

COST ACCOUNTING

(BCM4 B05)

CORE COURSE

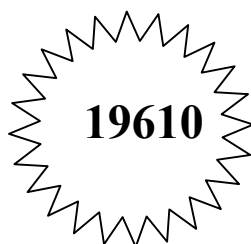
**IV Semester – B.Com
(2019 Admission Onwards)**



UNIVERSITY OF CALICUT

SCHOOL OF DISTANCE EDUCATION

Calicut University, P.O. Malappuram, Kerala, India-673 635



UNIVERSITY OF CALICUT
SCHOOL OF DISTANCE EDUCATION

COST ACCOUNTING
(BCM4 B05)

IV SEMESTER

CORE COURSE - B.Com.

Prepared by:

1. *Sri. Vinesh Ottuparammal,*
Assistant Professor,
Govt. College, Malappuram
2. *Smt. T. Shameera Kunhu. T,*
Assistant Professor,
Govt. College, Malappuram
3. *Sri.T.H. Jahfarali,*
Assistant Professor,
Govt. College, Malappuram.

Scrutinised by: Dr. K. Venugopalan,
Associate Professor,
Dept. of Commerce,
Govt. College, Madappally.

| <u>CONTENT</u> | <u>PAGE</u> |
|-----------------------|--------------------|
| Module I | 5 |
| Module II | 19 |
| Module III | 34 |
| Module IV | 60 |
| Module V | 98 |

Module I

Introduction

Cost Accounting is a branch of accounting and has been developed due to limitations of financial accounting. Financial accounting is primarily concerned with record keeping directed towards the preparation of Profit and Loss Account and Balance Sheet. It provides information regarding the profit and loss that the business enterprise is making and also its financial position on a particular date. The financial accounting reports help the management to control in a general way the various functions of the business but it fails to give detailed reports on the efficiency of various divisions. The limitations of Financial Accounting which led to the development of cost accounting are as follows.

Limitations of Financial Accounting

1. **No clear idea of operating efficiency:** Sometimes profits in an organization may be less or more because of inflation or trade depression and not due to efficiency or inefficiency. But financial accounting does not give a clear reason for profit or loss.
2. **Weakness not spotted out by collective results:** Financial Accounting shows the net result of an organization. When the profit and loss account of an organization, shows less profit or a loss, it does not give the reason for it or it does not show where the weakness lies.
3. **Does not help in fixing the price:** In Financial Accounting, we get the total cost of production but it does not aid in determining prices of the products, services, production order and lines of products.
4. **No classification of expenses and accounts:** In Financial Accounting, we don't get data relating to costs incurred by departments, processes separately or per unit cost of product lines, or cost incurred in various sales territories. Further expenses are not classified as direct or indirect, controllable and uncontrollable overheads and the value added in each process is not reported.
5. **No data for comparison and decision making:** It does not supply useful data to management for comparison with previous period and for taking various financial decisions as introduction of new products, replacement of labour by machines, price in normal or special circumstances, producing a part in the factory or buying it from outside market, production of a product to be continued or given up, priority accorded to different products, investment to be made in new products or not etc.
6. **No control on cost:** Financial Accounting does not help to control materials, supplies, wages, labour and overhead costs.
7. **Does not provide standards to assess the performance:** Financial Accounting does not help in developing standards to assess the performance of various persons or departments. It also does not help in checking that costs do not exceed a reasonable limit for a given quantum of work of the requisite quality.
8. **Provides only historical information:** Financial Accounting records only the historical costs incurred. It does not provide day-to-day cost information to the management for making effective plans for the future.

9. **No analysis of losses:** It does not provide complete analysis of losses due to defective material, idle time, idle plant and equipment etc.. In other words, no distinction is made between avoidable and unavoidable wastage.
10. **Inadequate information for reports:** It does not provide adequate information for reports to outside agencies such as banks, government, insurance companies and trade associations.
11. **No answer for certain questions:** Financial Accounting will not help to answer questions like:-
 - (a) Should an attempt be made to sell more products or is the factory operating to capacity?
 - (b) if an order or contract is accepted, is the price obtainable sufficient to show a profit?
 - (c) if the manufacture or sale of product A were discontinued and efforts made to increase the sale of B, what would be the effect on the net profit?
 - (d) Why the profit of last year is of such a small amount despite the fact that output was increased substantially? Etc.

Costing and Cost Accounting

The costing terminology of C.I.M.A., London defines costing as the “the techniques and processes of ascertaining costs”. These techniques consist of principles and rules which govern the procedure of ascertaining cost of products or services. The techniques to be followed for the analysis of expenses and the processes by which such an analysis should be related to different products or services differ from industry to industry. These techniques are also dynamic and they change with time.

The main object of traditional cost accounts is the analysis of financial records, so as to subdivide expenditure and to allocate it carefully to selected cost centers, and hence to build up a total cost for the departments, processes or jobs or contracts of the undertaking. The extent to which the analysis of expenditure should be carried will depend upon the nature of business and degree of accuracy desired. The other important objective of costing are cost control and cost reduction.

Cost Accounting may be regarded as “a specialized branch of accounting which involves classification, accumulation, assignment and control of costs.” The costing terminology of C.I.M.A., London defines cost accounting as “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 centers and cost units. In its widest usage, it embraces the preparation of statistical data, the application of cost control methods and the ascertainment of profitability of activities carried out or planned”.

Wheldon defines cost accounting as “classifying, recording and appropriate allocation of expenditure for determination of costs of products or services and for the presentation of suitably arranged data purposes of control and guidance of management”. It is thus a formal mechanism by means of which costs of products or services are ascertained and controlled.

General Principles of Cost Accounting

The following may be considered as the General Principles of Cost Accounting:

1. A cost should be related to its causes: Cost should be related as closely as possible to their causes so that cost will be shared only among the cost units that pass thorough the department of which the expenses are related.

2. A cost should be charged only after it has been incurred: While determining the cost of individual units those costs which have actually been incurred should be considered. For example, a cost unit should not be charged to the selling costs, while it is still in the factory. Selling costs can be charged with the products which are sold.
3. The convention of prudence should be ignored: Usually accountants believe in historical costs and while determining cost, they always attach importance to historical cost. In Cost Accounting this convention must be ignored, otherwise, the management appraisal of the profitability of the projects may be vitiated. According to W.M. Harper, “a cost statement should, as far as possible, give facts with no known bias. If a contingency needs to be taken into consideration it should be shown separately and distinctly”.
4. Abnormal costs should be excluded from cost accounts: Costs which are of abnormal nature (eg. Accident, negligence etc.) should be ignored while computing the cost, otherwise, it will distort costs figures and mislead management as to working results of their undertaking under normal conditions.
5. Past costs not to be charged to future period: Costs which could not be recovered or charged in full during the concerned period should not be taken to a future period, for recovery. If past costs are included in the future period, they are likely to influence the future period and future results are likely to be distorted.
6. Principles of double entry should be applied wherever necessary: Costing requires a greater use of cost sheets and cost statements for the purpose of cost ascertainment and cost control, but cost ledger and cost control accounts should be kept on double entry principle as far as possible.

Objectives of Cost Accounting

Cost accounting aims at systematic recording of expenses and analysis of the same so as to ascertain the cost of each product manufactured or service rendered by an organization. Information regarding cost of each product or service would enable the management to know where to economize on costs, how to fix prices, how to maximize profits and so on. Thus, the main objectives of cost accounting are the following.

1. To analyse and classify all expenditure with reference to the cost of products and operations.
2. To arrive at the cost of production of every unit, job, operation, process, department or service and to develop cost standard.
3. To indicate to the management any inefficiencies and the extent of various forms of waste, whether of materials, time, expenses or in the use of machinery, equipment and tools. Analysis of the causes of unsatisfactory results may indicate remedial measures.
4. To provide data for periodical profit and loss accounts and balance sheets at such intervals, e.g. weekly, monthly or quarterly as may be desired by the management during the financial

year, not only for the whole business but also by departments or individual products. Also, to explain in detail the exact reasons for profit or loss revealed in total in the profit and loss accounts.

5. To reveal sources of economies in production having regard to methods, types of equipment, design, output and layout. Daily, Weekly, Monthly or Quarterly information may be necessary to ensure prompt constructive action.
6. To provide actual figures of costs for comparison with estimates and to serve as a guide for future estimates or quotations and to assist the management in their price fixing policy.
7. To show, where Standard Costs are prepared, what the cost of production ought to be and with which the actual costs which are eventually recorded may be compared.
8. To present comparative cost data for different periods and various volume of output and to provide guidance in the development of business. This is also helpful in budgetary control.
9. To record the relative production results of each unit of plant and machinery in use as a basis for examining its efficiency. A comparison with the performance of other types of machines may suggest the necessity for replacement.
10. To provide a perpetual inventory of stores and other materials so that interim Profit and Loss Account and Balance Sheet can be prepared without stock taking and checks on stores and adjustments are made at frequent intervals. Also to provide the basis for production planning and for avoiding unnecessary wastages or losses of materials and stores.

Last but not the least, to provide information to enable management to make short term decisions of various types, such as quotation of price to special customers or during a slump, make or buy decision, assigning priorities to various products, etc.

Cost Accounting and Financial Accounting-

Both financial accounting and cost accounting are concerned with systematic recording and presentation of financial data. Financial accounting reveals profits and losses of the business as a whole during a particular period, while cost accounting shows, by analysis and localization, the unit costs and profits and losses of different product lines. The main difference between financial accounting and cost accounting are summarized below.

1. Financial accounting aims at safeguarding the interests of the business and its proprietors and others connected with it. This is done by providing suitable information to various parties, such as shareholders or partners, present or prospective creditors etc. Cost accounting on the other hand, renders information for the guidance of the management for proper planning, operation, control and decision making.
2. Financial accounts are kept in such a way as to meet the requirements of the Companies Act, Income Tax Act and other statutes. On the other hand cost accounts are generally kept voluntarily to meet the requirements of the management. But now the Companies Act has made it obligatory to keep cost records in some manufacturing industries.
3. Financial accounting emphasizes the measurement of profitability, while cost accounting aims at ascertainment of costs and accumulates data for this very purpose.

4. Financial accounts disclose the net profit and loss of the business as a whole, whereas cost accounts disclose profit or loss of each product, job or service. This enables the management to eliminate less profitable product lines and maximize the profits by concentrating on more profitable ones.
5. Financial accounting provides operating results and financial position usually gives information through cost reports to the management as and when desired.
6. Financial accounts deal mainly with actual facts and figures, but cost accounts deal partly with facts and figures, but cost accounts deal with facts and figures and partly with estimates.
7. In case of financial accounts stress is on the ascertainment and exhibition of profits earned or losses incurred in the business. On account of this reason in financial accounts, the transactions are recorded, classified and analyzed in a subjective manner i.e. according to the nature of expenditure. In cost accounts the emphasis is more on aspects of planning and control and therefore transactions are recorded in an objective manner.
8. Financial accounts are concerned with external transactions i.e. transactions between the business concern on one side and third parties on the other. These transactions form the basis for payment or receipt of cash. While cost accounts are concerned with internal transactions which do not form the basis of payment or receipt of cash.
9. The costs are reported in aggregate in financial accounts but costs are broken into unit basis in cost accounts.
10. Financial accounts do not provide information on the relative efficiencies of various workers, plants and machinery while cost accounts provide valuable information on the relative efficiencies of various plants and machinery.
11. In financial accounts stocks are valued at cost or market price whichever is less, whereas stocks are valued at cost price in cost accounts.

Importance of Cost Accounting

The limitations of financial accounting have made the management to realize the importance of cost accounting. Whatever may be the type of business, it involves expenditure on labour, materials and other items required for manufacturing and disposing of the product. The management has to avoid the possibility of waste at each stage. It has to ensure that no machine remains idle, efficient labour gets due incentive, by-products are properly utilized and costs are properly ascertained. Besides the management, the creditors and employees are also benefited in numerous ways by installation of a good costing system. Cost accounting increases the overall productivity of an organization and serves as an important tool, in bringing prosperity to the nation, thus, the importance of cost accounting can be discussed under the following headings:

- a) **Costing as an aid to management:-** Cost accounting provides invaluable aid to management. It provides detailed costing information to the management to enable them to maintain effective control over stores and inventory, to increase efficiency of the organization and to check wastage and losses. It facilitates delegation of responsibility for important tasks and rating of employees. For all these the management should be capable of using the information provided by cost accounts in a proper way. The various advantages derived by the management from a good system of costing are as follows:

1. **Cost accounting helps in periods of trade depression and trade competition.** In periods of trade depression, the organization cannot afford to have wastages which pass unchecked. The management must know areas where economies may be sought, waste eliminated and efficiency increased. The organization must wage a war not only for its survival but also continued growth. The management should know the actual cost of their products before embarking on any scheme of price reduction. Adequate system of costing facilitates this.
2. **Cost accounting aids price fixation.** Although the law of supply and demand determines the price of the product, cost to the producer does play an important role. The producer can take necessary guidance from his costing records in case he is in a position to fix or change the price charged.
3. **Cost accounting helps in making estimates.** Adequate costing records provide a reliable basis for making estimates and quoting tenders.
4. **Cost accounting helps in channelizing production on right lines.** Proper costing information makes it possible for the management to distinguish between profitable and non-profitable activities; profits can be maximized by concentrating on profitable operations and eliminating non-profitable ones.
5. **Cost accounting eliminates wastages.** As cost accounting is concerned with detailed breakup of costs, it is possible to check various forms of wastages or losses.
6. **Cost accounting makes comparisons possible.** Proper maintenance of costing records provides various costing data for comparisons which in turn helps the management in formulating future lines of action.
7. **Cost accounting provides data for periodical Profit and Loss Account.** Adequate costing records provide the management with such data as may be necessary for preparation of Profit and Loss Account and Balance Sheet at such intervals as may be desired by the management.
8. **Cost accounting helps in determining and enhancing efficiency.** Losses due to wastage of materials, idle time of workers, poor supervision etc will be disclosed if the various operations involved in the production are studied carefully. Efficiency can be measured, cost controlled and various steps can be taken to increase the efficiency.
9. **Cost accounting helps in inventory control.** Cost accounting furnishes control which management requires, in respect of stock of materials, work in progress and finished goods.

b) **Costing as an aid to Creditors.**

Investors, banks and other money lending institutions have a stake in the success of the business concern are therefore benefitted immensely by the installation of an efficient system of costing. They can base their judgment about the profitability and future prospects of the enterprise on the costing records.

c) **Costing as an aid to employees.**

Employees have a vital interest in their employer's enterprise in which they are employed. They are benefitted by a number of ways by the installation of an efficient system of costing. They are benefitted, through continuous employment and higher remuneration by way of incentives, bonus plans, etc.

d) **Costing as an aid to National Economy**

An efficient system of costing brings prosperity to the business enterprise which in turn brings prosperity to the business enterprise which in turn results in stepping up of the government revenue. The overall economic development of a country takes place as a consequence of increase in efficiency of production. Control of costs, elimination of wastages and inefficiencies led to the progress of the industry and, in consequence of the nation as a whole.

Cost units- The Chartered Institute of Management Accountants, London, defines a unit of cost as “a unit of quantity of product, service or time in relation to which costs may be ascertained or expressed”.

The forms of measurement used as cost units are usually the units of physical measurements like number, weight, area, length, value, time etc.

Following are some examples of cost unit.

| <u>Industry/product</u> | <u>Cost unit basis</u> |
|--------------------------------|--------------------------------------|
| Automobile | Numbers |
| Brick works | per 1000 bricks |
| Cement | per Tonne |
| Chemicals | Litre, gallon, kilogram, ton |
| Steel | Tonne |
| Sugar | Tonne |
| Transport | Passenger-kilometre, tonne kilometer |

Cost centre – According to Chartered Institute of Management Accountants, London, cost centre means “a location, person or item of equipment (or group of these) for which costs may be ascertained and used for the purpose of cost control”. Cost centre is the smallest organizational sub-unit for which separate cost collection is attempted. Thus cost centre refers to one of the convenient unit into which the whole factory organization has been appropriately divided for costing purposes. Each such unit consists of a department or a sub-department or item of equipment or , machinery or a person or a group of persons.

For example, although an assembly department may be supervised by one foreman, it may contain several assembly lines. Some times each assembly line is regarded as a separate cost centre with its own assistant foreman.

The selection of suitable cost centres or cost units for which costs are to be ascertained in an undertaking depends upon a number of factors which are listed as follows.

1. Organization of the factory
2. Conditions of incidence of cost
3. Requirements of the costing system ie. Suitability of the units or centres for cost purposes.
4. Availability of information
5. Management policy regarding making a particular choice from several alternatives.

Profit centre – A profit centre is that segment of activity of a business which is responsible for both revenue and expenses and discloses the profit of a particular segment of activity. Profit centres are created to delegate responsibility to individuals and measure their performance.

Difference between Profit centre and Cost centre

The various points of difference between Profit centre and cost centre are as follows. Cost centre is the smallest unit of activity or area of responsibility for which costs are collected whereas a profit centre is that segment of activity of a business which is responsible for both revenue and expenses.

- (i) Cost centres are created for accounting conveniences of costs and their control whereas as a profit centre is created because of decentralization of operations i.e., to delegate responsibility to individuals who have greater knowledge of local conditions etc.
- (ii) Cost centers are not autonomous whereas profit centres are autonomous.
- (iii) A cost centre does not have target cost but efforts are made to minimize costs, but each profit centre has a profit target and enjoys authority to adopt such policies as are necessary to achieve its targets.
- (iv) There may be a number of cost centres in a profit centre in a profit centre as production or service cost centres or personal or impersonal but a profit centre may be a subsidiary company within a group or division in a company.

Cost classification

Costs can be classified or grouped according to their common characteristics. Proper classification of costs is very important for identifying the costs with the cost centers or cost units. The same costs are classified according to different ways of costing depending upon the purpose to be achieved and requirements of a particular concern. The important ways of classification are:

1. **By Nature or Elements.** According to this classification the costs are classified into three categories i.e., Materials, Labour and Expenses. Materials can further be sub-classified as raw materials components, spare parts, consumable stores, packing materials etc. This helps in finding the total cost of production and the percentage of materials (labour or other expenses) constituted in the total cost. It also helps in valuation of work-in-progress.
2. **By Functions:** This classification is on the basis of costs incurred in various functions of an organization ie. Production, administration, selling and distribution. According to this classification, costs are divided into Manufacturing and Production Costs and Commercial costs.

Manufacturing and Production Costs are costs involved in manufacture, construction and fabrication of products.

Commercial Costs are (a) administration costs (b) selling and distribution costs.

3. **By Degree of Traceability to the Product :** According to this, costs are divided indirect costs and indirect costs. **Direct Costs** are those costs which are incurred for a particular product and can be identified with a particular cost centre or cost unit. Eg:- Materials, Labour. **Indirect Costs** are those costs which are incurred for the benefit of a number of cost centre or cost units and cannot be conveniently identified with a particular cost centre or cost unit. Eg:- Rent of Building, electricity charges, salary of staff etc.

4. **By Changes in Activity or Volume:** According to this costs are classified according to their behavior in relation to changes in the level of activity or volume of production. They are fixed, variable and semi-variable. **Fixed Costs** are those costs which remain fixed in total amount with increase or decrease in the volume of the output or productive activity for a given period of time. Fixed Costs per unit decreases as production increases and vice versa. Eg:- rent, insurance of factory building, factory manager's salary etc. **Variable Costs** are those costs which vary in direct proportion to the volume of output. These costs fluctuate in total but remain constant per unit as production activity changes. Eg:- direct material costs, direct labour costs, power, repairs etc. **Semi-variable Costs** are those which are partly fixed and partly variable. For example; Depreciation, for two shifts working the total depreciation may be only 50% more than that for single shift working. They may change with comparatively small changes in output but not in the same proportion.
5. **Association with the Product:** Cost can be classified as product costs and period costs. Product costs are those which are traceable to the product and included in inventory cost, thus product cost is full factory cost. Period costs are incurred on the basis of time such as rent, salaries etc. thus it includes all selling and administration costs. These costs are incurred for a period and are treated as expenses.
6. **By Controllability:** The **CIMA** defines controllable cost as "a cost **which can be** influenced by the action of a specified member of an undertaking" and a non-controllable cost as "a cost which cannot be influenced by the action of a specified member of an undertaking".
7. **By Normality:** There are normal costs and abnormal costs. Normal costs are the costs which are normally incurred at a given level of output under normal conditions. Abnormal costs are costs incurred under abnormal conditions which are not normally incurred in the normal course of production. Eg:- damaged goods due to machine break down, extra expenses due to disruption of electricity, inefficiency of workers etc.
8. **By Relationship with Accounting Period:** There are capital and revenue expenses depending on the length of the period for which it is incurred. The cost which is incurred in purchasing an asset either to earn income or increasing the earning capacity of the business is called capital cost, for example, the cost of a machine in a factory. Such cost is incurred at one point of time but the benefits accruing from it are spread over a number of accounting years. The cost which is incurred for maintaining an asset or running a business is revenue expenditure. Eg:- cost of materials, salary and wages paid, depreciation, repairs and maintenance, selling and distribution.
9. **By Time..**Costs can be classified as 1) Historical cost and 2) Predetermined Costs.
The costs which are ascertained and recorded after it has been incurred is called historical costs. They are based on recorded facts hence they can be verified and are always supported by evidences. Predetermined costs are also known as estimated costs as they are computed in advance of production taking into consideration the previous periods' costs and the factors affecting such costs. Predetermined costs when calculated scientifically become standard costs. Standard costs are used to prepare budgets and then the actual cost incurred is later-on compared with such predetermined cost and the variance is studied for future correction.

Types, Methods and Techniques of Costing

The general fundamental principles of ascertaining costs are the same in every system of cost accounting, but the methods of analysis and presenting the costs vary from industry to industry. Different methods are used because business enterprises vary in their nature and in the type of products or services they produce or render. Basically, there are two principal methods of costing, namely (i) Job Costing, and (ii) Process costing.

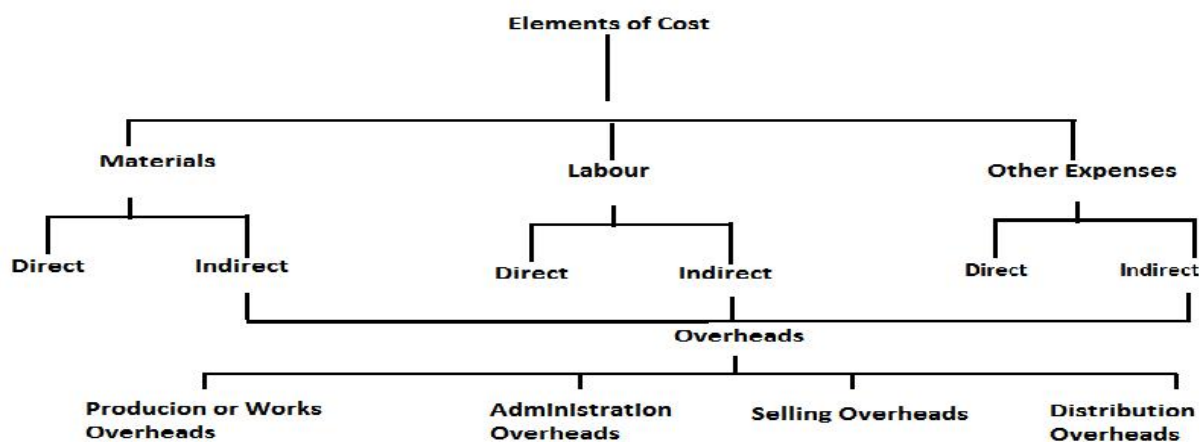
1. **Job costing**: It refers to a system of costing in which costs are ascertained in terms of specific jobs or orders which are not comparable with each other. Industries where this method of costing is generally applied are Printing Process, Automobile Garages, Repair Shops, Ship-building, House building, Engine and Machine construction, etc. Job Costing includes the following methods of costing:
 - (a) **Contract Costing**: Although contract costing does not differ in principle from job costing, it is convenient to treat contract cost accounts separately. The term is usually applied to the costing method adopted where large scale contracts at different sites are carried out, as in the case of building construction.
 - (b) **Batch Costing**: This method is also a type of job costing. A batch of similar products is regarded as one job and the cost of this complete batch is ascertained. It is then used to determine the unit cost of the articles produced. It should, however, be noted that the articles produced should not lose their identity in manufacturing operations.
 - (c) **Terminal Costing**: This method is also a type of job costing. This method emphasizes the essential nature of job costing, ie, the cost can be properly terminated at some point and related to a particular job.
 - (d) **Operation Costing**: This method is adopted when it is desired to ascertain the cost of carrying out an operation in a department, for example, welding. For large undertaking, it is frequently necessary to ascertain the cost of various operations.
2. **Process Costing**: Where a product passes through distinct stages or processes, the output of one process being the input of the subsequent process, it is frequently desired to ascertain the cost of each stage or process of production. This is known as process costing. This method is used where it is difficult to trace the item of prime cost to a particular order because its identity is lost in volume of continuous production. Process costing is generally adopted in textile industries, chemical industries, oil refineries, soap manufacturing, paper manufacturing, tanneries, etc.
3. **Unit or single or output or single output costing**: This method is used where a single article is produced or service is rendered by continuous manufacturing activity. The cost of the whole production cycle is ascertained as a process or series of processes and the cost per unit is arrived at by dividing the total cost by the number of units produced. The unit of costing is chosen according to the nature of the product. Cost statements or cost sheets are prepared under which various items of expenses are classified and the total expenditure is divided by total quantity produced in order to arrive at unit cost of production. This method is suitable in industries like brick-making, collieries, flour mills, cement manufacturing, etc. this method is useful for the assembly department in a factory producing a mechanical article eg. Bicycle.

