales value:** If the sales value of all the products are more or less equal, they are treated as joint products. If, however, there are wide differences in the relative sales values of products, the product with the greater sales value is treated as the main product and the products of lower value are treated as by-products.
- (b) **Objective of manufacture:** If the objective of manufacturing is product *A*, then unwanted products *B* and *C* be treated as by-products.
- (c) **Policy of management:** The management may decide to treat a particular product as the main product and the other products as by-products. Alternatively, it may choose to treat all products as joint products.

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By-products, Scrap and Waste

By-products should not be confused with waste or scrap. Waste is used to describe a material which has no value or even negative value, if it has to be disposed of at some cost. Examples of waste are gases, smoke and other unsaleable residues from the manufacturing process.

Scrap is also different from by-products in the sense that it is the leftover part of the raw materials whereas by-products are different from the material which went into the production process. Small pieces of wood left in furniture manufacture or metal sheet pieces left in utensil manufacture are examples of scrap, whereas minor chemicals, having some value, emerging from a chemical process are classified as by-products. Sale value of scrap is relatively less than that of by-products. However accounting treatment for scrap and by-products is quite similar.

Accounting for By-products

Various methods of accounting for by-products are as follows:

1. **Where by-products are of small total value:** In such a case it is not considered practicable to apportion any part of the joint cost to by-products. The net income realized by the sale of by-products may be treated in any one of the following two ways:

- (i) It may be treated as 'miscellaneous income' and credited to the Costing Profit and Loss Account.
- (ii) It may be credited to the process account in which the by-product has arisen.

In determining the net income from by-products, the following should be deducted from the sales value of by-products: (i) any selling and distribution expenses incurred in the sale of by-products; and (ii) any costs incurred in further processing of by-products to make them saleable.

2. **Where by-products are of considerable total value:** Where by-products are of considerable sales value, it is proper to apportion a part of the joint cost to by-products. Such apportioned cost of by-products is debited to by-product account and credited to the main product account or the relevant process account. Any cost incurred in further processing of the by-product is debited to by-product account. The by-product account is credited with its sales value and any profit/loss arising out of this account is transferred to costing Profit and Loss Account.

The apportionment of joint cost to by-products can be done by any of the four methods discussed earlier in costing of joint products. These methods are: (i) Sales value method; (ii) Physical units method; (iii) Average cost method; and (iv) Points value or survey method.

3. **Where by-products require further processing:** In such situations, the share of by-product in joint-cost at the split-off point may be arrived at by subtracting

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the profit and the further processing cost from the realizable value of the products, *i.e.*, by using Reverse Cost Method. In case the cost of the by-products at the split-off point is small or negligible, it may be treated as per the method (a) discussed above. On the contrary, if it is of considerable amount, it is treated as per method (b) discussed above, *i.e.*, joint cost is apportioned to by-products.

Illustration 8.11: Product Z yields two by-products A and B. The joint cost of manufacture is ₹ 65,800. From the following information, show how would you apportion the joint cost of manufacture:

	Z	A	B
(i) Sales	1,00,000	40,000	25,000
(ii) Manufacturing costs after separation		5,000	4,000
(iii) Estimated selling expenses on sales		20%	20%
(iv) Estimated profit on sales		25%	30%

Solution:

Statement of Cost of By-products—A and B

	A	B
Sales	40,000	25,000
Less: Profit	10,000	7,500
	30,000	17,500
Less: After separation costs	5,000	4,000
Selling expenses	8,000	5,000
Share in joint cost	17,000	8,500

Statement of Cost of Product Z

Total joint cost		65,800	
Less: Joint cost apportioned to	A	17,000	
	B	8,500	25,500
Cost of Product Z			40,300

4. Where by-product is utilized in the undertaking itself: In those cases where by-products are used by the company itself as a raw material for some other process, such by-products may be priced at the opportunity cost. The opportunity cost is that cost which would have been incurred had the by-product been purchased from an outside firm. For example, a company is running a sugar plant as well as a paper plant. The bagasse, a by-product of sugar plant, may be utilized in manufacture of paper as raw material. So credit for the cost of the bagasse would be given to the sugar cost at the price which the company would have otherwise paid to buy it from an outside firm for the manufacture of paper.

Decision regarding Further Processing of Joint and By-products

Apportionment of joint costs is not relevant in decision making regarding further processing of joint or by-products. Whenever management has to take a decision

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whether or not to further process a joint product or by-product after split-off, decision will be taken by comparing the incremental revenue after split-off point with the incremental cost after split-off point. So long as the incremental revenue is more than the incremental cost on further processing of a joint or a by-product, it is profitable to further process the product, not otherwise.

Illustration 8.12: A company produces two joint products *P* and *Q*, their cost upto separation point being ₹ 47,000. These products can be sold at the split-off point at ₹ 150 and ₹ 350 per unit, respectively. Alternatively, the two products can be further processed at a cost of ₹ 15,000 and ₹ 12,000, respectively. After further processing these can be sold at ₹ 320 and ₹ 500 per unit, respectively. The output of *P* is 150 units and of *Q* is 60 units.

Advise whether these products should be sold at split-off point or these should be processed further.

Solution:

Statement Showing Incremental Profit/Loss

	<i>Product P</i>	<i>Product Q</i>
Output	150 units	60 units
Incremental revenue from further processing		
<i>P</i> (₹ 320 – 150) × 150 units	₹ 25,500	
<i>Q</i> (₹ 500 – 350) × 60 units		₹ 9,000
Less: Incremental cost	15,000	12,000
Incremental Profit/loss (–)	10,500	(–) 3,000

Conclusion: Product *P* should be processed further because it gives an incremental profit of ₹ 10,500 whereas product *Q* should be sold at split-off point because it results in incremental loss of ₹ 3,000.

Limitations of Joint Cost Analysis

Analysis of joint cost over joint products and by-products suffers from the following limitations.

1. Apportionment of joint cost over various products is mainly arbitrary and the true costs of various individual products cannot be known.
2. Apportionment of joint cost is based on certain assumptions which may be unrealistic or even misleading.
3. Arbitrary apportionment of joint costs makes inter-firm comparison difficult.
4. There is no clear cut distinction between joint products and by-products. Different firms may treat them differently.
5. Where by-products are of very small value, no worthwhile purpose is served by joint cost analysis.
6. When management has to take a decision as to whether sell the products at the split off point or to further process the products, joint cost analysis is not very relevant for such decision making.

Check Your Progress

4. Give examples of joint costs.
5. What is the reason behind the name reverse cost method?

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8.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. For the purpose of computation of equivalent production and its evaluation, the following three statements are generally prepared: (a) Statement of equivalent production, (b) statement of cost (per unit) and (c) Statement of evaluation.
2. Abnormal loss is treated as if this were good production lost. Abnormal loss, thus, is added to equivalent production with due consideration to its degree of completion. Unless the degree of completion is specified, it may be assumed that abnormal loss units are 100% complete in respect of all elements of cost.
3. Internal process profits have the disadvantage of complicating the costing records. The complications brought into the accounts arise from the fact that inter-process profit, so introduced, remains included in the price of process stocks.
4. Some examples of joint costs are raw material, labour and overheads.
5. The reverse cost method is named so because net realizable values are calculated by working backwards from sales values.

8.6 SUMMARY

- Process costing mainly deals with continuous type of production. At the end of the accounting period, there may be some work-in-progress, i.e., semi-finished goods may be in the pipeline. The valuation of such work-in-progress is done in terms of equivalent or effective production.
- Equivalent production represents the production of a process in terms of completed units. Work-in-progress at the end of an accounting period are converted into equivalent completed units.
- In average cost method the cost of opening work-in-progress is not kept separately but is averaged with the additional costs incurred during the period. This method thus combines the cost of opening work-in-progress and new production. Information relating to degree of completion of opening WIP is not required.

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- In some businesses, it is a practice to charge the output of each process to the next process not at cost but at a price showing profit to the transferor process. The transfer price may be either the current market price or cost plus a fixed percentage. Thus each process is charged with its input at current price and no process obtains the benefits of saving or has to bear the losses caused by the efficiency or inefficiency of the earlier processes.
- The term joint products is used for two or more products of almost equal economic value, which are simultaneously produced from the same manufacturing process and the same raw material.
- Joint products thus represent two or more products separated in the course of processing, each product being in such proportion and of such economic significance that no single one of them can be regarded as the main product.
- The various methods of apportionment of joint costs are based mainly on individual opinion and tend to produce only approximate results. This is because no perfectly logical basis exists for the apportionment of joint costs to products and most of the methods are arbitrary. Therefore, while selecting a particular method it should be kept in mind that the method should be logical, appropriate and reliable and should be consistently followed.
- By-products should not be confused with waste or scrap. Waste is used to describe a material which has no value or even negative value, if it has to be disposed of at some cost. Examples of waste are gases, smoke and other unsaleable residues from the manufacturing process.

8.7 KEY WORDS

- **Equivalent production:** It represents the production of a process in terms of completed units.
- **Joint products:** Joint products are multiple products generated by a single production process at the same time.
- **Co-products:** It refers to more than one product being manufactured by a company but need not necessarily arise from the same raw material and manufacturing process
- **By-products:** It refers to products of relatively small value which are incidentally and unavoidably produced in the course of manufacturing the main product

8.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. How are normal and abnormal losses treated in the calculation of equivalent production?
2. State the characteristics of joint products.
3. Differentiate between joint products and by-products.
4. What is the difference between by-products, scrap and waste?
5. Write a short note on the inter process profits.

Long Answer Questions

1. Discuss the average cost method with the help of illustrations.
2. Describe the different methods of accounting for joint products.
3. Explain accounting for by-products.
4. A coke manufacturing company produces the following products by putting 5,000 tonnes of coal @ 25 per tonne into common process:
Coke 3,500 tonnes
Tar 1,200 tonnes
Sulphate 52 tonnes
Benzol 48 tonnes
Apportion the joint cost amongst the products on the basis of physical units method.

8.9 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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- Shillinglow, G. 1982. *Managerial Costing Accounting*. Homewood: Richard D. Irwin.
- Morse, W. J. 1978. *Cost Accounting*. Massachusetts: Addison-Wesley Publishing Co.
- Lal, Jawahar. 2003. *Cost Accounting*. New Delhi: Tata McGraw Hill.

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BLOCK - III
COSTING AND BUDEGTING CONTRACT

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UNIT 9 CONTRACT COSTING

Structure

- 9.0 Introduction
- 9.1 Objectives
- 9.2 Contract Costing: Meaning and Features
 - 9.2.1 Main Features of Contrast Costing
 - 9.2.2 Preparation of Contract Account
- 9.3 Special Points in Contract Costing
 - 9.3.1 Profit on Uncompleted Contracts
 - 9.3.2 Escalation Clause
 - 9.3.3 Cost-plus Contracts
- 9.4 Answers to Check Your Progress Questions
- 9.5 Summary
- 9.6 Key Words
- 9.7 Self Assessment Questions and Exercises
- 9.8 Further Readings

9.0 INTRODUCTION

Specific order costing is broad costing system applicable for places where there are jobs, batches or contracts involved. These specific work jobs are cost units on their own and different from each other. The specific order costing system assists which finding the costs of these units. In this unit, you will learn about contract costing. In industries such as railway line contracts, engineering projects, civil construction, construction of bridges, etc., contract costing is used. This extension of job costing is relevant for long term contracts. Another way to define contract costing is that it is used in the types of businesses where the completion of contracts takes a longer time, often spanning across different accounting periods. In this unit, you will get acquainted with the concepts related to contract costing.

9.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and features of contract costing
- Explain the features of contract costing
- Describe the preparation of contract account

- Examine accounting treatment of escalation clause, contract near completion and cost plus contracts

9.2 CONTRACT COSTING: MEANING AND FEATURES

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Contract costing, also known as terminal costing, is a variant of job costing. In this method of costing, each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon.

Contract Costing and Job Costing—Distinction

Main points of distinction between contract and job costing are as follows:

1. The number of jobs undertaken at a time are usually large as compared to number of contracts because contracts are generally much bigger in size.
2. In contract costing, most of the costs are chargeable direct to contract accounts. Under job costing, direct allocation to such an extent is not possible.
3. Allocation and apportionment of overhead costs is simpler in contract costing as compared to job costing.
4. Contract is generally big while job is small. It is well said, ‘a job is a small contract and a contract is a big job.’
5. Jobs are usually carried out in factory premises while contract work is done at site.

9.2.1 Main Features of Contrast Costing

Contract costing usually shows the following features:

1. Contracts are generally of large size and, therefore, a contractor usually carries out a small number of contracts in the course of one year.
2. A contract generally takes more than one year to complete.
3. Work on contracts is carried out at the site of contracts and not in factory premises.
4. Each contract undertaken is treated as a cost unit.
5. A separate contract account is prepared for each contract in the books of the contractor to ascertain profit or loss on each contract.
6. Most of the materials are specially purchased for each contract. These will, therefore, be charged direct from the supplier’s invoices. Any materials drawn from the store is charged to contract on the basis of material requisition notes.

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7. Nearly all labour is direct.
8. Most expenses (*e.g.*, electricity, telephone, insurance, etc.) are also direct.
9. Specialist sub-contractors may be employed for say, electrical fittings, welding work, glass work, etc.
10. Plant and equipment may be purchased for the contract or may be hired for the duration of the contract.
11. Payments by the customer (contractee) are made at various stages of completion of the contract based on architect's certificate for the completed stage. An amount, known as retention money, is withheld by the contractee as per agreed terms.
12. Penalties may be incurred by the contractor for failing to complete the work within the agreed period.

9.2.2 Preparation of Contract Account

The basic procedure for costing of contracts is as follows:

1. **Contract account:** Each contract is allotted a distinct number and a separate account is opened for each contract.
2. **Direct costs:** Most of the costs of a contract can be allocated direct by to the contract. All such direct costs are debited to the contract account. Direct costs for contracts include: (i) Materials; (ii) Labour and supervision; (iii) Direct expenses; (iv) Depreciation of plant and machinery; (v) Sub-contract costs, etc.
3. **Indirect costs:** Contract account is also debited with overheads which tend to be small in relation to direct costs. Such costs are often absorbed on some arbitrary basis as a percentage on prime cost, or materials, or wages, etc. Overheads are normally restricted to head office and storage costs.
4. **Transfer of materials or plant:** When materials, plant or other items are transferred from the contract, the contract account is credited by that amount.
5. **Contract price:** The contract account is also credited with the contract price. However, when a contract is not complete at the end of the financial year, the contract account is credited with the value of work-in-progress as on that date.
6. **Profit or loss on contract:** The balance of contract account represents profit or loss which is transferred to Profit and Loss Account. However, when contract is not completed within the financial year, only a part of the profit arrived is taken into account and the remaining profit is kept as reserve to meet any contingent loss on the incomplete portion of the contract. This is discussed in detail later in this unit.

9.3 SPECIAL POINTS IN CONTRACT COSTING

Some of the important points to be considered in contract costing are now discussed:

9.3.1 Profit on Uncompleted Contracts

Contracts which are started and finished during the same financial year create no accounting problems. But in case of those contracts which take more than one year to complete, a problem arises whether profit on such contracts should be worked out only on the completion of the contract or at the end of each financial year on the partly completed work. If profit is computed only on the completion of the contract, profit will be high in the year of completion of the contract, whereas in other years of working on contract, profit will be nil. This would result not only in distorted profit pattern but also higher tax liability because income tax at higher rates may have to be paid. Therefore, when contracts extend beyond a year, it becomes necessary to take into account the profit earned (or loss incurred) on the work performed during each year. This helps in avoiding distortion of the year-to-year profit trend of the business.

There are two aspects of profit computation:

- (a) Computation of notional profit or estimated profit.
- (b) Computation of the portion of such profit that is to be transferred to Profit and Loss Account.

Notional Profit

Notional profit is the difference between the value of work-in-progress certified and the cost of work-in-progress certified. It is computed as follows (Figures are assumed):

	Value of work certified	20,00,000
<i>Add:</i>	Cost of work not yet certified	1,50,000
		21,50,000
<i>Less:</i>	Cost of work to date	19,00,000
	Notional Profit	2,50,000

If in any year, cost of work done exceeds the value of work certified and uncertified, the result will be a notional loss.

Estimated Profit

Estimated profit represents the excess of the contract price over the estimated total cost of the contract. It is computed as follows (Figures are assumed):

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	Contract Price	30,00,000
<i>Less:</i>	Total cost already incurred	21,00,000
		9,00,000
<i>Less:</i>	Estimated additional costs to complete the contract	3,50,000
	Estimated Profit	5,50,000

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Portion of Notional Profit or Estimated Profit to be Transferred to Profit and Loss Account

The portion of the notional or estimated profit to be transferred to P&L Account depends upon the stage of completion of the contract, *i.e.*, ratio of work-in-progress certified to total contract work. For this purpose work-in-progress uncertified is not considered. Prudence requires that the total notional profit should not be transferred to P&L Account but a portion of it should be withheld as a reserve to meet any unforeseen future expenses or contingencies.

Rules: There are no hard and fast rules in this regard. However, the following general rules may be followed in this context.

1. When work certified is less than 1/4 of the contract price, no profit is transferred to Profit and Loss Account. This is based on the principle that no profit should be taken into account unless the contract has advanced reasonably.
2. When work-in-progress certified is 1/4 or more but less than 1/2 of the contract price, then generally 1/3 of the profit is transferred to Profit and Loss Account. The balance amount is treated as reserve. Thus, profit to be transferred to Profit and Loss Account is computed by the following formula:

$$\text{Transfer to P\&LA/c} = \text{Notional Profit} \times \frac{1}{3}$$

Alternatively, a more common practice is to further reduce this amount by the cash ratio.

$$\text{Thus: Transfer to P\&LA/c} = \text{Notional profit} \times \frac{1}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

3. When work certified is 1/2 or more but less than 9/10 of the contract price, (*i.e.* 50% to 90%), then the profit to be transferred to P & L Account is computed as follows:

$$\text{Transfer to P\&LA/c} = \text{Notional Profit} \times \frac{2}{3}$$

Here also a more common practice is to further reduce this amount by cash ratio. This is shown below:

$$\text{Transfer to P\&LA/c} = \text{Notional Profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

4. When contract is near completion, then the estimated profit should be calculated on the whole contract. The proportion of estimated profit to be transferred to Profit and Loss Account is computed by any one of the following formulas:

$$(a) \text{ Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}}$$

$$(b) \text{ Estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$(c) \text{ Estimated profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost of work}}$$

$$(d) \text{ Estimated profit} \times \frac{\text{Cost of work to date}}{\text{Estimated total cost of work}} \times \frac{\text{Cash received}}{\text{Work certified}}$$

5. *Loss on Uncompleted Contracts:* In the event of a loss on uncompleted contracts, this should be transferred in full to the Profit and Loss Account, whatever be the stage of completion of the contract.

It was stated earlier also that these are not hard and fast rules. The practice may vary from firm-to-firm depending upon the nature of work involved, degree of risk in the business, extent of work completed, etc. But whatever method is adopted, it should be applied consistently from year-to-year so as not to disturb the trend of profits.

Illustration 9.1: The following was the expenditure on a contract for ₹ 12,00,000 commenced in January 2009.

Materials	2,40,000
Wages	3,28,000
Plant	40,000
Overheads	17,200
Work uncertified	8,000

Cash received on account of the contract on 31 December 2009 was ₹ 4,80,000, being 80% of the work certified. The value of materials in hand was ₹ 12,000. The plant had undergone 20% depreciation.

Prepare Contract Account.

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Solution:

Contract Account
for the year ending 31 December 2009

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To Materials	2,40,000	By Materials in hand	12,000
To Wages	3,28,000	By Plant in hand	
To Plant	40,000	(40,000 less 20%)	32,000
To Overheads	17,200	By Work-in-progress:	
		Work certified	6,00,000
		$\left(4,80,000 \times \frac{100}{80} \right)$	
To Notional Profit c/d	26,800	Work uncertified	8,000
	6,52,000		6,52,000
To Profit & Loss A/c	14,293	By Notional Profit b/d	26,800
$\left(26,800 \times \frac{2}{3} \times \frac{80}{100} \right)$			
To Reserve	12,507		
	26,800		26,800

Note: Work certified is 50% of the contract price. Thus, transfer to P&L A/c is done by the following formula:

$$\text{Notional Profit} \times 2/3 \times \text{cash ratio}$$

Alternatively, the amount of notional profit to be transferred to P&L A/c may be calculated by the following formula:

$$\text{Notional Profit} \times 2/3$$

9.3.2 Escalation Clause

This clause is often provided in contracts to cover any likely changes in the price or utilization of materials and labour. Thus, a contractor is entitled to suitably enhance the contract price if the cost rises beyond a given percentage. The object of this clause is to safeguard the interest of the contractor against unfavourable changes in cost. The escalation clause is of particular importance where prices of material and labour are anticipated to increase or where quantity of material and/or labour time cannot be accurately estimated.

Just as an escalation clause safeguards the interest of the contractor by upward revision of the contract price, a de-escalation clause may be inserted to look after the interest of the contractee by providing for downward revision of the contract price in the event of cost going down beyond an agreed level.

9.3.3 Cost-plus Contracts

Cost-plus contract is a contract in which the price is not fixed at the time of entering into the contract. The contract price is determined by adding a specified amount or percentage of profit to the costs allowed in the contract. The contractee

compensates the contractor for all allowable costs actually incurred by him. Over and above these costs the contractor is paid a fixed amount or a fixed percentage of cost as profit. The items of cost to be included for the purpose of determining contract price are broadly agreed upon in advance. The accounts of the contractor are usually subject to audit by the contractee.

Cost-plus contracts are usually entered into for executing special types of work, like construction of dam, power house, newly designed ship, etc., where accurate cost estimation is difficult. Government often prefers to give contracts on 'cost-plus' terms.

Advantages: Cost-plus contracts offer the following advantages:

To the Contractor:

1. There is no risk of loss being incurred on such contracts.
2. It protects him from the risk of fluctuations in market prices of material, labour, etc.
3. It simplifies the work of preparing tenders and quotations.

To the Contractee: The contractee can ensure a fair price of the contract by being entitled to audit the accounts of the contractor.

Disadvantages

The disadvantages of cost-plus contracts are:

To the Contractor:

1. The contractor is deprived of the advantages which would have accrued due to favourable market prices.
2. The contractor has to suffer for his own efficiency. This is because profit is usually based as a percentage of cost and efficient working resulting in lower cost also leads to lower profits.

To the Contractee:

1. The contractee has to pay more for the inefficiency of the contractor as the contractor has no incentive to reduce costs.
2. The price the contractee has to pay is unknown until after the completion of work.

Check Your Progress

1. What is the difference between jobs and contracts in terms of where the work is done?
2. Mention the direct costs for contracts.
3. State the object of the escalation clause.