4. **Operating Costing**: This method is applicable where services are rendered rather than goods produced. The procedure is same as in the case of single output costing. The total expenses of the operation are divided by the units and cost per unit of services is arrived at. This method is employed in Railways, Road Transport, Water supply undertakings, Telephone services, Electricity companies, Hospital services, Municipal services, etc.
5. **Multiple or Complete Costing**: Some products are so complex that no single system of costing is applicable. It is used where there are a variety of components separately produced and subsequently assembled in a complex production. Total cost is ascertained by computing component costs which are collected by job or process costing and then aggregating the costs through use of the single or output costing system. This method is applicable to manufacturing concerns producing Motor Cars, Aeroplanes, Machine tools, Type-writers, Radios, Cycles, Sewing Machines, etc.
6. **Uniform Costing**: It is not a distinct method of costing by itself. It is the name given to a common system of costing followed by a number of firms in the same industry. This helps in comparing performance of one firm with that of another.
7. **Departmental Costing**: When costs are ascertained department by department, the method is called "Departmental Costing". Usually, for ascertaining the cost of various goods or services produced by the department, the total costs will have to be analysed, say, by the use of job costing or unit costing.

In addition to the above methods of costing, mention can be made of the following techniques of costing which can be applied to any one of the above method of costing for special purposes of cost control and policy making:

- a) Standard or Predetermined Costs.
- b) Marginal Costs

Elements of Cost- The management of an organization needs necessary data to analyze and classify costs for proper control and for taking decisions for future course of action. Hence the total cost is analyzed by elements of costs ie by the nature of expenses. The elements of costs are three and they are materials, labour and other expenses. These can be further analyzed as follows.



By grouping the above elements of cost, the following divisions of cost are obtained.

1. Prime cost = Direct Materials + Direct Labour+ Direct Expenses
2. Works or Factory Cost = Prime Cost + Works or Factory Overheads
3. Cost of Production = Works Cost + Administration Overheads
4. Total Cost or Cost of Sales = Cost of Production + Selling and Distribution Overheads

The difference between the cost of sales and selling price represents profit or loss.

Illustration 1. Find the Prime Cost, Works Cost, Cost of production, total Cost and profit from the following:- Direct Materials Rs.20000; Direct Labour Rs. 10000; Factory Expenses Rs. 7000; Administration Expenses Rs. 5000; Selling Expenses Rs. 7000 and Sales Rs.60,000.

Solution:

Prime Cost = Direct Materials + Direct Labour = Rs.20,000 + Rs.10,000 = Rs.30,000.

Works Cost = Prime Cost + Factory Expenses = Rs.30,000 + Rs.7,000 = Rs.37,000.

Cost of Production = Works Cost + Administration Expenses=Rs.37000+ Rs.5, 000 = Rs.42, 000.

Total Cost or Cost of sales= Cost of Production + Selling Expenses = Rs.42, 000+ Rs.7, 000 = Rs.49, 000.

Profit = Sales - Total Cost = Rs.60,000 - Rs.49,000=Rs.11, 000.

These terms can be explained as follows

1. **Direct Materials** are those materials which can be identified in the product and can be conveniently measured and directly charged to the product. For example, bricks in houses, wood in furniture etc. Hence all raw materials, materials purchased specifically for a job or process like glue for book making, parts or components purchased or produced like batteries for radios and tyres for cycles, and primary packing materials are direct materials.
2. **Indirect Materials** are those materials which cannot be classified as direct materials. Examples are consumables like cotton waste, lubricants, brooms, rags, cleaning materials, materials for repairs and maintenance of fixed assets, high speed diesel used in power generators etc.
3. **Direct Labour** is all labour expended in altering the construction, composition, confirmation or condition of the product. Thus direct wages means the wages of labour which can be conveniently identified or attributed wholly to a particular job, product or process or expended in converting raw materials into finished goods. Thus payment made to groups of labourers engaged in actual production, or carrying out of an operation or process, or supervision, maintenance, tools setting, transportation of materials, inspection, analysis etc is direct labour.
4. **Direct Expenses** are expenses directly identified to a particular cost centre. Hence expenses incurred for a particular product, job, department etc are direct expenses. Example royalty, excise duty, hire charges of a specific plant and equipment, cost of any experimental work carried out especially for a particular job, travelling expenses incurred in connection with a particular contract or job etc.
5. **Overheads** may be defined as the aggregate of the cost of indirect materials, indirect labour and such other expenses including services as cannot conveniently be charged direct to specific cost units. Overheads may be sub-divided into (i) Manufacturing Overheads; (ii) Administration Overheads; (iii) Selling Overheads; (iv) Distribution Overheads; (v) Research and Development Overheads.

Cost sheet or Statement of Cost: When costing information is set out in the form of a statement, it is called “Cost Sheet”. It is usually adopted when there is only one main product and all costs almost are incurred for that product only. The information incorporated in a cost sheet would depend upon the requirement of management for the purpose of control.

Specimen of Cost Sheet or Statement of Cost

| | Total Cost Rs. | Cost per Unit Rs. |
|---|-------------------|----------------------|
| Direct Materials | xxx | xxx |
| Direct Labour | xxx | xxx |
| Prime cost | xxx | xxx |
| Add: Works Overheads | xxx | xxx |
| Works Cost | xxx | xxx |
| Add: Administrative Overheads | xxx | xxx |
| Cost of Production | xxx | xxx |
| Add: Selling and Distribution Overheads | xxx | xxx |
| Total Cost or Cost of Sales | xxx | xxx |

Illustration 2: Calculate Prime Cost, Factory Cost, Cost of Production, Cost of Sales and profit from the following particulars:

| | Rs. | | Rs. |
|--------------------------------|----------|-----------------------|----------|
| Direct Materials | 1,00,000 | Consumable stores | 2,500 |
| Direct Wages | 30,000 | Manager's Salary | 5,000 |
| Wages of Foreman | 2,500 | Directors' fees | 1,250 |
| Electric power | 500 | Office Stationery | 500 |
| Lighting: Factory | 1,500 | Telephone Charges | 125 |
| Office | 500 | Postage and Telegrams | 250 |
| Storekeeper's wages | 1,000 | Salesmen's salary | 1,250 |
| Oil and water | 500 | Travelling expenses | 500 |
| Rent: Factory | 5,000 | Advertising | 1,250 |
| Office | 2,500 | Warehouse charges | 500 |
| Repairs and Renewals: | | Sales | 1,89,500 |
| Factory plant | 3,500 | Carriage outward | 375 |
| Transfer to Reserves | 1,000 | Dividend | 2,000 |
| Discount on shares written off | 500 | | |
| Depreciation: Factory Plant | 500 | | |
| Office Premises | 1,250 | | |

Solution**STATEMENT OF COST AND PROFIT**

| | Rs. | Rs. |
|--|--------------------|-----------------|
| Direct Materials | | 1,00,000 |
| Direct Wages | | <u>30,000</u> |
| | Prime Cost | 1,30,000 |
| Add: Factory Overheads: | | |
| Wages of foreman | 2,500 | |
| Electric power | 500 | |
| Storekeeper's Wages | 1,000 | |
| Oil and Water | 500 | |
| Factory rent | 5,000 | |
| Repairs and renewals-Factory Plant | 3,500 | |
| Factory lighting | 1,500 | |
| Depreciation-Factory Plant | 500 | |
| Consumable stores | <u>2,500</u> | |
| | | <u>17,500</u> |
| | Factory Cost | 1,47,500 |
| Add: Administration Overheads: | | |
| Office rent | 2,500 | |
| Repairs and Renewals-Office Premises | 500 | |
| Office lighting | 500 | |
| Depreciation : Office Premises | 1,250 | |
| Manager's Salary | 5,000 | |
| Director's fees | 1,250 | |
| Office Stationery | 500 | |
| Telephone charges | 125 | |
| Postage and telegrams | <u>250</u> | |
| | | <u>11,875</u> |
| | Cost of Production | 1,59,375 |
| Add: Selling and Distribution Overheads: | | |
| Carriage Outward | 375 | |
| Salesmen's Salaries | 1,250 | |
| Travelling Expenses | 500 | |
| Advertising | 1,250 | |
| Warehouse charges | <u>500</u> | |
| | | <u>3,875</u> |
| | Cost of Sales | 1,63,250 |
| | Profit | <u>26,250</u> |
| | Sales | <u>1,89,500</u> |

Module II

Materials

Materials: - The materials are a major part of the total cost of producing a product and are one of the most important assets in majority of the business enterprises. Hence the total cost of a product can be controlled and reduced by efficiently using materials.

The materials are of two types, namely:

- (i) Direct materials: The materials which can be easily identified and attributable to the individual units being manufactured are known as direct materials. These materials also form part of finished products. All costs which are incurred to obtain direct materials are known as direct material costs.
- (ii) Indirect materials: Indirect materials, on the other hand, are those materials which are of small value such as nuts, pins, screws, etc. and do not physically form part of the finished product. Costs associated with indirect materials are known as indirect material costs.

Factory supplies, office supplies and selling supplies are generally termed as stores.

Purchasing Control and Procedure: Purchasing is an art. Wrong purchases increase the cost of materials, store equipments and the finished goods. Hence it is imperative that purchases should be effectively, efficiently and economically performed.

Dr. Walters defines scientific purchasing as the “Procurement by purchase of the proper materials, machinery, equipment and supplies of stores used in the manufacture of a product, adapted to marketing in the proper quantity and quality at the proper time and the lowest price consistent with the quality desired”.

According to Alford and Beatty, “Purchasing is the procuring of materials, supplies, machines tools and services required for the equipment, maintenance and operation of a manufacturing plant”.

The major objectives of scientific purchasing is to purchase the right quantity at the best price, materials purchased should suit the objective, production should not be held up, unnecessarily capital should not be locked up in stores, best quality of materials should be purchased and company's competitive position and its reputation for fairness and integrity should be safeguarded.

Only scientific purchasing will help in achieving the above objectives. With proper plans, materials can be purchased at a lower price than competitors, turnover of investment in inventories can be high, purchasing department can advise regarding substitute materials, new products, change in trends, creating goodwill etc.

Methods of Purchasing

Purchasing can be broadly classified as centralized and localized purchasing.

- (a) Centralized Purchasing: In a large organization, manufacturing units are many. In such cases centralized purchasing is beneficial. The advantages of centralized purchasing are:
 - 1. Specialized and expert knowledge is available.
 - 2. Advantages arise due to bulk purchases.

3. The cost of purchasing can be reduced and selling price can be lowered.
4. As there is good knowledge of market conditions, greater control can be exercised.
5. When materials have to be imported, it is advantageous to centralize the buying.
6. Economy and ease in compilation and consultation of results.
7. It can take advantage of market changes.
8. Investment in inventories can be reduced.
9. Other advantages include undivided responsibility, consistent buying policies.

Factors to be considered when decision regarding centralization has to be taken are geographical separation of plants, homogeneity of products, type of material bought, location of supplies etc.

(b) **Decentralization of Purchases:** The advantages of localized purchasing or decentralization of purchases are:-

1. Each plant may have its own particular need. This can be given special attention.
2. Direct contact can be established with suppliers.
3. The time lag between indenting and receiving materials can be reduced.
4. Technical requirements of each plant can be ascertained.

Purchase Procedure: The steps usually followed for purchase of materials may be enumerated as follows:-

1. **Indenting for materials :** The stores department prepares indents for the purchase of materials for replenishment of stocks (regular indents) or for a special job(special indents) and sends it to the purchase department. Regular indents are prepared periodically and placed when the ordering level for different items of stocks are reached. The quantity indented is equal to the ordering quantity fixed for each item. The special indents are based on the demands received either from the planning or production department.

| XYZ Co. Ltd. | | | | | | |
|--------------------------|-------------|------------------------|-----------------|---------------------|-----------------|--|
| MATERIAL PURCHASE INDENT | | | | | | |
| Date: | | | For the Period: | | | |
| Indent No: | | | Demand Note No: | | | |
| Regular/Special | | | | | | |
| Sl. No. | Description | Stores Code No. | Quantity | Last Pur. Order No. | Special remarks | |
| | | | | | | |
| Store Keeper | | For Purchase Dept. Use | | | | |
| | | Tender Nos. | | | | |
| | | Issued on. | | | | |

2. **Issue of tenders to suppliers:** The purchase department issue tenders to suppliers or publish them in papers. The suppliers quote their terms of price and delivery/payment. After the last date for receipt of quotations is over, the tenders are opened and a comparative statement is prepared. Tenders are prepared in triplicate. Of them, two are sent to the suppliers and one is retained with the purchase department. The supplier mentions his terms in the original.

While considering the tenders, the reliability of the supplier has to be taken into account. The quality of goods and time taken to deliver the goods on previous occasions should be checked. The financial stability and capacity to deliver goods should be ensured.

Sometimes purchases may be made without inviting quotations. The circumstances are when prices are controlled, or purchases are made under long term contracts, or catalogue prices are available or when there is a cost plus contract. If purchase is made under cost plus profit basis, the cost composition and reasonableness of price should be checked.

| | | | | | | |
|---|----------------------|----------------------|---------------------------------|--------------------------------------|----------|-------|
| INVITATION TO TENDER | | | | | | |
| Indent No: | | | | Tender No: | | |
| Date: | | | | Date: | | |
| To | | | | | | |
| XYZ Co.Ltd. | | | | | | |
| | | | | | | |
| | | | | | | |
| Dear Sirs, | | | | | | |
| The stores mentioned below are required to be delivered at our works godown. The terms and conditions of supply are mentioned overleaf. The first copy of this tender should be returned to us duly filled in before..... | | | | | | |
| A security deposit of Rs.....should also accompany your reply which will be returned if we do not place an order with you. | | | | | | |
| Yours faithfully, | | | | | | |
| For ABC Co.Ltd. | | | | | | |
| Particulars Of stores/ Supplies | Quantity required | Place of Delivery | Date of delivery required | Quantity which can be supplied | Rate | |
| | | | | | Per Unit | Price |
| | | | | | | |
| We agree to supply the above on terms mentioned below. | | | | | | |
| Special conditions: | | | | | | |
| Place: | | | | For XYZ Co. Ltd. | | |

3. **Placing of purchase orders:** Normally six copies of purchase order are made. The supplier, stores, inspection department, store accounting section, purchase department and progress department are sent one copy each.

The purchase order has legal and accounting significance. From legal point of view, it binds both the parties to the terms of the contract. From the accounting point of view; it signifies the

amount which has to be spent. It signifies the stores department to accept the goods and the accounts department to accept the bill.

| A.B.C. CO. LTD. MATERIALS PURCHASE ORDER Order No: Indent No: Store Receipt No: Date: Quotation No: Inspection Note No: To This is in response to your quotation against our Tender No:..... The terms and conditions mentioned overleaf will be applicable. Please supply the following items at the prices indicated below: | | | | | | |
|--|-------------|-----------------|----------------------|----------|------|-------|
| Sl. No. | Description | Stores Code No. | Specification | Quantity | Unit | Price |
| | | | | | | |
| Terms of Delivery: | | | Please send bill to: | | | |
| Terms of Payment: | | | | | | |
| Special Conditions: | | | For A.B.C. Co. Ltd. | | | |

4. **Inspection:** The supplier delivers goods at the place specified. Two delivery challans are prepared by the supplier one of which is returned. It is a proof of delivery. After receiving the goods, the inspection department or production department or maintenance department (as the case may be) is intimated.

The inspector checks that the materials are in accordance with the quality required, standard expected, tolerances allowed etc. After inspection an inspection note is prepared in triplicate, one copy is sent to the supplier, one to the stores, and one to the inspection department.

5. **Receiving Stores:** The stores department prepares a Stores Receipt Note for the quantity of stock accepted in inspection. After issuing of the Stores Receipt, the Storekeeper is

responsible for the stocks. The stores receipt is the document for the posting of receipts in Bin Card and the Stores Ledger. It is prepared in quadruplicate and sent to the supplier; stores accounting section and purchase department and one copy are retained with the stores. The supplier encloses this copy along with his bill. The stores accounting section compares the note with the purchase order.

| ABC CO. Ltd. | | | | | |
|--|-------------|--------------------|----------|----------------------------------|-------|
| STORES RECEIPT NOTE | | | | | |
| S.R. No: | | P.O.No: | | Inspection Note No: | |
| Date: | | Date: | | Date: | |
| Received form M/s _____ under their delivery challan no: _____ dated _____ the following items of stores against the above purchase order: | | | | | |
| Stores Code No: | Description | Unit | Quantity | Price | Value |
| | | | | | |
| Posted in:- | | | | | |
| Bin Card | | Stores Ledger..... | | Signature of Storekeeper..... | |

6. **Checking and passing of bills for payment:** Bills received by the purchase department are forwarded to the stores accounting section to check the authenticity regarding quantity and price and the arithmetical accuracy. Special items included in the bills eg:- freight, packing charges are verified with the purchase order. The bill is later passed for payment.

Storekeeping: Store keeping is a service function. The storekeeper is a custodian of all the items kept in the store. The stores should be maintained properly and cost minimized. The main objectives of store keeping are:-

- i) To protect stores against losses
- ii) To keep goods ready for delivery/issue
- iii) To provide maximum service at minimum cost.

The duties and functions of Store-keeper can be summarized as follows:

- i) Materials should be received, unloaded, inspected and then moved to stores. The materials have to be stored in appropriate places and records the receipts in proper books.
- ii) The stores records should be maintained in an efficient and orderly manner so that materials can be easily located and information can be obtained for various departments.

- iii) The stores should provide maximum protection and safety and accessibility and utilize minimum space. Suitable storage devices should be installed.
- iv) The materials should be given special covering to prevent damage due to atmospheric conditions.
- v) All issues should be properly recorded, efficiently, promptly and accurately. All issues should be duly authorized and procedures laid down should be duly followed.
- vi) The storekeeper is responsible for co-ordination with materials control according to the type of production, size of the company, the organization structure etc.
- vii) Ensure that all transactions are posted in the Bin Card see that the Bin Card is up-to-date.
- viii) All items should be in its proper place.
- ix) Maintenance of stores at required levels.
- x) Neatness in stores to facilitate physical verification.
- xi) Co-ordination and supervision of staff in the stores department.
- xii) Periodical review of various scales, measuring instruments, conversion ratios etc.
- xiii) Protect stores from fires, rust, erosion, dust, theft, weather, heat, cold, moisture and deterioration etc.

Requisitioning for Stores

One of the duties of the storekeeper is to send requisitions for materials for replenishment in time so that the production is not held up due to shortage of materials. The storekeeper should also see that there is no unnecessary blocking of capital due to overstocking of materials. For this he keeps a check on the re-order level, economic ordering quantity, and the maximum and minimum quantity which he is authorized to store in respect of each kind of material.

(a) Re-ordering Level

Re-ordering level is that point of level of stock of a material where the storekeeper starts the process of initiating purchase requisition for fresh supplies of that materials. This level is fixed somewhere between the maximum and minimum levels in such a way that the difference of quantity of the material between the re-ordering level and minimum level will be sufficient to meet the requirements of production until the fresh supply of the materials is received.

Re-ordering Level= Minimum Level + Consumption during the time required to get the fresh delivery

According to Wheldon,

Re-ordering Level= Maximum Level x Minimum re-order period.

Here, maximum re-order period means the maximum period taken to get the material once the order for new material is placed. Wheldon has taken the maximum period and maximum consumption during that period so that factory may not stop production due to shortage of materials.

Illustration: 3. Calculate the ordering level of material A from the following particulars:

Minimum Limit 1,000 units.

Maximum Limit 5,000 units.

Daily requirement of material 200 units.

Time required for fresh delivery 10 days.

Solution

Ordering Level = Minimum limit + Consumption during the time required for fresh delivery

$$= 1000 \text{ units} + 200 \text{ units} \times 10 \text{ days} = 3000 \text{ units}$$

Order for the purchase of material should be placed when the material in stock reaches 3,000 units.

Illustration: 4. Calculate the re-ordering level from the following information:

Maximum consumption = 500 units per day

Minimum consumption = 400 units per day

Re-order period = 10 to 12 days

Solution

Re-order Level = Maximum consumption x maximum re-order period

$$= 500 \text{ units} \times 12 \text{ days} = 6000 \text{ units.}$$

(b) Economic Ordering Quantity

The quantity of material to be ordered at one time is known as economic ordering quantity. This quantity is fixed in such a manner as to minimize the cost of ordering and carrying the stock.

The total costs of a material usually consist of:

Total acquisition cost + total ordering cost + total carrying cost.

Since the acquisition cost per unit of material is same whatever is the quantity purchased, it is usually excluded when deciding the quantity of a material to be ordered at one time. The only costs to be taken care of are the ordering costs and carrying costs which vary with the quantity ordered.

Carrying Cost: It is the cost of holding the materials in the store and includes:

1. Cost of storage space which could have been utilized for some other purpose.
2. Cost of bins and racks
3. Cost of maintaining the materials to avoid deterioration.
4. Amount of interest payable on the amount of money locked up in the materials.
5. Cost of spoilage in stores and handling.
6. Transportation cost in relation to stock.
7. Cost of obsolescence of materials due to change in the process or product.
8. Insurance cost
9. Clerical cost etc.

In India all these costs amount to 20 to 25 % of the cost of materials per year. Hence it becomes necessary to reduce such carrying cost for efficient operations.

Ordering Cost: It is the cost of placing orders for the purchase of materials and includes:

1. Cost of staff posted in the purchasing department, inspection section and stores accounts department.
2. Cost of stationary postage and telephone charges.

Thus, this type of costs includes cost of floating tenders, cost of comparative evaluation of quotations, cost of paper work, and postage involved in placing the order, cost of inspection and cost of accounting and making payments. In other words, the cost varies with the number of orders.

When the quantity of materials ordered is less, the cost of carrying will decrease but ordering cost will increase and vice versa.

$$Q = \sqrt{\frac{2CO}{I}}$$

Q = Quantity to be ordered

C = Consumption of the material concerned in units during a year.

O = Cost of placing one order including the cost of receiving the goods i.e. the cost of getting an item into the firms inventory

I = Interest payment including variable cost of storing per unit per year i.e holding costs of inventory.

Illustration 4: Find out the economic ordering quantity (EOQ) from the following particulars.

Annual usage: 6000 units

Cost of material per unit: Rs. 20

Cost of Placing and receiving one order: Rs.60

Annual carrying cost of one unit: 10% of inventory value.

Solution

$$EOQ = \sqrt{\frac{2CO}{I}}$$

Where C = Annual usage of material ie 6,000 units

O = Cost of placing one order ie Rs.60

I = Annual carrying cost of one unit ie Rs. $\frac{20 \times 10}{100}$ = Rs. 2

$$EOQ = \sqrt{\frac{2 \times 6,000 \text{ units} \times 60}{\text{Rs.2}}} = \sqrt{3,60,000} = 600 \text{ units}$$

The formula $\sqrt{\frac{2CO}{I}}$ of economic ordering quantity is applicable only if annual consumption of raw material in

units is given. But if the consumption of material is given in value, the formula $\sqrt{\frac{2CO}{I}}$ of economic ordering quantity will remain the same; however, the meaning of signs will differ as given:

C= Annual requirement of material in rupees

O= Cost of placing one order

I = % carrying Cost.

c) Minimum Level or Safety Stock level

The minimum level is the minimum quantity of the material which must be maintained in hand at all times. The quantity is fixed so that the production is not held up due to shortage of the materials. In fixing this level, the following factors should be considered:

1. Lead time i.e. time lag between indenting and receiving of the material. It is the time required to replenish the supply.
2. Rate of consumption of the material during the lead time.
3. Nature of the material. Minimum level is not required in case of a special material which is required against customer's specific order.

Formula for calculating minimum level or safety stock level given by Wheldon is as follows:

Minimum Stock Level = Re-ordering level – (Normal consumption x Normal Re-order period)

d) Maximum Level

It is the maximum of stock which should be held in stock at any time during the year. The quantity is fixed so as to avoid overstocking as it leads to the following disadvantages.

1. Overstocking leads to increase in working capital requirement which could be profitable used somewhere else.
2. Overstocking will need more godown space, so more rent will have to be paid.
3. It may also lead to obsolescence on account of overstocking.
4. There are chances that the quality of materials will deteriorate because large stock will require more time before they are consumed.
5. There may be fear of depreciation in market values of the overstocked materials.

According to Wheldon,

$$\text{Maximum Stock level} = \text{Reordering level} + \text{Re-ordering Quantity} - (\text{Minimum consumption} \times \text{Minimum re-ordering period})$$

e) Danger Level

This level means that level of stock at which normal issues of the material are stopped and issues are made only under specific instructions. The purchase officer will make special arrangements to get the materials which reach at their danger levels so that the production may not stop due to shortage of materials.

Danger Level = Average consumption x Max.re-order period for emergency purchases.

f) Average Stock Level

The average stock level is calculated by the following formula:

Average Stock Level = Minimum Stock Level + $\frac{1}{2}$ of Re-order Quantity.

Or $\frac{1}{2}$ (Minimum Stock Level + Maximum Stock Level)

Illustration 5: Calculate the minimum stock level, maximum stock level, re-ordering level and average stock level from the following information:

- (i) Minimum consumption = 100 units per day
- (ii) Maximum consumption = 150 units per day
- (iii) Normal consumption = 120 units per day
- (iv) Re-order period = 10-15 days
- (v) Re-order quantity = 1,500 units
- (vi) Normal re-order period = 12 days

Solution

Re-ordering Level = Maximum Consumption x Maximum re-order period

$$= 150 \text{ units} \times 15 \text{ days} = 2,250 \text{ units}$$

Minimum Stock Level = Re-ordering Level - (Normal consumption x Normal re-order period)

$$= 2,250 - (120 \times 12) = 810 \text{ units}$$

Maximum Stock Level = Re-ordering Level + Re-order Quantity - (Minimum Consumption x Minimum Re-Order Period)

$$= 2,250 + 1500 - (100 \times 10) = 2,750 \text{ units}$$

Average stock Level = Minimum Stock Level + $\frac{1}{2}$ Re-order Quantity

$$= 810 \text{ units} + \frac{1}{2} \times 1500 \text{ units} = 1,560 \text{ units}$$

Stores (or Materials) records

In the stores the most important two records kept are bin cards and stores ledger.

- (a) Bin Card. A bin card is a record of the receipt and issue of material and is prepared by the store keeper for each item of stores. A bin card is also known as bin tag or stock card and is usually kept in the rack where the material is kept. In a bin card not only the receipt and issue of material is recorded, minimum quantity, maximum quantity and ordering quantity are stated on the card. This helps the store keeper to send the material requisition for the purchase of material in time.
- (b) Stores Ledger: This ledger is kept in the costing department and is identical with the bin card except that receipts, issues and balances are shown along with their money values. This provides the information for the pricing of materials issued and the money value at any time of each item of stores.

Perpetual Inventory System

The Chartered Institute of Management Accountants, London, defines the perpetual inventory as “a system of records maintained by the controlling department, which reflects the physical movements of stocks and their current balance”. Thus this is a system in which, with the help of Bin Cards and Stores Ledger, the balance of stock is ascertained after every receipt and issue of materials. This helps in avoiding closing down of firm for physical verification.

Advantages of the Perpetual Inventory System

The following are the advantages of the perpetual inventory system:

1. It avoids the disruption of production for physical checking of all items of stores at the end of the year.
2. The preparation of Profit and Loss Account and Balance Sheet is possible without physical verification of stock.
3. A detailed and more reliable control on the materials in store is obtained.
4. As the work of recording and continuous stocktaking is carried out systematically and without undue haste, the figures are more reliable.
5. Continuous stocktaking will make the storekeeper and the stores accountant more vigilant in their work and they will try to keep the records accurate and up-to-date.
6. Planning of production can be done without any fear of shortage as the management is constantly informed of the stores position.

7. An inbuilt system of internal check will be in operation as bin cards and the stores ledger keep a check on each other.
8. Errors and shortage of stock are readily discovered and efforts are made to avoid the shortage of stock in future.
9. The capital invested in the stores can be kept under control and efficiently used as stock can be compared with the minimum and maximum levels.
10. It makes available correct stock figures for claim to be lodged with the insurance company for loss on account of stock destroyed by fire.

ABC Analysis

Under ABC Analysis, the materials in stock are divided into three categories for the purpose of control. Generally it is seen that the materials which constitute the least percentage of items in stock may contribute to a large percentage of value and a large percentage of items may represent a smaller percentage of value of items consumed. Between these two items are those items, the percentage of which is more or less equal to their value in consumption. Items falling in the first category are treated as 'A' items, of the second category as 'B' items and items of the third category are taken as 'C' items. Such an analysis of material is known as ABC analysis. This technique of stock control is also known as stock control according to value method or Always Better Control method or Proportional Parts Value Analysis method. Thus, under this technique of material control, materials are listed in 'A', 'B' and 'C' categories in descending order based on money value of consumption.

ABC analysis measures the cost significance of each item of material. It concentrates on important items, so it is also known as 'Control by Importance and Exception' (CIE).

The report of the Indian Productivity Team on "Stores and Inventory Control in U.S.A., Japan and West Germany" gives the following example of ABC Analysis:

| <i>Group</i> | <i>Percentage of Items</i> | <i>Percentage of Costs</i> |
|--------------|----------------------------|----------------------------|
| A | 8% | 75% |
| B | 25% | 20% |
| C | 67% | 5% |

The significance of this analysis is that a very close control is exercised over the items of 'A' group which account for a high percentage of costs while less stringent control is adequate for category 'B' and very little control would suffice for category 'C' items.

Issue of materials

Materials issued from stores are debited to the jobs or work orders which received them and credited to the materials account. These jobs are debited with the value of materials issued to them.

But what is the value of materials? Theoretically the value includes the invoice price less trade discount, the freight, cartage, octroi and insurance on incoming materials, expenses of purchase, receiving, storing and record keeping and carriage from the stores up to the process plant. However,

in practice, it involves minute calculations for including all these expenses and is a big task compared to the benefit derived from it.

Moreover the price changes according to the market conditions and at any given time there will be stock of materials purchased at different times at different prices. Hence the problem as to at what price the materials should be issued?

There are many methods of pricing material issues. The most important being: FIFO, LIFO, simple and weighed average methods.

1) First in First Out (FIFO)

Under this method material is first issued from the earliest consignment on hand and priced at the cost at which that consignment was placed in the stores. In other words, materials received first are issued first. The units in the opening stock of materials are treated as if they are issued first, the units from the first purchase issued next, and so on until the units left in the closing stock of materials are valued at the latest cost of purchases.

This method is most suitable in times of falling prices because the issue price of materials to jobs or work order will be high while the cost of replacement of materials will be low. But in case of rising prices this method is not suitable because the issue price of materials to production will be low while the cost of replacement of materials will be high. The following example will illustrate how issues of materials are valued under this method.

Illustration 6: The received side of the Stores Ledger Account shows the following particulars:

| | | |
|--------|-----------------------|---------------------|
| Jan. 1 | Opening Balance: | 500 units @ Rs.4 |
| Jan. 5 | Received from vendor: | 200 units @ Rs.4.25 |
| Jan.12 | Received from vendor: | 150 units @ Rs.4.10 |
| Jan.20 | Received from vendor: | 300 units @ Rs.4.50 |
| Jan.25 | Received from vendor: | 400 units @ Rs.4 |

Issues of material were as follows:

Jan. 4- 200 units; Jan.10- 400 units; Jan. 15- 100 units; Jan 19- 100 units; Jan.26- 200 units; Jan.30- 250 units.

Issues are to be priced on the principle of “first in first out”. Write the Stores Ledger Account in respect of the materials for the month of January.

Solution:

2) Last in Last Out (LIFO)

Under this method, issues are priced in the reverse order of purchase i.e., the prices of the latest available consignment is taken. This method is suitable in times of rising prices because material will be issued from the latest consignment at a price which is closely related to the current price levels. Valuing material issues at the price of the latest available consignment will help the management in fixing the competitive selling prices of the products.

SOLUTION (Illustration 6)

STORES LEDGER ACCOUNT

| Date | Particulars | Receipts | | | Issues | | | Balance | | |
|--------|------------------------------|---------------------|-------------------|------------------|---------------------|-------------------|------------------|---------------------|----------------|-----------------|
| | | Quantity (Units) | Total Cost(Rs) | Unit cost(Rs) | Quantity (units) | Total Cost(Rs) | Unit cost(Rs) | Quantity (units) | Amount (Rs) | Per unit(Rs) |
| Jan 1 | Balance b/d | - | - | - | - | - | - | 500 | 2000 | 4 |
| Jan 4 | Requisition slip no. | - | - | - | 200 | 800 | 4 | 300 | 1200 | 4 |
| Jan 5 | Goods received note no. | 200 | 850 | 4.25 | - | - | - | 300 | 1200 | 4 |
| | | | | | | | | 200 | 850 | 4.25 |
| Jan 10 | Requisition slip no. | - | - | - | 300 | 1200 | 4 | | | |
| | | | | | 100 | 425 | 4.25 | 100 | 425 | 4.25 |
| Jan 12 | Goods received note no. | 150 | 615 | 4.10 | - | - | - | 100 | 425 | 4.25 |
| | | | | | | | | 150 | 615 | 4.10 |
| Jan 15 | Requisition slip no. | - | - | - | 100 | 425 | 4.25 | 150 | 615 | 4.10 |
| Jan 19 | Requisition slip no. | - | - | - | 100 | 410 | 4.10 | 50 | 205 | 4.10 |
| Jan 20 | Goods received note no. | 300 | 1350 | 4.50 | - | - | - | 50 | 205 | 4.10 |
| | | | | | | | | 300 | 1350 | 4.50 |
| Jan 25 | Goods received note no. | 400 | 1600 | 4.00 | - | - | - | 50 | 205 | 4.10 |
| | | | | | | | | 300 | 1350 | 4.50 |
| | | | | | | | | 400 | 1600 | 4.00 |
| Jan 26 | Requisition slip no. | - | - | - | 50 | 205 | 4.10 | 150 | 675 | 4.50 |
| | | | | | 150 | 675 | 4.50 | 400 | 1600 | 4.00 |
| Jan 30 | Requisition slip no. | - | - | - | 150 | 675 | 4.50 | 300 | 1200 | 4.00 |
| | | | | | 100 | 400 | 4.00 | | | |

Illustration 7: Prepare Stores Account on Last in First Out method assuming the same particulars as in Illustration 6:

3) Simple Average Method

In this method, price is calculated by dividing the total of the prices of the materials in the stock from which the material to be priced could be drawn by the number of the prices used in that total. This method may lead to over-recovery or under-recovery of cost of materials from production because quantity purchased in each lot is ignored.

Eg:- 1000 units purchased @ Rs.10
 2000 units purchased @ Rs.11
 3000 units purchased @ Rs.12

In this example, simple average price will be Rs.11 calculated as below:

$$\frac{\text{Rs.10} + \text{Rs.11} + \text{Rs.12}}{3} = \text{Rs.11}$$

4) Weighted Average Methods

In this method, price is calculated by dividing the total cost of materials in the stock from which the materials to be priced could be drawn by the total quantity of materials in that stock.

In the above example, the weighted average price is Rs.11.33 per unit calculated as follows:

$$\frac{1000 \times \text{Rs.10} + 2000 \times \text{Rs.11} + 3000 \times \text{Rs.12}}{1000 + 2000 + 3000} = \text{Rs.11.33}$$

In the periods of heavy fluctuations in the prices of materials, the average cost method gives better results because it tends to smooth out the fluctuations in prices by taking the average of prices of various lots in stock.

SOLUTION (Illustration 7) LIFO Method

STORES LEDGER ACCOUNT

| Date | Particulars | Receipts | | | Issues | | | Balance | | |
|--------|------------------------------|---------------------|-------------------|------------------|---------------------|-------------------|------------------|---------------------|----------------|-----------------|
| | | Quantity (Units) | Total Cost(Rs) | Unit cost(Rs) | Quantity (units) | Total Cost(Rs) | Unit cost(Rs) | Quantity (units) | Amount (Rs) | Per unit(Rs) |
| Jan 1 | Balance b/d | - | - | - | - | - | - | 500 | 2000 | 4 |
| Jan 4 | Requisition slip no. | - | - | - | 200 | 800 | 4 | 300 | 1200 | 4 |
| Jan 5 | Goods received note no. | 200 | 850 | 4.25 | - | - | - | 300 | 1200 | 4 |
| | | | | | | | | 200 | 850 | 4.25 |
| Jan 10 | Requisition slip no. | - | - | - | 200 | 850 | 4.25 | | | |
| | | | | | 200 | 850 | 4.00 | 100 | 400 | 4.00 |
| Jan 12 | Goods received note no. | 150 | 615 | 4.10 | - | - | - | 100 | 400 | 4.00 |
| | | | | | | | | 150 | 615 | 4.10 |
| Jan 15 | Requisition slip no. | - | - | - | 100 | 410 | 4.10 | 100 | 400 | 4.00 |
| | | | | | | | | 50 | 205 | 4.10 |
| Jan 19 | Requisition slip no. | - | - | - | 50 | 205 | 4.10 | | | |
| | | | | | 50 | 200 | 4.00 | 50 | 200 | 4.00 |
| Jan 20 | Goods received note no. | 300 | 1350 | 4.50 | - | - | - | 50 | 200 | 4.00 |
| | | | | | | | | 300 | 1350 | 4.50 |
| Jan 25 | Goods received note no. | 400 | 1600 | 4.00 | - | - | - | 50 | 200 | 4.00 |
| | | | | | | | | 300 | 1350 | 4.50 |
| | | | | | | | | 400 | 1600 | 4.00 |
| Jan 26 | Requisition slip no. | - | - | - | 200 | 800 | 4.00 | 50 | 200 | 4.00 |
| | | | | | | | | 300 | 1350 | 4.50 |
| | | | | | | | | 200 | 800 | 4.00 |
| Jan 30 | Requisition slip no. | - | - | - | 200 | 800 | 4.00 | 50 | 200 | 4.00 |
| | | | | | 50 | 225 | 4.50 | 250 | 1125 | 4.50 |

Module III

Labour

Labour cost is a second major element of cost. The control of labour cost and its accounting is very difficult as it deals with human element. Labour is the most perishable commodity and as such should be effectively utilized immediately.

Importance of Labour Cost Control

Labour is of two types (a) *direct labour*, (b) *indirect labour*. Direct Labour is that labour which is directly engaged in the production of goods or services and which can be conveniently allocated to the job, process or commodity or process. For example labour engaged in spinning department can be conveniently allocated to the spinning process.

Indirect Labour is that labour which is not directly engaged in the production of goods and services but which indirectly helps the direct labour engaged in production. The examples of indirect labour are supervisors, sweepers, cleaners, time-keepers, watchmen etc. The cost of indirect labour cannot be conveniently allocated to a particular job, order, process or article.

The distinction between direct and indirect labour must be observed carefully because payment of direct labour is a direct expenditure and is a part of prime cost whereas payment of indirect labour is an item of indirect expenditure and is shown as works, office, selling and distribution expenditure according to the nature of the time spent by the indirect worker.

Management is interested in the labour costs due to the following reasons.

- To use direct labour cost as a basis for increasing the efficiency of workers.
- To identify direct labour cost with products, orders, jobs or processes for ascertaining the cost of every product, order, or process.
- To use direct labour cost as a basis for absorption of overhead, if percentage of direct labour cost to overhead is to be used as a method of absorption of overhead.
- To determine indirect labour cost to be treated as overhead and
- To reduce the labour turnover.

Hence control of labour cost is an important objective of management and the realization of this objective depends upon the co-operation of every member of the supervisory force from the top executive to foremen.

Time keeping

Time-keeping will serve the following purposes:

1. Preparation of Pay Rolls in case of time-paid workers.
2. Meeting the statutory requirements.
3. Ensuring discipline in attendance.
4. Recording of each worker's time 'in' and 'out' of the factory making distinction between normal time, overtime, late attendance, early leaving.
5. For overhead distribution when overheads are absorbed on the basis of labour hours.

Methods of Time-keeping

There are two methods of time-keeping. They are the *manual methods* and the *mechanical methods*. Whichever method is used it should make a correct record of the time and the method should be cost effective and minimize the risk of fraud.

The manual methods of time keeping are as follows:

- a) Attendance Register Method, and
- b) Metal Disc Method

Attendance Register Method

This is the traditional method where an attendance register or muster roll is kept at the time office near the factory gate or in each department. The timekeeper records the name of the worker, the worker's number, the department in which he is working, the rate of wages, the time of arrival and departure, normal time and overtime. If the workers are literate, they may make a record of time themselves in the presence of a time-keeper or foreman.

This method is simple and inexpensive and can be used in small firms where the number of workers is not large. However recording the time of workers who work at customers' premises and places which are situated at a distance from the factory is not practical in this method.

Metal Disc Method

Under this method, each worker is allotted a metal disc or a token with a hole bearing his identification number. A board is kept at the gate with pegs on it and all tokens are hung on this board. These boards can be maintained separately for each department so that the workers can remove the token without delay and put it in a tray or box kept near the board. Immediately after the scheduled time for entering the factory, the box is removed and the latecomers will have to give their tokens to the timekeeper and their exact time of arrival is recorded. The tokens or disc left on the board will represent the absentee workers. Later the timekeeper records the attendance in the attendance register and subsequently it is passed on to the Pay Roll Department.

Mechanical Methods

The mechanical methods that are generally used for the recording of time of workers may be as follows:

- (a) Time Recording Clocks
- (b) Dial Time Records

Time Recording Clocks

The time recording clock is a mechanical device which automatically records the time of the workers. Under this method, each worker is given a *Time Card* which is kept in a tray near the factory gate and as the worker enters the gate, he picks up his card from the tray, puts it in the time recording clock which prints the exact time of arrival in the proper space against the particular day. This procedure is repeated for recording time of departure for lunch, return from lunch and time of leaving the factory in the evening. Late arrivals and overtime are recorded in red to attract the attention of the management.

Dial Time Records

Under this method, a dial time recorder machine is used. It has a dial with number of holes (usually about 150) and each hole bears a number corresponding to the identification number of the worker concerned. There is one radial arm at the centre of the dial. As a worker enters the factory gate, he is to press the radial arm after placing it at the hole of his number and his time will automatically be recorded on roll of a paper inside the dial time recorder against the number. The sheet on which the time is recorded provides a running account of the worker's time and it can calculate the number of hours and prepare the wage sheets. However, the high installation cost of the dial time recorder and its use for only a limited number of worker are the drawbacks of this method.

Time Booking

Time booking is the recording of time spent by the worker on different jobs or work orders carried out by him during his period of attendance in the factory. The objects of time booking are:

1. To ensure that time spent by a worker in a factory is properly utilized on different jobs or work orders.
2. To ascertain the labour cost of each individual job or work order.
3. To provide a basis for the apportionment of overhead expenses over various jobs or work orders when the method for the allocation of overheads depends upon time spent on different jobs.
4. To ascertain unproductive time or idle time so as to make efforts to keep it in limit.
5. To know the time taken to complete a particular job so that bonus can be paid as per the incentive schemes.
6. To know the efficiency of workers, it is necessary to make the comparison of actual time taken with time allowed for completing a particular task.

Following documents are generally used for time booking:

1. Daily Time Sheets
2. Weekly Time Sheets
3. Job Tickets or Job Cards.

Daily time sheets are given to each worker where he records the time spent by him on each job or work order. Weekly time sheets record the same particulars for a week and hence one card is required for a week. Job cards are used to keep a close watch on the time spent by a worker on each job so that the labour cost of a job may be conveniently ascertained.

Idle Time

There is always a difference between the time booked to different jobs or work orders and the time recorded at the factory gate. This difference is known as idle time. Idle time is of two types.

- (a) Normal Idle Time
- (b) Abnormal Idle Time

Normal Idle Time: This represents the time, the wastage of which cannot be avoided and, therefore, the employer must bear the labour cost of this time. But every effort should be made to reduce it to the lowest possible level. Examples of normal idle time are: time taken in going from the factory gate to the department in which the worker is to work and back at the end of the day, time taken in picking up the work for the day, time between the completion of one work and the start of another work, time taken for personal needs like tea or toilet, time taken for machine maintenance, time taken for waiting for instructions, printouts, machine set-up time etc.

Normal Idle Time is unavoidable cost as such should be included in cost of production. The cost of normal idle time can be treated as an item of factory expenses and recovered as an indirect charge or added to labour cost.

Abnormal Idle Time: It is that time the wastage of which can be avoided if proper precautions are taken. Example: time wasted due:- to breakdown of machinery on account of inefficiency of the works engineer, failure of the power supply, shortage of materials, waiting for instructions, waiting for tools and raw materials, strikes or lock-outs in the factory.

It is a principle of costing that all abnormal expenses and losses should not be included in costs and as such wages paid for abnormal idle time should not form part of the cost of production. Hence it is debited to Costing Profit and Loss Account.

Over Time: - It is the work done beyond the normal working period in a day or week. For overtime done, the workers are given double the wages for the overtime done. The additional amount paid on account of overtime is known as overtime premium.

Overtime increases the cost of production and should not be encouraged as it has the following disadvantages.

1. Overtime is paid at higher rate.
2. Overtime is done at late hours when workers have become tired and efficiency will be as much as during the normal working hours.
3. Workers will develop the habit of working slowly during normal hours and complete the work using overtime to earn more wages.
4. Expenses like lighting, cost of supervision, and wear and tear of machines will increase disproportionately.

Overtime should be recorded separately and thoroughly investigated to see that it is incurred only when genuinely required.

The treatment of overtime depends on the situation. If overtime is incurred for because of the sequence of jobs, then normal wages is charged to labour cost for the overtime also but if it is a rush job, then the overtime wages is added to the cost of labour. On the other hand if overtime arises due to any abnormal reason like breakdown of machinery or power failure, overtime premium is excluded from the cost of production and is debited to the Costing Profit and Loss Account.

Illustration 8: Calculate the normal and overtime wages payable to a workman from the following data:

| <i>Days</i> | <i>Hours Worked</i> |
|----------------------|--|
| Monday | 8 hrs. |
| Tuesday | 10 hrs. |
| Wednesday | 9 hrs. |
| Thursday | 11 hrs. |
| Friday | 9 hrs. |
| Saturday | <u>4 hrs.</u> |
| Total | <u>51 hrs.</u> |
| Normal Working Hours | 8 hours per day |
| Normal rate | Re.1 per hour |
| Overtime rate | up to 9 hours in a day at single rate and over 9 hours in a day at double rate; or up to 48 hours in a week at single rate and over 48 hours at double rate whichever is more beneficial to the workman. |

Solution:

| Days | Total Hours | Normal Working Hours | Overtime Hours | |
|-----------|-------------|----------------------|----------------|----------------|
| | | | At Single rate | At Double rate |
| Monday | 8 | 8 | - | - |
| Tuesday | 10 | 8 | 1 | 1 |
| Wednesday | 9 | 8 | 1 | - |
| Thursday | 11 | 8 | 1 | 2 |
| Friday | 9 | 8 | 1 | - |
| Saturday | 4 | 4 | | |
| Total | 51 | 44 | 4 | 3 |

Normal Wages for 44 hours @ Re.1 Rs.44

Overtime Wages:

At single rate for 4 hours @ Re.1 = Rs.4

At double rate for 3 hours @ Rs.2 = Rs.6 Rs.10

Total Wages Rs.54

Or

Normal Wages for 48 hours @ Re.1 per hour = Rs.48

Overtime Wages for 3 hours @ Rs.2 per hour= Rs. 6

Rs.54

Therefore, whichever method is followed, the amount of the wages payable to the worker is Rs.54.