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9.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. The difference between jobs are usually carried out in factory premises while contract work is done at site.
2. The direct costs for contracts include: (i) Materials; (ii) Labour and supervision; (iii) Direct expenses; (iv) Depreciation of plant and machinery; (v) Sub-contract costs, etc.
3. The object of the escalation clause is to safeguard the interest of the contractor against unfavourable changes in cost.

9.5 SUMMARY

- Contract costing also known as terminal costing is a variant of job costing in which each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon.
- Contract costing differs from job costing in the following ways: there are large number of contracts in contract costing, most of the costs here are chargeable direct to contract accounts, allocation and apportionment of overhead costs is simpler, contract is bigger than a job and while jobs are carried out in factories, contract works are done at site.
- The Contract costing procedure includes: preparation of a contract account, allocation of direct and indirect costs, transfer of materials or plant, crediting of the contract price and the determination of profit or loss on contract.
- Materials of contracting costing in contract costing can be either materials returned to store or materials at site.
- Progress payments are part payments of the contract amount which are paid from time to time on the basis of certificate issued by the architects, certifying the value of the work satisfactorily completed.
- When contracts extend beyond a year, it becomes necessary to take into account the profits earned (or loss incurred) on the work performed during each year. This helps in avoiding distortion of the year-to-year profit trend of the business.
- Escalation clause is a clause often provided in contracts to cover any likely changes in the price or utilization of materials and labour.
- Cost-plus contract is a contract in which the price is not fixed at the time of entering into the contract.

9.6 KEY WORDS

- **Contract costing:** It is a variant of job costing in which each contract is a cost unit and an account is opened for each contract in the books of the contractor to ascertain profit/loss thereon
- **Escalation clause:** It is a clause which is often provided in contracts to cover any likely changes in the price or utilization of materials and labour
- **Cost-plus contract:** It refers to a contract in which the price is not fixed at the time of entering into the contract

NOTES

9.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. How are direct and indirect costs treated in the contract costing procedure?
2. Briefly state the methods of ascertaining profit on the following contracts:
 - (a) When contract is completed
 - (b) When contract is not completed
 - (c) When the contract is nearing completion

Long Answer Questions

1. Distinguish between job costing and contract costing. State the special features of contract costing.
2. What is a cost-plus contract? Discuss this from the point of view of (a) the manufacturer, (b) the buyer.
3. Explain how the profits are determined in the case of uncompleted contracts.
4. Thekedar accepted a contract for the construction of a building for 10,00,000; the contractee agreeing to pay 90% of work certified as complete by the architect.

During the first year, the amounts spent were:

Material 1,20,000 Machinery 30,000

Labour 1,50,000 Other expenses 90,000

At the end of the year, the machinery was considered to be of 20,000, and materials at site were of the value of 5000. Work certified during the year totalled 4,00,000. In addition, work-in-progress but not certified at the end of year had cost 15,000. Prepare Contract Account in the books of

Thekedar. Also show the various figures of profit that can be transferred reasonably to the Profit and Loss Account.

NOTES

9.8 FURTHER READINGS

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UNIT 10 JOB AND BATCH COSTING

Structure

- 10.0 Introduction
- 10.1 Objectives
- 10.2 Job Costing
- 10.3 Batch Costing
- 10.4 Answers to Check Your Progress Questions
- 10.5 Summary
- 10.6 Key Words
- 10.7 Self Assessment Questions and Exercises
- 10.8 Further Readings

NOTES

10.0 INTRODUCTION

All industries may be broadly classified into two categories:

1. Job order industries
2. Mass production industries

In job order industries, production work is done against orders from customers. Each job work needs special treatment and can be clearly distinguished from other jobs. Each job is completed as per customer's specifications. Examples of job order industries are printing press, construction of buildings, bridges, roads ship building

In mass production, firms manufacture uniform types of products. Since production is of standard products, it is on a mass scale and on a continuous basis. No customer order or specifications are required for production. Examples of mass production industries are textiles, paper, sugar, chemicals and steel.

In job order industries, one of the methods used for cost ascertainment is job costing. The basic concepts related to job costing are discussed in this unit.

Batch costing is a variation of job costing. While job costing is concerned with costing of jobs that are made to a customer's particular requirements, batch costing is used when production consists of limited repetitive work and a definite number of articles are manufactured in each batch to be held in stock for sale to customers generally. In this unit, you will also learn about batch costing.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the meaning and procedure of job costing
- Explain the meaning and procedure involved in batch costing
- Discuss the concept of economic batch quantity

10.2 JOB COSTING

NOTES

Job costing or job order costing is a method of cost ascertainment used in job order industries. Special features of such industries are as follows:

- (a) Production is against customer's orders and not for stocks.
- (b) Each job has its own characteristics and requires special attention.
- (c) The flow of production from one department to another is not uniform. It is the nature of job which determines the department through which it is to be processed.

Objectives of Job Costing

The following are the main objectives of job costing:

1. Cost of each job/order is ascertained separately. This helps in finding out the profit or loss on each individual job.
2. It enables the management to know those jobs which are more profitable and those which are unprofitable.
3. It provides a basis for determining the cost of similar jobs undertaken in future. It thus helps in future production planning.
4. It helps the management in controlling costs by comparing the actual costs with the estimated costs.

Job Costing Procedure

The following steps are taken in job costing:

1. **Job number:** When an order has been accepted, an individual job number must be assigned to each job so that separate jobs are identifiable at all stages of production. Assignment of job numbers also facilitates reference for costing purposes in the ledger and is conveniently short for use on various forms and documents.

2. **Production order:** The production control department then makes out a Production Order, thereby authorizing to start work on the job. Several copies of the production order are prepared, the copies often being in different colours to distinguish between them more easily. These copies are passed on to the following:

- (i) All departmental foremen concerned with the job
- (ii) Storekeeper for issuance of materials
- (iii) Tool room for an advance notification of tools required

The columns provided in the production order differ widely, depending largely upon the nature of production. Sometimes orders are accompanied by the blue prints and contain a bill of materials and detailed instructions as to which tools and machinery are to be used.

3. **Job cost sheet:** The unique accounting document under job costing is the job cost sheet. Receipt of production order is the signal for the cost accountant to prepare a job cost sheet on which he will record the cost of materials used and the labour and machine time taken. Each concern has to design a job cost sheet to suit its needs.

Job cost sheets are not prepared for specified periods but they are made out for each job regardless of the time taken for its completion. However, material, labour and overhead costs are posted periodically to the relevant cost sheet.

The material, labour and overheads to be absorbed into jobs are collected and recorded in the following way:

- (a) **Direct materials:** The method of recording receipts and issues of materials on materials requisitions or bill of materials was explained in detail in the unit on materials. It may be recalled that material requisitions or bills on materials show the quantities of materials issued to jobs from store. When copies of these documents reach the cost office, they are priced and entered in the stores ledger account in the 'issues' column. Each requisition shows the job number to which the material is to be charged. Summaries of material requisitions are prepared at regular intervals on Materials Abstract or Materials Issue Analysis Sheet. These summaries facilitate debiting the job with total cost of materials rather than charging with many small items. These totals are also used for entries in stores ledger control account and work-in-progress control account.
- (b) **Direct wages:** As explained earlier in the unit on labour cost, the wages payable to workers are calculated on clock cards, job cards, time sheets, etc. The summaries of job cards are made on Wages Abstract or Wages Analysis Sheets, which show the direct wages chargeable to each job. The total of wages chargeable to various jobs is debited to work-in-progress control account.
- (c) **Direct expenses:** Direct expenses which can be identified with specific jobs are directly charged to these jobs, the total being debited to work-in-progress control account.
- (d) **Overheads:** Indirect materials, indirect wages and indirect expenses which cannot be identified with specific jobs are apportioned to cost centres in the manner described earlier in the chapter on overhead cost. Absorption of overheads by the jobs passing through the cost centres is based upon percentage of direct wages or direct material cost, direct labour hours or machine hours, etc. These methods of absorption have also been discussed in detail in the chapter on overheads.

The direct materials, wages and expenses and the overheads absorbed are totalled to give the total cost.

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Completion of Jobs

When jobs are completed, the cost is transferred to cost of sales account. The total cost of jobs completed during each period is set against the sales to determine the profit or loss for the, period.

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Illustration 10.1: A factory uses job costing. The following data are obtained from its books for the year ended 31 December 2017:

Direct materials	90,000	Selling and distribution overheads	52,500
Direct wages	75,000	Administration overheads	42,000
Profit	60,900	Factory Overheads	45,000

(a) Prepare a Job Cost Sheet indicating the Prime cost, Works cost, Production cost, Cost of sales and the Sales value.

(b) In 2017, the factory received an order for a number of jobs. It is estimated that direct materials required will be ₹ 1,20,000 and direct labour will cost ₹ 75,000. What should be the price for these jobs if factory intends to earn the same rate of profit on sales assuming that the selling and distribution overheads have gone up by 15%? The factory recovers factory overheads as a percentage of direct wages and administration and selling and distribution overheads as a percentage of works cost, based on cost rates prevailing in the previous year. (CA Inter)

Solution:

Production Statement
for the year ended 31 December 2017

Direct materials		90,000
Direct wages		75,000
	Prime Cost	<u>1,65,000</u>
Factory overheads		45,000
	Works Cost	<u>2,10,000</u>
Administration overheads		42,000
	Cost of Production	<u>2,52,000</u>
Selling and distribution overheads		52,500
	Cost of Sales	<u>3,04,500</u>
PROFIT		<u>60,900</u>
	Sales Value	<u>3,65,400</u>

Calculation of Rates

1. % of factory overheads to direct wages = $\frac{45,000}{75,000} \times 100 = 60\%$
2. % of administration overheads to works cost = $\frac{42,000}{2,10,000} \times 100 = 20\%$

3. Selling and distribution overheads	52,500
Add 15% increase	7875
	60,375

Job and Batch Costing

Selling and distribution overheads % to works cost

$$= \frac{60,375}{2,10,000} \times 100 = 28.75\%$$

$$4. \text{ \% of profit to sales} = \frac{60,900}{3,65,400} \times 100$$

$$= 16.67\% \left(\frac{1}{6} \text{ of sales or } \frac{1}{5} \text{ of total cost} \right)$$

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Job Cost Sheet

(Statement showing Estimated Cost and Price of Jobs in 2018)

Direct materials		1,20,000
Direct wages		75,000
	Prime Cost	1,95,000
Factory overheads (60% of direct labour)		45,000
	Works Cost	2,40,000
Administration overheads (20% of works cost)		48,000
	Cost of Production	2,88,000
Selling and distribution overheads (28.75% of works cost)		69,000
	Total Cost	3,57,000
PROFIT (1/5 of cost)		71,400
	Selling Price	4,28,400

10.3 BATCH COSTING

Batch costing is applied in the manufacture of shoes, toys, readymade garments, component parts of say, cars, radios, watches, etc. In shoe industry, for example, it is just not economical to manufacture a pair of shoes to meet the requirements of one customer. On the other hand, batches of say 500 to 5,000 shoes of each size, style, colour, etc., are economically made and held in stock for sale on demand.

Batch Costing is used in:

- Shoe manufacture
- Toys
- Readymade garments
- Tyres and tubes
- Component parts, etc.

Batch Costing Procedure**NOTES**

Each batch is given a batch number in exactly the same way as a job is given a job number. Direct materials, direct labour and direct expenses which can be identified with the batch are recorded on the Batch Cost Card. The costing of materials requisitions and time sheets follows normal job costing principles. Overheads are absorbed on one of the bases already explained as is done in job costing. When a batch is completed, the total cost of the batch is divided by the quantity produced in the batch to arrive at the cost per unit or per dozen etc., as required.

Often, a major cost in producing a batch is the cost of setting up jigs and tools. This is of the nature of fixed cost and is spread over the total number of articles in the batch. So the larger the batch size, the lower is the setting up cost per article.

Illustration 10.2: Component 89-X is made entirely in cost centre 75. Material cost is 6 paise per component and each component takes 10 minutes to produce. The machine operator is paid 72 paise per hour, and the machine hour rate is ₹ 1.50. The setting up of the machine to produce component 89-X takes 2 hours 20 minutes.

On the basis of this information, prepare a comparative cost sheet showing the production and setting up cost, both in total and per component assuming a batch of (a) 10 components, (b) 100 components and (c) 1,000 components, is produced. (CA Inter)

Solution:

Comparative Cost Sheet
Component 89-X

Particulars	Batch size in components		
	10	100	1,000
Setting-up Cost			
Labour—2 hrs 20 mts at 72 paise per hour	1.68		
Overheads—2 hrs 20 mts at ₹ 1.50 per machine hour	3.50	5.18	5.18
			5.18
Production Cost			
Material cost @ 6 paise per component	0.60	6.00	60.00
Wages @ 72 paise per hour			
For 10 components 1 hr 40 mts	1.20		
For 100 components 16 hrs 40 mts		12.00	
For 1,000 components 166 hrs 40 mts			120.00
Overheads @ ₹ 1.50 per machine hour			
For 10 components 1 hr 40 mts	2.50		
For 100 components 16 hrs 40 mts		25.00	
For 1,000 components 166 hrs 40 mts			250.00
Total Cost	9.48	48.18	435.18
Cost per component (Total cost ÷ No. of Components)	0.94	0.48	0.44

Economic Batch Quantity (EBQ)

In the above Illustration 10.2, it was seen that when batch size increases, the total cost per component decreases. It is due to the fixed nature of setting up cost which remains unchanged with the increase or decrease in the batch size. Thus larger the number of units in a batch, lower is the setting up cost per unit. In industries where batch costing is employed, an important point is the determination of the optimum quantity in a batch at which cost per unit is minimum. This is known as a *Economic Batch Quantity*. While determining economic batch quantity, two type of costs are considered:

- (a) **Setting-up costs:** This is the cost of setting the machine and the tools for production of a particular batch. This is of a fixed nature. Therefore, when the size of the batch is large, setting-up cost per article in the batch is lower.
- (b) **Carrying cost:** This includes the cost of storage, interest on capital invested, etc. Larger size of a batch leads to higher carrying costs.

In determining the economic batch quantity, there are five main considerations:

- (a) The cost and time taken in setting up the tools on the machines
- (b) The cost and time taken in manufacturing the parts
- (c) The interest on capital invested in the parts
- (d) The cost of storage
- (e) The rate of consumption or sale of the parts

As the concept of economic batch quantity is similar to economic order quantity (See the chapter on Material Cost), the former can also be determined with the help of tables, mathematical formulae and graphs. A simple formula for determining the economic batch quantity is given below:

$$EBQ = \sqrt{\frac{2 \cdot U \cdot S}{C}}$$

where EBQ = Economic Batch Quantity

U = No. of units to be produced in a year

S = Set-up costs per batch

C = Carrying cost per unit of production.

Example: U = Production per year = 12,000 units

S = Set-up costs per batch = ₹ 150

C = Carrying cost per unit = ₹ 0.20

$$EBQ = \sqrt{\frac{2 \times 12,000 \times 150}{0.20}} = 4,243 \text{ units}$$

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Check Your Progress

1. List the people to whom the production order copies are passed on to.
2. What is the signal for the cost accountant to prepare a job cost sheet?
3. Give some examples of carrying costs.

10.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The production order copies are passed on to the following people:
 - All departmental foremen concerned with the job
 - Storekeeper for insurance of materials
 - Tool room for an advance notification of tools required
2. Receipt of production order is the signal for the cost accountant to prepare a job cost sheet on which he will record the cost of materials used and the labour and machine time taken.
3. Some examples of carrying cost includes the cost of storage, interest on capital invested, etc.

10.5 SUMMARY

- In job order industries, production work is done against orders from customers. Each job work needs special treatment and can be clearly distinguished from other jobs. Each job is completed as per customer's specifications.
- Job costing or job order costing is a method of cost ascertainment used in job order industries.
- Objectives of job costing are: cost of each job is ascertained separately, it enables management to know which jobs are more profitable, helps in future production planning and helps in management in controlling costs by comparing estimated and actual costs.
- The steps in the job costing procedure include: assigning of job number, making of the production order, preparation of job cost sheet, and completion of jobs to cost of sales account.
- While job costing is concerned with costing of jobs that are made to a customer's particular requirements, batch costing is used when production consists of limited repetitive work and a definite number of articles are manufactured in each batch to be held in stock for sale to customers generally.

- Procedure of batch costing includes the allotment of a batch number, recording in the batch cost card and on completion of batch, the total cost of the batch is divided by the quantity produced in the batch to arrive at the cost per unit or per dozen etc.
- In industries where batch costing is employed an important point is the determination of the optimum quantity in a batch at which cost per unit is minimum. This is known as economic batch quantity.
- Two types of costs are considered while determining the economic batch quantity: these are setting up costs and carrying costs.

NOTES

10.6 KEY WORDS

- **Job costing:** It is a method of cost ascertainment used in job order industries
- **Batch costing:** It is a method of cost ascertainment used when production consists of limited repetitive work and a definitive work and a definite number of articles are manufactured in each batch to be held in stock for sale to customers generally
- **Economic batch quantity:** It refers to the optimum quantity in a batch at which cost per unit is minimum

10.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a note on job costing and the industries which adopt job costing.
2. What are the main features of job costing? Give a pro forma cost sheet under such a system.
3. What is economic batch quantity?
4. What is a job order number?

Long Answer Questions

1. What are the main features of job costing? Describe briefly the procedure of recording costs under job order costing.
2. Write a short note on batch costing.
3. Explain how costs are booked against job order numbers.

10.8 FURTHER READINGS

NOTES

Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.

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UNIT 11 BUDGET AND BUDGETARY CONTROL

*Budget and
Budgetary Control*

NOTES

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- 11.0 Introduction
- 11.1 Objectives
- 11.2 Meaning of Budget and Budgetary Control
 - 11.2.1 Forecast and Budget
 - 11.2.2 Budgetary Control as a Management Tool
 - 11.2.3 Limitations of Budgetary Control
 - 11.2.4 Preliminaries in the Installation of Budget System
- 11.3 Classification of Budgets
 - 11.3.1 Fixed and Flexible Budgets
- 11.4 Specific Variants of Budgeting
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 - 11.4.2 Performance Budgeting
 - 11.4.3 Responsibility Accounting
- 11.5 Answers to Check Your Progress Questions
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11.0 INTRODUCTION

Budgetary control is an important tool of planning and control. *Planning* involves looking systematically at the future so that decisions can be made today which will bring the company its desired results. *Control* is the process of measuring and correcting actual performance to ensure that plans for implementing the chosen course of action are carried out. In this section, you will learn about the concept of budget and budgetary control.

11.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand and define a budget and budgetary control
- Explain the limitations of budgetary control and know the role of budgets in planning, coordinating and controlling
- Distinguish between fixed and flexible budgeting
- Prepare flexible budgets
- Explain the concepts of zero base budgeting, performance budgets and their utility

11.2 MEANING OF BUDGET AND BUDGETARY CONTROL

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Budget refers to a plan relating to a definite future period of time expressed in monetary and/or quantitative terms. In relation to business, a budget is a formal expression of the expected incomes and expenditures for a definite future period. The Chartered Institute of Management Accountants (CIMA) London, has defined a budget as '*a financial and/or quantitative statement, prepared prior to a defined period of time, of the policy to be pursued during that period for the purpose of attaining a given objective.*' It may include income, expenditure and employment of capital.

Characteristics—Budgets have the following characteristics:

- (a) A budget is primarily a planning device but it also serves as a basis for performance evaluation and control.
- (b) A budget is prepared either in money terms or in quantitative terms or in both.
- (c) A budget is prepared for a definite future period.
- (d) Purpose of a budget is to implement the policies formulated by management for attaining the given objectives.

Budgeting: The act of preparing budgets is called budgeting. In the words of J Batty, '*the entire process of preparing the budgets is known as budgeting.*'

Concept of Budgetary Control

Budgetary control is a system of controlling costs through preparation of budgets. Budgeting is thus only a part of the budgetary control. According to CIMA, London, '*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.*'

In the words of Brown and Howard, '*Budgetary control system is a system of controlling costs which includes the preparation of budgets, co-ordinating the departments and establishing responsibilities, comparing actual performance with the budgeted and acting upon results to achieve maximum profitability.*'

Characteristics—The main characteristics of budgetary control are:

- (a) *Establishment of budgets* for each function/department of the organization.
- (b) *Comparison of actual performance* with the budgets on a continuous basis.

- (c) *Analysis of variations* of actual performance from that the budgeted performance to know the reasons thereof.
- (d) Taking suitable *remedial action*, where necessary.
- (e) *Revision of budgets* in view of changes in conditions.

The principles involved in budgeting have been likened to those followed by the captain of a ship. Before the voyage, he will plan his route, taking into account such factors as shipping hazards, tides and possible adverse weather forecasts. During the journey, he will record details of progress and frequently check actual progress with that planned. Though trying to keep to the plan, he may have to deviate from the plan if prevailing circumstances require it. On completion of the journey, he will compare the conditions he encountered with those he expected. The experience so gained will be used by him in planning similar voyages in the future. This simple analogy serves to illustrate the basic practice used in budgeting and budgetary control.

The technique of budgetary control is now widely used in the business world. Many businesses fail because of lack of efficient planning which could have revealed that the business should not have been started or that one should have been prepared to face serious dangers ahead.

11.2.1 Forecast and Budget

It is important to note carefully the distinction between forecast and a budget.

A forecast is a prediction of what may happen as a result of a given set of circumstances. It is an assessment of probable future events.

A budget, on the other hand, is a planned exercise to achieve a target. It is based on the pros and cons of a forecast. Forecasting thus precedes the preparation of budget.

Thus the main points of distinction between the two are:

1. Budgets relate to 'planned events', *i.e.*, policies and programmes to be pursued. Forecast is concerned with 'probable events', *i.e.*, events expected to happen under anticipated conditions.
2. Budget, being a formal business plan, can be prepared only by the authorized management but forecast can be made by anybody.
3. Budget is a tool of control while the forecast is simply an anticipation of events.
4. Forecasting is a prerequisite for budgeting while budgeting is not a prerequisite for forecasting.
5. Budgets relate to economic activities of business, enterprises, government or others. Forecast may relate to economic as well as non-economic activities, *e.g.*, weather forecast and stock market forecast.

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11.2.2 Budgetary Control as a Management Tool

The following are the main objectives of a budgetary control system:

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1. **Planning:** A budget provides a detailed plan of action for a business over a definite period of time. Detailed plans are drawn up relating to production, sales, raw material requirements, labour needs, advertising and sales promotion, performance, research and development activities, capital additions, etc. Planning helps in anticipating many problems, long before they may arise and their solutions can be sought through careful study. Thus most business emergencies can be avoided by planning. In brief, budgeting forces managements to think ahead, to anticipate and prepare for the situation.

2. **Co-ordination:** Budgeting aids managers in co-ordinating their efforts so that objectives of the organization as a whole harmonize with the objectives of its divisions. Effective planning and organizing contribute a lot in achieving co-ordination. There should be co-ordination in the budgets of various departments. For example, the budget of sales should be in co-ordination with the budget of production. Similarly, the production budget should be prepared in co-ordination with the purchase budget, and so on.

3. **Communication:** A budget is a communication device. The approved budget copies are distributed to all management personnel, which provides not only adequate understanding and knowledge of the programmes and policies to be followed but also alerts about the restrictions to be adhered to.

It is not the budget itself that facilitates communication, but the vital information is communicated in the act of preparing budgets and participation of all responsible individuals in this act.

4. **Motivation:** A budget is a useful device for motivating managers to perform in line with the company objectives. If individuals have actively participated in the preparation of budgets, it acts as a strong motivating force to achieve the targets.

5. **Control:** Control is necessary to ensure that plans and objectives as laid down in the budgets are being achieved. Control, as applied to budgeting, is a systematized effort to keep the management informed of whether the planned performance is being achieved or not. For this purpose, a comparison is made between plans and actual performance. The difference between the two is reported to the management for taking corrective action.

6. **Performance evaluation:** A budget provides a useful means of informing managers how well they are performing in meeting targets they have previously helped to set. In many companies there is a practice of rewarding employees on the basis of their achieving the budget targets or promotion of a manager may be linked to his budget achievement record.

11.2.3 Limitations of Budgetary Control

The list of advantages given above is impressive, but a budget is not a cure all for organization ills. Budgetary control system suffers from certain limitations and those using the system should be fully aware of them.

The main limitations are:

1. **The budget plan is based on estimates:** Budgets are based on forecasts and forecasting cannot be an exact science. Absolute accuracy, therefore, is not possible in forecasting and budgeting. The strength or weakness of the budgetary control system depends to a large extent, on the accuracy with which estimates are made. Thus, while using the system, the fact that budget is based on estimates must be kept in view.
2. **Danger of rigidity:** A budget programme must be dynamic and continuously deal with the changing business conditions. Budgets will lose much of their usefulness if they acquire rigidity and are not revised with the changing circumstances.
3. **Budgeting is only a tool of management:** Budgeting cannot take the place of management but is only a tool of management. 'The budget should be regarded not as a master, but as a servant.' Sometimes it is believed that introduction of a budget programme is alone sufficient to ensure its success. Execution of a budget will not occur automatically. It is necessary that the entire organization must participate enthusiastically in the programme for the realization of the budgetary goals.
4. **Opposition from staff:** Employees may not like to be evaluated and thus oppose introduction of budgetary control system. As such, inefficient managers may try to create difficulties in the way of introducing and operating this system.
5. **Expensive technique:** The installation and operation of a budgetary control system is a costly affair as it requires the employment of specialized staff and involves other expenditure which small concerns may find difficult to incur. However, it is essential that the cost of introducing and operating a budgetary control system should not exceed the benefits derived therefrom.

11.2.4 Preliminaries in the Installation of Budget System

Prerequisites for the successful implementation of a budgetary control system are as follows:

1. **Creation of budget centres:** A budget centre is a section of the organization of an undertaking for which a separate budget is prepared. A budget centre may be a department or a part thereof. Budget centre must be clearly defined because a separate budget has to be set for each such centre with the help of the head of the department concerned. For example, in the preparation of purchase budget, the purchase manager has to be consulted. Similarly, while preparing labour cost budget, the personnel manager will be of great help.

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2. Introduction of adequate accounting records: The accounting system should be so designed as to be able to record and analyse the information required. The budget procedures must also employ the same classification of revenues and expenses as the accounting department. Comparisons cannot be made if the classifications do not coincide. A chart of accounts corresponding with the budget centres should be maintained.

3. Preparation of an organization chart: Proper organization is essential for a successful budget system. An organization chart should be prepared which clearly shows the plan of the organization. Each member of management should know the exact scope of his authority and responsibility and his relationship to other members. For this purpose, copies of the organization chart and written supplements should be distributed to all concerned.

The organization chart will depend upon the nature and size of the company.

4. Establishment of budget committee: In large concerns, the direction and execution of the budget is delegated to a budget committee which reports directly to the top management. The financial controller is usually appointed to serve as the budget director. He is in charge of preparing budget manual of instructions and accumulates the budget and actual figures for reporting. Other members of the budget committee usually comprise various heads of functional departments, like sales manager, purchase manager, production manager and chief accountant, as shown in the above organization chart. Each member prepares his own departmental budget(s) which are then considered by the committee for coordination.

Functions: The main functions of a budget committee are as follows:

- (a) To provide historical data to all departmental heads to help them in estimating
- (b) To issue instructions to departments regarding requirements, dates of submission of estimates, etc.
- (c) To define the general policies of the management in relation to the budget system
- (d) To receive budget estimates from various departments for consideration and review
- (e) To discuss difficulties with departmental heads and suggest possible revisions
- (f) To evaluate and revise the estimates before preparing the final budget
- (g) To make recommendations on budget matters where there is conflict between departments
- (h) To prepare budget summaries
- (i) To prepare a master budget after functional budgets have been approved
- (j) To inform departmental heads of any revisions made in their budgets by the committee

- (k) To coordinate all budget work
- (l) To analyse variances and recommend corrective action, where necessary.

5. Preparation of budget manual: A budget manual has been defined by CIMA, London as 'a document which sets out the responsibilities for the persons engaged in the routine of and the forms and records required for budgetary control.' A budget manual is thus a statement of budget policies. It lays down the details of the organizational set-up with duties and responsibilities of executives, including the budget committee and budget director and the procedures and programmes to be followed for developing budgets for various activities.

Contents: The contents of a budget manual are summarized as follows:

- (a) Description of the budget system and its objectives
- (b) Procedure and forms to be used in budget preparation
- (c) Responsibilities of operational executives, budget committee and budget director
- (d) Budget calendar, specifying definite dates for the completion of each part of the budget and submission of the reports
- (e) Method of accounting and account codes in use
- (f) Procedure to be adopted in operating the system
- (g) Follow-up procedures.

6. Budget period: Budget period is a length of time for which a budget is prepared and operated. Budget periods vary between short-term and long-term and no specific period can be laid down for all budgets. It varies among concerns and industries for several factors.

A budget is usually prepared for one year which corresponds to the accounting year. It is then sub-divided into quarters and in turn each quarter is broken down into three separate months. When a business experiences seasonal fluctuations, the budget period may be fixed to cover one seasonal cycle. If the seasonal cycle covers say two or three years, a long-term budget should be prepared to cover that period. The long period may then be broken down into smaller periods by preparing short-term budgets.

Budgets for capital expenditure are usually prepared on a long-term basis. For example, in electricity companies which incur very heavy capital expenditure, the need for new power stations is forecast possibly five to ten years in advance. Such long-term budgets are supplemented by short-term ones.

7. Determination of the key factor: Also known as limiting factor, governing factor and principal budget factor, the key factor means the factor which limits the size of output. It is defined as 'the factor the extent of whose influence must first be assessed in order to ensure that functional budgets are capable of fulfilment' Such a factor is of vital importance and affects all budgets to a large extent.

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The key factor serves as the starting point for the preparation of budgets. For instance, when sales potential is limited, sales is the key factor. Therefore, sales budget should be prepared first. Production and other budgets will follow the sales budget. Thus a key factor determines priorities in functional budgets.

It is possible that more than one key factor is operating at the same time. Under such conditions, the relative impact of such factors is considered in budget preparation. Moreover, key factor is not necessarily a permanent factor. The management may be provided with opportunities to overcome the limitations imposed by key factors. For example, plant capacity can be increased by the installation of new and improved plant and machinery which may be financed by the issue of new shares.

Check Your Progress

1. State the characteristics of budgets.
2. Differentiate between a forecast and a budget.
3. What serves as the starting point for the preparation of budgets?

11.3 CLASSIFICATION OF BUDGETS

Budgets may be classified into the following categories:

1. On the basis of function and scope:

- (a) Functional budgets
- (b) Master budget

2. On the basis of flexibility:

- (a) Fixed budget
- (b) Flexible budget

In this section, we will only concentrate on fixed and flexible budget. Let's briefly glance over functional and master budgets.

Functional Budgets

A functional budget is one which relates to a particular function of the business, e.g., Sales Budget, Production Budget, Purchase Budget, etc.

Master Budget

When all the functional budgets have been prepared, these are summarized into what is known as a master budget. Thus a master budget is a consolidated summary of all the functional budgets. According to CIMA, London, '*master budget is a summary budget incorporating its component functional budgets and which is finally approved, adopted and employed.*'

A master budget has two parts (i) *operating budget, i.e.*, budgeted profit and loss account, and (ii) *financial budget, i.e.*, budgeted balance sheet. Thus, a projected profit and loss account and a balance sheet together constitute a master budget.

The master budget is prepared by the budget director (or budget officer) and is presented to the budget committee for approval. If approved, it is submitted to the Board of Directors for final approval. The Board may make certain amendments/alterations before it is finally approved.

11.3.1 Fixed and Flexible Budgets

Based on level of activity or capacity utilization, budgets are classified into fixed budget and flexible budget.

Fixed Budget

A fixed budget is one which is prepared keeping in mind one level of output. It is defined as a budget '*which is designed to remain unchanged irrespective of the level of activity attained.*' If actual output differs from budgeted level of output, variances will arise. Fixed budget is prepared on the assumption that output and sales can be estimated with a fair degree of accuracy. This means that in those situations where sales and output cannot be accurately estimated, fixed budget does not suit.

Flexible Budget

In contrast to a fixed budget, a flexible budget is one '*which is designed to change in relation to the level of activity attained.*' The underlying principle of flexible budget is that a budget is of little use unless cost and revenue are related to the actual volume of production. Flexible budgeting has been developed with the objective of changing the budget figures to correspond with the actual output achieved. Thus a budget might be prepared for various levels of activity, say, 70%, 80%, 90% and 100% capacity utilization. Then whatever the level of output actually reached, it can be compared with an appropriate level.

Flexible budgets are prepared in those companies where it is extremely difficult to forecast output and sales with accuracy. Such a situation may arise in the following cases.

1. Where nature of business is such that sales are difficult to predict, *e.g.*, demand for luxury goods is quite unpredictable.
2. Where sales are affected by weather conditions, *e.g.*, soft drink industry, woollen garments, etc.
3. Where sales are affected by changes in fashion, *e.g.*, readymade garments.
4. Where company frequently introduces new products.
5. Where large part of output is intended for export.

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Uses of Flexible Budgets: The figures in flexible budgets are adaptable to any given set of operating conditions. They are, therefore, more realistic than a fixed budget which is true only in one set of operating conditions.

Flexible budgets are also useful from control point of view. Actual performance of an executive should be compared with what he should have achieved in the actual circumstances and not with what he should have achieved under quite different circumstances.

In brief, flexible budgets are more realistic, practical and useful. Fixed budgets, on the other hand, have a limited application and are suited only for items like fixed costs.

Distinction between Fixed and Flexible Budgets

The main points of distinction between the two are as follows:

1. Fixed budget assumes static business conditions whereas flexible budget is based on the assumption of changing business conditions.
2. Fixed budget is prepared for only one level of activity but flexible budgets may be prepared for different capacity levels or for any level of activity.
3. Fixed budget figures are not changed when actual level of activity changes. But in flexible budgets, the figures are adjusted according to the actual level of activity attained.
4. When actual level of activity differs from budgeted level of activity, then in fixed budgets meaningful comparison between actual and budget figures is not possible. But in flexible budgets, such comparisons are quite meaningful.
5. Under changing business environments, fixed budgets have very limited use for control. But flexible budgets are very useful for cost control and performance evaluation under changing business environments.

Preparation of Flexible Budgets

The preparation of flexible budgets necessitates the analysis of all costs into fixed and variable components. This analysis, of course, not peculiar to flexible budgeting, is more important in flexible budgeting than in fixed budgeting. This is so because in flexible budgeting, varying levels of output are considered and each class of overhead will be different for each level. In flexible budgeting, a series of budgets are prepared for every major level of activity so that whatever that actual level of output, it can be compared with appropriate budget or can be interpolated between budgets of the activity levels on either side. For example, budgets may be prepared for, say, 60%, 70%, 80%, 90% and 100% levels of activity. If the actual level of activity is 85%, then the budget allowance for 85% activity should be computed.

While computing fixed cost at various levels, it is to be noted that fixed cost in total amount remains unchanged at various levels of activity. However, fixed cost per unit decreases when level of output increases and vice versa, *i.e.*, fixed cost per unit increases when level of activity decreases.

Regarding the behaviour of variable costs, it is important to note that total variable cost increases in proportion to increase in the level of activity and vice versa. However, variable cost per unit does not change with the change in level of activity.

Semi-variable cost should be separated into fixed and variable components. Fixed component of the semi-variable cost will not change between levels but variable part of the semi-variable cost will change in the proportion of level of activity. This is explained in the following Illustrations.

Illustration 11.6: Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates at 70%, 80% and 90% plant capacity.

At 80% capacity

Variable overheads:	
Indirect labour	12,000
Stores including spares	4,000
Semi-variable overheads:	
Power (30% fixed, 70% variable)	20,000
Repairs and maintenance (60% fixed, 40% variable)	2,000
Fixed overheads:	
Depreciation	11,000
Insurance	3,000
Salaries	10,000
Total overheads	62,000
Estimated direct labour hours	1,24,000 hrs
	(ICWA Inter)

Solution:

Flexible Budget
for the period

capacity	At 70% capacity	At 80% capacity	At 90%
Variable overheads:			
Indirect labour	10,500	12,000	13,500
Stores including spares	3,500	4,000	4,500
Semi-variable overheads:			
Power:			
Fixed	6,000	6,000	6,000
Variable	12,250	14,000	15,750
Repairs and Maintenance:			
Fixed	1,200	1,200	1,200
Variable	700	800	900
Fixed overheads:			
Depreciation	11,000	11,000	11,000
Insurance	3,000	3,000	3,000
Salaries	10,000	10,000	10,000
(A) Total overheads	<u>58,150</u>	<u>62,000</u>	<u>65,850</u>
(B) Estimated direct labour hours	1,08,500	1,24,000	1,39,500
Direct labour hour rate (A ÷ B)	0.536	0.500	0.472

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Working Notes:

$$1. \text{ Indirect labour cost at 70\%} = 12,000 \times \frac{70}{80} = \text{` } 10,500$$

$$\text{at 90\%} = 12,000 \times \frac{90}{80} = \text{` } 13,500$$

Similar calculation can be made for other variable items, *i.e.*, stores.

$$2. \text{ Power – Fixed} = \text{` } 6,000, \text{ Variable} = \text{` } 14,000.$$

$$\text{Variable power at 70\%} = 14,000 \times \frac{70}{80} = \text{` } 12,250$$

$$\text{at 90\%} = 14,000 \times \frac{90}{80} = \text{` } 15,750$$

Similar calculations can be made for repairs and maintenance.

$$3. \text{ Direct labour hours at 70\%} = 1,24,000 \times \frac{70}{80} = 1,08,500$$

$$\text{at 90\%} = 1,24,000 \times \frac{90}{80} = 1,39,500$$

Check Your Progress

4. What are the types of budgets according to function and scope?
5. Which budget is considered to be more realistic, practical and useful?

11.4 SPECIFIC VARIANTS OF BUDGETING

In this section, we will discuss certain specific types of budgeting.

11.4.1 Zero Base Budgeting (ZBB)

ZBB is a recent development in the area of management control system and is steadily gaining importance in the business world. Before preparing a budget, a base is determined from which the budget process begins. Quite often current year's budget is taken as the base or the starting point for preparing the next year's budget. The figures in the base are changed as per the plan for the next year. This approach of preparing a budget is called *incremental budgeting* since the budget process is concerned mainly with the increases or changes in operations that are likely to occur during the budget period. For example, sales of the current year's budget may be taken as the base and next year's budget for sales will be current year's sales plus an allowance for price increases and expected changes in sales volumes. The main drawback of this approach is that it perpetuates the past inefficiencies.

Zero Base Budgeting or Zero-based Budgeting (ZBB) is an alternative to incremental budgeting. ZBB was introduced at Texas Instruments in USA in 1969, by Peter Phyr, who is known as the father of ZBB. It is not based on incremental approach and previous year's figures are not taken as the base for preparing next year's budget. Instead, the budget figures are developed with zero as the base,

which means that a budget will be prepared as if it is being prepared for a new company for the first time.

In simple words, ZBB is a system whereby each budget item, regardless of whether it is new or existing, must be justified in its entirety each time a new budget is prepared. It is a formalized system of budgeting for the activities of an enterprise as if each activity were being performed for the first time, *i.e.*, from zero base.

The novel part of the ZBB is the requirement that the budgeting process starts at zero with all expenditures to be completely justified. This contrasts with the usual approach in which a certain level of expenditure is allowed as a starting point and the budgeting process focuses on requests for incremental expenditures.

In ZBB, budget requests for appropriation are accepted on the basis of cost/benefit approach which ensures value for money. It questions long standing assumptions and systematically examines and perhaps abandons any unproductive projects. This means that those of the activities which are of no value find no place in the forthcoming budget even though these might have been an integral part of the past budget prepared under the traditional approach. ZBB in a way tries to locate those activities which are not essential.

Main Features of Zero Base Budgeting (ZBB)

The main features of ZBB are as under:

1. All budget items, both old and newly proposed, are considered totally afresh
2. Amount to be spent on each budget item is to be totally justified
3. A detailed cost benefit analysis of each budget programme is undertaken and each programme has to compete for scarce resources
4. Departmental objectives are linked to corporate goals
5. The main stress is not on 'how much' a department will spend but on 'why' it needs to spend
6. Managers at all levels participate in ZBB process and they have corresponding accountabilities.

ZBB is now-a-days widely used. In fact, when Jimmy Carter became the President of USA, he directed that all federal government agencies adopt ZBB. On a review of literature on the use of ZBB, it is found that in many organizations, ZBB has led to a considerable improvement in the budget process. But at the same time, in many organizations it has not proved successful.

11.4.2 Performance Budgeting

Performance budgeting is also a recent development which tries to overcome the limitations of traditional budgeting. In traditional system of budgeting, as used in business enterprises and government departments, the main defect is that the control

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of performance in terms of physical units and the related costs is not achieved. This is because in such budgeting, money concept is given more importance. Performance budgeting is a relatively new concept which focuses on functions, programmes and activities.

In other words, in case of traditional budgeting, both input and output are mostly measured in monetary units while performance budgeting lays emphasis on achievement of physical targets. Performance budgets are established in such a manner that each item of expenditure related to a specific responsibility centre is closely linked with the performance of that centre. Thus performance budgeting lays stress on activities and programmes. It tries to answer questions like—what is to be achieved? How is it to be achieved? When is it to be achieved? etc.

The Government of India has now decided to introduce performance budgeting in all its departments in a phased manner. An example of performance budgeting in government system of accounting may be that generally expenditure is classified under the heads like pay and allowances, transport, repairs and maintenance, etc. In performance budgeting, the classification of expenditure may be setting up of a steel mill, construction of a railway station, computerization of railway booking system, purchase of an aircraft carrier, etc. and other physical targets. When work on these activities is started, funds are obtained against these physical targets. Reports are then prepared for any under-spending or over-spending which are then analysed for corrective action to be taken.

Performance budgeting is sometimes called Programme Budgeting or Planning, Programme and Budget System (PPBS).

Steps in Performance Budgeting

1. **Establishment of responsibility centre:** First of all, responsibility centres are established. A responsibility centre is a segment of an organization where an individual manager is held responsible for the performance of the segment.
2. **Establishment of performance targets:** For each responsibility centre, targets are set in terms of physical performance to be achieved. For example, for sales department, which is a responsibility centre, targets may be set in terms of number of units to be sold during the budget period. For production department, the target would then be the number of units to be produced.
3. **Estimating financial requirements:** In this step, the financial support needed to achieve the physical targets is estimated. In other words, the amount of expenditure involved under various heads to meet the physical performance is forecasted.
4. **Comparison of actual with budgeted performance:** This is a usual step in budgetary control to evaluate the actual performance.
5. **Reporting and action:** Variances from budgeted performance are analysed and reported for corrective action to be taken.

11.4.3 Responsibility Accounting

Responsibility accounting is one of the basic components of a good control system, in large and decentralized companies. This is a system of responsibility, accountability and performance evaluation. The main characteristic feature of this control system is that it is relevant to measurement of performance of divisions of an organization while other control systems are applicable to the organization as a whole. Budgeting and variance analysis (standard costing) are thus part of the responsibility accounting process.

Responsibility accounting has close link with the size of an organization. It has no scope in a small organization because in such a business all decision making is centralized at one place and in one individual. However, in big and diversified companies like ITC Ltd and Hindustan Uniliver Ltd, which produce and sell a wide variety of products/services, responsibility accounting proves extremely useful. Because of the complexity of operations in such companies, it is very difficult for the head office to directly control the operations of all divisions of business. It is, therefore, appropriate to divide the company into separate self-contained divisions and to allow all divisional managers to operate with a great deal of independence. Take the case of ITC Ltd, which is in the business of hotels, packaged food, FMCG, cigarettes, information technology, branded apparel, etc., all over India. In applying responsibility accounting to such a business model, each individual hotel manager may be asked to run the hotel as an independent unit, like a small business. Each hotel will then be treated as a responsibility centre. Similarly, the cigarette business may be decentralized and made a responsibility centre. In this way, a number of responsibility centres will be created for different divisions, which should promote the long-term interests of the larger organization and coordinate their activities with other responsibility centres of the company.

Meaning and Definition

Responsibility accounting is a method of accumulating and reporting both budgeted and actual costs and revenues by divisional managers responsible for them. It means in responsibility accounting, business activities are identified with persons rather than products or functions and responsibility is assigned to the manager best placed to effect control. The idea of responsibility accounting is that managers will be held responsible only for those items over which they can exercise a significant amount of control.

Hornsgren has defined responsibility accounting as '*a system of accounting that recognizes various responsibility centres throughout the organization and reflects the plans and actions of each of these centres by assigning particular revenues and costs to the one having the pertinent responsibility.*'

Responsibility accounting is also defined as '*that segregates revenues and costs into areas of personal responsibility, in order to assess performance attained by persons to whom authority has been assigned.*'

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Prerequisites for Responsibility Accounting

Responsibility accounting is based on certain assumptions. These prerequisites/assumptions are as follows:

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1. It should be a big company with a divisionalized organizational structure and where areas of responsibility are well defined at different levels of the organization.
2. There are clearly set goals and targets for each responsibility centre.
3. Managers actively participate in establishing the budgets against which their performance is measured.
4. Accounting system generates correct and dependable information for each responsibility centre.
5. The managers are held responsible only for those activities over which they exercise significant degree of control.
6. Managers must try to attain the goals and objectives.
7. Goals for each area of responsibility should be attainable with efficient performance.
8. Performance reporting should be timely and should contain significant information relating to the responsibility centre.