System of Wage Payment

There is no single method of wage payment which is acceptable both to the employers and the workers. The system of wages should result into higher production, improved quality of output and a contented labour force.

There are two principal wage systems: (i) Payment on the basis of time spent in the factory irrespective of the amount of work done. This method is known as time wage system. (ii) Payment on the basis of the work done irrespective of the time taken by the worker. This method is called piece rate system.

Other methods called premium plans or bonus and profit sharing schemes are used with either of the two principal methods of wage payment.

Time Wage System

Under this method of wage payment, the worker is paid at an hourly, daily, weekly or monthly rate. This payment is made according to the time worked irrespective of the work done.

This method is highly suitable for following types of work:

1. Where highly skilled and apprentices are working.
2. Where quality of goods produced is of extreme importance eg., artistic goods
3. Where the speed of work is beyond the control of the workers.
4. Where close supervision of work is possible.
5. Where output cannot be measured.

The disadvantages of this method are:

1. Workers are not motivated.
2. Workers will get payment for idle time.
3. Efficient workers will become inefficient in the long run as all of them get same wages.
4. Employer finds it difficult to calculate labour cost per unit as it varies as production increases and decreases.
5. Strict supervision is necessary to get the work done.
6. Inefficiency results in upsetting the production schedule and increases the cost per unit.
7. It will encourage a tendency among workers to go slow so as to earn overtime wages.

Thus this method does not establish a proportionate relationship between effort and reward and the result is that it is not helpful in increasing production and lowering labour cost per unit.

Piece Rate System (payment by result)

Under this system of wage payment, a fixed rate is paid for each unit produced, job completed or an operation performed. Thus, payment is made according to the quantity of work done no consideration is given to the time taken by the workers to perform the work.

There are four variants of this system.

- a) Straight piece rate system
- b) Taylor's differential piece rate system
- c) Merrick's multiple piece rate system
- d) Gant's task and bonus plan

(a) Straight piece rate system

Payment is made as per the number of units produced at a fixed rate per unit. Another method is piece rate with guaranteed time rate in which the worker is given time rate wages if his piece rate wages is less than the time rate.

Advantages

1. Wages are linked to output so workers are paid according to their merits.
2. Workers are motivated to increase production to earn more wages.
3. Increased production leads to decreased cost per unit of production and hence profit per unit increases.
4. Idle time is not paid for and is minimized.
5. The employer knows his exact labour cost and hence can make quotations confidently.
6. Workers use their tools and machinery with a greater care so that the production may not be held up on account of their defective tools and machinery.
7. Less supervision is required because workers get wages for only the units produced.
8. Inefficient workers are motivated to become efficient and earn more wages by producing more.

Disadvantages

1. Fixing of piece work rate is difficult as low piece rate will not induce workers to increase production.
2. Quality of output will suffer because workers will try to produce more quickly to earn more wages.
3. There may not be an effective use of material, because of the efforts of workers to increase the production. Haste makes waste. Thus there will be more wastage of material.
4. When there is increased production, there may be increased wastage of materials, high cost of supervision and inspection and high tools cost and hence cost of production might increase.
5. Increased production will not reduce the labour cost per unit because the same rate will be paid for all units. On the other hand, increased production will reduce the labour cost per unit under the time wage system.
6. Workers have the fear of losing wages if they are not able to work due to some reason.
7. Workers may work for long hours to earn more wages, and thus, may spoil their health.
8. Workers may work at a very high speed for a few days, earn good wages and then absent themselves for a few days, upsetting the uniform flow of production.
9. Workers in the habit of producing quality goods will suffer because they will not get any extra remuneration for good quality.
10. The system will cause discontentment among the slower workers because they are not able to earn more wages.

This method can be successfully applied when:

1. The work is of a repetitive type.
2. Quantity of output can be measured.
3. Quality of goods can be controlled.
4. It is possible to fix an equitable and acceptable piece rate
5. The system is flexible and rates can be adjusted to changes in price level.
6. Materials, tools and machines are sufficiently available to cope with the possible increase in production.
7. Time cards are maintained so that workers are punctual and regular so that production may not slow down.

(b) Taylor's Differential Piece Rate system

This system was introduced by Taylor, the father of scientific management to encourage the workers to complete the work within or less than the standard time. Taylor advocated two piece rates, so that if a worker performs the work within or less than the standard time, he is paid a higher piece rate and if he does not complete the work within the standard time, he is given a lower piece rate.

Illustration 9 : Calculate the earnings of workers A and B under Straight Piece-rate System and Taylor's Differential Piece-rate System from the following particulars.

Normal rate per hour = Rs.1.80

Standard time per unit = 20 seconds

Differentials to be applied:

80 % of piece rate below standard

120% of piece rate at or above standard.

Worker A produces 1,300 units per day and worker B produces 1,500 units per day.

SOLUTION

Standard production per 20 seconds = 1 unit

Standard production per minute = $60/20 = 3$ units

Standard production per hour = $3 \times 60 = 180$ units

Standard production per day of 8 hrs(assumed) = $180 \times 8 = 1440$ units

Normal rate per hour = Rs.1.80

Normal piece rate = $\text{Rs.1.80} / 180 \text{ units} = 1 \text{ paisa}$

Low piece rate below standard production $\frac{1\text{P} \times 80}{100} = 0.8 \text{ paise}$

High piece rate at or above standard $\frac{1\text{P} \times 120}{100} = 1.2 \text{ paise}$

Earning of worker A

Under straight piece rate system

$$1300 \text{ units @ } 1\text{P} = \frac{1300 \times 1}{100} = \text{Rs.13}$$

Under Taylor's Differential Piece-rate System

$$1300 \text{ units @ } 0.8 \text{ P} = \frac{1300 \times 0.8}{100} = \text{Rs.10.40}$$

Low piece rate has been applied because worker A's daily production of 1300 units is less than the standard daily production of 1,440 units.

Earnings of Worker B

Under Straight Piece-rate System

$$1500 \text{ units @ } 1\text{P} = \frac{1500 \times 1}{100} = \text{Rs.15}$$

Under Taylor's Differential Piece-rate System

$$1500 \text{ units @ } 1.2\text{P} = \frac{1500 \times 1.2}{100} = \text{Rs.18}$$

High piece-rate has been applied because worker B's daily production of 1500 units is more than the standard daily production of 1440 units.

c) Merrick's Multiple Piece Rate System

This method seeks to make an improvement in the Taylor's differential piece rate system. Under this method, three piece rates are applied for workers with different levels of performance. Wages are paid at ordinary piece rate to those workers whose performance is less than 83% of the standard output, 110% of the ordinary piece rate is given to workers whose level of performance is between 83% and 100% of the standard and 120% of the ordinary piece rate is given to workers who produce more than 100% of the standard output.

This method is not as harsh as Taylor's piece rate because penalty for slow workers is relatively lower.

Illustration 10: Calculate the earnings of workers A, B and C under straight piece rate system and Merrick's multiple piece rate system from the following particulars:

Normal rate per hour Rs.1.8

Standard time per unit 1 minute

Output per day is as follows:

Worker A : 384 units

Worker B : 450 units

Worker C : 552 units

Working hours per day are 8

SOLUTION

| | |
|--|--|
| Standard output per minute | = 1 unit |
| Standard production per hour | = 60 units |
| Standard production per day of 8 hours | = 480 units(8 x 60) |
| Normal rate per hour | = Rs.1.80 |
| Normal output per hour | = 60 units |
| Normal piece rate | = $\frac{\text{Rs. 1.80}}{60} = 3 \text{ paise}$ |

Calculation of level of performance:

| | |
|---------------------------------|--|
| Standard output per day | = 480 units |
| Worker A's output per day | = 384 units |
| Worker A's level of performance | = $\frac{384}{480} \times 100 = 80\%$ |
| Worker B's output per day | = 450 units |
| Worker B's level of performance | = $\frac{450}{480} \times 100 = 93.75\%$ |
| Worker C's output per day | = 552 units |
| Worker C's level of performance | = $\frac{552}{480} \times 100 = 115\%$ |

Earnings of Worker A

Under straight piece rate system:

For 384 units @ 3 paise per unit = $384 \times 0.03 = \text{Rs.}11.52$

Under Merrick's multiple piece rate system:

For 384 units @ 3 paise per unit = $384 \times 0.03 = \text{Rs.}11.52$

Earnings of Worker B

Under straight piece rate system:

For 450 units @ 3 paise per unit = $450 \times 0.03 = \text{Rs.}13.50$

Under Merrick's multiple piece rate system:

For 450 units @ 3.3 paise per unit = $450 \times 0.033 = \text{Rs.}14.85$

Earnings of Worker C

Under straight piece rate system:

For 552 units @ 3 paise per unit = $552 \times 0.03 = \text{Rs.}16.56$

Under Merrick's multiple piece rate system:

For 552 units @ 3.6 paise per unit = $552 \times 0.036 = \text{Rs.}19.87$

Worker C's level of performance is 115% which is more than 100% of standard output; so he is entitled to get 120% of normal piece rate (ie. 120% of 3 paise or 3.6 paise per unit)

Premium and Bonus Plan

The object of a premium plan is to increase the production by giving an inducement to the workers in the form of higher wages for less time worked.

Under a premium plan, a standard time is fixed for the completion of a specific job or operation at an hourly rate plus wages for a certain fraction of the time saved by way of a bonus. The plan is also known as incentive plan because a worker has the incentive to earn more wages by completing the work in less time.

This system of wage payment is in between the time wage system and piece work system. In time wage system, worker does not get any reward for the time saved and in piece work system, the worker gets full payment for time saved whereas in a premium plan both the worker and the employer share the labour cost of the time saved.

The following are some of the important premium plans.

- (i) **Halsey Premium Plan:** Under this method, the worker is given wages for the actual time taken and a bonus equal to half of wages for time saved. The standard time for doing each job or operation is fixed. In practice the bonus may vary from 33 % to 66 % of the wages of the time saved.

Thus if S is the standard time, T the time taken, R the labour rate per hour, and % the percentage of the wages of time saved to be given as bonus, total earnings of the worker will be:

$$T \times R + \% (S-T) R$$

Under Halsey-Weir plan, the premium is set at 30% of the time saved.

Illustration 11:

Rate per hour = Rs.1.50 per hour

Time allowed for job = 20 hours

Time taken = 15 hours

Calculate the total earnings of the worker under the Halsey Plan. Also find out effective rate of earnings.

SOLUTION:

Standard time (S) = 20 hours

Time taken (T) = 15 hours

Rate per hour (R) = Rs.1.50 per hour

$$\begin{aligned}\text{Total Earnings} &= T \times R + 50\% (S-T) \times R \\ &= 15 \times \text{Rs. } 1.50 + \frac{50}{100} (20-15) \times \text{Rs. } 1.50 \\ &= \text{Rs. } 26.25\end{aligned}$$

Total wages for 15 hours = Rs.26.25

Therefore, effective rate of earning per hour

$$= \frac{\text{Total Wages}}{\text{Actual Time Taken}} = \frac{\text{Rs. } 26.25}{15} = \text{Rs. } 1.75$$

Actual Time Taken

(The percentage of bonus is taken as 50% when not given)

The advantages of the Halsey Premium Plan are:

It is simple to understand and relatively simple to calculate.

1. It guarantees time wages to workers.
2. The wages of time saved are shared by both employers and workers, so it is helpful in reducing labour cost per unit.
3. It motivates efficient workers to work more as there is increasing incentive to efficient workers.
4. Fixed overhead cost per unit is reduced with increase in production.
5. The employer is able to reduce cost of production by having reduction in labour cost and fixed overhead cost per unit. So, he is induced to provide the best possible equipment and working conditions.

Disadvantages

1. Quality of work suffers because workers are in a hurry to save more and more time to get more and more bonus.
2. Workers criticize this method on the ground that the employer gets a share of wages of the time saved.

- (ii) **Rowan Plan:** The difference between Halsey plan and Rowan Plan is the calculation of the bonus. Under this method also the workers are guaranteed the time wages but the bonus is that proportion of the wages of the time taken which the time saved bears to the standard time allowed.

$$\text{Total Earnings} = T \times R + \frac{S-T}{S} \times T \times R$$

Illustration 12:

A worker completes a job in a certain number of hours. The standard time allowed for the job is 10 hours, and the hourly rate of wages is Rs.1. The worker earns a 50% rate of bonus of Rs. 2 under Halsey Plan. Ascertain his total wages under the Rowan Premium Plan.

Solution: The worker earns Rs.2 as bonus at 50%; so total bonus at 100% should be Rs.4. The hourly rate of wages being Re.1, the time saved should be 4 hours.

| | |
|-----------------------|----------------|
| Standard time allowed | 10 hours |
| Less: Time Saved | <u>4 hours</u> |
| Time Taken | <u>6 hours</u> |

Earnings under the Rowan Premium Plan

$$\text{Earnings} = T \times R + \frac{S-T}{S} \times T \times R$$

Where, T = 6 hours

S = 10 hours

R = Re.1 per hour

$$\begin{aligned} \text{Earnings} &= 6 \times 1 + \frac{10-6}{10} \times 6 \times 1 \\ &= 6 + \text{Rs.}2.40 = \text{Rs.}8.40 \end{aligned}$$

Advantages

1. It guarantees time wages to workers
2. The quality of work does not suffer as they are not induced to rush through production as bonus increases at a decreasing rate at higher levels of efficiency.
3. Labour cost per unit is reduced because wages of time saved are shared by employer and employee.
4. Fixed overhead cost is reduced with increase in production.

Disadvantages

1. The Rowan plan is criticized by workers on the ground that they do not get the full benefit of the time saved by them as they are paid bonus for a portion of the time saved.
2. The Rowan plan suffers from another drawback that two workers, one very efficient and the other not so efficient, may get the same bonus.

Overheads: -

Cost related to a cost center or cost unit may be divided into two ie. Direct and Indirect cost. The Indirect cost is the overhead cost and is the total of indirect material cost, indirect labour cost, indirect expenses. CIMA defines indirect cost as *“expenditure on labour, materials or services which cannot be economically identified with a specific salable cost per unit”*. Indirect costs are those costs which are incurred for the benefit of a number of cost centers or cost units. So any expenditure over and above prime cost is known as overhead. It is also called ‘burden’, ‘supplementary costs’, ‘on costs’, ‘indirect expenses’.

Classification of Overheads

Overheads can be classified on the following basis:

- i) **Function-wise classification:** Overheads can be divided into the following categories on functional basis.
 - (a) Manufacturing or production overheads eg:- indirect materials like lubricants, cotton wastes, indirect labour like salaries and wages of supervisors, inspectors, storekeepers, indirect expenses like rent, rates and insurance of factory, power, lighting of factory, welfare expenses like canteen, medical etc.
 - (b) Administration overheads eg:- indirect materials like office stationery and printing, indirect labour salaries of office clerks, secretaries, accountants, indirect expenses rent, rates and insurance of office, lighting heating and cleaning of office, etc.
 - (c) Selling and Distribution overheads eg:- indirect materials like catalogues, printing, stationery, price list, indirect salary of salesmen, agents, travellers, sales managers, indirect expenses like rent, rates and insurance of showroom, finished goods, godown etc., advertising expenses, after sales service, discounts, bad debts etc.
- ii) **Behavior-wise classification:** Overheads can be classified into the following categories as per behavior pattern.
 - (a) Fixed overheads like managerial remuneration, rent of building, insurance of building, plant etc.
 - (b) Variable overheads like direct material and direct labour.
 - (c) Semi-variable overheads like depreciation, telephone charges, repair and maintenance of buildings, machines and equipment etc.
- iii) **Element-wise classification:** Overheads can be classified into the following categories as per element.
 - (a) Indirect materials
 - (b) Indirect labour
 - (c) Indirect expenses

Allocation and Apportionment of Overhead to Cost Centres (Departmentalisation of Overhead)

When all the items are collected properly under suitable account headings, the next step is allocation and apportionment of such expenses to cost centres. This is also known as departmentalization or primary distribution of overhead.

A factory is administratively divided into different departments like Manufacturing or Producing department, Service department, partly producing departments.

Allocation of Overhead Expenses

Allocation is the process of identification of overheads with cost centres. An expense which is directly identifiable with a specific cost centre is allocated to that centre. Thus it is allotment of a whole item of cost to a cost centre or cost unit. For example the total overtime wages of workers of a department should be charged to that department. The electricity charges of a department if separate meters are there should be charged to that particular department only.

Apportionment of Overhead Expenses

Cost apportionment is the allotment of proportions of cost to cost centres or cost units. If a cost is incurred for two or more divisions or departments then it is to be apportioned to the different departments on the basis of benefit received by them. Common items of overheads are rent and rates, depreciation, repairs and maintenance, lighting, works manager's salary etc.

Basis of Apportionment

Suitable bases have to be found out for apportioning the items of overhead cost to production and service departments and then for reapportionment of service departments costs to other service and production departments. The basis selected should be correlated to the expenses and the expense should be measurable by the basis. This process of distribution of common expenses over the departments on some equitable basis is known as 'Primary Distribution'.

The following are the main bases of overhead apportionment utilized in manufacturing concerns:

Direct Allocation. Under direct allocation, overheads are directly allocated to the department for which it is incurred. Example overtime premium of workers engaged in a particular department, power, repairs of a particular department etc.

- (i) **Direct Labour/Machine Hours.** Under this basis, overhead expenses are distributed to various departments in the ratio of total number of labour or machine hours worked in each department. Majority of general overhead items are apportioned on this basis.
- (ii) **Value of materials passing through cost centres.** This basis is adopted for expenses associated with material such as material handling expenses.
- (iii) **Direct wages.** Expenses which are booked with the amounts of wages eg:- worker's insurance, their contribution to provident fund, worker's compensation etc. are distributed amongst the departments in the ratio of wages.

Illustration 13: The Modern Company is divided into four departments: A, B and C are producing departments, and D is a service departments. The actual costs for a period are as follows:

| | | | |
|-----------------------|---------|------------------------------------|--------|
| Rent | Rs.1000 | Repairs to Plant | Rs.600 |
| Supervision | Rs.1500 | Fire Insurance in respect of Stock | Rs.500 |
| Depreciation of Plant | Rs.450 | Power | Rs.900 |
| Light | Rs.120 | Employers' liability for insurance | Rs.150 |

The following information is available in respect of the four departments;

| | Dept.A | Dept.B | Dept.C | Dept.D |
|----------------------|--------|--------|--------|--------|
| Area (sq.mtrs) | 1,500 | 1,100 | 900 | 500 |
| Number of Employees | 20 | 15 | 10 | 5 |
| Total Wages (Rs.) | 6,000 | 4,000 | 3,000 | 2,000 |
| Value of Plant (Rs.) | 24,000 | 18,000 | 12,000 | 6,000 |
| Value of stock (Rs.) | 15,000 | 9,000 | 6,000 | - |
| H.P. of Plant | 24 | 18 | 12 | 6 |

Apportion the costs to the various departments on the most equitable basis.

SOLUTION

OVERHEADS DISTRIBUTION SUMMARY

| Items | Basis of apportionment | Total Amount Rs. | Product Departments | | | Service Department D Rs. |
|----------------------|------------------------|---------------------|---------------------|--------------|--------------|-----------------------------|
| | | | A Rs. | B Rs. | C Rs. | |
| Rent | Floor Area | 1,000 | 375 | 275 | 225 | 125 |
| Supervision | No. of Employees | 1,500 | 600 | 450 | 300 | 150 |
| Depreciation | Plant Value | 450 | 180 | 135 | 90 | 45 |
| Light | Floor area | 120 | 45 | 33 | 27 | 15 |
| Repairs to Plant | Plant Value | 600 | 240 | 180 | 120 | 60 |
| Fire Insurance | Stock Value | 500 | 250 | 150 | 100 | - |
| Power | HP. Of Plant | 900 | 360 | 270 | 180 | 90 |
| Employer's Liability | No. of Employees | 150 | 60 | 45 | 30 | 15 |
| Total | | <u>5,220</u> | <u>2,110</u> | <u>1,538</u> | <u>1,072</u> | <u>500</u> |

Re-apportionment of Service Department Costs to Production Departments

Service department costs are to be reappportioned to the production departments or the cost centres where production is going on. This process of re-apportionment of overhead expenses is known as '**Service Distribution**'. The following is a list of the bases of apportionment which may be accepted for the service departments noted against

| Service Department Cost | Basis of Apportionment |
|---|--|
| 1. Maintenance Department | -Hours worked for each department |
| 2. Payroll or time-keeping department | -Total labour or Machine hours or number of employees in each department |
| 3. Store keeping department | - no. of requisitions or value of materials of each department. |
| 4. Employment or Personnel department. | - Rate of labour turnover or number of employees in each department. |
| 5. Purchase Department | -no. of purchase orders or value of materials |
| 6. Welfare, ambulance, canteen service, recreation room expenses. | -No. of employees in each department. |
| 7. Building service department | -Relative area in each department |
| 8. Internal transport service or overhead crane service | -Weight, value graded product handled, weight and distance travelled. |
| 9. Transport Department | -crane hours, truck hours, truck mileage, truck tonnage, truck tonne-hours, tonnage handled, number of packages. |
| 10. Power House (Electric power cost) | -wattage, horse power, horse power machine hours, number of electric points etc. |

The following are the various methods of re-distribution of service department costs to production departments.

1. Direct re-distribution method
2. Step distribution method
3. Reciprocal Services method
 - a. Simultaneous Equation Method
 - b. Repeated Distribution Method
 - c. Trial and Error Method

Direct re-distribution method

Under this method, the costs of service departments are directly apportioned to production departments without taking into consideration any service from one service department to another service department. Thus, proper apportionment cannot be done on the assumption that service departments do not serve each other and as a result the production departments may either be overcharged or undercharged. The share of each service department cannot be ascertained accurately for control purposes. Budget for each department cannot be prepared thoroughly. Therefore, Department Overhead rates cannot be ascertained correctly.

Illustration 14: In an Engineering factory, the following particulars have been collected for the three months' period ended on 31st March, 2007. You are required to prepare Production Overheads Distribution Summary showing clearly the basis of apportionment where necessary.

| | | Production Departments | | | Service Departments | |
|-----------------|-------|------------------------|--------|--------|---------------------|-------|
| | | A | B | C | D | E |
| Direct Wages | Rs. | 2000 | 3000 | 4000 | 1000 | 2000 |
| Direct Material | Rs. | 1000 | 2000 | 2000 | 1500 | 1500 |
| Staff | Nos. | 100 | 150 | 150 | 50 | 50 |
| Electricity | Kwh. | 4000 | 3000 | 2000 | 1000 | 1000 |
| Light Points | No. | 10 | 16 | 4 | 6 | 4 |
| Asset Value | Rs. | 60,000 | 40,000 | 30,000 | 10,000 | 10000 |
| Area Occupied | Sq.m. | 150 | 250 | 50 | 50 | 50 |

The expenses for the period were:

Motive power Rs.550; Lighting Power Rs.100; Stores Overheads Rs.400; Amenities to Staff Rs.1500; Depreciation Rs.15,000; Repairs and Maintenance Rs.3,000; General Overheads Rs.6000; and Rent and Taxes Rs. 275.

Apportion the expenses of service department E in proportion of 3:3:4 and those of service department D in the ratio of 3:1:1 to departments A, B and C respectively.