Responsibility Centre

The basic idea of responsibility accounting is that large diversified organizations are difficult, if not impossible, to manage as a single segment. Thus they must be decentralized or separated into smaller manageable divisions. The divisions or segments are referred to as responsibility centres.

A responsibility centre *'is a division of the organization for which a manager is held responsible.'* CIMA, London has defined responsibility centre as *'a segment of the organization, where an individual manager is held responsible for its segment's performance.'*

In the words of Horngren, *'a responsibility centre is a part, segment or sub-unit of an organization whose manager is accountable for a specified set of activities.'* Example of a responsibility centre in a company running a chain of hotels may be one hotel whose manager will be accountable for its performance. A responsibility centre is like a small business to achieve the objectives of a large organization. For an organization to be successful, the activities of its responsibility centres must be coordinated. An important criterion for creating responsibility centre is that the unit of organization should be separate and identifiable for the purpose of its performance evaluation. It should also be understood that for creating responsibility centre, it is not necessary that organization must be decentralized because responsibility centres can be found in both centralized and decentralized organizations.

Types of Responsibility Centre

Responsibility centres are of four types — cost centre, revenue centre, profit centre and investment centre. Together they form the basis of responsibility accounting.

Features of Responsibility Accounting

The basic method of control in responsibility accounting is the same as used in budgetary control and standard costing and may be stated in the following points:

1. Responsibility centres are created.
2. A plan is prepared in the form of budgets or standards for each responsibility centre.
3. The performance of the responsibility centre is evaluated by comparing actual results with those budgeted in the regular monthly reports.
4. Variances between actual and budgeted performance are analysed so as to fix responsibility.
5. Corrective and preventive action is taken, wherever possible.

Check Your Progress

6. State the novel part of the ZBB as compared to the usual approach.
7. Mention other names for performance budgeting.
8. Name the four types of responsibility centres.

11.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Budgets have the following characteristics:
 - A budget is primarily a planning device but it also serves as a basis for performance evaluation and control.
 - A budget is prepared either in money terms or in quantitative terms or in both.
 - A budget is prepared for a definite future period.
 - Purpose of a budget is to implement the policies formulated by management for attaining the given objectives.
2. A forecast is a prediction of what may happen as a result of a given set of circumstances. It is an assessment of probable future events. A budget is a planned exercise to achieve a target. It is based on the pros and cons of a forecast.
3. The key factor serves as the starting point for the preparation of budgets.

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4. According to function and scope, there are two types of budgets:
 - Functional Budget
 - Master Budget
5. Flexible budget is considered to be more realistic, practical and useful.
6. The novel part of the ZBB is the requirement that the budgeting process starts at zero with all expenditures to be completely justified.
7. Performance budgeting is sometimes called Programme Budgeting or Planning, Programme and Budget System (PPBS).
8. The four types of responsibility centres are cost centre, revenue centre, profit centre and investment centre.

11.6 SUMMARY

- Budgetary control is an important tool of planning and control. *Planning* involves looking systematically at the future so that decisions can be made today which will bring the company its desired results.
- *Control* is the process of measuring and correcting actual performance to ensure that plans for implementing the chosen course of action are carried out.
- Budget refers to a plan relating to a definite future period of time expressed in monetary and/or quantitative terms. In relation to business, a budget is a formal expression of the expected incomes and expenditures for a definite future period.
- Budgetary control is a system of controlling costs through preparation of budgets. Budgeting is thus only a part of the budgetary control. According to CIMA, London, '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.'
- The technique of budgetary control is now widely used in the business world. Many businesses fail because of lack of efficient planning which could have revealed that the business should not have been started or that one should have been prepared to face serious dangers ahead.
- Budgeting aids managers in co-ordinating their efforts so that objectives of the organization as a whole harmonize with the objectives of its divisions. Effective planning and organizing contribute a lot in achieving co-ordination.

- A budgetary control system can prove successful only when certain conditions and attitudes exist, absence of which will negate to a large extent, the value of a budget system in any business.
- In large concerns, the direction and execution of the budget is delegated to a budget committee which reports directly to the top management. The financial controller is usually appointed to serve as the budget director.
- Budget period is a length of time for which a budget is prepared and operated. Budget periods vary between short-term and long-term and no specific period can be laid down for all budgets. It varies among concerns and industries for several factors.
- Budgets may be classified into the following categories: On the basis of function and scope as functional and master budgets and on the basis of flexibility as fixed and flexible budgets.
- Budget reports should be prepared at regular intervals (say, every month) showing the reasons for the differences between actual and budget figures. The reports should be prepared in such a way that they establish the responsibility for the variances. Reports should also reveal whether a variance is favourable or unfavourable and also whether a variance is controllable or uncontrollable.
- In ZBB, budget requests for appropriation are accepted on the basis of cost/benefit approach which ensures value for money. It questions long standing assumptions and systematically examines and perhaps abandons any unproductive projects.
- Performance budgeting are established in such a manner that each item of expenditure related to a specific responsibility centre is closely linked with the performance of that centre.
- Responsibility accounting is one of the basic components of a good control system, in large and decentralized companies. This is a system of responsibility, accountability and performance evaluation.

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11.7 KEY WORDS

- **Zero base budgeting (ZBB):** It is a method of budgeting whereby all activities are reevaluated each time a budget is set. The novel part of the ZBB is that the budgeting process starts with zero as the base, with all budget items to be justified as is done in the case of a new company.
- **Performance budgeting:** It is a relatively new concept which focuses on functions, programmes and activities as it lays emphasis on achievement of physical targets.

11.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. Define budget and budgetary control.
2. What are the limitations of budgetary control?
3. Distinguish between fixed budget and flexible budget. Briefly state the circumstances in which flexible budgets are used.
4. What is zero base budgeting? What are the advantages of zero base approach over traditional approach?
5. What do you understand by Performance Budgeting? What steps are required to be taken for preparing performance budgets?

Long Answer Questions

1. Explain the process by which the various budgets are prepared.
2. What do you understand by the term flexible budget? How is it drawn up and what difficulties do you expect to face in its compilation? Is flexible budget useful to management?
3. Mr Managing Director is surprised that his profit every year is quite different from what he wants or expects to achieve. Someone advised him to install a formal system of budgeting. He employs a fresh cost accountant to do this. For two years, the accountant faithfully makes all the assumption based on previous years accounts. The problem remains unsolved. Advise Mr Managing Director and the accountant on what steps they should take. Make assumptions about what is lacking.
4. The following data are available in a manufacturing company for a yearly period:

Fixed expenses:	<i>₹ lakh</i>
Wages and salaries	9.5
Rent, rates and taxes	6.6
Depreciation	7.4
Sundry administration expenses	6.5
Semi-variable expenses (At 50% of capacity):	
Maintenance and repairs	3.5
Indirect labour	7.9
Sales department salaries, etc.	3.8
Sundry administration salaries	2.8

Variable expenses (At 50% of capacity):

Materials	21.7
Labour	20.4
Other expenses	7.9
Total cost	98.0

*Budget and
Budgetary Control*

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Assume that the fixed expenses remain constant for all levels of production; semi variable expenses remain constant between 45 per cent and 65 per cent of capacity, increasing by 10 per cent between 65 per cent and 80 per cent capacity and by 20 per cent between 80 per cent and 100 per cent capacity.

<i>Sales at various levels are:</i>	<i>lakh</i>
50% capacity	100
60% capacity	120
75% capacity	150
90% capacity	180
100% capacity	200

Prepare a flexible budget for the year and forecast the profit at 60 per cent, 75 per cent, 90 per cent and 100 per cent of capacity

11.9 FURTHER READINGS

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BLOCK - IV
STANDARD COSTING AND DECISION MAKING

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UNIT 12 STANDARD COSTING

Structure

- 12.0 Introduction
- 12.1 Objectives
- 12.2 Standard costing: meaning and limitations
 - 12.2.1 Standard Costs and Budgeted Costs
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- 12.5 Summary
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- 12.8 Further Readings

12.0 INTRODUCTION

Standard costing is a specialised technique of cost management to control the cost. From the point of view of cost control, 'what a product should have costed' is more important than 'what it did actually cost'. Standard costing tells what the cost should be.

As against standard costing, in historical costing only actual costs are ascertained. Historical costs are the actual costs which have been incurred in the past. Such costs are ascertained only after these have been incurred. In the initial stages of development of cost accounting, historical costing was the only system available for ascertaining costs.

In this unit, you will learn about the concept of standard costing.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the meaning and limitations of standard costing
- Explain the concept of standard costs and budgeted costs

- Describe the determination of standard cost
- Explain the concept of cost variances including direct material and direct labour

12.2 STANDARD COSTING: MEANING AND LIMITATIONS

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Standard costing was introduced in 1920s as an alternative for the traditional or historical costing. So, to understand the meaning of standard costing, let's learn about the limitations of historical costing.

A system of historical costing suffers from the following limitations:

1. **No basis for cost control:** Historical costs cannot be used for the purpose of cost control as the cost has already been incurred before the cost figures can become available to management.
2. **No yardstick for measuring efficiency:** Historical costs do not provide any yardstick against which efficiency can be measured. It only indicates the actual cost which is of little value in measuring performance efficiency.
3. **Delay in availability of information:** Cost data under historical costing is obtained too late and is not of much use in price quotations and production planning.
4. **Expensive system:** Historical costing is comparatively an expensive system of costing as it involves the maintenance of a larger volume of records.

The above given limitations of Historical costing encouraged the development of a more satisfactory standard costing approach based on predetermined costs. Standard costing is not an alternative system to job order or process costing. It is a special technique to control costs and can be used in conjunction with any other system like job costing, process costing or marginal costing.

12.2.1 Standard Costs and Budgeted Costs

The word standard means 'a norm' or a criterion. Standard cost is thus a criterion cost which may be used as a yardstick to measure the efficiency with which actual cost has been incurred. In other words, standard costs are predetermined costs or target costs that should be incurred under efficient operating conditions.

According to Chartered Institute of Management Accountants (CIMA), London, '*Standard cost is the predetermined cost based on technical estimates for materials, labour and overhead for a selected period of time for a prescribed set of working conditions*'.

In the words of Brown and Howard, '*the standard cost is a predetermined cost which determines what each product or service should cost under given*

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circumstances'. Thus standard costs are planned costs that should be attained under a given set of operating conditions. The main object of standard cost is to look forward and assess what the cost '*should be*' as distinct from what the cost has been in the past.

Budgeted Costs

In comparison to standard costs, budgeted costs reflect the projected revenues, costs and expenses. These are based on established forecasts and goals.

12.2.2 Concept of Standard Costing

Standard costing is simply the name given to a technique whereby standard costs are computed and subsequently compared with the actual costs to find out the differences between the two. These differences (known as variances) are then analysed to know the causes thereof so as to provide a basis of control. The CIMA, London has defined standard costing as '*the preparation of standard costs and applying them to measure the variations from actual costs and analysing the courses of variations with a view to maintain maximum efficiency in production.*' Brown and Howard have defined it, '*as a technique of cost accounting which compares the standard cost of each product or service with the actual costs, to determine the efficiency of the operations so that any remedial action may be taken immediately.*'

Steps: Standard costing system involves the following steps:

1. The setting of standard costs for different elements of cost, *i.e.*, material, labour and overheads.
2. Ascertaining actual costs.
3. Comparing standard with actual costs to determine the differences between the two, known as 'variances'.
4. Analysing variances for ascertaining reasons thereof.
5. Reporting of these variances and analysis thereof to management for appropriate action, where necessary.

Applicability of Standard Costing

The application of standard costing requires certain conditions to be fulfilled. These are:

- (a) A sufficient volume of standard products or components should be produced.
- (b) Methods, operations and processes should be capable of being standardized.
- (c) A sufficient number of costs should be capable of being controlled.

Industries producing standardized products which are repetitive in nature, *i.e.*, industries using process costing method, fulfil all the above conditions and thus the system can be used to the best advantage in such industries. Examples are fertilizers, cement, steel and sugar.

In jobbing industries, it is not worthwhile to develop and employ a full system of standard costing. This is because in such industries each job undertaken may be different from another and setting standards for each job may prove difficult and expensive. In such industries, therefore, a partial system may be adopted in appropriate circumstances. For example, certain processes and operations performed may be of a repetitive nature and thus the principles of standard costing may be applied by setting standard for each such process or operation.

12.2.3 Limitations of Standard Costing

Standard costing system may suffer from certain disadvantages. This may be because of lack of education and communication and resultant misunderstanding on the part of managerial staff. Possible disadvantages are:

1. The system may not be appropriate to the business.
2. The staff may not be capable of operating the system.
3. A business may not be able to keep standards up-to-date. In other words, a business may not revise standards to keep pace with the frequent changes in manufacturing conditions. Firms may avoid revising standards as it is a costly affair.
4. Inaccurate and unreliable standards cause misleading results and thus may not enjoy the confidence of the users of the system.
5. Operation of the standard costing system is a costly affair and small firms cannot afford it.
6. Standard costing is expensive and unsuitable in job order industries which are manufacturing non-standardized products.

12.2.4 Preliminaries in Establishing a System of Standard Costing and Determination Standard Cost

In establishing a system of standard costing, there are a number of preliminaries to be considered. These are as follows:

1. Establishment of Cost Centres

The first step in the establishment of a system of standard costing is the establishment of cost centres with clearly defined areas of responsibility. The meaning of cost centre is explained in Chapter One. In this context it may be noted that in establishing cost centres, there should be no doubt about the responsibility of each cost centre so that in case of off standard performance, responsibility may be identified.

2. Classification of Accounts

Accounts are classified according to the purpose in hand. Classification may be by function, revenue item, etc. For speedy collection and analysis of accounts, codes and symbols may be used.

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3. Types of Standards

Standards may be divided into the following two main classes—basic and current.

Basic standards: These are the standards which are established for an indefinite period of time. They are similar to an index number against which all later results are measured. Variances from basic standards show trends of deviation of the actual cost. However, basic standards are of no practical utility from the point of view of cost control.

Current Standards: Such standards remain in operation for a limited period and are related to current conditions. These standards are revised at regular intervals. Current standards are of three types: (i) Ideal standards; (ii) Expected standards; and (iii) Normal standards.

(i) **Ideal standard:** This is a theoretical standard which is rather not practicable to attain. It pre-supposes that the performance of men, materials and machines is perfect and thus makes no allowance for loss of time, accidents, machine breakdowns, wastage of materials and any other type of waste or loss. This ideal is obviously unrealistic and unattainable. Such a standard has the advantage of establishing a goal, which, though not attainable in practice, is always aimed at.

(ii) **Expected or practical standards:** This is a standard, which may be anticipated to be attained during a future period. Such standards are based on expected performance after making a reasonable allowance for unavoidable losses and other inevitable lapses from perfect efficiency. By far this is the most commonly used type of standard and is best suited from cost control point of view.

(iii) **Normal standards:** This is known as *Past Performance Standard* because it is based on the average performance in the past. The aim of such a standard may be to eliminate the variations in the cost which arise out of trade cycles.

4. Setting Standard Costs

The success of a standard costing system depends on the reliability, accuracy and acceptance of the standards. Extreme care, therefore, must be taken to ensure that all factors have been considered in the establishment of standards.

Standard costs are set for each element of cost, *i.e.*, direct materials, direct labour and overheads. These are described below:

Setting standards for direct materials: Two standards are developed for material costs:

- (a) Material price standard
- (b) Material usage (or quantity) standard

(a) **Material price standard:** This is a forecast of the average prices of materials during the future period. This standard is quite difficult to establish because prices

are regulated more by the external factors than by the company management. The purchasing department notifies the standard prices after considering factors like:

- (i) Purchase prices of recent orders
- (ii) Prices specified in the long-term contracts
- (iii) Forecasts of the commodity price trends

Provision should be made for discounts, packing and delivery charges.

(b) Material quantity (or usage) standard: While setting quantity standard, the quality and size of material items to be consumed should be standardized. The standard is usually developed from material specifications prepared by the department of engineering of product design.

Setting standards for direct labour: The following two standards are usually established for direct labour costs:

- (a) Labour rate standard
- (b) Labour time standard

(a) Labour rate standard: This standard is determined having regard to the current rates of pay and any anticipated variations. Sometimes an agreement between trade unions and employer covers a number of future months or years. In such cases, the agreed rate should be adopted as the standard rate for the period.

Where workers are paid on time basis, it is necessary to establish:

- (i) the labour time standard for each operation
- (ii) the wage rate of each grade of labour
- (iii) the grades of labour to be employed

The type of operation will determine the grade of labour to be employed—male or female, skilled, unskilled or semi-skilled.

Where workers are paid on piece basis, the standard cost will be a fixed rate per piece.

(b) Labour time (or efficiency) standard: Standard time for labour should be scientifically determined by time and motion studies, carried out in conjunction with a study to determine the most efficient method of working. Due allowance should be made for normal loss of labour time, like fatigue, idle time, tool setting, etc.

Setting Standards for Direct Expenses: Direct expenses are not very common, but if there are any direct expenses relating to the cost unit, standards for these too must be set. Setting these standards is usually quite simple, as these may be based on past records, adjusted according to anticipated changes therein.

Setting Standards for Overheads: Setting standards for overheads is more complex than the development of material and labour standards. Developing this standard involves the following two distinct calculations:

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- (a) Determination of the standard overhead costs; and
 (b) Determination of the estimates of production, *i.e.*, standard level of activity reduced to a common base, such as direct labour hours, units of production or machine hours.

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A standard overheads absorption rate is computed with the use of these two figures by the following formula:

$$\text{Standard overhead rate (per hour)} = \frac{\text{Standard overhead cost for the period}}{\text{Standard hours for the period}}$$

or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Standard overhead cost for the period}}{\text{Standard production (in units) for the period}}$$

Thus this rate may be per unit of production when base is in units of production and it will be per hour, if base is the number of hours.

An overall blanket rate of overheads absorption is rarely accurate in any costing system. Thus a separate rate should be computed for each cost centre (or department) created for this purpose.

Overhead standards will be more useful to management if they are divided to show fixed and variable components. Separate overheads absorption rates should be computed for these two types of overheads, *i.e.*, fixed overheads and variable overheads.

Standard Hour

Production may be expressed in diverse type of units such as kilograms, tonnes, litres, gallons, numbers, etc. When a company is manufacturing different types of products, it is almost impossible to aggregate the production, which cannot be expressed in the same unit. Therefore, it is essential to have a common unit in which the production, which is measured in different type of units, can be expressed. As time factor is common to all operations, a common practice is to express the various units in terms of time, known as *standard hour*. The standard hour is the quantity of output or amount of work which should be performed in one hour. In the words of CIMA, London, a standard hour is '*a hypothetical hour which represents the amount of work which should be performed in one hour under stated conditions.*' Time and motion studies may indicate what the output of each process in one hour should be. For example, if 10 units of product should be produced in one hour, then an output of 200 units would represent 20 standard hours.

Standard Cost Card (Standard Cost Sheet)

Once the standard costs have been established, these are recorded on a standard cost card. A standard cost card is thus a record of the standard material, labour and overhead costs. Such a card is maintained for each product or service. The

card will normally show the quantity and price of each material item to be consumed, the time and rate of labour required, the overheads to be absorbed and the total cost. Costs shown in the card should be approved by the person who will be responsible for the operations concerned, otherwise he may not cooperate with much enthusiasm in attaining the standards.

Check Your Progress

1. Why is it not worthwhile to develop and employ a full system of standard costing in jobbing industries?
2. Name the three types of current standards.

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12.3 COST VARIANCES

Cost variance is the *difference between a standard cost and the comparable actual cost incurred during a period*. CIMA, London.

Variance analysis is the process of analysing variances by sub-dividing the total variance in such a way that management can assign responsibility for any off standard performance. According to CIMA, London, Terminology, variance analysis is *the process of computing the amount of variance and isolating the causes of variance between actual and standard*. An important aspect of variance analysis is the need to separate controllable from uncontrollable variances. A detailed analysis of controllable variances will help the management to identify the persons responsible for its occurrence so that corrective action can be taken.

Favourable and Unfavorable Variances

Where the actual cost is less than standard cost, it is known as *favourable* or *credit* variance. On the other hand, where the actual cost is more than standard cost, the difference is referred to as *unfavourable*, *adverse* or *debit* variance.

In simple words, any variance that has a favourable effect on profit is favourable variance and any variance which has an adverse or unfavourable effect on profit is unfavourable variance.

Many students experience difficulty in ascertaining whether a variance is favourable or adverse. In the formulae given in this book, positive (+) variance will indicate favourable variance and negative (–) variance will indicate adverse variance. Favourable variances will be designated by (*F*) and Adverse by (*A*).

Controllable and Uncontrollable Variances

If a variance can be regarded as the responsibility of a particular person, with the result that his degree of efficiency can be reflected in its size, then it is said to be a controllable variance. For example, excess usage of material is usually the responsibility of the foreman concerned. However, if the excessive usage is due to

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material being defective, the responsibility may rest with the Inspection Department for non-detection of the defects.

If a variance arises due to certain factors beyond the control of management, it is known as uncontrollable variance. For example, change in the market prices of materials, general increase in the labour rates, increase in the rates of power or insurance premium, etc., are not within the control of the management of the company. Responsibility for uncontrollable variances cannot be assigned to any person or department.

The division of variances into controllable and uncontrollable is extremely important. The management should place more emphasis on controllable variance as it is these variances which require investigation and possibly corrective action. The uncontrollable variances, on the other hand, may be ignored. This follows the well known *principle of exception* whereby those matters which are going right are ignored and any deviations from efficient performance are investigated.

Methods Variance

While setting standards, specific methods of production are kept in view. If, for some reason or the other, a different method of production is adopted, it will give rise to a different amount of cost, thereby resulting in a variance. Such a variance is known as methods variance. Thus a methods variance arises due to the use of methods other than those specified. According to CIMA, London Terminology, methods variance is '*the difference between the standard cost of a product or operation, produced or performed by the normal method and the standard cost of a product or operation, produced or performed by the alternative method actually employed.*'

Revision Variance

After setting standards, sometimes standard cost has to be revised on account of unavoidable changes in prices of various factors like wages, materials, etc. The standard costs once set are not disturbed every now and then to account for these uncontrollable factors. Rather a revision variance is created and the basic standard cost is allowed to stand. This revision variance is the difference between the standard cost originally set and the revised standard cost.

Thus:

$$\text{Revision variance} = \text{Original standard cost of actual output} - \text{Revised standard cost of actual output}$$

Creation of revision variance is only an interim adjustment which allows the standard costing system to operate usefully even when there are changes in standard costs.

Variances for each Element of Cost

The total cost variance is divided into Material, Labour and Overheads variances.

12.3.1 Material Variances

The different material variances are as follows:

Direct Material Cost Variance

This is the difference between the standard cost of direct materials specified for the output achieved and the actual cost of direct materials used. It is calculated as:

Material Cost Variance = Standard cost of actual output – Actual cost

$$MCV = SC - AC$$

or Material Cost Variance

$$= \left[\begin{array}{l} \text{Standard quantity} \\ \text{for actual output} \end{array} \times \begin{array}{l} \text{Standard} \\ \text{price} \end{array} \right] - \left[\begin{array}{l} \text{Actual} \\ \text{quantity} \end{array} \times \begin{array}{l} \text{Actual} \\ \text{price} \end{array} \right]$$

$$MCV = (SQ \times SP) - (AQ \times AP)$$

The material cost variance may be further divided into price variance and usage variance.

Material Price Variance

This is 'that portion of the material cost variance which is due to the difference between the standard price specified and the actual price paid'.¹ It is calculated by the following formula:

Material Price Variance = (Standard price – Actual price) × Actual quantity

$$MPV = (SP - AP) \times AQ$$

Thus, this is the difference between standard price and actual price multiplied by actual quantity.

Example: With the figures in Example given before, the material price variance will be calculated as follows:

$$\begin{aligned} MPV &= (SP - AP) \times AQ \\ MPV &= (5 - 5.50) \times 4,300 \\ &= ₹ 2,150 (A) \end{aligned}$$

Reasons for Material Price Variance: This variance usually arises due to the following reasons:

1. Change in the market prices of materials
2. Failure to purchase the specified quality, thereby resulting in a different price being paid
3. Change in the quantity of materials, thereby leading to lower/higher quantity discount
4. Not availing cash discounts, when standards set took into account such discounts.
5. Inefficient purchasing

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6. Change in the delivery costs
7. Rush purchases
8. Purchase of a substitute material on account of non-availability of the material specified
9. Change in the rates of excise duty, purchase tax, etc.
10. Off-season purchasing for certain seasonal products, like jute, cotton, etc.

Material Usage (or Quantity) Variance

This is 'that portion of the material cost variance which is due to the difference between the standard quantity specified and the actual quantity used'. Its formula is:

$$\text{Material Usage Variance} = \left(\frac{\text{Standard quantity for actual output} - \text{Actual quantity}}{\text{Standard quantity}} \right) \times \text{Standard price}$$

$$MUV = (SQ - AQ) \times SP$$

Thus, this is the difference between standard quantity and actual quantity multiplied by the standard price.

Example: Continuing example given above, material usage variance will be calculated as under:

$$\begin{aligned} MUV &= (SQ - AQ) \times SP \\ &= (4,000 - 4,300) \times 5 \\ &= ₹ 1,500 (A) \end{aligned}$$

Reasons for Material Usage Variance: The material usage variance may be caused by some or all of the following reasons:

1. Use of defective or sub-standard materials
2. Carelessness in the use of materials
3. Pilferage
4. Poor workmanship
5. Defect in plant and machinery
6. Change in the design or specification of the product
7. Change in the quality of materials
8. Use of substitute materials
9. Use of non-standard material mixture
10. Yield from materials in excess of or less than standard yield

Check: The algebraic sum of material price variance and material usage variance should be equal to material cost variance. Thus:

$$\begin{aligned} MCV &= MPV + MUV \\ 3,650 (A) &= ₹ 2,150 (A) + ₹ 1,500 (A) \end{aligned}$$

Illustration 12.1: From the following particulars, compute: (a) Material cost variance; (b) Material price variance; and (c) Material usage variance

Quantity of materials purchased	3,000 units
Value of materials purchased	₹ 9,000
Standard quantity of materials required per tonne of output	30 units
Standard rate of material	₹ 2.50 per unit
Opening stock of materials	Nil
Closing stock of materials	500 units
Output during the period	80 tonnes

NOTES**Solution:****Basic Calculations:**

Actual quantity of material purchased = 3,000 units

Value of materials purchased = ₹ 9,000

Actual price per unit = $\frac{₹ 9,000}{3,000 \text{ units}}$ = ₹ 3 per unit

Standard price = ₹ 2.50 per unit

Standard quantity = 80 tonnes × 30 units = 2,400 units

Actual quantity = Opening stock + Purchase – Closing stock
= Nil + 3,000 – 500 = 2,500 units

Calculation of variances

(a) **Material Cost Variance** = $SC - AC$
= $(SQ \times SP) - (AQ \times AP)$
= $(2,400 \times 2.50) - (2,500 \times 3.00)$

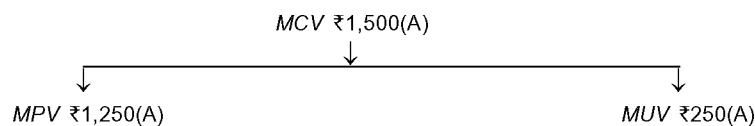
MCV = ₹ 1,500 (A)

(b) **Material Price Variance** = $(SP - AP) \times AQ$
= $(2.50 - 3.00) \times 2,500$

MPV = ₹ 1,250 (A)

(c) **Material Usage Variance** = $(SQ - AQ) \times SP$
= $(2,400 - 2,500) \times 2.50$

MUV = ₹ 250 (A)

Check:**Classification of Material Usage Variance**

Material usage variance is further sub-divided into:

- (a) Material mix variance
- (b) Material yield variance (Or Material sub-usage variance)

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(a) **Material Mix Variance:** This is sub-variance of material usage variance. It arises only where more than one type of material is used for producing the finished product. A company may be using a mixture of materials which does not comply with the predetermined standard mixture. This gives rise to material mix variance.

The material mix variance is defined as *that portion of the material usage variance which is due to the difference between standard and actual composition of materials*. It may arise in industries like chemicals, rubber, etc., where a number of raw materials are mixed to produce a final product. Change from the standard mix may be due to non-availability of one or more components of the mix or due to non-purchase of materials at proper time. Increase in the proportion of cheaper materials results in favourable mix variance and vice versa, the use of more expensive materials in larger proportion results in adverse variance.

This variance is calculated with the help of the following formula:

$$\text{Material mix variance} = \left(\frac{\text{Revised standard quantity}}{\text{Actual quantity}} - \frac{\text{Standard quantity}}{\text{Standard price}} \right) \times \text{Standard price}$$

$$MMV = (RSQ - AQ) \times SP$$

The revised standard quantity is nothing but the standard proportion of total of actual quantities of all the materials. This is calculated as under:

$$RSQ = \frac{\text{Standard quantity of one material}}{\text{Total of standard quantities of all materials}} \times \frac{\text{Total of actual quantities}}{\text{of all materials}}$$

(b) **Material Sub-usage (or Material Revised Usage) Variance:** This is a sub-variance of the material usage variance and represents that portion of the material usage variance which is attributed to reasons other than those which give rise to material mix variance. Thus the algebraic sum of this revised usage variance and material mix variance is equal to material usage variance. Its formula is:

$$\text{Material revised usage variance} = \left(\frac{\text{Standard quantity}}{\text{Revised standard quantity}} - \frac{\text{Standard price}}{\text{Standard price}} \right) \times \text{Standard price}$$

$$MRUV = (SQ - RSQ) \times SP$$

In Illustration 19.2 material revised usage variance is calculated as follows:

$$MRUV = (SQ - RSQ) \times SP$$

$$X = (40 - 44) \times 50 = ₹ 200 (A)$$

$$Y = (60 - 66) \times 40 = ₹ 240 (A)$$

$$MRUV = ₹ 440 (A)$$

Check:

$$MUV = MMV + MRUV$$

$$500(A) = 60 (A) + 440 (A)$$

Material Yield Variance: This is also a sub-variance of material usage variance. It arises in process industries, like chemicals, where loss of materials in production is inevitable. While setting standards, the normal or standard loss is taken into account. But actual loss may differ from normal or standard loss. This results in actual yield or output being different from standard yield.

Thus material yield variance is that portion of the material usage variance which is due to the difference between standard yield specified and actual yield obtained. The standard yield is the output expected to be obtained from the actual usage of raw materials. It should be noted that yield variance as used in standard costing is the same thing as abnormal loss or abnormal gain in the other costing systems.

One important feature of yield variance which differentiates it from other material variances (price, usage and mix variances) is that yield variance is an *output variance*, while others are *input variances*. In other words, yield variance represents a gain or loss on output in terms of finished production, while other variances represent a gain or loss on the cost of material input. Its formula is given on the following page:

$$\text{Material Yield Variance} = \left(\text{Actual yield} - \text{Standard yield} \right) \times \text{Standard Output Price}$$

$$MYV = (AY - SY) \times SOP$$

Standard output price (*SOP*) is the standard material cost per unit of output.

Note: Material revised usage variance and Material yield variance are two different methods of calculating the same thing and are hence clubbed together.

Illustration 12.2: The standard mix to produce one unit of product is as follows:

Material A	60 units @ ` 15 per unit	=	900
Material B	80 units @ ` 20 per unit	=	1,600
Material C	<u>100 units</u> @ ` 25 per unit	=	<u>2,500</u>
	<u>240 units</u>		<u>5,000</u>

During the month of April, 10 units were actually produced and consumption was as follows:

Material A	640 units @ ` 17.50 per unit	=	11,200
Material B	950 units @ ` 18.00 per unit	=	17,100
Material C	<u>870 units</u> @ ` 27.50 per unit	=	<u>23,925</u>
	<u>2,460 units</u>		<u>52,225</u>

Calculate all material variances.

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Solution:**NOTES**

Material	Standard for 10 units			Actual for 10 units		
	Qty units	Rate	Amt	Qty Units	Rate	Amt
A	600	15	9,000	640	17.50	11,200
B	800	20	16,000	950	18.00	17,100
C	1,000	25	25,000	870	27.50	23,925
Total	2,400		50,000	2,460		52,225

1. **Material Cost Variance** = Standard cost – Actual cost

$$= ₹ 50,000 - ₹ 52,225 \text{ (A)}$$

$$MCV = ₹ \mathbf{2,225(A)}$$

2. **Material Price Variance** = (Std Price – Actual Price) × Actual Qty

$$\text{Material A} = (15 - 17.50) \times 640 = ₹ 1,600 \text{ (A)}$$

$$\text{Material B} = (20 - 18) \times 950 = ₹ 1,900 \text{ (F)}$$

$$\text{Material C} = (25 - 27.50) \times 870 = ₹ 2,175 \text{ (A)}$$

$$MPV = ₹ \mathbf{1,875 (A)}$$

3. **Material Usage Variance** = (Std Qty – Actual Qty) × Std Price

$$\text{Material A} = (600 - 640) \times 15 = ₹ 600 \text{ (A)}$$

$$\text{Material B} = (800 - 950) \times 20 = ₹ 3,000 \text{ (A)}$$

$$\text{Material C} = (1,000 - 870) \times 25 = ₹ 3,250 \text{ (F)}$$

$$MUV = ₹ \mathbf{350 (A)}$$

Check: $MCV = MPV + MUV$

$$₹ 2,225 \text{ (A)} = ₹ 1,875 \text{ (A)} + ₹ 350 \text{ (A)}$$

4. **Material Mix Variance** = (Revised Std Qty – Actual Qty) × Std Price

$$\text{Material A} = (615^* - 640) \times 15 = ₹ 375 \text{ (A)}$$

$$\text{Material B} = (820^* - 950) \times 20 = ₹ 2,600 \text{ (A)}$$

$$\text{Material C} = (1,025^* - 870) \times 25 = ₹ 3,875 \text{ (F)}$$

$$MMV = ₹ \mathbf{900 (F)}$$

*Revised Standard Quantity (RSQ) is calculated as follows:

$$\text{Material A} = \frac{2,460}{2,400} \times 600 = 615 \text{ units}$$

$$\text{Material B} = \frac{2,460}{2,400} \times 800 = 820 \text{ units}$$

$$\text{Material C} = \frac{2,460}{2,400} \times 1,000 = 1,025 \text{ units}$$

5. Material Yield Variance

For yield variance, certain basic calculations have to be made as follows:

$$\text{Standard yield} = \frac{\text{Actual usage of materials}}{\text{Standard usage per unit of output}} = \frac{2,460}{240} = 10.25 \text{ units}$$

$$\text{SOP (Std material cost per unit of output)} = ` 50,000 \div 10 \text{ units} = ` 5,000$$

$$\text{Material Yield Variance} = (AY - SY) \times \text{SOP}$$

$$\text{MYV} = (10 - 10.25) \times 5,000 = ` 1,250(\text{A})$$

Material Revised Usage (or Sub-usage) Variance (MRUV)

$$= (\text{Standard Quantity} - \text{Revised Standard Quantity}) \times \text{Standard Price}$$

$$\text{Material A} = (600 - 615) \times 15 = ` 225 (\text{A})$$

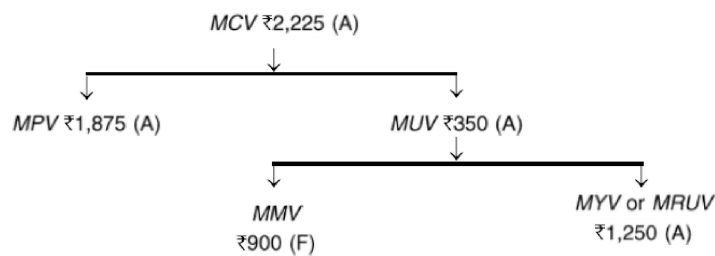
$$\text{Material B} = (800 - 820) \times 20 = ` 400 (\text{A})$$

$$\text{Material C} = (1,000 - 1,025) \times 25 = ` 625 (\text{A})$$

$$\text{MRUV} = ` 1,250 (\text{A})$$

Note: Either MMV or MRUV is calculated. These two are always equal.

Check:



12.3.2 Labour Variances

The analysis and computation of labour variances is quite similar to material variances.

Labour Cost Variance

This is the difference between the standard direct labour cost specified for the activity achieved and the actual direct labour cost incurred. It is calculated as under:

$$\text{Labour Cost Variance} = \frac{\text{Std labour cost of actual output}}{\text{Actual labour cost}}$$

$$\text{LCV} = \text{SC} - \text{AC}$$

Or, Labour Cost Variance

$$\text{LCV} = \left(\frac{\text{Std hours for actual output}}{\text{Std rate per hour}} \right) - \left(\frac{\text{Actual hours}}{\text{Actual rate per hour}} \right)$$

$$\text{LCV} = (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

NOTES

Example: The following information is given:

Standard hours per unit	15
Standard rate	₹ 4 per hour
Actual data:	
Actual production	1,000 units
Actual hours	15,300 hours
Actual rate	₹ 3.90 per hour
Calculate labour cost variance.	

NOTES

Solution:

$$\begin{aligned} \text{Labour Cost Variance} &= (SH \text{ for actual output} \times SR) - (AH \times AR) \\ &= (1,000 \times 15 \times 4) - (15,300 \times 3.90) \\ LCV &= ₹ 330 \text{ (F)} \end{aligned}$$

Classification of Labour Cost Variance

Labour cost variance is further divided into rate variance and efficiency variance.

Labour Rate Variance: This is that portion of the labour cost variance which is due to the difference between the standard rate of labour specified and the actual rate paid. Its formula is:

$$\text{Labour Rate Variance} = (\text{Standard rate} - \text{Actual rate}) \times \text{Actual hours}$$

$$LRV = (SR - AR) \times AH$$

Thus, this is the difference between standard and actual rates of wages, multiplied by actual hours.

Example: Using the data given in the above example:

$$\begin{aligned} LRV &= (SR - AR) \times AH \\ &= (4 - 3.90) \times 15,300 = ₹ 1,530 \text{ (F)} \end{aligned}$$

Reasons for labour rate variance: Usual reasons are:

1. Change in the basic wage rates
2. Use of a different method of wage payment
3. Employing workers of grades different from the standard grades specified
4. Unscheduled overtime
5. New workers not being paid at full rates

Often, labour rate variance will be an uncontrollable variance as labour rates are usually determined by demand and supply conditions in the labour market, backed by negotiable strength of the trade union. Where this variance is due to the use of a grade of labour other than that specified, there may well be such acceptable explanations as non-availability of the labour grade specified. But when a foreman carelessly employs a wrong grade of labour on a job, he may be held responsible.

Labour Time (or Efficiency) Variance: This is that portion of the labour cost variance

which is due to the difference between labour hours specified for actual output and the actual labour hours expended. This variance is calculated as follows:

$$\text{Labour Efficiency Variance} = \left(\frac{\text{Std hours for actual output} - \text{Actual hours}}{\text{actual output}} \right) \times \text{Standard rate}$$

$$LEV = (SH - AH) \times SR$$

Thus, this variance is the difference between standard and actual time valued at standard rate.

Example: Using the data given in above example:

$$\begin{aligned} LEV &= (SH \text{ for actual output} - AH) \times SR \\ &= (15,000 - 15,300) \times 4 = ` 1,200 (A) \end{aligned}$$

The algebraic total of labour rate variance and labour efficiency variance is equal to labour cost variance. Thus:

$$\begin{aligned} LCV &= LRV + LEV \\ ` 330 (F) &= ` 1,530 (F) + ` 1,200 (A) \end{aligned}$$

Reasons for labour efficiency variance: This variance is usually caused by one or more of the following reasons:

1. Poor working conditions, *e.g.*, inadequate lighting and ventilation, excessive heating, etc.
2. Defective tools and plant and machinery
3. Inefficient workers
4. Incompetent supervision
5. Use of defective or non-standard materials
6. Time wasted by factors, like waiting for materials, tools or machine break-down
7. Insufficient training of workers
8. Change in the method of operation
9. Non-standard grade of workers

Classification of Labour Efficiency Variance

Labour efficiency variance is further divided into the following sub-variances:

- (a) Idle time variance
- (b) Labour mix variance
- (c) Labour yield variance (or Labour revised efficiency variance)

(a) **Idle Time Variance:** This variance represents that portion of the labour efficiency variance which is due to abnormal idle time, such as time lost due to machine break-down, power failure, strike, etc. It is calculated by valuing idle hours at standard rate. Thus:

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Idle Time Variance = Idle hours × Standard rate

$$ITV = IH \times SR$$

NOTES

As idle hours represent a loss, idle time variance is always unfavourable.

Some accountants do not treat Idle Time Variance as a part of labour efficiency variance but treat it as a part of labour cost variance.

Example: Using the data give in the above example and further assuming that idle time is 200 hours, then the idle time variance would be:

$$ITV = 200 \times 4 = ₹ 800 (A)$$

When idle time variance is treated as a sub-variance of labour cost variance and not of labour efficiency variance, then for labour efficiency variance, the actual time would be 15,300 – 200 = 15,100 hours. Labour efficiency variance will be calculated on the basis of 15,100 hours. Thus

$$\begin{aligned} \text{Labour Efficiency Variance} &= (SH - AH) \times SR \\ &= (15,000 - 15,100) \times 4 = ₹ 400 (A) \end{aligned}$$

In this case, the total of Labour Rate Variance, Labour Efficiency Variance and Idle Time Variance would be equal to Labour Cost Variance. Thus

$$\begin{aligned} LCV &= LRV + LEV + ITV \\ 330 (F) &= 1,530 (F) + 400 (A) + 800 (A) \end{aligned}$$

(b) **Labour Mix Variance (Gang Composition Variance):** This variance is similar to material mix variance. It arises only when more than one grade of workers are employed and the composition of actual grade of workers differs from those specified. It is calculated with the help of following formula:

$$\text{Labour Mix Variance} = \left(\frac{\text{Revised standard hours}}{\text{Actual hours}} - \frac{\text{Actual}}{\text{hours}} \right) \times \text{Standard rate}$$

$$LMV = (RSH - AH) \times SR$$

Illustration 12.3: Coates India Ltd manufactures a particular product, the standard direct labour cost of which is ₹ 120 per unit, whose manufacture involves the following:

Grade of workers	Hours	Rate	Amount
A	30	2	60
B	<u>20</u>	3	<u>60</u>
	<u>50</u>		<u>120</u>

During a period, 100 units of the product were produced, the actual labour cost of which was as follows:

Grade of workers	Hours	Rate	Amount
A	3,200	1.50	4,800
B	<u>1,900</u>	4.00	<u>7,600</u>
	<u>5,100</u>		<u>12,400</u>

NOTES

Calculate (a) Labour Cost Variance (b) Labour Rate Variance
(c) Labour Efficiency Variance (d) Labour Mix Variance

Solution: During the month of May, the following data applies:

Grade of worker	Standard for 100 units			Actual for 100 units		
	Hours	Rate	Amt	Hours	Rate	Amt
A	3,000	2	6,000	3,200	1.50	4,800
B	2,000	3	6,000	1,900	4.00	7,600
Total	5,000		12,000	5,100		12,400

$$(a) \text{ Labour Cost Variance} = SC - AC$$

$$LCV = 12,000 - 12,400 = \text{` } 400 \text{ (A)}$$

$$(b) \text{ Labour Rate Variance} = (SR - AR) \times AH$$

$$A = (2 - 1.50) \times 3,200 = \text{` } 1,600 \text{ (F)}$$

$$B = (3 - 4.00) \times 1,900 = \text{` } 1,900 \text{ (A)}$$

$$LRV = \text{` } 300 \text{ (A)}$$

$$(c) \text{ Labour Efficiency Variance} = (SH - AH) \times SR$$

$$A = (3,000 - 3,200) \times 2 = \text{` } 400 \text{ (A)}$$

$$B = (2,000 - 1,900) \times 3 = \text{` } 300 \text{ (F)}$$

$$LEV = \text{` } 100 \text{ (A)}$$

Check:

$$LCV = LRV + LEV$$

$$400 \text{ (A)} = 300 \text{ (A)} + 100 \text{ (A)}$$

$$(d) \text{ Labour Mix Variance} = (RSH^* - AH) \times SR$$

$$A = (3,060 - 3,200) \times 2 = \text{` } 280 \text{ (A)}$$

$$B = (2,040 - 1,900) \times 3 = \text{` } 420 \text{ (F)}$$

$$LMV = \text{` } 140 \text{ (F)}$$

*Calculation of Revised Standard Hours (RSH)

$$RSH = \frac{\text{Std hours of the grade}}{\text{Total std hours}} \times \text{Total actual hours}$$

$$\text{Grade A} = \frac{3,000}{5,000} \times 5,100 = 3,060 \text{ hrs} \quad \text{Grade B} = \frac{2,000}{5,000} \times 5,100 = 2,040 \text{ hrs}$$

hrs

NOTES

(c) Labour Revised Efficiency Variance (Or Labour Sub-efficiency Variance): This is similar to Material Revised Usage Variance and is a sub-variance of labour efficiency variance. It arises due to factors other than those which give rise to idle time variance and labour mix variance. Thus, this is a residue of labour efficiency variance left after idle time and mix variance have been separated. Its formula is:

$$\text{Labour Revised Efficiency Variance} = \left(\frac{\text{Std hours for actual output} - \text{Revised std hours}}{\text{actual output}} \right) \times \text{Std rate}$$

$$LREV = (SH - RSH) \times SH$$

Labour Yield Variance: This is quite similar to Material Yield Variance. This variance reveals the effect on labour cost of actual output or yield being more or less than the standard yield. Its formula is:

$$\text{Labour Yield Variance} = \left(\frac{\text{Actual yield} - \text{Std yield from actual input}}{\text{Actual yield}} \right) \times \text{Std labour cost per unit of output}$$

Note: Labour revised efficiency variance and Labour yield variance are two methods of calculating the same thing, and are hence clubbed together.