SOLUTION**PRODUCTION OVERHADS DISTRIBUTION SUMMARY***For the quarter ending 31st March, 2007*

| | Production Departments | | | Service Departments | | Total Rs. |
|---|------------------------|----------|----------|---------------------|----------|--------------|
| | A Rs. | B Rs. | C Rs. | D Rs. | E Rs. | |
| Direct Wages | | | | 1000 | 2000 | 3000 |
| Direct Materials | | | | 1500 | 1500 | 3000 |
| Motive Power @ 5p.per Kwh | 200 | 150 | 100 | 50 | 50 | 550 |
| Lighting Power @ Rs.2.50per Point | 25 | 40 | 10 | 15 | 10 | 100 |
| Stores Overhead @ 5% of Direct Material | 50 | 100 | 100 | 75 | 75 | 400 |
| Amenities to staff @ Rs.3 per employee | 300 | 450 | 450 | 150 | 150 | 1500 |
| Depreciation @ 10% of the value of asset. | 6000 | 4000 | 3000 | 1000 | 1000 | 15000 |
| Repairs and maintenance @ 2% of value | 1200 | 800 | 600 | 200 | 200 | 3000 |
| General Overheads @ 50% of Direct Wages | 1000 | 1500 | 2000 | 500 | 1000 | 6000 |
| Rent and Taxes @Re.0.50 per sq.meter | 75 | 125 | 25 | 25 | 25 | 275 |
| Total | 8,850 | 7,165 | 6,285 | 4,515 | 6,010 | 32,825 |
| Dept. E (3: 3 : 4) | 1,803 | 1,803 | 2,404 | | (6,010) | |
| Dept. D (3 : 1 : 1) | 2,709 | 903 | 903 | (4,515) | | |
| Total | 13,362 | 9,871 | 9,592 | | | 32,825 |

Step Distribution Method

Under this method, the cost of most serviceable department is first apportioned to other service departments and production departments. The next service department is taken up and its cost is apportioned and this process goes on till the cost of the last service department is apportioned. Thus, the cost of last service department is apportioned only to production departments.

Illustration 15: A manufacturing company has two Production Departments, P1 and P2 and three Service Departments, Time-keeping, Stores and Maintenance. The Departmental Summary showed the following expenses for July, 2007 .

*Production Departments**Service Departments**(in order of their importance)*

| P1 | P2 | S1 | S2 | S3 |
|--------|--------|----------------|----------|---------------|
| | | (Time-keeping) | (Stores) | (Maintenance) |
| Rs. | Rs. | Rs. | Rs. | Rs. |
| 16,000 | 10,000 | 4,000 | 5,000 | 3,000 |

The other information relating to departments were:

| | Service Departments | | | Production Departments | |
|----------------------------|---------------------|-------------|------------------|------------------------|------|
| | S1 (Time-keeping) | S2 (Stores) | S3(Main-tenance) | P1 | P2 |
| No. of Employees | - | 20 | 10 | 40 | 30 |
| No. of Stores requisitions | - | - | 6 | 24 | 20 |
| Machine Hours | - | - | - | 2400 | 1600 |

SOLUTION:

| Department | As per Primary Distribution System | | | | |
|-------------------|------------------------------------|----------|----------|----------|--------|
| S1 (Time-keeping) | 4000 | (-) 4000 | | | |
| S2 Stores | 5000 | 800 | (-) 5800 | | |
| S3 Maintenance | 3000 | 400 | 696 | (-) 4096 | |
| P1 | 16000 | 1600 | 2784 | 2458 | 22,842 |
| P2 | 10000 | 1200 | 2320 | 1638 | 15,158 |
| | 38,000 | | | | 38,000 |

Note: basis of apportionment

- (a) Time-keeping – No. of employees (ie. 2:1:4:3)
- (b) Stores – No. of stores requisitions (ie. 3:12:10)
- (c) Maintenance- Machine Hours (ie. 3:2)

The most important limitation of this method is that the cost of one service centre to other service cost centres is ignored and thus the cost of individual cost centres are not truly reflected.

Reciprocal Services Method

In order to avoid the limitation of Step Method, this method is adopted. This method recognizes the fact that if a given department receives service from another department, the department receiving such service should be charged. If two departments provide service to each other, each department should be charged for the cost of services rendered by the other. There are three methods available for dealing with inter-service departmental transfer:

- a. Simultaneous Equation Method
- b. Repeated Distribution Method
- c. Trial and Error Method

(a) Simultaneous Equation method

Under this method, the true cost of the service departments are ascertained first with the help of simultaneous equations; these are then redistributed to production departments on the basis of given percentage. The following illustration may be taken to discuss the application of this method.

Illustration 16:

A company has three production departments and two service departments, and for a period the departmental distribution summary has the following totals.

| | Rs. |
|--------------------------------------|-------------|
| Production Departments | |
| P1- Rs. 800; P2- Rs. 700; P3- Rs.500 | 2000 |
| Service Departments: | |
| S1 – Rs. 234; S2- Rs.300 | <u>534</u> |
| | <u>2534</u> |

The expenses of the service departments are charged out on a percentage basis as follows;

| | P1 | P2 | P3 | S1 | S2 |
|-----------------------|-----|-----|-----|-----|-----|
| Service Department S1 | 20% | 40% | 30% | - | 10% |
| Service Department S2 | 40% | 20% | 20% | 20% | - |

Prepare a statement showing the apportionment of two service departments expenses to production departments by Simultaneous Equation Method.

SOLUTION:

By Simultaneous Equation Method

Let x = total overheads of department S1

y = total overheads of department S2

Then,

$$x = \text{Rs.}234 + .2y$$

$$y = \text{Rs.}300 + .1x$$

Rearranging and multiplying to eliminate decimals;

$$10x - 2y = \text{Rs.}2,340 \quad \dots\dots\dots(1)$$

$$-x + 10y = \text{Rs.}3,000 \quad \dots\dots\dots(2)$$

Multiplying equation (1) by 5 and add result to (2), we get

$$49x = \text{Rs.}14,700$$

$$x = \text{Rs.}300$$

Substituting this value in equation (1), we get

$$y = \text{Rs.}330$$

All that now remains to be done is to take these values $x = \text{Rs.}300$ and $y = \text{Rs.}330$ and apportion them on the basis of the agreed percentage to the three production departments; thus:

| | Total | P1 | P2 | P3 |
|--------------------------|-------|-----|-----|-----|
| Per distribution summary | 2,000 | 800 | 700 | 500 |
| Service department S1 | 270 | 60 | 120 | 90 |
| Service department S2 | 264 | 132 | 66 | 66 |
| | 2,534 | 992 | 886 | 656 |

This method is recommended in more than two service departments if the data is processed with computers and in two service departments only where the data is processed manually.

(b) Repeated Distribution Method

Under this method, the totals are shown in the departmental distribution summary, are put out in a line, and then the service department totals are exhausted in turn repeatedly according to the agreed percentages until the figures become too small to matter.

By solving illustration 16 by Repeated Distribution Method, we get the Secondary Distribution Summary which is given as follows:

SECONDARY DISTRIBUTION SUMMARY

| | P1 | P2 | P3 | S1 | S2 |
|-----------------------|-----|-----|-----|-------|-------|
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| As per summary | 800 | 700 | 500 | 234 | 300 |
| Service Department S1 | 47 | 94 | 70 | (234) | 23 |
| Service Department S2 | 129 | 65 | 65 | 64 | (323) |
| Service Department S1 | 14 | 25 | 19 | (64) | 6 |
| Service Department S2 | 2 | 2 | 2 | | (6) |
| | 992 | 886 | 656 | - | - |

(c) Trial and Error Method

Under this method, the cost of one service department is apportioned to another centre. The cost of another centre plus the share received from the first centre is again apportioned to the first cost centre and this process is repeated till the balancing figure becomes negligible.

By solving illustration 16 by Trial and Error Method, we get the following:

| | Service Departments | |
|---------------------------|---|--|
| | S1 | S2 |
| Original apportionment | Rs. 234 (23) 65(20% of 323) (65) 1(20% of 7) | Rs. 300 23 (10% of 234) (323) 7 (10% of 65) (7) |
| Total of positive figures | 300 | 330 |

ABSORPTION OF OVERHEAD

Absorption means the distribution of the overhead expenses allotted to a particular department over the units produced in that department. Overhead absorption is accomplished by overhead rates.

Methods of Absorption of Manufacturing Overhead

The following are the main methods of absorption of manufacturing or factory overheads.

- (a) **Direct Material Cost Method.** Under this method percentage of factory expenses to value of direct materials consumed in production is calculated to absorb manufacturing overheads.

The formula is

$$\text{Overhead Rate} = \frac{\text{Production Overhead Expenses (Budgeted)}}{\text{Anticipated Direct Material Cost}}$$

Anticipated Direct Material Cost

If in a factory the anticipated cost of direct material is Rs. 4,00,000 and the over head budgeted expenses are Rs. 1,00,000, then the overhead rate will be 25% ie.(Rs.1,00,000 ÷ Rs.4,00,000) of the materials used. It is assumed that relationship between materials and factory expenses will not change. This method is simple and can be adopted under the following circumstances:

- (i) Where the proportion of overheads to the total cost is significant.
- (ii) Where the prices of materials are stable.
- (iii) Where the output is uniform ie. Only one kind of article is produced.
- (b) **Direct Labour Cost (or Direct Wages) Method.** This is a simple and easy method and widely used in most of the concerns. The overhead rate is calculated as under:

$$\text{Overhead Rate} = \frac{\text{Production Overhead Expenses}}{\text{Direct Labour Cost}}$$

If from past experience, the percentage of factory expenses to direct wages is 50%, then the factory expenses in the next year is taken as 50% of the direct wages.

This method is suitable under the following situations:

- (i) Where direct labour constitutes a major proportion of the total cost of production.
- (ii) Where production is uniform.
- (iii) Where labour employed and types of work performed are uniform.
- (iv) Where the ratio of skilled and unskilled labour is constant.
- (v) Where there are no variations in the rates of pay ie., the rates of pay and the methods are the same for the majority of the workers in the concern.

In some concerns a separate rate is calculated for the fringe benefits and applied on the basis of direct labour cost.

- (c) **Prime Cost Method.** Under this method the recovery rate is calculated dividing the budgeted overhead expenses by the aggregate of direct materials and direct labour cost of all the products of a cost centre. The formula is

$$\text{Overhead Recovery Rate} = \frac{\text{Production Budgeted Overhead Expenses}}{\text{Anticipated Direct Materials and Direct Labour Cost}}$$

Suppose if the budgeted overheads are Rs.50,000 and the estimated values of direct materials and direct labour are Rs.30,000 and Rs.20,000, then overhead recovery rate will be 100%

$$\text{i.e., } \frac{50000}{30000+20000} \times 100.$$

- (d) **Direct Labour (or Production) Hour Method.** This rate is obtained by dividing the overhead expenses by the aggregate of the productive hours of direct workers. The formula is

$$\text{Overhead rate} = \frac{\text{Production Overhead Expenses}}{\text{Direct Labour Hours}}$$

If in a particular period the overhead expenses are Rs.50,000 and direct labour hours are 1,00,000, then overhead labour rate will be Re.0.50 (i.e., Rs.50,000 ÷ 1,00,000).

This rate is suitable where:

- (i) The production is done using more of labour and less technology is used.
- (ii) It is desired to taken into consideration the time factor.
- (iii) The rate may not be affected by the method of wage payment or the grade or the rate of workers.

Illustration17: From the following particulars find out “Direct Labour Rate”.

| | |
|--|-------------|
| (a) Total number of labourers working in the department. | 400 |
| (b) Total working days in a year | 300 |
| (c) Number of working hours per day | 8 |
| (d) Total departmental overheads per year | Rs.1,82,400 |
| (e) Normal idle time allowed. | 5% |

SOLUTION:

CALCULATION OF DIRECT LABOUR RATE FOR DEPARTMENTAL OVERHEADS

| | |
|---|--------------------|
| Total working days in a year | 300 |
| Number of working hours per day | 8 |
| Total working hours available per worker per year | 2,400 (300 x 8) |
| Less: normal idle time allowed (5% of 2,400hrs) | 120 |
| Effective working hours per worker per year (2400-120) | 2,280 |
| Number of workers working in the department | 400 |
| Total effective working hours in the department(2280 x 400) | 9,12,000 |
| Total departmental overheads per year | Rs.1,82,000 |

Direct Labour Rate for absorption of overheads per hour Re.0.20
(Rs.182,400 ÷ 9,12,000hrs = Rs.0.20)

- (e) **Machine Hour Rate.** Machine hour rate is the cost of running a machine per hour. It is one of the methods of absorbing factory expenses to production. There is a basic similarity between the machine hour and the direct labour hour rate methods, in so far as both are based on the time factor. The choice of one or the other method depends on the actual circumstances of the individual case. In respect of departments or operations, in which

machines predominate and the operators perform a relatively a passive part, the machine hour rate is more appropriate. This is generally the case for operations or processes performed by costly machines which are automatic or semi-automatic and where operators are needed merely for feeding and tending them rather than for regulating the quality or quantity of their output. In such cases, the machine hour rate method alone can be depended on to correctly apportion the manufacturing overhead expenses to different items of production. What is needed for computing the machine hour rate is to divide overhead expenses for a specific machine or group of machines for a period by the operating hours of the machine or the group of machines for the period. It is calculated as follows:

$$\text{Machine hour rate} = \frac{\text{Amount of overheads}}{\text{Machine hours during a given period}}$$

The following steps are required to be taken for the calculation of machine hour rate:

- 1) Each machine or group of machine should be treated as a cost centre.
- 2) The estimated overhead expenses for the period should be determined for each machine or group of machines.
- 3) Overheads relating to a machine are divided into two parts i.e., fixed or standing charges and variable or machine expenses.
- 4) Standing charges are estimated for a period for every machine and the amount so estimated is divided by the total number of normal working hours of the machine during that period in order to calculate an hourly rate for fixed charges. For machine expenses, an hourly rate is calculated for each item of expenses separately by dividing the expenses by the normal working hours.
- 5) Total of standing charges and machines expenses rates will give the ordinary machine hour rate.

Some of the bases which may be adopted for apportioning the different expenses for the purpose of calculation of machine hour rate are given below.

Some of the expenses and the basis of apportionment are given below.

1. Rent and Rates - Floor area occupied by each machine including the surrounding space.
2. Heating and Lighting - The number of points used plus cost of special lighting or heating for any individual machine, alternatively according to floor area occupied by each machine.
3. Supervision – estimated time devoted by the supervisory staff to each machine.
4. Lubricating Oil and Consumable Stores – On the basis of past experience.
5. Insurance – Insurable value of each machine
6. Miscellaneous Expenses – Equitable basis depending upon facts.

Machine Expenses

1. Depreciation – cost of machine including cost of stand-by equipment such as spare motors, switchgears etc., less residual value spread over its working life.
2. Power – Actual consumption as shown by meter readings or estimated consumption ascertained from past experience.
3. Repairs – Cost of repairs spread over its working life.

Illustration 18: A machine is purchased for cash at Rs.9,200. Its working life is estimated to be 18,000 hours after which its scrap value is estimated at Rs.200. it is assumed from past experience that:

- (i) The machine will work for 1,800 hours annually.
- (ii) The repair charges will be Rs.1,800 during the whole period of life of the machine.
- (iii) The power consumption will be 5 units per hour at 6 paise per unit.
- (iv) Other annual standing charges are estimated to be: Rs.
 - (a) Rent of department (machine occupies $1/5^{\text{th}}$ of total space) 780
 - (b) Light (12 points in the department-2 points engaged in the machine) 288
 - (c) Foreman's salary ($1/4^{\text{th}}$ of his time is occupied in the machine) 6000
 - (d) Insurance premium (fire) for machinery 36
 - (e) Cotton waste 60

Find out the machine hour rate on the basis of above data for allocation of the works expenses to all jobs for which the machine is used.

SOLUTION:

CALCULATION OF MACHINE HOUR RATE

| | <i>Per Annum Rs.</i> | <i>Per Hour Rs.</i> |
|---|--------------------------|-------------------------|
| Standing Charges: | | |
| Rent [Rs.780 ÷ Rs.5] | 156 | |
| Light [$2/12 \times \text{Rs.}288$] | 48 | |
| Insurance Charges | 36 | |
| Cotton waste | 60 | |
| | <u>1,500</u> | |
| Total Standing Charges | 1,800 | |
| Hourly rate of standing charges $\frac{\text{Rs.}1800}{1800}$ | | |
| <u>Machine Expenses:</u> | | |
| Depreciation (Rs.9,200-Rs.200)÷18,000 = Rs.9000 ÷18,000 | | 1.00 |
| Repairs and Maintenance (Rs.1,080÷18,000) | | 0.50 |
| Power (0.06 x 5) | | 0.06 |
| | | 0.30 |
| Machine Hour Rate | | 1.86 |

- (f) **Rate Per Unit of Production.** This method is simple, direct and easy. It is suitable for mining and other extractive industries, foundries and brick laying industries, where the output is measured in convenient physical units like number, weight, volume etc. the rate is calculated as under:

$$\text{Overhead Rate} = \frac{\text{Overhead expenses (budgeted)}}{\text{Budgeted production}}$$

For example, if the overhead expenses (budgeted) are Rs. 30,000 and the budgeted production is 10,000 tonnes, then overhead rate according to this method will be Rs. 3 per tonne.

The main limitation of this method is that it is restricted to those concerns which produce only one item of product or a few sizes, qualities or grades of the same product. If more than one item are produced, then it is essential to express dissimilar units against a common denominator on weightage or point basis.

- (g) **Sale Price Method:** Under this method, budgeted overhead expenses are divided by the sale price of units of production in order to calculate the overhead recovery rate. The formula is

$$\text{Overhead Recovery Rate} = \frac{\text{Budgeted overhead expenses}}{\text{Sale value of units of production}}$$

The method is more suitable for apportioning of administration, selling and distribution, research, development and design costs of products. It can also be used with advantage for the appropriation of joint products costs.

Module IV

Methods of Costing

1. UNIT COSTING

It is an important method of costing. It is also known as output costing or single costing. It is used to ascertain the cost of producing a unit of output.. This method is called 'unit' costing since every unit of production is identical in all respects and the cost unit is a standard product.

According to J.R Batliboi, "Single or output cost system is used in business where a standard product is turned out and it is desired to find out the cost of a basic unit of production."

Features:

1. It is used where output can be measured in convenient physical unit
2. It is followed in concern s engaged in the production of a single product
3. It is followed in industries where manufacturing process is continuous
4. It is followed where all units of production are identical

Cost sheet:

Cost sheet is a device used to determine and present the cost under unit costing. It is a statement of costs incurred at each level of manufacturing a product or service. In a Cost sheet all the elements of cost is taken into consideration. It includes Prime cost, Factory/manufacturing cost, cost of production, cost of sale Profit/loss etc.

Items excluded from Cost Sheet:

1. Pure financial expenses like interest on capital, interest on loan, discount on debentures, loss on sale of fixed asset provision for bad debts and doubtful debts, writing off goodwill, copyright, preliminary expenses etc.
2. Pure financial incomes like interest received, profit on sale of investment, dividend received, rent received, commission received, discount received etc.

In addition to the above, no appropriation items will include in cost sheet

Form of a Cost Sheet: Cost sheet for the period ending -----

| | Total | Per Unit |
|---------------------------------|--------|----------|
| Direct material | Xxx | Xx |
| Direct wages | Xxx | Xx |
| Direct Expenses | Xxx | Xx |
| Prime Cost | Xxx | Xx |
| Add Factory OH | xx | Xx |
| Factory Cost | xxx | Xx |
| Add Administration OH | xx | Xx |
| Cost of Production | xxx | Xx |
| Add selling and distribution OH | xx | Xx |
| Total Cost /Cost of sale | xxxxxx | xxxxxx |

Treatment of Stock:

While preparing a cost sheet we have to consider the opening and closing stocks of the following three items

1. Stock of Raw materials
2. Stock of finished goods
3. Stock of work in progress

Stock of Raw materials: In order to get the cost of material consumed, opening stock of material is added to the cost of raw materials purchased and closing stock of raw materials is deducted from it.

| | |
|--------------------------------|-------|
| Opening stock of raw materials | xxx |
| Add Purchase of RM | xxx |
| | ----- |
| | xxx |
| Less closing stock of RM | xx |
| | ----- |
| Cost of materials consumed | xxx |
| | ===== |

Stock of Work – in – progress: The Cost of work in progress are adjusted at the work cost stage

| | |
|---------------------------|-------|
| Prime cost | xxx |
| Add works OH | xxx |
| | ----- |
| | Xxx |
| Add opening stock of WIP | xx |
| | ----- |
| | xxx |
| Less closing stock of WIP | xx |
| | ----- |
| Works cost | xxxx |
| | ===== |

Stock of finished goods: It is adjusted immediately after ascertaining the cost of production.

| | |
|--------------------------|-------|
| Cost of production | xxx |
| Add opening stock of FG | xx |
| | ----- |
| | Xxxx |
| Less closing stock of FG | xxx |
| | ----- |
| Cost of Goods sold | xxxx |
| | ===== |

Illustration 1

From the following particulars prepare a cost sheet for the month of March 2008.

Rs.

| | |
|-------------------------------------|--------|
| Stock in hand 1 st March | |
| Raw materials | 26,000 |
| Finished goods | 18,300 |

| | |
|--|--------|
| Work in Progress | 9,200 |
| Stock on hand – 31 st March | |
| Raw materials | 27,200 |
| Finished goods | 16,700 |
| Work in Progress | 10,100 |
| Purchase of Raw materials | 23,000 |
| Carriage on purchases | 1,500 |
| Direct wages | 18,500 |
| Indirect wages | 1,000 |
| Sale of finished goods | 76,000 |
| Chargeable expenses | 2,200 |
| Factory overheads | 9,500 |
| Administration OH | 4,000 |
| Selling and Distribution OH | 5,200 |

Solution

Cost sheet for the month of March 2008

| | Rs. | Rs. |
|--------------------------------------|--------|--------|
| Opening stock of materials | 26,000 | |
| Add Purchases | 23,000 | |
| Add carriages on Purchases | 1,500 | |
| | <hr/> | |
| | 50,500 | |
| Less closing stock of materials | 27,200 | |
| | <hr/> | |
| Cost of materials consumed | | |
| , Direct wages | | 23,300 |
| Chargeable expenses | | 18,500 |
| PRIME COST | | 2,200 |
| | | <hr/> |
| Factory OH | | 44,000 |
| Indirect wages | | 9,500 |
| Add opening stock of WIP | | 1,000 |
| | | 9,200 |
| | | <hr/> |
| Less closing stock of WIP | | 63,700 |
| Factory Cost | | 10,100 |
| Add Administration OH | | 53,600 |
| Cost of Production | | 4,000 |
| Add opening stock of finished goods | | 57,600 |
| | | 18,300 |
| | | <hr/> |
| Less closing stock of finished goods | | 75,900 |
| Cost of goods sold | | 16,700 |
| Add selling and distribution OH | | 59,200 |
| Total cost | | 5,200 |
| Profit | | 64,400 |
| Sales | | 11,600 |
| | | <hr/> |
| | | 76,000 |
| | | ===== |

Tenders or Quotations: A tender or quotation is an offer made by a person to supply certain goods at a specified price. It is an estimated price which is determined in advance of production. A reasonable margin of profit is added to the estimated cost to get the tender price. A tender has to be prepared very carefully as the receipts of orders depend upon the acceptance of quotations or tenders supplied by the manufacturers. It requires information regarding Prime cost, works cost, administration and selling overhead cost and profit of the preceding period.

Computation of Tender price

I. Calculation of Tender price on the basis of Percentages of Overheads

In this case a cost sheet is prepared for the past period with the total amount of different elements of cost. Here Indirect or overhead costs are charged on a percentage basis. The percentage is calculated on the basis of the past year's cost sheet. These are calculated as follows:

- Factory OH is charged as a percentage of direct wages.

$$= \frac{\text{Factory OH} \times 100}{\text{Direct wages}}$$
- Administration OH is charged as a percentage of Factory cost

$$= \frac{\text{Administration OH} \times 100}{\text{Factory Cost}}$$
- Selling and Distribution OH is charged as percentage of Factory cost

$$= \frac{\text{Selling and Distribution} \times 100}{\text{Factory cost}}$$

Profit may be calculated either as a percentage of cost or selling price. If the given percentage of profit is on selling price, the percentage of profit on selling price should be converted into percentage of profit on cost.

Illustration 1. Following particulars relates to the manufacture of machines by ABC Co Ltd for the year ending 31st March 2011

| | |
|-----------------------|----------|
| Materials used | 2,50,000 |
| Direct wages | 1,90,000 |
| Factory OH | 38,000 |
| Establishment charges | 35,900 |

Prepare a cost sheet showing the cost of Production of the Machines. What price the company should quote to manufacture a machine which, it is estimated will require an expenditure of Rs. 12,000 in material and Rs. 10,000 in wages so that it will yield a profit of 20% on selling price.

Solution:

Cost sheet for the year ending 31st March 2011

| | Rs. |
|-----------------------|----------|
| Materials used | 2,50,000 |
| Direct wages | 1,90,000 |
| Prime cost | 4,40,000 |
| Factory Over head | 38,000 |
| Factory Cost | 4,78,000 |
| Establishment charges | 35,900 |
| Cost of Production | 5,13,900 |

$$\text{a. Percentage of factory overhead on direct wages} = \frac{38,000 \times 100}{1,90,000}$$

$$= 20\%$$

$$\text{b. Percentages of establishment charges on factory OH}$$

$$= \frac{35900 \times 100}{4,78,000}$$

$$= 7.5\%$$

Estimated Cost Sheet

| | Rs. |
|---|--------|
| Materials | 12,000 |
| Direct wages | 10,000 |
| Prime Cost | 22,000 |
| Factory OH (20% on direct wages) | 2,000 |
| Factory Cost | 24,000 |
| Establishment charges (7.5% on factory cost) | 1,800 |
| Cost of Production | 25,800 |
| Profit (20 % on selling price or 25% on cost) | 6,450 |
| Selling price | 32,250 |
| | ===== |

II. Computation of Tender price on the basis of Previous year's per unit cost:

Under this situation , previous periods cost and output figures are available. Tender price is fixed by multiplying the quantity with previous periods per unit cost and adding the required percentage of profit. There are three different situations under this method.

- a. **When there is no change in past cost and past percentage of profit.** In this case a detailed probable cost sheet is prepared by multiplying previous period's cost of each unit with the quantity of tender. Profit is added at the same percentage of profits of the past period.
- b. **When there is change in past cost, but no change in past percentage of profit: -** Here the cost of the tender is calculated by making necessary adjustments in the elements of cost. Same percentage of cost is added as profit to get tender price.
- c. **When there is change in past cost and past percentage of profit: -** Here the total cost tender is calculated by making necessary adjustments in the cost and the tender price is then calculated by adding the required percentage of profit.

Illustration II. The following is the Trading and Profit and loss account of XYZ Co. for the year ending 31st March 2011 in which half year 1000 refrigerators manufactured and sold.

Trading and Profit & Loss Account

| | | | |
|----------------------|-----------------|-----------|-----------------|
| To materials | Rs. 80,000 | By sales | Rs. 4,00,000 |
| To wages | 1,20,000 | | |
| To Manufacturing exp | 50,000 | | |
| To G/P C/D | 1,50,000 | | |
| | <u>4,00,000</u> | | <u>4,00,000</u> |
| To staff salaries | 60,000 | By GP/b/d | 1,50,000 |
| “Selling Exp | 30,000 | | |
| “ General Exp | 20,000 | | |
| “ Rent & Taxes | 10,000 | | |
| “ N/P | 30,000 | | |
| | <u>1,50,000</u> | | <u>1,50,000</u> |
| | ===== | | ===== |

For the year ending 31st March 2012, it is estimated that:

1. The price of raw materials will increase by 20% on the previous year's level.
2. Rate of wages will rise by 5%
3. The output and sale will be 1,200 Refrigerators
4. Selling exp. Per unit will remain constant.
5. Manufacturing OH will rise in proportion to combined cost of material and wages
6. Other expenses remain unaffected by the rise in output.

You are required to prepare an estimated cost sheet for the year 2012, showing the prices at which a refrigerator should be sold keeping a net profit of 10% on the selling price.

Solution: Cost sheet for the year ended 31st March 2011

| | Total Rs(1000) | Per unit cost(Rs.) |
|--------------------|-----------------|--------------------|
| Material | 80,000 | 80 |
| Labour | 1,20,000 | 120 |
| Prime cost | <u>2,00,000</u> | <u>200</u> |
| Manufacturing OH | 50,000 | 50 |
| Factory cost | <u>2,50,000</u> | <u>250</u> |
| Office OH | 90,000 | 90 |
| | <u>3,40,000</u> | <u>340</u> |
| Cost of Production | 30,000 | 30 |
| Selling Exp. | <u>3,70,000</u> | <u>370</u> |
| Cost of Sale | 30,000 | 30 |
| Profit | <u>4,00,000</u> | <u>400</u> |
| Sales | ===== | ===== |

Estimated cost sheet for the year ended 31st March 2012

| | Total (1200)Rs | Per unit(Rs) |
|---|----------------|--------------|
| Material (80+20) | 1,15,200 | 96 |
| Labour (120+5) | 1,51,200 | 126 |
| Prime Cost | 2,66,400 | 222 |
| Manufacturing OH(50x 222/200) | 66,600 | 55.5 |
| Factory Cost | 3,33,000 | 277.5 |
| Office OH (90,000/1,200) | 90,000 | 75 |
| Cost of Production | 4,23,000 | 352.5 |
| Selling exp. | 36,000 | 30 |
| | 4,59,000 | 382.5 |
| Cost of Sale | 51,000 | 42.5 |
| Profit (10% of selling price, ie 1/9 of cost) | 5,10,000 | 425 |
| Sales | | |

III Calculation of Tender price based on fixed and variable costs: Here, costs are classified according to variability into three types,, fixed, variable and semi variable. Tender price is calculated on the basis of degree of variability

Illustration III The Cost of manufacturing 5000 units of a commodity comprises Material cost Rs. 40,000, wages Rs. 50,000 Direct expenses Rs. 800, Variable OH Rs. 8000 and fixed OH Rs. 32,000. For the manufacturing of every 1000 extra units of the commodity, the cost of production increases as follows:

- Fixed OH Rs. 400 extra
- Direct expenses proportionately
- Wages 10% less than proportionately
- Materials proportionately
- Variable OH 25% less than proportionately.

Calculate the estimated cost of producing 8,000 units of the commodity.

Solution:

Statement of Cost

| | 5000 units (Rs) | 3000 extra units(Rs) | 8000 units (Rs) |
|-----------------|--------------------|-------------------------|--------------------|
| Materials | 40,000 | 24,000 | 64,000 |
| Wages | 50,000 | 27,000 | 77,000 |
| Direct expenses | 800 | 480 | 1,280 |
| Prime Cost | 90,800 | 51,480 | 1,42,280 |
| Fixed OH | 32,000 | 1,200 | 33,200 |
| Variable OH | 8,000 | 3,600 | 11,600 |
| | 1,30,800 | 56,280 | 1,87,080 |
| | ===== | ===== | ===== |

Notes:

Increase in the Value of Materials = $40,000/5000 \times 3000 = \text{Rs. } 24,000$

“ Wages = $50000/5000 \times 3000 - 10\% = \text{Rs. } 27,000$

“ Direct expenses = $800/5000 \times 3000 = \text{Rs. } 480$

“ Fixed Expenses = $400 \times 3 = \text{Rs. } 1200$

“ Variable expenses = $8000/5000 \times 3000 - 25\% = \text{Rs. } 3,600$

JOB COSTING

It means ascertaining costs of an individual job, work order or project separately. According to ICMA London, “job costing is that form of specific order costing which applies where work is undertaken to customer’s specific requirements and each order is of comparatively of short duration.” Under this method of costing, each job is considered to be a distinct cost unit. As such, each job is separately identifiable.

In the case of a job, work is usually carried out within the factory or workshop. Sometimes, a job is accomplished even in the customer’s premises. This method of costing is applicable to ship building, printing, engineering, machine tools, readymade garments, shoes, hats, furniture, musical instruments, interior decorations etc.

Features:

1. Each job has its own characteristics, depending up on the special order placed by the customer.
2. Each job is treated as a cost unit.
3. A separate job cost sheet is made out for each job on the basis of distinguishing numbers.
4. A separate work in progress ledger is maintained for each job.
5. The duration of the job is normally a short period.
6. Profit or loss is determined for each job independently of others

Advantages of Job costing:

1. It helps to distinguish profitable jobs from unprofitable jobs
2. It helps to identify defective work and spoilage with a department or person
3. Selling price of special orders can easily be fixed.
4. It helps to prepare estimates of cost for submitting quotations and tender for similar jobs
5. It helps to control future cost.

Requisites of Job costing system:

1. A sound system of production control
2. An effective time booking system
3. Clearly defined cost centre
4. Appropriate overhead absorption rate, and
5. Proper material issue pricing method.

Procedure for Job order costing system:

The Procedure for job order costing system may be summarized as follows:-

1. Receiving an enquiry from the customer regarding price, quality etc
2. Make an estimation of the price of the job after considering the cost incurred for the execution of similar job in the previous year
3. Receiving an order, if the customer is satisfied with the quotation price and other terms of execution.
4. If the job is accepted, a production order is made by the Planning department.
5. The costs are collected and recorded for each job under separate production order Number, and a Job Cost Sheet is maintained for that purpose.
6. On completion of job, a completion report is sent to costing department.

Illustration I

From the following particulars calculate the cost of Job No.505 and price for the job to give a profit of 25% on the selling price.

Material : Rs. 6820

Wage details:

Department X : 60 hrs @ Rs. 3 per hr

Y : 50 hrs @ Rs. 3 per hr

Z : 30 hrs @ Rs. 5 per hr

The variable Overheads are as follows:

Department X : Rs. 5000 for 5000 hrs

Y : Rs. 4000 for 2000 hrs

Z : Rs. 2000 for 500 hrs

The total fixed expenses amounted to Rs. 20,000 for 10,000 working hours.

Calculate the cost of Job No. 505 and price for the job to give a profit of 25% on selling price

Solution:

Job Cost Sheet No. 505

| | | Rs. |
|--|---------------|--------|
| Direct Material | | 6,820 |
| Wages: | | |
| Department X | 60x3=180 | |
| Department Y | 50x3=150 | |
| Department Z | 30x5=150 | 480 |
| | | ----- |
| Prime Cost | | 7,300 |
| Overheads: - Variables | | |
| Department X | 60 x1 = 60 | |
| Department Y | 50 x2= 100 | |
| Department Y | 30x 4= 120 | 280 |
| | | ----- |
| | | 7,580 |
| Fixed OH 140 x 2 = 280(60+50+30 x 2) | | 280 |
| | | ----- |
| | Total cost | 7,860 |
| Profit 25% on selling price ie 1/3 of cost 7860 x1/3 | | 2,620 |
| | | ----- |
| | Selling price | 10,480 |

Practical problem 1

The following information is extracted from the Job ledger in respect of Job No. 205

Materials Rs. 8,500

Wages : 80 hours @ Rs. 6 per hour

Variable OH incurred for all jobs is Rs. 10,000 for 4,000 labour hours. Find the profit if the job is billed for Rs. 8,400.

Practical Problem 2

From the following information, ascertain the work cost of Job No. 505

The job was commenced on 10th January 2011 and completed on 1st Feb.2011. Materials used were Rs. 2,400 and labour charges were Rs. 1,600. Other details were as follows:

1. Indirect labour cost in the factory amounted to Rs. 1,200
2. Machine X was used for 50 hours @ Rs. 20 per hour
3. Machine Z was used for 40 hours @ Rs. 22 per hour

CONTRACT COSTING

Meaning

It is a special form of job costing and it is the most appropriate method to be adopted in such industries as building and construction work, civil engineering, mechanical fabrication and ship building. In other words, it is a form of specific order costing which applies where the work is undertaken to customer's requirements and each order of long duration as compared to job costing. It is also known as terminal costing.

The official CIMA terminology defines contract costing as “ a form of specific order costing in which costs are attributed to individual contracts.”

Basic features:

1. Each contract itself a cost unit.
2. Work is executed at customers site
3. The existence of sub contract
4. Most of the expenses incurred upon the contracts are direct.
5. Cost control is very difficult in contract costing.

Types of contracts

Generally there are three types of contracts:

1. Fixed price contracts: Under these contracts both parties agree to a fixed contract price.
2. Fixed price contract with Escalation clause
3. Cost plus contract: Under this contract no fixed price could be settled for a contract.

Contract Account

A contract account is a nominal account in nature. It is prepared to find out the cost of contract and to know profit or loss made on the contract. A contractor may undertake a number of contracts at a time. For each contract a separate account is opened. In the contract account all direct cost such as material, labour and other direct expenses incurred during an accounting period are debited and the indirect expenses are apportioned on an equitable basis. The differences between the two sides are known as Notional profit or notional loss.

SPECIAL TERMS IN CONTRACT ACCOUNT

1. **Work in Progress:** It is the unfinished contract at the end of the accounting period and it includes amount of work certified and amount of work uncertified. Work in progress is an asset, shown in the balance sheet by deducting there from any advance received from the contractee.
2. **Work certified:** The sales value of work completed as certified by the architect is known as 'work certified'. In the case of contracts of long duration, the amount payable by the customer to the contractor is based on the sales value of work done as certified by the architect. At the end of the financial year, the total sales value of work done and certified by the architect is credited to the contract account.

3. **Work Uncertified:** It means work which has been carried out by the contractor but has not been certified by the architect. Sometimes, work which is complete remains uncertified at the end of the financial year. The reasons for the same may be
- Work not sufficient enough to be certified
 - Work has not reached the stipulated stage to qualify for certification
- It is always valued at cost and credited to the contract account.
4. **Retention money:** - Regardless of the amount of work certified, the contractor is paid a specified percentage of the same and the balance is held or retained by the contractee. This is because of the fact that the contractee has to safe guard himself against any contingency arising from the non fulfillment of the terms of the contract by the contractor. The unpaid balance of work certified or the amount held back or retained by the contractee is known as 'retention money'.
5. **Sub contract:** Sometimes the contractor enters into contracts with another contractor to give a portion of work undertaken by him. In such cases the work performed by the subcontractor s forms a direct charge to the contract concerned. Sub contract cost will be shown on the debit side of the contract account.
6. **Escalation clause:** This is clause which is provided in the contract to cover up any increase in the price of the contract due to increase in the prices of raw material or labour or in the utilization of any other factors of production. If material and labour utilization exceeds a particular limit, the customer agrees to bear the additional cost occasioned by excessive utilization. Here, the contractor has to satisfy the customer that excessive utilization is not the result of decreased efficiency.

SPECIMEN FORM OF CONTRACT ACCOUNT (Unfinished contract)

Contract A/C

| | | | |
|-----------------------------|-------|---------------------------|-------------|
| To materials | Xxx | By work in progress: | |
| To Labour | Xxx | Work | certified |
| To Plant | Xxx | xxx | Xxx |
| To Overheads | Xxx | Work | uncertified |
| To cost of sub contracts | Xxx | xxx | Xxx |
| To Notional Profit c/d(B/F) | Xxx | By material returned | Xxx |
| | | By | plant |
| | Xxx | xxx | Xxx |
| | | Less:Depreciation | xx |
| To Profit and Loss A/C | Xxx | By material lying at site | Xxx |
| To WIP (B/F) | Xxx | | |
| | Xxx | By Notional profit B/d | Xxx |
| | ===== | | ===== |

Treatment of Plant and Machinery:

One of the distinguishing features of a contract is the use of special plant and machinery. The cost of these is capital expenditure, but yet, the usage of these should be reflected in the form of depreciation. There are two distinct methods of charging depreciation.

1. At the time of issue of plant to contract the contract account is debited with the full value of the plant. At the end of the period contract account is credited with the depreciated value. This method is used when plant and machinery is used at the contract site for a long period.
2. In the second method, contract account is debited with an hourly rate of depreciation for the number of hours the plant is used on the contract. A cost centre is set up for each machine. An estimate is made of the cost such as maintenance, depreciation, driver's wage etc to be incurred. The total of this cost is divided by the number of hours that the machine is expected to be used.

Profit on Incomplete Contract:

In the case of a small contract extending over the financial period, profit or loss on the same may be ascertained by crediting it with the contract price due by the contractee. This procedure cannot be adopted in the case of contracts extending beyond the accounting period, and taking a long time for completion. If there is any profit upon the incomplete contract, it cannot be taken as actual profit. The profit upon the incomplete contract is called notional profit.

For the purpose of determining the amount of profit to be transferred to profit and loss account and making provision for future contingencies, the following guidelines may be kept in mind.

1. **When the work has not reasonably advanced (1/4 or less than 1/4) :** - No profit should be taken to the credit of p/L account in the case of contracts which have just commenced and a small portion of the work is complete.
2. **Where the work is complete more than 1/4 but less than 1/2 of contract price:** In this case 1/3 of the notional profit as reduced by the percentage of cash received may be credited to profit and loss account. The usual formula is

$$\text{Notional profit} \times \frac{1}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

The balance of notional profit shall be kept as reserve till the completion

3. **If the contract completed is more than 1/2 but less than 90%:** Here 2/3 rd of the notional profit should be taken to profit and loss account.

$$\text{Notional profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Work certified}}$$

The balance of notional profit shall be transferred to work in progress as reserve. It is to be noted that in order to find out how much portion of contract is completed, work certified should be compared with contract price.

4. **If the contract is nearing completion:** Here, estimated profit may be ascertained by deducting the total cost of contract to date plus estimated additional expenses to complete the contract, from the contract price. It is calculated by using the following formula

$$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Contract price}}$$

The loss on incomplete contract should be fully transferred to profit and loss account.

Example 1

The following was the expenditure on a contract for Rs. 6,00,000

| | |
|-----------|----------|
| Material | 1,20,000 |
| Wages | 1,64,000 |
| Plant | 20,000 |
| Overheads | 8,600 |

Cash received on account of the contract was Rs. 2,40,000 being 80% of the work certified. The Value of material in hand was Rs. 10,000. The plant has undergone 20% depreciation.

Solution:

| CONTRACT ACCOUNT | | | |
|--------------------|-----------|----------------------------|------------|
| | Rs. | | Rs. |
| To materials | 1,20,000 | By material in hand | 10,000 |
| To Wages | 1,64,000 | By plant on hand | 16,000 |
| To Plant | 20,000 | By work certified | |
| To overheads | 8,600 | (2,40,000x100/80) | 3,00,000 |
| To Notional profit | 13,400 | | |
| | <hr/> | | <hr/> |
| | 3,26,000 | | 3,26,000 |
| | ===== | | ===== |
| To P/L account | 7,147 | By notional profit b/d | 13,400 |
| To Balance c/d | 6,253 | | |
| | <hr/> | | <hr/> |
| | 13, 400 | | 13,400 |

Example 2

XY Ltd undertook a contract, the following was the expenditure on a contract for Rs. 6,00,000.

| | |
|-----------------------------|--------------|
| Material issued to contract | Rs. 1,02,000 |
| Plant issued for contract | Rs. 30000 |
| Wages | Rs.1,62,000 |
| Other expenses | Rs. 10,000 |

Cash received on account of contract up to 31st march 2011 amounted to Rs. 2,56,000 being 80% of work certified. Of the plant and material charged to the contract plant costing Rs. 3000 and material costing Rs. 4000/ were lost. On Ist March 2011, Plant which cost Rs. 2,000 was returned to the store, the cost of work done but not certified was Rs. 3000 and material costing Rs. 2,500 were in hand on site. Provide 10% depreciation on plant, reserve 1/3 of profit received and prepare contract account from the above particulars.

Solution**CONTRACT ACCOUNT**

| | | | |
|-------------------------------|---------------|-----------------------------------|---------------|
| To materials | 1,02,000 | By work in progress: | |
| To Plant | 30,000 | Work certified | |
| | | 256000x100/80 | 3,20,000 |
| To wages | 1,62,000 | Work uncertified | 3,000 |
| To other expenses | 10,000 | By P & L Account | |
| | | Plant lost | 3,000 |
| | | Material lost | <u>4,000</u> |
| | | | 7,000 |
| | | By plant returned: | 2,000 |
| | | Less: depreciation | <u>200</u> |
| | | | 1,800 |
| | | By material in hand | 2,500 |
| To Notional profit c/d (B. F) | 52,800 | By plant at site(30000-3000-2000) | 25,000 |
| | | Less: depr | <u>2,500</u> |
| | | | 22,500 |
| | <u>35,680</u> | | <u>35,680</u> |
| To P/L Account | 28,160 | By notional profit B/d | ===== |
| 52800x2/3x80/100 | | | 52,800 |
| | 24,640 | | |
| - Reserve BF | <u>52,800</u> | | <u>52,800</u> |
| | ===== | | ===== |

WORK IN PROGRESS ACCOUNT

| | | | |
|-----------------|-----------------|---------------------------|-----------------|
| To contract A/c | 3,23,000 | By Contract A/c (reserve) | 24,640 |
| | | By Balance c/d | 2,98,360 |
| | <u>3,23,000</u> | | <u>3,23,000</u> |
| | ===== | | ===== |

Note: It is assumed that the contract has begun on 1/4/10.

Example- 3

Mr. A has undertaken several contract works. He maintains a separate record for each contract. From the records for the year ending 31-12-98, Prepare contract account for Contract No.50 and find the amount transferred to profit and loss account.

| | |
|-----------------------------|----------|
| Direct purchase of material | 1,80,000 |
| Material issued from stores | 50,000 |
| Wages | 2,44,000 |
| Direct expenses | 24,000 |
| Machinery purchased | 1,60,000 |
| Establishment charges | 54,000 |

The contract price was Rs. 15,00,000. Cash received up to 31-12-2008 was Rs. 6,00,000 which is 80% of work certified. Material at site Rs. 16,000. Depreciation for Machine Rs. 16,000.

Solution:

| | | | |
|----------------------|-----------------|------------------------------------|-----------|
| To materials: | | By material at site | 16,000 |
| Direct purchase | 1,80,000 | Machinery on hand (1,60,000-16000) | 1, 44,000 |
| Issued from stores | 50,000 | Work certified | 7, 50,000 |
| Wages | 2,44,000 | | |
| Direct expenses | 24,000 | | |
| Machinery purchased | 1,60,000 | | |
| Establishment | 54,000 | | |
| Notional profit | <u>1,98,000</u> | | |
| | 9,10,000 | | 9, 10,000 |
| | ===== | | ===== |
| To P/L account | 1,05,600 | By notional profit b/d | 1,98,000 |
| Work in progress A/c | 92,400 | | 1,98,000 |
| | <u>1,98,000</u> | | ===== |
| | ===== | | |

PROCESS COSTING

Process costing is the method of costing applied in the industries engaged in continuous or mass production. Process costing is a method of costing used to ascertain the cost of a product at each process or stage of manufacturing.

According to ICMA terminology, “Process Costing is that form of operation costing which applies where standardized goods are produced”.

So it is a basic method to ascertain the cost at each stage of manufacturing. Separate accounts are maintained at each process to which expenditure incurred. At the end of each process the cost per unit is determined by dividing the total cost by the number of units produced at each stage. Hence, this costing is also called as “Average Costing” or “Continuous Costing”. Process Costing is used in the industries like manufacturing industries, chemical industries, mining works and public utility undertakings.

Characteristics of Process Costing

1. Production is continuous
2. Products pass through two or more distinct processes of completion.
3. Products are standardized and homogeneous.
4. Products are not distinguishable in processing stage.
5. The finished product of one process becomes the raw material of the subsequent process.
6. Cost of material, labour and overheads are collected for each process and charged accordingly.

Advantages of Process Costing

1. It is easy to compute average cost because the products are homogeneous in Process Costing.
2. It is possible to ascertain the process costs at short intervals.
3. Process Costing is simple and less expensive in relation to job costing.
4. By evaluating the performance of each process effective managerial control is possible.

Disadvantages of Process Costing

1. Valuation of work in progress is difficult.
2. It is not easy to value losses, wastes, scraps etc.
3. The apportionment of total cost among joint products and by-products is difficult.
4. Process costs are not accurate, they are only average costs
5. Process costs are only historical.

Principles of Process Costing

The following points are considered while determining the cost under Process Costing.

1. Production activity should be divided into different processes or departments.
2. A separate account is opened for each process.
3. Both direct and indirect costs are collected for each process.
4. The quantity of output and costs are recorded in the respective process accounts.
5. The cost per unit is determined by dividing the total cost at the end of each process by the number of output of each process.
6. Normal loss and abnormal loss are credited in the process account
7. The accumulated cost of each process is transferred to subsequent process along with output. The output of the last process along with cost is transferred to the finished goods account.
8. In case of by-products and joint products their share in joint cost should be estimated and credited to the main process.
9. When there is work in progress at the end of the period the computation of inventory is made in terms of complete units.