Illustration 12.4: The standard labour employment and the actual labour engaged in a week for a job are as under:

	<i>Skilled workers</i>	<i>Semi-skilled workers</i>	<i>Unskilled workers</i>
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 | (CA Inter) |

Solution:

<i>Category of workers</i>	<i>Standard</i>			<i>Actual</i>		
	<i>Hrs*</i>	<i>Rate</i>	<i>Amount</i>	<i>Hrs*</i>	<i>Rate</i>	<i>Amount</i>
Skilled	1,280	3	3,840	1,120	4	4,480
Semi-skilled	480	2	960	720	3	2,160
Unskilled	240	1	240	160	2	320
	2,000		5,040	2,000		6,960

*Hrs = No. of workers × 40 hours.

$$\text{Std cost of actual output} = \frac{`5,040}{2,000 \text{ hrs}} \times 1,800 \text{ hrs} = `4,536$$

Labour Cost Variance = Std cost of actual output – Actual cost

$$LCV = `4,536 - 6,960 = `2,424 \text{ (A)}$$

Labour Rate Variance = $(SR - AR) \times AH$

$$\text{Skilled} = (3 - 4) \times 1,120 = `1,120 \text{ (A)}$$

$$\text{Semi-skilled} = (2 - 3) \times 720 = `720 \text{ (A)}$$

$$\text{unskilled} = (1 - 2) \times 160 = `160 \text{ (A)}$$

$$LRV = `2,000 \text{ (A)}$$

Labour Efficiency Variance = $(*SH \text{ for actual output} - AH) \times SR$

$$\text{Skilled} = (1,152 - 1,120) \times 3 = `96 \text{ (F)}$$

$$\text{Semi-skilled} = (432 - 720) \times 2 = `576 \text{ (A)}$$

$$\text{Unskilled} = (216 - 260) \times 1 = `56 \text{ (F)}$$

$$LEV = `424 \text{ (A)}$$

*Std hrs for actual output are calculated as follows:

$$\text{Skilled} = \frac{1,800}{2,000} \times 1,280 = 1,152 \text{ hrs}$$

$$\text{Semi-skilled} = \frac{1,800}{2,000} \times 480 = 432 \text{ hrs}$$

$$\text{Unskilled} = \frac{1,800}{2,000} \times 240 = 216 \text{ hrs}$$

Labour Mix Variance = $(\text{Revised std hrs} - AH) \times SR$

$$\text{Skilled} = (1,280 - 1,120) \times 3 = `480 \text{ (F)}$$

$$\text{Semi-skilled} = (480 - 720) \times 2 = `480 \text{ (A)}$$

$$\text{Unskilled} = (240 - 160) \times 1 = `80 \text{ (F)}$$

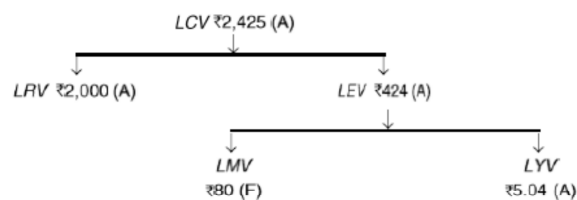
$$LMV = `80 \text{ (F)}$$

Labour Yield Variance

= $\left(\frac{\text{Actual output} - \text{Std output for actual hours}}{\text{actual hours}} \right) \times \text{*Std rate per hour of work}$

$$LYV = (1,800 - 2,000) \times \frac{5,040}{2,000} = `504 \text{ (A)}$$

Check:



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Check Your Progress

3. What is known as the difference between the standard cost originally set and the revised standard cost?
4. State the formula for labour mix variance.

12.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. In jobbing industries, it is not worthwhile to develop and employ a full system of standard costing because in such industries each job undertaken may be different from another and setting standards for each job may prove difficult and expensive.
2. The three types of current standards are: ideal standards, expected and normal standards.
3. The revision variance is known as the difference between the standard cost originally set and the revised standard cost.
4. The formula for labour mix variance is

Labour Mix Variance= (Revised standard hours- Actual Hours) x Standard Rate

12.5 SUMMARY

- Standard costing is a specialized technique of cost management to control the cost.
- The limitations of historical costing encouraged the development of a more satisfactory standard costing approach based on predetermined costs.
- Standard costing is not an alternative system to job order or process costing. It is a special technique to control costs and can be used in conjunction with any other system like job costing, process costing or marginal costing.
- Standard costing system may suffer from certain disadvantages. This may be because of lack of education and communication and resultant misunderstanding on the part of managerial staff.
- Establishing a system of standard costing: establishment of cost centres, classification of accounts, types of standards, and setting of standard costs.
- Cost variance is the difference between a standard cost and the comparable actual cost incurred during a period. These variances can be favourable or unfavourable and controllable and uncontrollable variances.

- While setting standards, specific methods of production are kept in view. If, for some reason or the other, a different method of production is adopted, it will give rise to a different amount of cost, thereby resulting in a variance. Such a variance is known as methods variance.
- The total cost variance is divided into material, labour and overheads variances.
- The material cost variance is further divided into material price and material usage variances.
- The labour cost variance is divided into labour rate variance and labour efficiency variance.

NOTES

12.6 KEY WORDS

- **Historical costing:** It is a cost accounting concept in which the assets and liabilities are reported at their historical costs, which does not account for changes in the item's value
- **Standard costs:** These are predetermined costs or target costs that should be incurred under efficient operating conditions
- **Standard hour:** It refers to the quantity of output or amount of work which should be performed in one hour
- **Cost variance:** It refers to the difference between a standard cost and the comparable actual cost incurred during a period

12.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the limitations of historical costing?
2. Define standard and budgeted costs.
3. Write a short note on the applicability of standard costing.
4. List the limitation of standard costing.
5. What are the different types of variances?

Long Answer Questions

1. Explain the steps involved in the establishment of standard costing.
2. Describe the process of setting standard costs.
3. Discuss the different material and labour variances.

12.8 FURTHER READINGS

NOTES

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UNIT 13 MARGINAL COSTING AND PROFIT PLANNING

*Marginal Costing and
Profit Planning*

NOTES

Structure

- 13.0 Introduction
- 13.1 Objectives
- 13.2 Marginal and Absorption Costing
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- 13.3 Cost-Volume-Profit Analysis and Profit Planning
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- 13.4 Answers to Check Your Progress Questions
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13.0 INTRODUCTION

Marginal cost is defined as the amount of any given volume of output by which aggregate costs are changed, if the volume of output is increased or decreased by one unit.

Marginal Costing may be defined as ‘the ascertainment by differentiating between fixed cost and variable cost, of marginal cost and of the effect on profit of changes in volume or type of output.’ With marginal costing procedure costs are separated into fixed and variable cost.

Break-even point is that point at which there is neither profit nor loss. It is at this point costs are equal to sales. It is otherwise called as balancing point, neutral point, equilibrium point, loss ending point, profit beginning point, etc. After breakeven point is achieved, all the further sales will contribute to profit.

In this unit, you will learn about the concept or marginal costing and profit planning.

NOTES

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Define and understand marginal (variable) cost and marginal costing
- Distinguish between marginal costing and absorption costing
- Describe break-even analysis/cost-volume-profit (CVP) analysis
- Draw a break-even chart
- Explain key terms, like contribution, P/V ratio, margin of safety, angle of incidence

13.2 MARGINAL AND ABSORPTION COSTING

There are mainly two techniques of product costing and income determination — (a) Absorption costing; (b) Marginal costing.

Absorption Costing

This is a total cost technique under which total cost (*i.e.*, fixed cost as well as variable cost) is charged as production cost. In other words, in absorption costing, all manufacturing costs are *absorbed* in the cost of the products produced. In this system, fixed factory overheads are absorbed on the basis of a predetermined overhead rates, based on normal capacity. Under/over absorbed overheads are adjusted before computing profit for a particular period. Closing stock is also valued at total cost which includes all direct costs and fixed factory overheads (and sometimes administration overheads also).

Absorption costing is a traditional approach and is also known as *Conventional Costing* or *Full Costing*.

Marginal Costing

An alternative to absorption costing is marginal costing, also known as '*variable costing*' or *direct costing*. Under this technique, only variable costs are charged as product costs and included in inventory valuation. Fixed manufacturing costs are not allotted to products but are considered as period costs and thus charged directly to Profit and Loss Account of that year. Fixed costs also do not enter in stock valuation.

Both absorption costing and marginal costing treat non-manufacturing costs (*i.e.*, administration, selling and distribution overheads) as period costs. In other words, these are not inventoriable costs.

Meaning of Marginal Costing

Marginal costing is defined by CIMA London as *‘The accounting system in which variable costs are charged to cost units and fixed costs of the period are written off in full, against the aggregate contribution. Its special value is in decision making’*.

Characteristics of Marginal Costing

The essential characteristics and mechanism of marginal costing technique may be summed up as follows:

1. **Segregation of costs into fixed and variable elements:** In marginal costing all costs are classified into fixed and variable. Semi-variable costs are also segregated into fixed and variable elements.
2. **Marginal costs as products costs:** Only marginal (variable) costs are charged to products produced during the period.
3. **Fixed costs as period costs:** Fixed costs are treated as period costs and are charged to Costing Profit and Loss Account of the period in which they are incurred.
4. **Valuation of inventory:** The work-in-progress and finished stocks are valued at marginal cost only.
5. **Contribution:** Contribution is the difference between sales value and marginal cost of sales. The relative profitability of products or departments is based on a study of ‘contribution’ made by each of the products or departments.
6. **Pricing:** In marginal costing, prices are based on marginal cost plus contribution.
7. **Marginal costing and profit:** In marginal costing, profit is calculated by a two-stage approach. First of all, contribution is determined for each product or department. The contributions of various products or departments are pooled together and such a total of contributions from all products is called ‘Fund’. Then from this fund is deducted the total fixed cost to arrive at a profit or loss.

Product Costs and Period Costs

The concepts of product costs and period costs was explained in Chapter 1 of this book. It may be recalled that product costs are those costs which become a part of production cost. Such costs are also included in inventory valuation. Period costs, on the other hand, are those costs which are not associated with production. Such costs are treated as an expense of the period in which these are incurred.

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These do not form part of the cost of products or inventory. These are directly transferred to Profit and Loss Account of the period.

13.2.1 Marginal Cost

NOTES

Marginal cost is the additional cost of producing an additional unit of product. It is the total of all variable costs. It is composed of all direct costs and variable overheads. The CIMA London has defined marginal cost '*as the amount at any given volume of output by which aggregate costs are changed, if volume of output is increased or decreased by one unit*'. It is the cost of one unit of product which would be avoided if that unit were not produced. An important point is that marginal cost per unit remains unchanged, irrespective of the level of activity.

13.2.2 Absorption Costing and Marginal Costing: Differences and Determination

The points of distinction between marginal costing and absorption costing are summarized as follows:

1. **Treatment of fixed and variable costs:** In marginal costing, only variable costs are charged to products. Fixed costs are treated as period costs and charged to Profit and Loss Account of the period.

In absorption costing, all costs (both fixed and variable) are charged to the product. The fixed factory overhead cost is absorption in units produced at a rate predetermined on the basis of normal capacity utilization (and not on the basis of actual production).

2. **Valuation of stock:** In marginal costing, stock of work-in-progress and finished goods are valued at marginal cost only.

In absorption costing, stocks are valued at total cost which includes both fixed and variable costs. Thus stock values in marginal costs are lower than that in absorption costing.

3. **Measurement of profitability:** In marginal costing, relative profitability of products or departments is based on a study of relative contribution made by respective products or departments. The managerial decisions are thus guided by contribution.

In absorption costing, relative profitability is judged by profit figures which is also a guiding factor for managerial decisions.

Income Determination under Marginal Costing and Absorption Costing

The net profit under the two systems may be same or may be different. Difference in profit may be because of the different basis of inventory valuation. In marginal costing stocks of work-in-progress and finished goods are valued at variable cost whereas in absorption costing stocks are valued at total cost.

You can understand the preparation of income statement under the two systems through the following illustration.

Illustration 13.1: Zen Ltd supplies you the following data:

Direct material cost	₹ 48,000
Direct wages	₹ 22,000
Variable overheads—Factory	₹ 13,000
—Adm. and selling	₹ 2,000
Fixed overheads —Factory	₹ 20,000
—Adm. and selling	₹ 8,000
Sales	₹ 1,25,000

NOTES

Prepare an income statement under absorption costing and marginal costing.

Solution:

Income Statement (Absorption Costing)

(A) Sales		1,25,000
Direct materials		48,000
Direct wages		22,000
Factory overheads—Variable	13,000	
—Fixed	20,000	33,000
Cost of Production		1,03,000
Adm. and selling overheads		
—Variable	2,000	
—Fixed	8,000	10,000
(B) Total Cost		1,13,000
Profit (A – B)		12,000

Income Statement (Marginal Costing)

(A) Sales		1,25,000
Direct materials		48,000
Direct wages		22,000
Variable overheads —Factory		13,000
—Adm. and selling		2,000
(B) Variable cost		85,000
(C) Contribution (A – B)		40,000
Fixed overheads —Factory	20,000	
—Adm. and selling	8,000	
(D) Total fixed overheads	2,8000	
Profit (C – D)		12,000

Comments: Profit under absorption costing and marginal costing is the same. This is because there are no opening and closing stocks. However, when there are opening and/or closing stocks, profit/loss under the two systems may be different.

NOTES

Check Your Progress

1. What are some of the other names for absorption costing?
2. How are stock of work-in-progress and finished goods valued under marginal and absorption costing?

13.3 COST-VOLUME-PROFIT ANALYSIS AND PROFIT PLANNING

Cost-volume-profit analysis (CVP analysis) is an extension of the principles of marginal costing. It studies the interrelationship of three basic factors of business operations:

- (a) Cost of production
- (b) Volume of production/sales
- (c) Profit

These three factors are interconnected in such a way that they act and react on one another because of cause and effect relationship amongst them. The cost of a product determines its selling price and the selling price determines the level of profit. The selling price also affects the volume of sales which directly affects the volume of production and volume of production in turn influences cost. In brief, variations in volume of production results in changes in cost and profit. CIMA London has defined CVP analysis as, '*the study of the effects on future profits of changes in fixed cost, variable cost, sales price, quantity and mix.*'

An understanding of CVP analysis is extremely useful to management in budgeting and profit planning. It explains the impact of the following on the net profit:

- (a) Changes in selling prices
- (b) Changes in volume of sales
- (c) Changes in variable cost
- (d) Changes in fixed cost

In fact, CVP analysis helps in determining the probable effect of change in any one of these factors on the remaining factors.

13.3.1 Break-even Analysis

Break-even analysis is a widely-used technique to study the CVP relationship. It is interpreted in narrow as well as broad sense.

In its *narrow sense*, break-even analysis is concerned with determining break-even point, *i.e.*, that level of production and sales where there is no profit and no loss. At this point total cost is equal to total sales revenue.

When used in *broad sense*, break-even analysis is used to determine probable profit/loss at any given level of production/sales. It is also used to determine the amount of sales to earn a desired amount of profit.

Assumptions underlying Break-even Analysis

The break-even analysis is based on the following assumptions:

1. All costs can be separated into fixed and variable components.
2. Variable cost per unit remains constant and total variable cost varies in direct proportion to the volume of production.
3. Total fixed cost remains constant.
4. Selling price per unit does not change as volume changes.
5. There is only one product or in the case of multiple products, the sales mix does not change. In other words, when several products are being sold, the sale of various products will always be in some predetermined proportion.
6. There is synchronization between production and sales. In other words, volume of production equals volume of sales.
7. Productivity per worker does not change.
8. There will be no change in the general price level.

Contribution and Marginal Cost Equation

As stated earlier, contribution is the difference between sales and the marginal (variable) cost of sales. It is also known as contribution margin (C_m) or gross margin. Thus contribution is calculated by the following formula:

$$\text{Contribution} = \text{Sales} - \text{Variable cost} \quad (C = S - V)$$

$$\text{Also, Contribution} = \text{Fixed cost} + \text{Profit} \quad (C = F + P)$$

$$\text{or Contribution} = \text{Fixed cost} - \text{Loss} \quad (C = F - L)$$

From this, the following marginal cost equation is developed:

$$S - V = F + P$$

If any three of the above four factors in the equation are known, the fourth one can be easily found out. Thus:

$$\text{or} \quad P = S - V - F$$

$$P = C - F$$

$$F = C - P$$

$$V = S - F - P$$

The concept of contribution is extremely helpful in the study of break-even analysis and management decision making.

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13.3.2 Profit-Volume Ratio (P/V Ratio)

The profit/volume ratio, better known as contribution/sales ratio (C/S ratio), expresses the relation of contribution to sales.

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Symbolically,
$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{C}{S} = \frac{S - V}{S}$$

By transposition, we have

(i) $C = S \times \text{P/V ratio}$

(ii) $S = \frac{C}{\text{P/V ratio}}$

Uses of P/V ratio

P/V ratio is one of the most important ratios to watch in business. It is an indicator of the rate at which profit is being earned. A high P/V ratio indicates high profitability and a low ratio indicates low profitability in the business. The profitability of different sections of the business such as sales areas, classes of customers, product lines, methods of production, etc., may also be compared with the help of profit-volume ratio. The P/V ratio is also used in making the following type of calculations:

- (a) Calculation of break-even point
- (b) Calculation of profit at a given level of sales
- (c) Calculation of the volume of sales required to earn a given profit
- (d) Calculation of profit when margin of safety is given
- (e) Calculation of the volume of sales required to maintain the present level of profit, if selling price is reduced

Methods of Break-even Analysis

Break-even analysis may be performed by the following two methods:

- (a) Algebraic calculations
- (b) Graphic presentation

Algebraic Method (Calculations in Break-even Analysis)

Break-even point: The break-even point is the volume of output or sales at which total cost is exactly equal to sales. It is a point of no profit and no loss. This is the minimum point of production at which total cost is recovered and after this point profit begins.

The fundamental formula to calculate break-even point is:

$$\text{Break-even point (in units)} = \frac{\text{Total fixed cost}}{\text{Contribution per unit}} = \frac{F}{S - V}$$

$$\text{Break-even point (in Rupees)} = \frac{\text{Total fixed cost}}{\text{Contribution}} \times \text{Sales} = \frac{F \times S}{S - V}$$

or
$$\text{Break-even point (in Rupees)} = \frac{\text{Total fixed cost}}{\text{P/V ratio}}$$

Illustration 13.2: The following information is given:

Sales = ₹ 2,00,000

Variable cost = ₹ 1,20,000

Fixed cost = ₹ 30,000

Calculate (a) Break-even point

(b) New break-even point if selling price is reduced by 10%

(c) New break-even point if variable cost increases by 10%

(d) New break-even point if fixed cost increases by 10%

Solution:

$$\text{P/V ratio} = \frac{S - V}{S} = \frac{2,00,000 - 1,20,000}{2,00,000} = \frac{80,000}{2,00,000} \times 100 = 40\%$$

$$(a) \text{ Break-even point} = \frac{F}{\text{P/V ratio}} = \frac{30,000}{40\%} = \text{₹ } 75,000$$

(b) When selling price is reduced by 10%, new sales = 2,00,000 – 10% = ₹ 1,80,000

$$\text{New P/V ratio} = \frac{1,80,000 - 1,20,000}{1,80,000} = \frac{60,000}{1,80,000} = \frac{1}{3}$$

$$\text{New Break-even point} = \frac{F}{\text{P/V ratio}} = \frac{30,000}{1/3} = \text{₹ } 90,000$$

(c) When variable cost increases by 10%, new variable cost

$$= 1,20,000 + 10\% = \text{₹ } 1,32,000$$

$$\text{New P/V ratio} = \frac{2,00,000 - 1,32,000}{2,00,000} = \frac{68,000}{2,00,000} \times 100 = 34\%$$

$$\text{New Break-even point} = \frac{30,000}{34\%} = \text{₹ } 88,235 \text{ (Approx)}$$

(d) If fixed cost increases by 10%, new fixed cost = 30,000 + 10% = ₹ 33,000

P/V ratio remains unaffected at 40%

$$\text{New Break-even point} = \frac{33,000}{40\%} = \text{₹ } 82,500$$

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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—

$$\text{Cash break even point} = \frac{\text{Cash fixed costs}}{\text{Contribution per unit}}$$

13.3.3 Margin of Safety (M/S)

Margin of safety may be defined as the difference between actual sales and sales at break-even point. In other words, it is the amount by which actual volume of sales exceeds the break-even point. Margin of safety may be expressed in absolute money terms or as a percentage of sales. Thus,

$$\text{M/S} = \text{Actual sales} - \text{Break-even point}$$

The size of the margin of safety indicates soundness of a business. When margin of safety is large, it means the business can still make profits even after a serious fall in sales. In such a situation, the business stands better chance of survival in times of depression. A large margin of safety usually indicates low fixed costs. When margin of safety is low, any loss of sales may be a matter of a serious concern.

Margin of safety is directly related to profit. This is shown below:

$$\text{Profit} = \text{Margin of safety} \times \text{Profit/volume ratio}$$

$$P = \text{M/S} \times \text{P/V ratio}$$

Thus
$$\text{M/S} = \frac{P}{\text{P/V ratio}}$$

If profit is 10% and P/V ratio is 40%, then

$$\text{M/S} = \frac{10\%}{40\%} = 25\%$$

When actual sales are given—

$$\text{Profit} = \text{M/S ratio} \times \text{P/V ratio} \times \text{Actual sales}$$

When profit is not known but M/S is known, then

$$P = \text{M/S} \times \text{P/V ratio}$$

$$P = 25\% \times 40\% = 10\%$$

Improvement in M/S: When margin of safety is not satisfactory, the following steps may be taken to improve it:

(a) Increase the volume of sales; (b) Increase the selling price; (c) Reduce fixed cost; (d) Reduce variable cost; (e) Improve sales mix by increasing the sales of products with larger P/V ratio.