Difference between Process Costing and Job Costing

| Process Costing | Job Costing |
|---|---|
| 1. Production is continuous | 1. Production is according to customers' orders |
| 2. Production is for stock | 2. Production is not for stock |
| 3. All units produced are identical or homogeneous | 3. Each job is different from the other |
| 4. There is regular transfer of cost of one process to subsequent processes | 4. There is no regular transfer of cost from one job to another |
| 5. Work in progress always exists | 5. Work in progress may or may not exist |

Procedure for Process Costing

1. Each process is separately identified. Separate process account is opened for each process.
2. Along with 'Particulars Column', two columns are provided on both sides of the process account – units (quantity) and amount (Rupees).
3. All the expenses are debited in the respective process account.

4. Wastage, sale of scrap, by-products etc are reentered on the credit side Of the process account.
5. The difference between debit and credit side shows the cost of production and output of that particular process which is transferred to the next process.
6. The cost per unit in every process is calculated by dividing the net cost by the output.
7. The output of last process is transferred to the Finished Stock Account.
8. Incomplete units at the end of the each period in every process is converted in terms of completed units.

Specimen of Process Account

Process Account

| | Units | Rs. | | Units | Rs. |
|----------------------------|-------|-----|-------------------|-------|-----|
| To Direct materials | | | By Loss in weight | | |
| To Direct Wages | | | (Normal | | |
| To Direct Expenses | | | Loss) | | |
| To Indirect expenses | | | By sale of Scrap | | |
| To Other Expenses (if any) | | | By Next Process | | |
| | | | Account(Transfer) | | |

Preparation of Process Accounts

The preparation of Process Account depends upon the following situations

1. Simple Process Account
2. Process costing with normal process loss
3. Process costing with abnormal process loss
4. Process costing with abnormal process gains
5. Inter – process profits.

Simple Process Account

Under this case it is very easy to prepare process account. A separate account is opened for each process. All costs are debited to the process account. The total cost of the process is transferred to the next process. At the end of each process the cost per unit is obtained by dividing the total cost by the number of units.

Illustration 1: Product A requires three distinct processes and after the third process the product is transferred to finished stock. Prepare various process accounts from the following information.

| | Total | P1 | P2 | P3 |
|----------------------|-------|------|------|-----|
| Direct Materials | 5000 | 4000 | 600 | 400 |
| Direct Labour | 4000 | 1500 | 1600 | 900 |
| Direct Expenses | 800 | 500 | 300 | |
| Production overheads | 6000 | | | |

Production overheads to be allocated to different processes on the basis of 150% of direct wages. Production during the period was 200 units. Assume there is no opening or closing stock.

Solution:**Process I Account**

| | Units | Rs. | | Units | Rs. |
|--|-------|------|--|-------|------|
| To Direct materials | 200 | 4000 | By Process II | | |
| To Direct Wages | | 1500 | Account(Transfer) | 200 | 8250 |
| To Direct Expenses | | 500 | Cost per unit $\frac{8250}{200} = 41.25$ | | |
| To Production overheads (1500x150%) | 200 | 2250 | | 200 | 8250 |
| | | | | | |
| | 200 | 8250 | | 200 | 8250 |

Process II Account

| | Units | Rs. | | Units | Rs. |
|--|-------|-------|---|-------|-------|
| To Process I A/c | 200 | 8250 | By Process III | | |
| To Direct materials | | 600 | Account(Transfer) | 200 | 13150 |
| To Direct Wages | | 1600 | Cost per unit $\frac{13150}{200} = 65.75$ | | |
| To Direct Expenses | | 300 | | | |
| To Production overheads (1600x150%) | | 2400 | | 200 | |
| | 200 | 13150 | | 200 | 13150 |

Process III Account

| | Units | Rs. | | Units | Rs. |
|---------------------------------------|-------|-------|--|-------|-------|
| To Process II A/c | 200 | 13150 | By Finished stock A/c | | |
| To Direct materials | | 400 | (Output Transferred) | 200 | 15800 |
| To Direct Wages | | 900 | Cost per unit $\frac{15800}{200} = 79$ | | |
| To Production overheads (900x150%) | | 1350 | | | |
| | 200 | 15800 | | 200 | 15800 |

Process losses

The process loss is classified into two- normal process loss and abnormal process loss.

Normal process loss

This is the loss which is unavoidable on account of inherent nature of production process. It arises under normal conditions. It is usually calculated as a certain percentage of input. Normal process loss includes either waste or scrap or both. Waste is unsalable and has no value. Loss in weight is an example of waste. Loss in weight should be credited to the concerned process account. It should be recorded only in terms of quantity.

Loss in weight = Opening Stock + output from the preceding process – (output of the Concerned process + closing stock)

Illustration 2: From the following figures, show the cost of three processes of manufacture. The production of each process is passed on to the next process immediately on completion.

| | Process A | Process B | Process C |
|--|--------------|--------------|--------------|
| Wages and Materials | 30400 | 12000 | 29250 |
| Works Overhead | 5600 | 5250 | 6000 |
| Production ion units | 36000 | 37500 | 48000 |
| Stock on 1 July 2012 (units from preceding process) | | 4000 | 16500 |
| Stock on 31 July 2012 (units from preceding process) | | 1000 | 5500 |

Solution:

Process A Account

| | Units | Rs. | | Units | Rs. |
|------------------------|-------|-------|---|-------|-------|
| To Wages and Materials | 36000 | 30400 | By Process B A/c | | |
| To Works Overhead | | 5600 | (Transfer) | 36000 | 36000 |
| | | | Cost per unit $\frac{36000}{36000} = 1$ | | |
| | 36000 | 36000 | | 36000 | 36000 |

Process B Account

| | Units | Rs. | | Units | Rs. |
|-----------------------------|-------|-------|--|-------|-------|
| To Opening Stock (Re.1 p.u) | 4000 | 4000 | By loss in weight (Bal. fig) | 1500 | |
| To Process A A/c (transfer) | 36000 | 36000 | By Closing stock @ Re.1 | 1000 | 1000 |
| To Wages and Materials | | 12000 | p.u | | |
| To Works Overhead | | 5250 | By Process C A/c (Transfer) | 37500 | 56250 |
| | | | Cost per unit $\frac{56250}{37500} = 1.50$ | | |
| | 40000 | 57250 | | 40000 | 57250 |

Process C Account

| | Units | Rs. | | Units | Rs. |
|--------------------------------|-------|--------|---|-------|--------|
| To Opening Stock (Rs.1.50 p.u) | 16500 | 24750 | By loss in weight (Bal. fig) | 500 | |
| To Process B A/c (transfer) | 37500 | 56250 | By Closing stock @ Rs.1.5p.u | 5500 | 8250 |
| To Wages and Materials | | 29250 | By Finished stock A/c (Transfer) | 48000 | 108000 |
| To Works Overhead | | 6000 | Cost per unit $\frac{108000}{48000} = 2.25$ | | |
| | 54000 | 116250 | | 54000 | 116250 |

Illustration 3: Bihar Chemicals Ltd produced three chemicals during the month of July 2012 by three consecutive processes. In each process 2% of the total weight put in is lost and 10 % is scrap which from process 1 and 2 realizes Rs.100 a ton and from process 3 Rs.20 a ton.

The product of three processes is dealt with as follows:

| | Process 1 | Process 2 | Process 3 |
|-------------------------------|-----------|-----------|-----------|
| Passed on to the next process | 75% | 50% | |
| Sent to warehouse for sale | 25% | 50% | 100% |

Expenses incurred:

| | Rs | Tons | Rs | Tons | Rs | Tons |
|---------------------|--------|------|-------|------|--------|------|
| Raw materials | 120000 | 1000 | 28000 | 140 | 107840 | 1348 |
| Manufacturing wages | 20500 | | 18520 | | 15000 | |
| General expenses | 10300 | | 7240 | | 3100 | |

Prepare Process Cost Accounts showing the cost per ton of each product.

Solution:

Process 1 Account

| | Tons | Rs. | | Tons | Rs. |
|------------------------|------|--------|--|------|--------|
| To Raw materials | 1000 | 120000 | By loss in weight (2%) | 20 | |
| To Manufacturing wages | | 20500 | By Sale of scrap (10%) | 100 | 10000 |
| To General expenses | | 10300 | By Warehouse - transfer (880x25%) | 220 | 35200 |
| | | | By Process 2 A/c(Transfer) | 660 | 105600 |
| | | | Cost per unit $\frac{140800}{880} = 160$ | | |
| | 1000 | 150800 | | 1000 | 150800 |

Process 2 Account

| | Tons | Rs. | | Tons | Rs. |
|-----------------------------|------|--------|--|------|--------|
| To Process 1 A/c(Transfer) | 660 | 105600 | By loss in weight (2%) | 16 | |
| To Raw materials | 140 | 28000 | By Sale of scrap (10%) | 80 | 8000 |
| To Manufacturing wages | | 18520 | By Warehouse - transfer (704x50%) | 352 | 75680 |
| To General expenses | | 7240 | By Process 2 A/c(Transfer) | 352 | 75680 |
| | | | Cost per unit $\frac{151360}{704} = 215$ | | |
| | 800 | 159360 | | 800 | 159360 |

Process 3 Account

| | Tons | Rs. | | Tons | Rs. |
|-----------------------------|------|--------|---------------------------|------|--------|
| To Process 2 A/c(Transfer) | 352 | 75680 | By loss in weight (2%) | 34 | |
| To Raw materials | 1348 | 107840 | By Sale of scrap (10%) | 170 | 3400 |
| To Manufacturing wages | | 15000 | By Warehouse - transfer | | 198220 |
| To General expenses | | 3100 | Cost p unit <u>198220</u> | 1496 | |
| | | | =132.5 | | |
| | | | 1496 | | |
| | 1700 | 201620 | | 1700 | 201620 |

Abnormal Process Loss

Any loss caused by unexpected or abnormal conditions such as plant break don, substandard materials, carelessness, accident etc. or loss in exceeds of the margin anticipated for normal process loss can be called as abnormal process loss. It is controllable and avoidable. When actual loss in the process is greater than the estimated normal loss, it is a case of abnormal loss. It may also be determined by comparing actual output with expected or normal output. If actual output is less than the normal output, the difference is abnormal loss.

$$\text{Value of Abnormal loss} = \frac{\text{Normal cost of normal output}}{\text{Normal output}} \times \text{Units of Abnormal loss}$$

$$\text{Normal cost of normal output} = \text{Total expenditure (i.e., total debit of process A/c)} - \text{Sale Proceeds of scrap (i.e. Value of normal loss)}$$

$$\text{Normal output} = \text{Input} - \text{Units of normal loss}$$

Illustration 4: In process A 100 units of raw materials were introduced at a cost of Rs.1000. the other expenditure incurred by the process was Rs. 602. Of the units introduced 10% are normally lost in the course of manufacture and them posses a scrap value of Rs.3 each. The output of process A was only 75 units. Prepare Process A A/c and Abnormal loss A/c.

Solution:

Process A A/c

| | Units | Rs. | | Units | Rs. |
|-------------------|-------|------|---|-------|------|
| To Raw Materials | 100 | 1000 | By Normal <u>loss- 100x10% @Rs.3 each</u> | 10 | 30 |
| To Other expenses | | 602 | By Abnormal loss (Bal.Fig) | 15 | 262* |
| | | | | 75 | 1310 |
| | 100 | 1602 | By Process B A/c (transfer) | 100 | 1602 |

Working Note:

$$\begin{aligned} \text{Normal cost of normal output} &= \text{Total expenditure} - \text{Sale Proceeds of scrap} \\ &= 1602 - 30 = \underline{1572} \end{aligned}$$

$$\begin{aligned} \text{Normal output} &= \text{Input} - \text{Units of normal loss} \\ &= 100 - 10 = \underline{90} \end{aligned}$$

$$\begin{aligned}\text{Value of Abnormal loss} &= \frac{\text{Normal cost of normal output}}{\text{Normal output}} \times \text{Units of Abnormal loss} \\ &= \frac{1572}{90} \times 15 = \text{Rs. } 262\end{aligned}$$

Abnormal Loss A/c

| | Units | Rs. | | Units | Rs. |
|--------------|-------|-----|--------------------------------------|-------|-----|
| To Process A | 15 | 262 | By Cash (scrap value of loss @ Rs.3) | 15 | 45 |
| | | | By Costing P&L A/c | | 217 |
| | 15 | 262 | | 15 | 262 |

Abnormal Gain (or Abnormal Effective)

Sometimes actual loss or wastage in a process is less than expected normal loss. In this case the difference between actual loss and expected loss is known as abnormal gain or abnormal effective. It is the excess of actual production over normal output.

Abnormal gain is valued in the same manner as abnormal loss. The value of abnormal gain is debited to process A/c and credited to abnormal gain A/c. the value of scrap is debited to abnormal gain A/c and credited to normal loss A/c. finally abnormal loss A/c is closed by transferring the credit balance to Costing P&L A/c.

$$\begin{aligned}\text{Value of Abnormal Gain} &= \frac{\text{Normal cost of normal output}}{\text{Normal output}} \times \text{Units of Abnormal gain} \\ \text{Normal cost of normal output} &= \text{Total expenditure} - \text{Sale Proceeds of scrap} \\ \text{Normal output} &= \text{Input} - \text{Units of normal loss}\end{aligned}$$

$$\begin{aligned}\text{Units of Abnormal gain} &= \text{Normal loss} - \text{Actual loss} \\ \text{Or} &= \text{Actual output} - \text{Normal output}\end{aligned}$$

Illustration 5: Product X is obtained after it passes through three distinct processes. 2000 kg of materials at Rs.5 per kg were issued to the first process. Direct wages amounted to Rs.900 and production overhead incurred was Rs.500. Normal loss is estimated at 10% of input. This wastage is sold at Rs.3 per kg. The actual output is 1850 kg. Prepare process I A/c and Abnormal Gain/ Abnormal loss A/c as the case may be.

Solution:

Process I Account

| | Kg | Rs. | | Kg | Rs. |
|-------------------------|-----------------|------------------|---------------------------------|------|--------------------|
| To Materials | 2000 | 10000 | By Normal loss (Sale of scrap) | 200 | 600 |
| To Direct wages | | 900 | By Process II - transfer | 1850 | 11100 ² |
| To Production OH | | 500 | | | |
| To Abnormal gain (Bal.) | 50 ¹ | 300 ³ | | | |
| | 2050 | 11700 | | 2050 | 11700 |

Abnormal Gain A/c

| | Kg | Rs. | | Kg | Rs. |
|---------------------------------|----|-----|------------------|----|-----|
| To Normal loss (loss of income) | 50 | 150 | By Process I A/c | 50 | 300 |
| To Costing P&L A/c (Bal.) | | 150 | | | |
| | 50 | 300 | | 50 | 300 |

Working note:

1. $(200+1850)-2000=\underline{50}$
2. $\frac{(10000+900+500)-600}{1850-50} = \text{Rs.}\underline{6}$
3. $50 \times 6 = \underline{30}$

Illustration 6: The product of a company passes through three distinct processes to completion – A, B and C. from the past experience it is ascertained that losses incurred in each process as – A-2%, B-5% and C-10%.

In each case the percentage of loss is computed on the number of units entering the process concerned. The loss of each process possesses a scrap value. The loss of processes A and B sold at Rs.5 per 100 units and that of C at Rs.20 per 100 units.

The output of each process passes immediately to the next process and the finished units are passed from process C into stock.

| | Process A | Process B | Process C |
|------------------------|-----------|-----------|-----------|
| Materials consumed | 6000 | 4000 | 2000 |
| Direct labour | 8000 | 6000 | 3000 |
| Manufacturing expenses | 1000 | 1000 | 1500 |

20000 units have been issued to process A at a cost of Rs.10000. the output of each process has been as under:

A-19500, B- 18800 and C - 16000.

There is no work in progress in any process. Prepare process accounts. Calculations should be made to the nearest rupee.

Solution:

Process A Account

| | Units | Rs. | | Units | Rs. |
|---------------------------|-------|-------|-------------------------|-------|-------|
| To Units introduced | 20000 | 10000 | By Normal loss | 400 | 20 |
| To Materials | | 6000 | By Abnormal loss (Bal.) | 100 | 127 |
| To Direct labour | | 8000 | By Process B - transfer | 19500 | 24853 |
| To Manufacturing Expenses | | 1000 | | | |
| | 20000 | 25000 | | 20000 | 25000 |

Process B Account

| | Units | Rs. | | Units | Rs. |
|---------------------------|-------|-------|-------------------------|-------|-------|
| To Process A A/c | 19500 | 24853 | By Normal loss | 975 | 49 |
| To Materials | | 4000 | By Process C - transfer | 18800 | 36336 |
| To Direct labour | | 6000 | | | |
| To Manufacturing Expenses | | 1000 | | | |
| To abnormal gain | 275 | 532 | | | |
| | 19775 | 36385 | | 19775 | 36385 |

Process C Account

| | Units | Rs. | | Units | Rs. |
|---------------------------|-------|-------|----------------------------------|-------|-------|
| To Process B A/c | 18800 | 36336 | By Normal loss | 1880 | 376 |
| To Materials | | 2000 | By To abnormal loss | 920 | 2309 |
| To Direct labour | | 3000 | By Finished stock A/c - transfer | 16000 | 40151 |
| To Manufacturing Expenses | | 1500 | | | |
| | 18800 | 42836 | | 18800 | 42836 |

Finished Stock A/c

| | Units | Rs. | | Units | Rs. |
|------------------|-------|-------|--|-------|-------|
| To Process C A/c | 16000 | 40151 | | | |
| | 16000 | 40151 | | 16000 | 40151 |

Abnormal Loss A/c

| | Units | Rs. | | Units | Rs. |
|--------------|-------|------|--|-------|------|
| To Process A | 100 | 127 | By Cash (100@Rs.5 per | | |
| To Process C | 920 | 2309 | 100+920@Rs.20per 100) | 1020 | 189 |
| | | | By Costing P&L A/c | | 2247 |
| | 1020 | 2436 | | 1020 | 2436 |

Normal loss A/c

| | Units | Rs. | | Units | Rs. |
|--------------|-------|-----|---------------------|-------|-----|
| To Process A | 400 | 20 | By Abnormal Gain | 275 | 14 |
| To Process B | 975 | 49 | By Cash/Debtors A/c | 2980 | 431 |
| To Process C | 1880 | 376 | | | |
| | 3255 | 445 | | 3255 | 445 |

Abnormal Gain A/c

| | Units | Rs. | | Units | Rs. |
|---------------------------------|-------|-----|------------------|-------|-----|
| To Normal loss (loss of income) | 275 | 14 | By Process C A/c | 275 | 532 |
| To Costing P&L A/c (Bal.) | | 538 | | | |
| | 275 | 532 | | 275 | 532 |

Working note:

Process A:

Value of Abnormal loss = Rs.24980/19600 units x 100 units = Rs. 127.

Process B:

Value of Abnormal gain = Rs.35804/18525 units x 275 units = Rs. 532.

Process C:

Value of Abnormal loss = Rs.42460/16920 units x 920 units = Rs. 2309.

Work-in-Progress

In most of the firms manufacturing is on a continuous basis and the problem of work-in-progress is quite common. The work-in-progress consists of direct materials, direct wages and production overhead.

Equivalent Production

Equivalent production represents the production of a process in terms of completed units. In other words, it means converting the incomplete units into its equivalent of completed units. It is also known as effective production. For calculating equivalent production, work-in-progress needs to be inspected. Then an estimate is made of the degree of completion, usually on a percentage basis.

Steps and procedure of computation of Equivalent Production

1. Ascertain Equivalent Production in respect of opening work-in-progress, if any. In this case the Equivalent Production is computed by taking into consideration the percentage of work required to finish now in the process. The following formula is used.

Opening WIP (Units) x % of work needed to complete.

2. Find the units introduced and completed and add this to (1). It is calculated as follows:

Units completed and transferred – Opening work-in-progress.

3. Convert the equivalent production of closing work-in-progress and add to the above. The formula is:

Closing work-in-progress (units) x % of work completed.

4. Obtain the total Equivalent Production terms of materials, labour and overhead separately (if degree of completion is different). For this, 'Statement of Equivalent Production' is prepared.

5. Find out the net process costs, element wise- materials, labour and overheads.

6. Ascertain the cost per unit of Equivalent Production for each element of cost separately.

$$\text{Material cost per unit} = \frac{\text{Material cost}}{\text{Equivalent Production in respect of materials}}$$

$$\text{Labour cost per unit} = \frac{\text{Labour cost}}{\text{Equivalent Production in respect of labour}}$$

$$\text{Overhead cost per unit} = \frac{\text{Overhead cost}}{\text{Equivalent Production in respect of overhead}}$$

For this purpose 'Statement of Cost is prepared'

7. Find out the value of opening work-in-progress, finished units and closing work-in-progress. The formula is:

Equivalent Production in respect of materials x Material cost per unit

Equivalent Production in respect of labour x Labour cost per unit

Equivalent Production in respect of overhead x Overhead cost per unit

For this purpose 'Statement of Evaluation or Apportionment' is prepared.

In short, the following three statements are to be prepared:

1. Statement of Equivalent Production

2. Statement of Cost

3. Statement of Evaluation.

I. When there is only closing work-in-progress but with no process losses

Under this case the closing work-in-progress is converted into equivalent units on the basis of estimate as regards degree of completion of materials, labour and production overhead.

Illustration 7: Input 3800 units, Output 3000 units and closing work-in-progress 800 units.

| | Degree of completion | Process costs Rs. |
|-----------|----------------------|-------------------|
| Materials | 80% | 7280 |
| Labour | 70% | 10680 |
| Overheads | 70% | 7120 |

Find out Equivalent Production, Cost per unit of equivalent production and prepare the Process A A/c assuming that there is no opening work-in-progress and process loss.

Solution:

Statement of Equivalent Production

| Input | | Output | | Equivalent Production | | | |
|------------------|-------|---|-------|-----------------------|-----|-------------------|-----|
| Items | Units | Items | Units | Materials | | Labour & Overhead | |
| | | | | Units | % | Units | % |
| Units introduced | 3800 | Units completed & transferred Work in progress | 3000 | 3000 | 100 | 3000 | 100 |
| | | | 800 | 640 | 80 | 560 | 70 |
| | 3800 | | 3800 | 3640 | | 3560 | |

Statement of Cost

| Elements of cost | Cost (Rs.) | Equivalent Production (units) | Cost per completed unit |
|------------------|------------|-------------------------------|-------------------------|
| Materials | 7280 | 3640 | 2.00 |
| Labour | 10680 | 3560 | 3.00 |
| Overheads | 7120 | 3560 | 2.00 |
| | 25080 | | 7.00 |

Statement of Evaluation

| | | |
|-----------------------|------|-------|
| Finished goods 3000x7 | | 21000 |
| Work-in-progress: | | |
| Materials 640x2 | 1280 | |
| Labour 560x3 | 1680 | |
| Overhead 560x2 | 1120 | |
| | | 4080 |

Process A A/c

| | Units | Rs. | | Units | Rs. |
|--------------|-------|-------|----------------------------------|-------|-------|
| To Materials | 3800 | 7280 | By Finished stock A/c - transfer | 3000 | 21000 |
| To Labour | | 10680 | By Work-in-progress | 800 | 4080 |
| To Overhead | | 7120 | | | |
| | 3800 | 25080 | | 3800 | 25080 |

II. When there is only closing work-in-progress but with process losses

In case of normal loss, nothing should be added as equivalent production. However, abnormal loss should be considered as production of good units completed during the period.

Illustration 8: During January 2000 units were introduced into Process I. the normal loss was estimated at 5% on input. At the end of the month, 1400 units had been produce and transferred to the 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 20000 units was Rs.5800

Direct material introduced during the process Rs.1440

Direct wages Rs.3340

Production overheads incurred were Rs. 1670

Units scrapped realized Re.1 each.

Units scrapped passed through the process, so were 100% completed as regards material, labour and overhead.

Find out Equivalent Production, Cost per unit and prepare the necessary accounts.