The effect of a price reduction is always to reduce P/V ratio, raise the break-even point and shorten the margin of safety.

This is illustrated on the following page:

Example: Suppose price is reduced from ₹ 75 to ₹ 60, variable cost ₹ 50 per unit, fixed cost 10,000, calculate margin of safety.

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	<i>Before price reduction</i>	<i>After price reduction</i>
Selling price per unit (<i>S</i>)	75	60
Variable cost per unit (<i>V</i>)	50	50
Total fixed cost (<i>F</i>)	10,000	10,000
Contribution (<i>S</i> – <i>V</i>)	25	10
P/V ratio	$\frac{25}{75} = \frac{1}{3}$	$\frac{10}{60} = \frac{1}{6}$
Break-even point $\left(\frac{F}{P/V \text{ ratio}} \right)$	$= \frac{10,000}{1/3}$ = 30,000	$= \frac{10,000}{1/6}$ = 60,000
Actual sales (assumed)	75,000	75,000
M/S (Actual sales – B.E. Point)	75,000 – 30,000 = 45,000	75,000 – 60,000 = 15,000

Cost Indifference Point

Cost indifference point refers to that level of output where the total cost or the profit of the two alternatives is equal. Such a level may be calculated where two or more alternative methods of production or machines are considered and the use of one machine involves higher fixed cost and lower variable cost per unit while the other machine involves lower fixed cost and higher variable cost per unit. The calculation of point of cost indifference helps in a cost minimization exercise and identifies the alternative which is more profitable for a given level of output or sales. A machine with a lower fixed cost and a higher variable cost per unit is more profitable when actual sales are below the point of cost indifference and vice versa, a machine with a higher fixed cost and a lower variable cost per unit is more profitable when actual sales are more than the point of cost indifference. The formula for calculation is as follows:

$$\text{Cost indifference point (in units)} = \frac{\text{Difference in fixed cost}}{\text{Difference in contribution per unit}}$$

$$\text{Cost indifference point (in ₹)} = \frac{\text{Difference in fixed cost}}{\text{Difference in P/V ratio}}$$

Illustration 13.3: GMR Co. Ltd has to choose between machine X₁ and X₂ and provides the following data:

	X ₁	X ₂
Output per annum (units)	10,000	10,000
Profit at the above level	₹ 30,000	24,000
Fixed cost per annum	₹ 30,000	16,000

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Compute:

- (i) B.E. Point of the two machines
- (ii) Level of output where the two machines are equally profitable
- (iii) The machine suitable for different levels of output of the product

Solution:

$$\text{Contribution} = \text{Fixed cost} + \text{Profit}$$

$$\text{Machine A} = 30,000 + 30,000 = ₹ 60,000$$

$$\text{Machine B} = 16,000 + 24,000 = ₹ 40,000$$

$$\text{C or contribution per unit} - \text{A} = ₹ 60,000 \div 10,000 \text{ units} = ₹ 6$$

$$- \text{B} = ₹ 40,000 \div 10,000 \text{ units} = ₹ 4$$

(i) Break-even point = FC ÷ C

$$\text{A} = ₹ 30,000 \div ₹ 6 = 5,000 \text{ units}$$

$$\text{B} = ₹ 16,000 \div ₹ 4 = 4,000 \text{ units}$$

(ii) Cost indifference point = $\frac{\text{Difference in FC}}{\text{Difference in C}}$

$$= \frac{30,000 - 16,000}{6 - 4} = \frac{14,000}{2} = 7,000 \text{ units}$$

At 7,000 units, both the machines will produce the same amount of profit.

- (iii) Machine B will be more profitable between break-even point and point of cost indifference, i.e., between 4,000 units and 7,000 units.

A is more profitable when sales one more than 7,000 units.

13.3.4 Limiting or Key Factor

The objective of a business is to earn maximum profit. However, it is not always easy to achieve this objective because profit earning is affected by a variety of factors. For example, an undertaking may have sufficient orders on hand, ample skilled labour and production capacity, but may be unable to obtain all the quantity of material it needs for the manufacture of maximum quantities which could be

sold. Thus, material is the factor which *limits* the size of output and prevents an undertaking from maximizing its profit. Similarly, sometimes a business is not able to sell all that it can produce. In such a case, sales is the limiting factor.

A limiting or key factor may thus be defined as the *factor in the activities of an undertaking, which at a particular point in time or over a period will limit the volume of output*. Examples of limiting factors are:

- (i) Sales
- (ii) Materials
- (iii) Labour of particular skill
- (iv) Production capacity or machine hours
- (v) Financial resources.

The purpose of the limiting factor technique is to indicate the most profitable course of action in all such cases where alternatives are possible.

Contribution per unit of key factor—When a key factor is operating, the most profitable position is reached when contribution per unit of key factor is maximum. For instance, if a choice lies between producing product A which yields a contribution of ₹ 15 per unit and product B which yields a contribution of ₹ 20 per unit, product B would be more profitable.

If, however, product A takes 3 kg of material (which is a limiting factor) and product B takes 5 kg the respective contributions per kg of material would be:

$$\text{Product A} = ₹ 15 \div 3 \text{ kgs} = ₹ 5$$

$$\text{Product B} = ₹ 20 \div 5 \text{ kgs} = ₹ 4$$

Product A, which gives the greater contribution in terms of per unit of limiting factor will be more profitable.

Illustration 13.4: The following data at is given:

	Product A	Product B
Direct materials	₹ 24	14
Direct labour @ ₹ 3 per hour	6	9
Variable overhead @ ₹ 4 per hour	8	12
Selling price	100	110
Standard time	2 hrs	3 hrs

State which product you would recommend to manufacture when:

- (a) Labour time is the key factor
- (b) Sales value is the key factor

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Solution:

	Product A	Product B
Selling price (S)	100	110
Direct material	24	14
Direct labour	6	9
Variable overhead	8	12
Variable cost (V)	38	35
Contribution (S – V)	62	75
(a) Contribution per labour hour	$\text{₹ } 62 \div 2 \text{ hrs}$ = ₹ 31	$\text{₹ } 75 \div 3 \text{ hrs}$ = ₹ 25
(b) Contribution per rupee of sales value	$= \text{₹ } 62 \div 100$ = 62 paise	$= \text{₹ } 75 \div 110$ = 68 paise

Conclusion

- (a) Product A is recommended when labour time is the key factor because contribution per labour hour of product A is more than that of product B.
- (b) When sales value is the key factor, product B is recommended because contribution per rupee of sales value of product B is more than that of product A.
- (c) When sale quantity is the key factor, product B is more profitable because its contribution per unit is higher than that of product A.

13.3.5 Break-even Chart and Angle of Incidence

Break-even chart is a graphic presentation of break-even analysis. This chart takes its name from the fact that the point at which the total cost line and the sales line intersect is the break-even point. A break-even chart not only shows the break-even point but also shows profit and loss at various levels of activity. Thus a break-even chart portrays the following information:

- (i) Break-even point—the point at which neither profit nor loss is made
- (ii) The profit/loss at different levels of output
- (iii) The relationship between variable cost, fixed cost and total cost
- (iv) The margin of safety
- (v) The angle of incidence, indicating the rate at which profit is being made
- (vi) The amount of contribution at various levels of sales. (This can be shown only on a specially designed ‘contribution break-even chart.’)

Angle of Incidence

This angle is formed by the intersection of sales line and total cost line at the break-even point (see Fig. 13.1). 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. Therefore, the aim of management will be to have as large an angle as possible.

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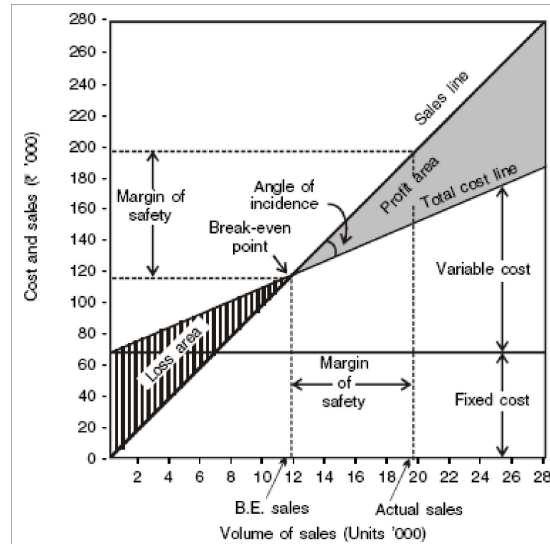


Fig. 13.1 Break-even Chart

The angle of incidence is of particular importance in boom periods when sales are expanding. Taking in conjunction with margin of safety, therefore, a large angle of incidence with a high margin of safety indicates an extremely favourable position.

Construction of Break-even Chart

The principal steps in the construction of a break-even chart are as follows:

1. **Select a scale on X-axis:** The X-axis is a horizontal base line which is drawn and spaced into equal distances to represent any one or more of the following factors:

- (i) Volume of output (units)
- (ii) Volume of output (in rupee value)
- (iii) Volume of sales (units)
- (iv) Volume of sales (in rupee value)
- (v) Production capacity (in percentage)

2. **Select scale on Y-axis:** The Y-axis is a vertical line at the extreme left of the chart which is spaced into equal distances. On this Y-axis, it is usual to show cost and sales in rupee value.

3. **Draw the fixed cost line:** This is drawn parallel to X-axis, starting from an appropriate point on Y-axis.

4. **Draw the total cost line:** The variable cost is depicted in the chart by superimposing it on the fixed cost line. Thus a total cost line is drawn starting from the point on the Y-axis which represents fixed cost.

5. **Drawn the sales line:** This line starts from the 0 point at the left (the intersection of X-axis and Y-axis, where there is no production at a nil cost) and extends to the point of maximum or any other sales value.

The sales line intersects the total cost line at break-even point representing 60,000 sales and output.

Effect of Change in the Profit Factors

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The break-even chart can also show the effect of change in any of the following factors, which affect profit:

- (a) Change in fixed cost
- (b) Change in variable cost
- (c) Change in selling price
- (d) Change in sales volume

The profit of a business can be increased when there is (a) decrease in fixed cost, and/or (b) decrease in variable cost, and/or (c) increase in selling price, and (d) increase in sales volume. The first three, *i.e.*, (a), (b) and (c) factors will have the effect of lowering the break-even point and thus increasing profit.

Check Your Progress

3. List the factors whose effect on net profit is revealed by the CVP analysis.
4. Name the point after which the minimum point of production at which total cost is recovered.
5. State the purpose of the limiting factor technique.

13.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Absorption costing is also known as conventional costing or full costing.
2. In marginal costing, stocks of work-in-progress and finished goods are valued at variable cost whereas in absorption costing stocks are valued at total cost.
3. An understanding of CVP analysis is extremely useful to management in budgeting and profit planning. It explains the impact of the following on the net profit: (a) Changes in selling prices, (b) changes in volume of sales, (c) changes in variable cost and (d) changes in fixed cost.
4. The break-even point is the minimum point of production at which total cost is recovered and after this point profit begins.
5. The purpose of the limiting factor technique is to indicate the most profitable course of action in all such cases where alternatives are possible.

13.5 SUMMARY

- There are mainly two techniques of product costing and income determination: (a) Absorption costing; (b) Marginal costing.

- Absorption costing is a total cost technique under which total cost (*i.e.*, fixed cost as well as variable cost) is charged as production cost. In other words, in absorption costing, all manufacturing costs are *absorbed* in the cost of the products produced.
- Marginal cost is the additional cost of producing an additional unit of product. It is the total of all variable costs. It is composed of all direct costs and variable overheads.
- Marginal costing is defined by CIMA London as ‘The accounting system in which variable costs are charged to cost units and fixed costs of the period are written off in full, against the aggregate contribution. Its special value is in decision making’.
- In marginal costing, profit is calculated by a two-stage approach. First of all, contribution is determined for each product or department. The contributions of various products or departments are pooled together and such a total of contributions from all products is called ‘Fund’. Then from this fund is deducted the total fixed cost to arrive at a profit or loss.
- Cost-volume-profit analysis (CVP analysis) is an extension of the principles of marginal costing. It studies the interrelationship of three basic factors of business operations:
 - (a) Cost of production, (b) Volume of production/sales, (c) Profit
- Break-even analysis is a widely-used technique to study the CVP relationship. It is interpreted in narrow as well as broad sense.
- In its *narrow sense*, break-even analysis is concerned with determining break-even point, *i.e.*, that level of production and sales where there is no profit and no loss. At this point total cost is equal to total sales revenue.
- When used in *broad sense*, break-even analysis is used to determine probable profit/loss at any given level of production/sales. It is also used to determine the amount of sales to earn a desired amount of profit.
- P/V ratio is one of the most important ratios to watch in business. It is an indicator of the rate at which profit is being earned. A high P/V ratio indicates high profitability and a low ratio indicates low profitability in the business.
- Margin of safety may be defined as the difference between actual sales and sales at break-even point. In other words, it is the amount by which actual volume of sales exceeds the break-even point.
- Cost indifference point refers to that level of output where the total cost or the profit of the two alternatives is equal. Such a level may be calculated where two or more alternative methods of production or machines are considered and the use of one machine involves higher fixed cost and lower variable cost per unit while the other machine involves lower fixed cost and higher variable cost per unit.

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- Break-even chart is a graphic presentation of break-even analysis. This chart takes its name from the fact that the point at which the total cost line and the sales line intersect is the break-even point.

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13.6 KEY WORDS

- **Profit Volume Ratio:** The Profit Volume (PV) Ratio is the ratio of Contribution over Sales. It measures the Profitability of the firm and is one of the important ratios for computing profitability.
- **Margin of safety:** Margin of safety (safety margin) is the difference between the intrinsic value of a stock and its market price.

13.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. State the characteristics of marginal costing.
2. Differentiate between marginal and absorption costing.
3. What are the assumptions underlying break-even analysis?
4. Write a short note on cost indifference point.
5. Briefly explain the limiting or key factor.
6. What is the angle of incidence?

Long Answer Questions

1. Describe the concept of Profit-Volume Ratio.
2. Explain the margin of safety.
3. Describe the construction of Break-even Chart.

13.8 FURTHER READINGS

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UNIT 14 DECISION-MAKING, INTEGRATED AND NON- INTEGRATED ACCOUNTS

*Decision-Making,
Integrated and Non-
Integrated Accounts*

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Structure

- 14.0 Introduction
- 14.1 Objectives
- 14.2 Concept of Decision-Making and Steps Involved
 - 14.2.1 Applications of Marginal Costing in Decision-Making and It's Steps
- 14.3 Non-Integral or Cost Ledger Accounting
 - 14.3.1 Reconciliation of Cost and Financial Profits
 - 14.3.2 Control Accounts and Need for Control
- 14.4 Integral Accounting
- 14.5 Answers to Check Your Progress Questions
- 14.6 Summary
- 14.7 Key Words
- 14.8 Self Assessment Questions and Exercises
- 14.9 Further Readings

14.0 INTRODUCTION

More than any sophisticated technology, decision-making for managers finds its foundational basis on relevant costs. These costs assist the managers in identifying areas where the expenses are going as well as plan ahead for future transactions. There are varied costs which help in such decision-making; examples include future costs, sunk costs, common costs, committed costs, as well as non-cash expenses. Cost accounting then becomes the backbone of the decision-making process. But how does companies use this in the process. In this unit, you will learn about the concepts related to cost accounting in decision-making.

The manner in which books are kept in the companies is essential for all the recording of transactions. In the double entry system of book-keeping, the companies have two options: integral accounts and non-integral accounts. In the former, the financial and cost books are kept integrated while in another two separate books are maintained to record the transactions. In this unit, you will also learn about the basics of non-integral and integral accounting.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of decision-making
- Explain the steps involved in decision-making
- Describe the determination of sales mix and make or buy decisions

- Examine the non-integral and integral systems of keeping account books
- Know the meaning and purpose cost ledger and subsidiary ledgers
- Explain the meaning of control accounts

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14.2 CONCEPT OF DECISION-MAKING AND STEPS INVOLVED

Decision-making is the basic function of management. It involves selection of the best course of action from out of several alternatives available. Tactical decision-making is “*choosing among alternatives with only an immediate or limited end in view*”. (Hanson and Mowen). These decisions are short term and the goal is to ensure success in what it is set to accomplish. Thus management is continuously engaged in evaluating various alternative courses of action and in selecting the best out of these. For each managerial problem, generally there are at least two alternatives available. For example, in a company, which is manufacturing televisions, the management may have to decide whether to make the picture tube within the company or to buy it from an outside supplier at lower than own cost. Similarly, a company may have to decide whether to accept or not an export order at less than prevailing domestic price. The decision to be taken will be affected by cost and non-cost factors and the cost accountant must use all the information at his disposal to help management make the right decision.

Short-term and Long-term Decisions

The focus of this unit is on short-term decisions. Most managers consider a decision as a short-term if it involves a period of one year or less. This cut off period is arbitrary but commonly used, though a better distinction is that long-term decisions normally require substantial capital investment with implications for several future years. Moreover, short-term decisions can be more easily reversed than long-term. For example, price of a product can always be changed according to market conditions, export sales can be stopped, if necessary, and so on.

Long-term decisions involve consideration of return on capital employed, discounted cash flow, etc. Such decisions have not been discussed in this unit.

Relevant Costs and Relevant Revenues

When management makes decisions, it has to concentrate on relevant costs and relevant revenues. Not all costs and revenues are relevant. The relevant costs and relevant revenues are those expected future costs and expected future revenues that differ under different alternative courses of action being considered. Thus relevant costs and relevant revenues should have two characteristics:

- (a) The costs and revenues must relate to future; and
- (b) They must differ among different courses of action.

The focus is on the future because decision to be made affect only future. Nothing can be done to change the past. Management cannot change the cost of

plant and machinery purchased in 2001. It can change future costs by its current decisions. Hence, relevant costs are future costs that will differ depending on the actions of the management. For each decision, the management must decide which costs are relevant.

Cost and Non-cost Factors in Decision-making

In tactical decisions, cost alone does not become a basis of decision. Certain non-cost factors also come into play. *Cost factors or quantitative factors* are those which can be quantified in monetary terms. For example, in determining the selling price of a product, the cost of production of which is ₹ 100 per unit, the management will add, say 20% margin of profit and decide the selling price at ₹ 100 + 20 = ₹ 120 per unit. While the company is selling its product at ₹ 120 per unit, a competitor enters the market and starts selling the same product at ₹ 95 per unit. Now the company will incur a loss of ₹ 5 per unit if in order to compete, it sells the product at competitor's price because its own cost is ₹ 100 per unit. So, on cost considerations alone, the company should stop selling the product because selling results in a loss of ₹ 5 per unit. The management has to decide whether to sell at a loss or stop production of the product to avoid the loss.

In such a situation, it is difficult to make a decision on cost factors alone. It is essential that *non-cost factors or qualitative factors* must be brought to the attention of the management in decision-making process, since otherwise there is a danger of wrong decision being made. Non-cost factors are those which cannot be expressed in monetary terms with accuracy. For example, it may not be possible to quantify in monetary terms the effect of a decline in the morale of employees or loss of customer goodwill, if the company closes down the manufacturing facilities of a particular product.

Special Costs for Management Decision-making

There are certain costs which are specially computed for use by the management for the purpose of decision-making. These costs may not be recorded in the books of account.

Marginal Costing and **Differential Cost Analysis** are the two valuable techniques used for short-term business decisions.

In this unit, you will only study decision-making in the context of marginal costing.

14.2.1 Applications of Marginal Costing in Decision-Making and Its Steps

The decision making process differs from company to company depending on the scale of business, types of decision, budgets and other related factors. However, there are certain general steps that may be enumerated as steps in decision-making. These are: Perception of the deviation and defining the problem, Collection of relevant data, Diagnosis and analysis of the problem, Finding the root cause of the problem, Identification of resources and constraints, Development of criteria for

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successful solutions, Generation and development of alternatives, evaluating alternatives and selecting an alternative, Implementation of the decision and Monitoring feedback. In cost accounting, the accounting costs assists the managers with the decision making. As mentioned earlier, in accounting, marginal and differential cost analysis are used for decision-making.

The most useful contribution of marginal costing is the assistance that it renders to the management in vital decision making. This is to say that marginal costing is an invaluable aid to management decision making. Specific areas where marginal costing proves its worth in decision-making are: Selling price decisions, Make or buy decisions, Sales mix decisions, Selection of a suitable of method production and Plant shut down decision. In this section, you will only study the decision making related to make-or-buy decisions and the determination of sales mix.

1. Make or Buy Decisions (Insourcing vs Outsourcing)

Marginal cost analysis renders useful assistance when a decision has to be taken by the management on whether a component part should be manufactured internally or purchased from an outside firm. *Insourcing* is producing the goods by the firm itself whereas *outsourcing* is the process of purchasing the goods or services from outside suppliers. For example, a car manufacture may rely on outside vendors to supply some component parts but may choose to manufacture other parts internally.

This is particularly common when a component part is available in the market at a price below firm's own total cost. This type of decision based on total cost analysis may be misleading. Such a decision can be arrived at by comparing the outside supplier's price with firm's own marginal cost. On the face of it, since the only cost to manufacture the component is its marginal cost, then the amount by which marginal cost falls below supplier's price is the saving that arises in making. Therefore, it will be profitable to buy from outside only when supplier's price is below firm's own marginal cost.

Illustration 14.1: Auto Parts Ltd has an annual production of 90,000 units for a motor component. The component cost structure is as below:

Materials	₹ 270 per unit
Labour (25% fixed)	₹ 180 per unit
Expenses:	
Variable	₹ 90 per unit
Fixed	₹ 135 per unit
Total	₹ 675 per unit

- (a) The purchase manager has an offer from a supplier who is willing to supply the component at ₹ 540. Should the component be purchased and production stopped?
- (b) Assume the resources now used for this component's manufacture are to be used to produce another new product for which the selling price is ₹ 485.

In the latter case, the material price will be ₹ 200 per unit. 90,000 units of this product can be produced at the same cost basis as above for labour and expenses. Discuss whether it would be advisable to divert the resources to manufacture that new product, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

NOTES

(CA Inter)

Solution:

Material	270
Labour (75% of ₹ 180)	135
Variable expenses	90
Total variable cost when component is produced	495
Suppliers price	540

Excess of purchase price over variable cost = $540 - 495 = ₹ 45$

- (a) Fixed expenses have to be incurred whether the component is made or purchased. Thus company should make the component itself because if purchased from outside it will have to pay ₹ 45 per unit more and on 90,000 units @ ₹ 45 it comes to ₹ 40,50,000.
- (b) Cost implications of proposal to divert available production facilities for a new product:

Selling price of per unit of new product	485
Less: Variable costs — Material	200
Labour	135
Expenses	90
Contribution per unit	60

Loss if present component is purchased = $540 - 495 = ₹ 45$.

If company diverts the resources for the production of a new product, it will benefit by ₹ 15 (i.e., ₹ 60 - 45) per unit.

On 90,000 units it will save @ ₹ 15, i.e., ₹ 13,50,000. Thus, it is advisable to divert the production facilities in the manufacture of the new product and the component presently being manufactured should be bought from outside. This will result in additional profit of ₹ 13,50,000.

Outsourcing and Idle Capacity: When a firm has no spare capacity and manufacturing a component involves setting aside other work, the loss of contribution of displaced work should also be given due consideration. In other words, it will be profitable to buy only when the purchase price is below marginal cost plus loss of contribution of displaced work. The loss of contribution is usually best found by the use of contribution per unit of key factor.

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Non-cost or Qualitative Factors: While making a decision on make or buy a component, the following non-cost factors should also be considered.

- (a) Assurance of continued supply, if bought from outside
- (b) Assurance of quality of the product by the supplier
- (c) Assurance of no price increase during the period of agreement

2. Sales Mix Decisions

Sales mix or product mix denotes the proportion in which various products are sold or produced. The problem of selecting a profitable mix of sales thus, arises only when a business enterprise has a variety of product lines and each making a contribution of its own. Any change in sales mix also results in the change in profit position. The technique of marginal costing helps the management in determining the most profitable sale mix.

The discussion on selection of the most profitable product mix may be discussed in two parts:

- (a) When there is no key factor; and (b) When there is a key factor.

(a) When key (or limiting) factor is not given

The concept of key factor was explained in the chapter on Cost-volume-profit Analysis. When there is no key factor, the product mix that provides the highest amount of *contribution* is considered as the most profitable sales mix. This holds good when fixed cost does not change due to changes in sales mix.

However, when changes in sales mix are associated with changes in fixed cost, then that sales mix which provides the highest profit is considered as the most profitable sales mix. In other words, relative profitability of mixes will be evaluated on the basis of their profit and not on the basis of their contribution when a change in product mix is associated with change in fixed cost.

Illustration 14.2: Allied Manufacturing Company given you the following information.

	Product A	Product B
Fixed overheads – ₹ 10,000 p.a.		
Direct materials per unit	20	25
Direct labour per unit	10	15
Variable overheads (100% of direct labour)		
Selling price per unit	60	100

You are required to present a statement showing the marginal cost of each product and recommend which of the following sales mixes should be adopted:

- (a) 900 units of A and 600 units of B
- (b) 1,800 units of A only
- (c) 1,200 units of B only
- (d) 1,200 units of A and 400 units of B

(Adapted)

Solution:

Marginal Cost Statement

	Per unit	
	Product A	Product B
Direct materials	20	25
Direct labour 10	15	
Variable overheads	10	15
Marginal cost	40	55
Contribution	20	45
Selling price	60	100

Statement of Contributions and Profits of Different Sales Mixes

Sales mix	Contribution per unit	Contribution	Total contribution	Fixed cost	Profit
(a) A – 900 units	20	18,000			
B – 600 units	45	27,000	45,000	10,000	35,000
(b) A – 1,800 units	20	36,000			
B – Nil	45	Nil	36,000	10,000	26,000
(c) A – Nil	20	Nil			
B – 1,200 units	45	54,000	54,000	10,000	44,000
(d) A – 1,200 units	20	24,000			
B – 400 units	45	18,000	42,000	10,000	32,000

Thus, sales mix (c) is recommended as it yields the highest profit of ₹ 44,000. This is because contribution per unit of B is more than that of A, and therefore, any sales mix that takes into account the maximum number of units of B would be more profitable.

(b) When there is a key factor

When a key factor is operating, selection of the most profitable sales mix is based on contribution per unit of key factor. The product which makes the highest amount of contribution per unit of key factor, is the most profitable one and its production is pushed up. The second preference is to be given to product which yields the second highest contribution per unit of key factor and so on and in the end that product should be produced which yields least contribution per unit of key factor and to the extent of availability of the key factor.

In case a number of key factors are operating simultaneously, the basic principle remains the same but problem becomes more mathematical in nature and one has to resort to Linear Programming to determine the optimal product mix.

Illustration 14.3: A company manufactures three products. The budgeted quantity, selling prices and unit costs are as under:

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	A	B	C
Raw materials (@ ` 20 per kg)	80	40	20
Direct wages (@ ` 5 per hour)	5	15	10
Variable overheads	10	30	20
Fixed overheads	9	22	18
Budgeted production (in units)	6,400	3,200	2,400
Selling price per unit (in `)	140	120	90

Required:

- (i) Present a statement of budgeted profit.
- (ii) Set optimal product mix and determine the profit, if the supply of raw materials is restricted to 18,400 kgs.

Solution:

(i) **Statement of Budgeted Profit**

	A	B	C	Total `
Budgeted production (units)	6,400	3,200	2,400	
Selling price `	140	120	90	
Sales (S)	8,96,000	3,84,000	2,16,000	14,96,000
Raw materials	5,12,000	1,28,000	48,000	
Direct wages	32,000	48,000	24,000	
Variable overheads	64,000	96,000	48,000	
Total variable cost (V)	6,08,000	2,72,000	1,20,000	10,00,000
Contribution (S – V)	2,88,000	1,12,000	96,000	4,96,000
Less: fixed cost*				1,71,200
Profit				3,24,800

***Calculation of Fixed Cost**

A = 6,400 unit × ` 9	= ` 57,600
B = 3,200 units × ` 22	= 70,400
C = 2,400 units × ` 18	= 43,200
Total fixed cost	= ` 1,71,200

(ii) **When raw material is the key factor**

	A	B	C
Raw material per unit of output	4 kgs	2 kgs	1 kgs
Total raw material consumed (kg)	6400 × 4 = 25,600	3200 × 2 = 6,400	2400 × 1 = 2,400
*Contribution per kg of raw material	= $\frac{\text{` 2,88,000}}{25,600 \text{ kgs}}$ = ` 11.25	= $\frac{\text{` 1,12,000}}{6,400 \text{ kgs}}$ = ` 17.50	= $\frac{\text{` 96,000}}{2,400 \text{ kgs}}$ = ` 40
Ranks	III	II	I

* Contribution per kg of raw material is calculated as:
Total contribution ÷ Total raw materials consumed

Suggested sales mix (raw material is the key factor)

Rank I – Product C – 2,400 units × 1 kg	= 2,400 kgs
Rank II – Product B – 3,200 units × 2 kgs	= 6,400 kgs
Rank III – Product A – 2,400 units × 4 kgs (balance)	= 9,600 kgs
Total materials	18,400 kgs

Thus product mix is: A – 2,400 units, B 3,200 units and C – 2,400 units

Calculation of Profit		Contribution
Product A	2,400 units @ ` 45 p.u.	` 1,08,000
B	3,200 units @ ` 35 p.u.	` 1,12,000
C	2,400 units @ ` 40 p.u.	` 96,000
Total contribution		` 3,16,000
Less: Total fixed cost		<u>` 1,71,200</u>
Profit		<u>` 1,44,800</u>

*Decision-Making,
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Check Your Progress

1. State the two characteristics that is a must for relevant costs and relevant revenues in decision-making.
2. How is the loss of contribution best found in decision-making?

14.3 NON-INTEGRAL OR COST LEDGER ACCOUNTING

There are two methods of keeping cost accounts by double entry system. These are—

- (a) Non-integrated accounts (Non-integral system)
- (b) Integrated accounts (Integral system)

Under non-integral system, two separate set of account books are maintained, one for cost accounts and the other for financial accounts. In other words, cost accounts are maintained separately from financial accounts. Non-integrated system of accounting is also known as cost ledger accounting or interlocking accounting system. CIMA, London has defined it as '*a system in which the cost accounts are distinct from financial accounts, the two sets of accounts being kept continuously in agreement by the use of control accounts or made readily reconciliable by other means*'. Like financial accounting, it is also based on double entry system.

In financial books, there are three types of accounts:

- (a) **Personal** *e.g.*, debtors and creditors
- (b) **Real** *e.g.*, cash, stocks, fixed assets, etc.
- (c) **Nominal** *e.g.*, wages, lighting, heating, discounts, rent and rates, etc.

In cost accounts, there are no personal accounts because cost accounts do not show relationship with outsiders. In real accounts, only stocks are shown in cost accounts. The main emphasis is on nominal accounts where costs are analysed in detail. Thus cost accounting department is concerned mainly with the ascertainment of income and expenditure of the business. It is particularly interested in nominal accounts, to some extent in real accounts but in no way in personal accounts. In other words cost accounts, are concerned with impersonal accounts, *i.e.*, real and nominal accounts.

Ledgers to be Maintained

The following four important ledgers are maintained by the costing department under non-integrated system.

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1. **Cost ledger:** This is the principal ledger in cost books which controls all other ledgers in the costing department. It contains all impersonal accounts and is similar to general ledger of financial accounts. It contains, *inter alia*, a number of control accounts like stores ledger control accounts, wages control account, factory overheads control account, etc. and also a cost ledger control account to make the cost ledger self-balancing.
2. **Stores ledger:** This ledger maintains a separate account for each item of store (raw material, components, consumable stores, etc.). It is used for recording receipts, issues and balances of stores, both in quantity and amount. A reference to stores ledger was also made in the chapter on pricing the materials issues.
3. **Work-in-progress ledger or job ledger:** It contains a separate account for each job in progress. Each such account is debited with the material costs, wages and overheads chargeable to the jobs and credited with the cost of work completed. The balance in this account represents the cost of unfinished work.
4. **Finished goods ledger:** It contains an account for each item of finished product.

As stated above, the cost ledger is the principal ledger. Other ledgers, *i.e.*, stores ledger, work-in-progress ledger and finished goods ledger are referred to as subsidiary ledgers of the cost accounting department. The cost ledger is made self-balancing by opening a control account for each of these subsidiary ledgers.

14.3.1 Reconciliation of Cost and Financial Profits

We have already studied this topic under Unit 6 of this book. Let's recapitulate the concept here briefly. Reconciliation of cost and financial profits might arise due to items being shown only in financial books, or shown only in cost accounts; there is over and under absorption of overheads; different bases of stock valuation is used; or different depreciation charges are applied. For reconciliation, one needs to make all the additions and deductions in costing profit, the resulting figure shall be the profit as per financial books.

14.3.2 Control Accounts and Need for Control

Control accounts are the total accounts in the cost ledger. In these accounts, entries are made once in each accounting period on the basis of the periodical totals of transactions in related subsidiary ledgers and books. For example, stores ledger control account represents stores ledger in a summary form. Purchases of individual items of stores shown in individual accounts in the stores ledger are totalled and shown in stores ledger control account as total purchases. Similarly, other individual

debits and credits in individual accounts in stores ledger are abstracted, totalled and taken to stores ledger control account. Thus the opening balance of this control account should always equal the total of opening balances on each individual account in the stores ledger. In this way, a control account is also kept for each of the other subsidiary ledger, *i.e.*, job ledger and finished goods ledger. In addition, a control account is opened for cost ledger with the main object of completing the double entry and making the cost ledger self-balancing.

Need for Control

This can be understood through analysing the advantages of control account.

Advantages: The main advantages of control accounts are:

1. Control accounts present the management with a summary of detailed information contained in various subsidiary ledgers.
2. It makes possible the division of accounting work among ledger keepers, thereby resulting in specialization in work.
3. It permits prompt preparation of profit and loss account and balance sheet, at the end of each period, by providing stock figures without delay.
4. It provides internal check leading to greater accuracy of records.
5. It provides a basis for reconciliation of cost and financial accounts.

Principal Accounts to be Maintained

The principal accounts in the cost ledger and their functions are summarized below:

1. **Stores Ledger Control Account:** This account deals with material transactions. It is a summary of the value of stores received, issued and balance in store. Receipts are posted from goods received notes or invoices to the debit side of this account. Similarly, issues of materials are posted from material requisitions or materials issues analysis sheet to the credit side of this account. The balance of this account represents the total balance of stock which should agree with the aggregate of the balances of individual accounts in the Stores Ledger.

2. **Wages Control Account:** This account records wage transactions in aggregate. Postings are made from wages analysis sheet. This account is debited with gross wages (paid and accrued) and is closed by transfer of direct wages to work-in-progress and indirect wages to factory, administration and selling and distribution overheads control accounts.

3. **Factory Overheads Control Account:** This account deals with factory overheads in aggregate. It is debited with indirect material cost, indirect wages and indirect expenses and is credited with overheads absorbed, which are transferred to work-in-progress. The balance in this account represents under or over-absorbed overheads and is transferred to Overheads Adjustment Account or Costing Profit and Loss Account.

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4. Work-in-progress Ledger Control Account: This account starts with opening balance of work-in-progress and is debited with materials, labour and factory overheads charged. It is credited with cost of finished goods. Closing balance shows the value of unfinished jobs.

5. Finished Goods Ledger Control Account: This account starts with opening balance of finished stock. It is debited with cost of finished goods transferred from work-in-progress control account and the amount of administration overheads absorbed. This account is credited with cost of sales by transferring to cost of sales account. The closing balance of this account represents the cost of goods remaining unsold at the end of the period.

6. Administration Overheads Account: This account is debited with administration overhead cost incurred and is credited with overheads absorbed by finished goods. The balance in this account represents under or over-absorbed overheads which is transferred to Overheads Adjustment Account or to Costing Profit and Loss Account.

However, when administration overheads are excluded from costs, the entire amount is straight away transferred to costing profit and loss account, and when administration overheads are apportioned to production and selling and distribution overheads, the amounts are transferred to the respective accounts.

7. Cost of Sales Account: This account is debited with the cost of goods sold by transfer from finished goods ledger control account and also selling and distribution overheads absorbed. It is closed by transfer to Costing Profit and Loss account.

8. Selling and Distribution Overheads Account: This account is debited with selling and distribution overheads incurred and is credited with overheads absorbed by cost of sales. It is closed by transferring the balance to costing Profit and Loss Account or Overheads Adjustment Account for under or over-absorbed overhead.

9. Overheads Adjustment Account: This account is debited with under-absorbed overheads for factory, administration and selling and distribution overheads and is credited with over-absorbed overheads. The balance in this account represents the net amount of over or under-absorption which is transferred to Costing Profit and Loss Account.

Sometimes, this account is not maintained and the amount of under or over-absorbed overheads of each category is directly transferred to Costing Profit and Loss Account.

10. Costing Profit and Loss Account: This account is debited with the cost of sales, abnormal losses and under-absorbed overheads. It is credited with sale value of goods sold, abnormal gains and over-absorbed overheads. The balance in this account represents costing profit or loss which is transferred to cost ledger control account. It is shown below:

11. Cost Ledger Control Account: This account is also known as General Ledger Adjustment Account or Financial Ledger Control Account. The purpose of this

account is to complete the double entry and make the cost ledger self-balancing. As no personal accounts are kept in the cost books, in order to complete the double entry, all accounts relating to financial accounts but not required for cost accounting are debited or credited to the cost ledger control account. For example, wages paid amount to ₹ 250 and as no cash or bank account is maintained in the cost ledger, then in order to complete the double entry, the following entry will be made, so as to credit cost ledger control account in place of cash or bank.

Wages Account	..... Dr. ₹ 250	
To Cost Ledger Control Account		₹ 250

Cost ledger control account is sometimes disrespectfully referred to as 'dustbin account' because it is for disposing of the odds and ends of double entry which do not find any other place.

Thus, the cost ledger control account is equivalent to debtors, creditors and cash or bank accounts in the financial ledger. Sales are debited to this account and net profit or loss is also transferred to this account. All transfer entries of internal nature which affect only cost accounts and have no implications in financial accounts do not appear in cost ledger control account. For example, transfer from stores ledger to work-in-progress, from work-in-progress to finished goods, etc., are not shown in cost ledger control account. The balance of cost ledger control account represents the total of all balances of impersonal accounts.

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14.4 INTEGRAL ACCOUNTING

Integrated or Integral accounting is a system in which cost and financial accounts are kept in the same set of books. In such a system, transactions of both cost and financial accounts are recorded in one combined set of books based on double entry system. This system eliminates the need for separate sets of account books for costing and financial accounting purposes. Accounts are designed in such a way that full information required for costing as well as financial accounting purposes is obtained from one set of books.

Advantages

Integrated system of accounting offers the following advantages:

1. *Economical system:* Integral system is quite economical as it eliminates the duplication of recording the transactions in two separate sets of books. This results in saving of clerical costs.
2. *No need for reconciliation:* As only one set of accounts is maintained, there will be only one profit or loss figure and as such there will be no need for reconciliation between costing and financial profit or loss.
3. *Centralization of accounting work:* Centralization of accounting function in one department helps in achieving greater control and saves administration costs.

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4. *Information available without delay:* There is no delay in the availability of cost information because cost accounts are directly written-up from the books of original entry.
5. *Pooling of knowledge:* The knowledge of cost and financial accounting may be combined together to achieve better results.
6. *Better coordination:* The system helps in achieving better coordination in the activities of cost accounting and financial accounting staff.
7. *Suitable in mechanized accounting:* Integral system is quite suitable in mechanized accounting and other data processing techniques.
8. *Wide outlook:* The system tends to broaden the outlook of the accounting staff who are in a better position to appreciate one set of account books revealing so much.

Disadvantages

Integrated system suffers from the following drawbacks:

1. *Unsuitable for large concerns:* Integrated system is not very suitable for very large concerns which require detailed cost and financial information on a continuous basis.
2. *Complicated system:* A system which is expected to provide costing as well as financial information is quite cumbersome and complicated and requires the services of expert accountants.
3. *Need for reconciliation:* Unless there is full integration of cost and financial accounts, there may be a need for reconciliation between the two.

Distinctive Features

Integral accounting has the following distinctive features:

1. In integral accounting, there is no need to open a Cost Ledger Control Account as it is possible to complete double entry without this account.
2. Subsidiary ledgers, *i.e.*, stores ledger, work-in-progress ledger and finished goods ledger are maintained as is done in non-integrated accounting. In addition, a sales ledger (containing personal accounts of all customers) and a purchase ledger (containing personal accounts of all suppliers) are also maintained. Overheads ledger is maintained to contain separate accounts for factory, administration and selling and distribution overheads.
3. For each subsidiary ledger, a control account is opened in the general ledger. Main control accounts are as follows:
 - (i) Stores ledger control account
 - (ii) Work-in-progress ledger control account
 - (iii) Finished goods ledger control account
 - (iv) Wages control account

- (v) Factory overheads control account
 - (vi) Administrative overheads control account
 - (vii) Selling and distribution overheads control account
 - (viii) Sales ledger control account
 - (ix) Purchase ledger control account
4. Balance in various overheads control accounts represents over or under absorption which is transferred to Profit and Loss Account.
 5. Balance in Profit and Loss Accounts represents profit or loss which is transferred to Profit and Loss Appropriation Account.
 6. Degree of integration must be determined in advance. Many firms integrate the cost and financial accounts completely while other firms integrate the two only upto a stage of prime cost or factory cost.
 7. A suitable coding system is generally developed to serve the purposes of both cost accounts as well as financial accounts.

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Check Your Progress

3. Mention some of the other names for non-integrated system of accounting.
4. Why is the control account opened for cost ledger?

14.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The relevant costs and relevant revenues should have two characteristics:
 - The costs and revenues should relate to future; and
 - They must differ among different courses of action.
2. The loss of contribution is usually best found by the use of contribution per unit of key factor.
3. Some of the other names for non-integrated system of accounting are: cost ledger accounting or interlocking accounting system.
4. The control account is opened for cost ledger with the main object of completing the double entry and making the cost ledger self-balancing.

14.5 SUMMARY

- One of the major objectives of management accounting to help management in decision making, i.e., in selecting the best course of action from two or more available alternatives. For this the management has to evaluate various alternative courses of action.

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- In making decisions, management should consider all relevant costs, i.e., the future costs which differ among alternative courses of action. Those costs which were incurred in the past and also which do not change between alternatives are irrelevant costs.
- Specific areas where marginal (variable) costing proves its worth in short-term decisions include selling price decisions, make or buy decisions, sales mix decisions, selection of a suitable method of production, etc.
- Variable cost analysis also helps in make or buy decisions. In such decisions, outside supplier's price should be compared with firm's own variable cost. It is profitable to buy from outside if supplier's price is below firm's own variable cost of manufacture. But before arriving at a final decision, the management should also consider certain non-cost factors, such as assurance of continued supply, quality of the product, etc.
- In sales or product mix decisions, a mix that provides the highest amount of contribution is considered as the most profitable mix. When a key factor is operating, selection of the most profitable sales mix is based on contribution per unit of key factor. The product which makes the highest amount of contribution per unit of key factor, is the most profitable one.
- Cost accounting books may be maintained either independent of financial accounting books or these two sets of books may be merged into one set of books.
- When these books are merged or integrated, the system is known as integrated accounts or integral system.
- But when cost and financial books are kept separately, it is called non-integrated accounts or non-integral system.
- Under non-integral system, the two separate sets of account books are maintained, one for cost accounts and the other for financial accounts. Non-integrated system of accounting is also known as cost ledger accounting or interlocking accounting system. Under this system, cost ledger is the principal ledger and other ledgers, i.e., stores ledger, work-in-progress ledger and finished goods ledger are referred to as subsidiary ledgers.
- Control accounts are the total accounts which are opened in the cost ledger with the main object of completing the double entry and making the cost ledger self-balancing.

14.6 KEY WORDS

- **Decision making:** It is the basic function of management which involves selection of best course of action from out of several alternatives available
- **Cost factors:** These refer to the quantitative factors which can be quantified in monetary terms

- **Non-cost factors:** These refer to the qualitative factors which cannot be expressed in monetary terms with accuracy
- **Sales mix:** It denotes the proportion in which various products are sold or produced
- **Control accounts:** These refer to the total accounts in the cost ledger

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14.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What are the relevant costs and relevant revenues in decision making?
2. Write a short note on cost and non-cost factors in decision making.
3. What are the ledgers to be maintained in costing department under non-integrated system?
4. Enlist the advantages of control accounts.

Long Answer Questions

1. Explain the make or buy decisions in management decision making.
2. Describe the sales mix decisions in decision making.
3. Discuss the principle accounts to be made in control accounts.
4. Examine the advantages, disadvantages and distinctive features of integral accounting.

14.8 FURTHER READINGS

- Arora, M.N. 2012. *A Textbook of Cost and Management Accounting*, Tenth edition. New Delhi: Vikas Publishing House.
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