Solution:

Statement of Equivalent Production

| Input Units | Output | Units | Equivalent Production | | | |
|--------------------|---------------------|-------|-----------------------|-----|-------------------|-----|
| | | | Materials | | Labour & Overhead | |
| | | | Units | % | Units | % |
| 2000 | Normal loss | 100 | | | | |
| | Abnormal loss | 40 | 40 | 100 | 40 | 100 |
| | Finished production | 1400 | 1400 | 100 | 1400 | 100 |
| | Work in progress | 460 | 345 | 75 | 230 | 50 |
| 2000 | | 2000 | 1785 | | 1670 | |

Statement of Cost

| Elements of cost | Cost (Rs.) | Equivalent Production (units) | Cost per completed unit |
|----------------------------------|------------|-------------------------------|-------------------------|
| Materials | | | |
| Cost of units introduced | 5800 | | |
| Direct Materials | 1440 | | |
| | 7240 | | |
| Less: Scrap value of normal loss | 100 | | |
| | 7140 | 1785 | 4 |
| Direct wages | 3340 | 1670 | 2 |
| Overheads | 1670 | 1670 | 1 |
| Total | 12150 | 5125 | 7 |

Statement of Evaluation

| Production | Cost Elements | Equivalent Production | Cost per unit | Cost | Total Cost |
|---------------------|---------------|-----------------------|---------------|------|------------|
| Abnormal loss | Material | 40 | 4 | 160 | |
| | Labour | 40 | 2 | 80 | |
| | Overheads | 40 | 1 | 40 | 280 |
| Finished production | Material | 1400 | 4 | 5600 | |
| | Labour | 1400 | 2 | 2800 | |
| | Overheads | 1400 | 1 | 1400 | 9800 |
| Work-in-progress | Material | 345 | 4 | 1380 | |
| | Labour | 230 | 2 | 460 | |
| | Overheads | 230 | 1 | 230 | 2070 |
| | | | | | 12150 |

| Process I A/c | | | | | |
|-------------------------|-------|-------|--------------------------------------|-------|-------|
| | Units | Rs. | | Units | Rs. |
| To Units introduced | 2000 | 5800 | By Normal loss | 100 | 100 |
| To Materials | | 1440 | By abnormal loss | 40 | 280 |
| To Labour | | 3340 | By Finished production | 1400 | 9800 |
| To Overhead | | 1670 | By Balance c/d (Work-in-progress) | 460 | 2070 |
| | 2000 | 12250 | | 2000 | 12250 |
| Finished Production A/c | | | | | |
| | Units | Rs. | | Units | Rs. |
| To Process I A/c | 1400 | 9800 | | | |
| Abnormal Loss A/c | | | | | |
| | Units | Rs. | | Units | Rs. |
| To Process I A/c | 40 | 280 | By Cash (sale @ Re.1 p.u) | 40 | 40 |
| | | | By Costing P&L A/c (loss) | | 240 |
| | 40 | 280 | | 40 | 280 |

III. When there is opening as well as closing work in progress but with no process loss.

Sometimes in a continuous process there will be opening as well as closing work in progress which are to be converted into equivalent of completed units for apportionment of process costs. The procedure of conversion of opening work in progress will vary depending upon whether average cost or FIFO or LIFO method of apportionment of costs is followed.

Illustration 9: From the following details, prepare statement of equivalent production, statement of cost, statement of evaluation and process A/c by following FIFO method.

Opening work-in-progress (2000 units):

Materials (100% complete) Rs. 5000

Labour (60% complete) Rs. 3000

Overheads (60% complete) Rs. 1500

Units introduced into the process Rs. 8000

There are 2000 units in progress and the stage of completion is estimated to be:

Materials 100%

Labour 50%

Overheads 50%

8000 units are transferred to the next process:

The process costs for the period are:

Materials Rs. 96000

Labour Rs. 54600

Overheads Rs. 31200

Solution:

Statement of Equivalent Production

| Output | Units | Equivalent Production | | | |
|--|-------|-----------------------|-----|-------------------|-----|
| | | Materials | | Labour & Overhead | |
| | | Units | % | Units | % |
| Opening WIP | 2000 | | | 800 | 40 |
| Completed processed during the period(8000-2000) | 6000 | 6000 | 10 | 6000 | 100 |
| Closing WIP | 2000 | 2000 | 0 | 1000 | 50 |
| Total | 10000 | 8000 | 100 | 7800 | |

Statement of Cost

| Elements of cost | Cost (Rs.) | Equivalent Production (units) | Cost per completed unit |
|------------------|------------|-------------------------------|-------------------------|
| Materials | 96000 | 8000 | 12 |
| Labour | 54600 | 7800 | 7 |
| Overheads | 31200 | 7800 | 4 |
| Total | 181800 | | 23 |

Statement of Evaluation

| | | | | |
|--|---------|--|-------------|---------------|
| Opening Work-in-progress (current cost) | | | | |
| Materials | | | | |
| Labour | 800x7 | | 5600 | |
| Overhead | 800x4 | | <u>3200</u> | 8800 |
| Closing WIP | | | | |
| Materials | 2000x12 | | 24000 | |
| Labour | 1000x7 | | 7000 | |
| Overhead | 1000x4 | | 4000 | 35000 |
| units completely processed during the period 6000@23 | | | | 138000 |
| | | | | <u>181800</u> |

Process A/c

| | Units | Rs. | | Units | Rs. |
|----------------|-------|--------|--|-------|--------|
| To Opening WIP | 2000 | 9500 | By Finished stock transferred to next process (9500+8800+138000) By Closing WIP | | |
| To Materials | 8000 | 96000 | | 8000 | 156300 |
| To Labour | | 54600 | | | 35000 |
| To Overhead | | 31200 | | 2000 | |
| | 10000 | 191300 | | 10000 | 191300 |

IV. When there is opening as well as closing work-in-progress but with losses.

Under this equivalent production units regarding opening and closing work in progress are to be calculated with due adjustment for process losses.

Illustration 10: Following data are relating Process A for March 2012.

Opening WIP – 1500 units for Rs.15000

Degree of completion:

Materials 100%, Labour and overheads 33 1/3%

Input of materials 18500 units at Rs.52000

Direct labour Rs. 14000

Overheads Rs. 28000

Closing WIP - 5000 units.

Degree of completion: Materials 90% and labour and overheads 30%.

Normal process loss is 10% of total input (opening WIP units + units put in)

Scrap value Rs. 2 per unit.

Unit transferred to the next process 15000 units.

Compute equivalent units of production, cost per equivalent unit for each cost element and cost of finished output and closing WIP. Also prepare Process and other accounts. Assume that FIFO method is used by the company and the cost of opening WIP is fully transferred to the next process.

Solution:

Statement of Equivalent Production and Cost

| Input Units | Output | Units | Equivalent Production | | | | | |
|----------------|--------------------------|-------|-----------------------|-----|--------|--------|----------|--------|
| | | | Materials | | Labour | | Overhead | |
| | | | Units | % | Units | % | Units | % |
| 1500 | Opening WIP | 1500 | | | 1000 | 66 2/3 | 1000 | 66 2/3 |
| 18500 | Normal loss | 2000 | | | | | | |
| | Finished goods | 13500 | 13500 | 100 | 13500 | 100 | 13500 | 100 |
| | Closing WIP | 5000 | 4500 | 90 | 1500 | 30 | 1500 | 30 |
| 20000 | | 22000 | 18000 | | 16000 | | 16000 | |
| | less: Abnormal gain | 2000 | 2000 | 100 | 2000 | 100 | 2000 | 100 |
| | | 20000 | 16000 | | 14000 | | 14000 | |
| | | 52000 | | | | | | |
| | Materials | 4000 | 48000 | | 14000 | | 28000 | |
| | less: scrap value | | | | | | | |
| | Cost per equivalent unit | | Rs.3 | | Rs.1 | | Rs.2 | |

Statement of Evaluation

| | | | | | |
|---------------------------------|--------------|---------------|-------------------|--------------|---------------|
| Opening Work-in-progress | | | | | |
| Materials | | | | | |
| Labour | 1000x1 | | | 1000 | |
| Overhead | 1000x2 | | | <u>2000</u> | 3000 |
| Finished goods | 13500x6 | | | | 81000 |
| Abnormal gain | 2000x6 | | | | 12000 |
| Closing WIP | | | | | |
| Materials | 4500x3 | | | 13500 | |
| Labour | 1500x1 | | | 1500 | |
| Overhead | 1500x2 | | | <u>3000</u> | 18000 |
| Process I A/c | | | | | |
| | Units | Rs. | | Units | Rs. |
| To Opening WIP | 1500 | 15000 | By normal loss | 2000 | 4000 |
| To Materials | 18500 | 52000 | By Finished stock | | |
| To Labour | | 14000 | (18000+81000) | | 99000 |
| To Overhead | | 28000 | By Closing WIP | 15000 | 18000 |
| To Abnormal gain | 2000 | 12000 | | 5000 | |
| | <u>22000</u> | <u>121000</u> | | <u>22000</u> | <u>121000</u> |
| Normal loss A/c | | | | | |
| | Units | Rs. | | Units | Rs. |
| To Process I | 2000 | 4000 | By Abnormal Gain | 2000 | 4000 |
| Abnormal Gain A/c | | | | | |
| | Units | Rs. | | Units | Rs. |
| To Normal loss (loss of income) | 2000 | 4000 | By Process I A/c | 2000 | 12000 |
| To Costing P&L A/c (Bal.) | | 8000 | | | |
| | <u>2000</u> | <u>12000</u> | | <u>2000</u> | <u>12000</u> |

OPERATING COSTING**(SERVICE COSTING)**

It is the costing procedure used for determining the cost of per unit of service rendered. It is a method of costing applied to undertaking which provides service rather than production of commodities. The services may be in the form of transport, supply service, welfare service, etc. There is a difference between operating costing and operation costing. Operating costing is a method of costing designed to find out the cost of operating or rendering a service. On the other hand, operation costing is a method of costing applied to determine the total cost and unit cost of

each operation. Though service undertakings are of different types, but here we discuss only transport operating costing.

Transport costing:

Transport industries include Air, Water, Rail and Road. They render services to the community at large. We have to give utmost care while selecting the cost unit. The cost unit of other forms operation costing is quite different from that of a service undertaking. The cost unit of a service organization is a composite unit. The important factors to be considered includes the number of passengers, tonnage carried, distance covered etc.

Classification of Costs:

Operating costs of a transport undertaking comprising different items, which are classified under the following three groups.

1. **Standing or fixed charges:** These charges are incurred in spite of the kilometers run. It is fixed in nature. Eg. Insurance, Motor vehicle tax, license fee, rent, salary of operating manager etc.
2. **Maintenance charges:** It includes semi variable expenses Eg. Tyres and tubes, repairs and paintings etc.
3. **Operating and running charges:** These charges vary more or less in direct proportion to kilometers. All the variable charges of running vehicles are included in this group. Generally it includes, petrol, oil,, grease etc., wages of driver, attendant if payment is related to time or distance of trip etc.

In the place of the above classification, all expenses can be divided into two – fixed cost and variable costs. Here, both maintenance charges and running charges are considered as variable charges.

Selection of Unit:

In transport costing, a composite unit such as passenger mile or passenger kilometer or tone kilometer is often selected. Such unit takes into account both the number of passengers or weight of goods carried and distance run.

Absolute passenger or commercial passenger/ tone km:

It is calculated by multiplying every part of distance travelled/covered with either weight carried or passenger carried.. After getting the product of each journey we add all the products. The total is absolute ton/quintal km

In the case of goods transport the equation is

Distance of each part of journey x weight carried

In the case of passenger transport, the following formula is used

Distance of each part of journey x No. of passengers taken for the same distance

Commercial method:

The following steps are used to find out the commercial tone km

- a. Find out average trip load
- b. Find out total distance of journey
- c. Multiply a and b , the resultant figure is commercial tone km

Example 1

A truck starts with a load of 10 tonnes of goods from station P. It unloads 4 tonnes at station Q and rest of the goods at station R. It reaches back directly to station P after getting reloaded with 8 tonnes of goods at station R. The distance between P to Q, Q to R and then from R to P are 40 kms, 60 kms, and 80 kms respectively. Compute absolute tone kms and commercial tone-km .

Absolute ton/ km = Total distance x weight carried

$$= (40 \times 10) + (60 \times 6) + (80 \times 8) = 400 + 360 + 640 = 1400$$

Commercial tone/km = Distance x average load

$$= [40 + 60 + 80] \times \{10 + 6 + 8 / 3\} = 180 \times 8 = 1440$$

Example 2

A bus with a capacity of 50 passengers makes a return trip from P to Q via station X every day. The distance between P and X is 60 kms where as between X and Q is 40 40 km. During the onward journey, the bus is full to capacity up to station X but only 60% full between X and Q. On the other hand, on return trip it is full from Q to X but only comes 40% of the capacity between X and P.

Compute the total passenger kms of service the bus renders every day.

Solution:

Total passenger kms per day:

Onward journey:

| | | |
|--------|--------------|-------|
| P to X | 60kms X 50 | =3000 |
| X to Q | 40kmsX50X60% | =1200 |
| | | ----- |
| | Total (A) | 4200 |

Return Trip:

| | | |
|--------|--------------------|-------|
| Q to X | 40 kms X 50 X 100% | =2000 |
| X to P | 60 kms X 50 X 40 % | =1200 |
| | | ----- |
| | Total (B) | 3200 |

Total passenger kms every day= (A) + (B) = 4200 + 3200 = 7400 kms

Preparation of Operating Cost sheet:

An operating cost sheet is prepared periodically in order to ascertain the cost per unit. Here, the total fixed, maintenance and running costs are collected and allocated under respective heads and these are then divided by total units.

The Performa of a operating cost sheet is given below:

OPERATING COST SHEET

| Particulars | Total cost | Cost per unit |
|--------------------------------------|------------|---------------|
| A. Fixed or standing charges: | | |
| Garage rent | | |
| License fee | | |
| Insurance | | |
| Motor vehicle tax | | |
| Interest on capital | | |
| Supervision | | |
| Office establishment | | |
| Administrative overheads | | |
| Salary of foreman , manager etc | | |
| Total | | |
| B. Maintenance charges: | | |
| Repairs and renewals | | |
| Tyres and tubes | | |
| Paintings | | |
| Overhauling | | |
| Cleaning | | |
| Gas and electric charges | | |
| Spare parts and accessories | | |
| Total | | |
| C. Operating charges: | | |
| Petrol | | |
| Engine oil | | |
| Lubricating oil, grease etc | | |
| Wages of operators | | |
| Depreciation | | |
| Salaries of running staff | | |
| Water | | |
| Total | | |

Calculation of Depreciation:

If the rate of depreciation is not given, depreciation is calculated as follows:

$$\text{Depreciation} = \frac{\text{Cost} - \text{scrap}}{\text{Life in years}}$$

$$\text{Depreciation per mile, or km} = \frac{\text{Depreciation p.a}}{\text{Kms/miles run p.a}}$$

Example 3

From the following data calculate the cost per mile of a vehicle:

| | |
|----------------------------|------------|
| Value of vehicle | Rs. 15,000 |
| Road license for the year | 500 |
| Insurance charges per year | 100 |
| Garage rent per year | 600 |
| Drivers' wages per month | 200 |

| | |
|---|----------------|
| Cost of petrol per litre | 0.80 |
| Miles per litre | 8 |
| Proportional charge for tyre and maintenance per mile | 0.20 |
| Estimated life | 1,50,000 miles |
| Ignore interest on capital. | |

Solution:**Operating cost statement**

| Particulars | Annual cost | Cost per unit |
|---|-------------|---------------|
| Fixed expenses: | | |
| Road license fee | 500 | 0.08 |
| Insurance charge | 100 | 0.02 |
| Garage rent | 600 | 0.10 |
| Maintenance charges: | | |
| Cost of tyre and maintenance of per mile | 0.20 | 0.20 |
| Operating /running charges: | | |
| Cost of petrol per mile 80p/8 | | 0.10 |
| Drivers wage per mile 2400/6000 | | 0.40 |
| Depreciation of vehicle 15000X6000/1,50,000 | | 0.10 |
| | | <hr/> |
| | | 1.00 |
| | | ===== |

Example 4

Mathrubhumi Transport Co. is running four buses between two towns which are fifty miles apart, seating capacity of each bus is 40 passengers.

The following particulars were obtained from their books for the month of November 2010.

| | |
|--|----------|
| Salaries of office and supervisory staff | Rs. 3000 |
| Diesel oil and other oils | Rs/ 4000 |
| Wages of Drivers and conductors | Rs. 2400 |
| Repairs and maintenance | Rs. 800 |
| Taxation, insurance etc | Rs. 1600 |
| Depreciation | Rs. 2600 |
| Interest and other charges | Rs. 2000 |
| | ----- |
| | 16,400 |

Actual passengers carried were 75% of the seating capacity. All the four buses ran on 30 days in a month, each bus made one round trip per day.

Prepare an operating cost statement for the month showing cost per passenger mile.

Operating cost sheet for the month of November 2010

| Particulars | Total cost |
|------------------------------------|------------|
| Salaries of office staff | 3000 |
| Wages of driver's , conductors etc | 2400 |
| Diesel oil and other oils | 4000 |
| Repairs and maintenance | 800 |
| Taxation , insurance etc | 1600 |
| Depreciation | 2600 |
| Interest and other charges | 2000 |
| | <hr/> |
| | 16400 |
| | ===== |

Cost per passenger mile $= 16400 / 3,60,000 = 0.04$ paise

Working note:-

Passenger miles = No. of Trips per day X No. of days in a month X percentage of capacity X mileage per trip

$$= 4 \times 1 \times 30 \times (75\% \text{ of } 40) \times (50 \times 2)$$

$$4 \times 1 \times 30 \times 30 \times 100 = 3,60,000 \text{ passenger miles.}$$

Practical problem 1

Work out in appropriate cost sheet form the unit cost per passenger km for the year 2009-10 for a fleet of passenger buses run by a transport company from the following figures extracted from its books:-

5 passenger buses costing Rs.60,000, Rs.1,20,000, Rs.50,000, Rs. 65,000 and Rs. 45,000. respectively. Yearly depreciation of vehicles is 20% of cost.

Annual repairs, maintenance and spare parts is 80% of depreciation. Wages of 10 drivers @Rs. 100 each per month, wages of 20 cleaners @ Rs. 50 each per month. Yearly rate of interest @ 4% on capital. Rent of 6 garages @ Rs. 50 each per month. Directors fees @ Rs.400 per month, office establishment @ Rs. 1000 per month, license and taxes@ Rs.1000 every six months, realization by sale of old tyres and tubes @ Rs. 3,200 every six months, 900 passengers were carried over 1,600 kms during the year.

Module V

Cost Control Techniques

BUDGET AND BUDGETORY CONTROL

Meaning and definition of budget:

A budget is a plan of action for a future period. It simply means a financial plan expressed in terms of money. The budget pertaining to any of the activities of business is always forward looking. The term 'budget' has been derived from the French word, "bougette", which means a leather bag into which funds are appropriated to meet the anticipated expenses.

The CIMA Official Terminology defines a budget as "A quantitative statement, for a defined period of time, which may include planned revenues, expenses, assets, liabilities and cash flows."

Budgeting and Budgetary control:

Budgeting simply means preparing budgets. It is a process of preparation, implementation and the operation of budget. Being a plan of action, a budget guides every manager in the decision making process.

In the words of Rowland Harr, "Budgeting is the process of building budgets".

Budgetary control is a system of using budgets for planning and controlling costs. The official terminology of CIMA defines the term 'budgetary control', as "the establishment of budgets relating to the responsibilities of executives to the requirement of a policy, and the continuous comparison of actual with budgetary result, either to secure by individual action the objectives of that policy or to provide a basis for its revision." Thus, when plans are embodied in a budget and the same is used as the basis for regulating operations, we have budgetary control. As such budgetary control starts with budgeting and ends with control.

Objectives of Budget and Budgetary control:

The following points reveal the objectives of Budget and budgetary control:-

1. To aid the planning of annual operations
2. To co ordinate the activities of the various parts of the organization
3. To communicate plans to the various responsibility centre managers
4. To motivate managers to strive to achieve the organizational goals.
5. To control activities
6. To eliminates the wastes of all kinds
7. To provide a yard stick against which actual results can be compared
8. To evaluate the performance of managers.
9. To reduce the uncertainties

Meaning of Estimate, forecast and Budget:

An estimate is predetermination of future events either on the basis of simple guess work or following scientific principles.

Forecast is an assessment of probable future events. Budget is based on the implication of a forecast and related to planned events. To establish a realistic budget, it is necessary to forecast a wide range of factors like sales volume, sales prices, material availability, wage rate, the cost of overheads etc.

Steps involved in Budgetary Control:

The following steps may be considered necessary for a comprehensive budgetary control programme:-

1. Laying down organizational goals or objectives
2. Formulating the necessary plans to ensure that the desired objectives are achieved.
3. Translating plans into budget
4. Relating the responsibilities of executives to the requirements of a policy.
5. Recording and reporting actual performance
6. Continuous comparison of actual with budgeted results
7. Ascertainment of deviations, if any
8. Focusing attention on significant deviations
9. Investigation into deviations to establish causes
10. Presentation of information to management, relating the variations to individual responsibility.
11. Taking corrective action to prevent recurrence of variations.
12. Provide a basis for revision of budgets.

Essentials of a Budgetary Control system: Successful implementation of a budgetary control system depends up on the following essentials.

1. **Support by top management:** The wholehearted support of all managerial persons is very necessary for the success of a budgetary control system.
2. **Formal organization:** The existence of a formal and sound organizational structure is of an absolute necessity for an effective system of budgetary control.
3. **Budget centers:** For budgetary control purposes, the entire organization will be split into a number of departments, area or functions, known as 'centres', and budgets will be prepared for each such centers
4. **Clear cut objectives and reasonably attainable goals:-** If goals are too high to be attained, the purpose of budgeting is defeated. On the other hand, if the goals are so low that they can be attained very easily, there will be no incentive to special effort.
5. **Participative budgeting:** Every executive responsible for the implementation of budgets should be given an opportunity to take part in the preparation of budgets.
6. **Budget committee:** The work of preparing a budget manual should be entrusted to a Budget committee. The work of scrutinizing the budgets as well as approving of the same should be the work of this committee.
7. **Comprehensive budgeting:** Budgeting should not be partial, it should cover all the functions .
8. **Adequate accounting system:** There should be an adequate accounting system for the successful budgetary control system, because those who are involved in the preparation of estimates depend heavily on the accounting department.
9. **Periodic reporting:** - There should be a prompt and timely communication and reporting system for the effective implementation of a budgetary control system.

Budget manual:

CIMA England, defines a budget manual as “ a document , schedule or booklets which sets out; inter alia, the responsibilities of the persons engaged in the routine of and the forms and records required for budgetary control”. In other words, it is a written document which guides the executives in preparing various budgets.

Budget period: This may be defined as the period for which a budget is prepared and employed. The budget period will depend on the type of business and the control aspects. There is no general rule governing the selection of the budget period.

Classification of Budget

1. Classification according to time factor
2. Classification according to flexibility factor
3. Classification according to function.

I. Classification according to time factor: - On this basis, budgets can be of three types:

1. Long term budget – for a period of 5 to 10 years
2. Short term budgets – Usually for a period of one to two years
3. Current budgets - Usually covers a period of one month or so,

II. Classification according to flexibility: It includes

1. Flexible budgets and
2. Fixed budgets

Flexible budgets: It is a dynamic budget. It gives different budgeted cost for different levels of activity. It is prepared after making an intelligent classification of all expenses between fixed , semi variable and variable because the usefulness of such a budget depends up on the accuracy with which the expenses can be classified.

Steps in preparing flexible budgets:

1. Identifying the relevant range of activity
2. Classify cost according to variability
3. Determine variable cost
4. Determine fixed cost
5. Determine semi variable cost
6. Prepare the budget for selected levels of activity

Example 1

The expenses budgeted for production of 10,000 unit in a factory are furnished below:

| | Per unit in Rs |
|--------------------------------------|----------------|
| Material cost | 70 |
| Labour cost | 25 |
| Variable factory over head | 20 |
| Fixed over head (Rs. 1,00,000) | 10 |
| Variable expenses(Direct) | 5 |
| Selling expenses (20% fixed) | 15 |
| Distribution overhead (10% fixed) | 10 |
| Administration expenses (Rs, 50,000) | 5 |

Prepare a flexible budget for production of 8,000 units.

Solution:

| | Out put Per unit(Rs) | 10,000 units Total | Out put Per unit(Rs) | 8,000 units Total(Rs.) |
|--------------------------|----------------------------|-----------------------|-------------------------|---------------------------|
| Material | 70.00 | 7,00,000 | 70.00 | 5,60,000 |
| Labour | 25.00 | 2,50,000 | 25.00 | 2,00,000 |
| Direct expe, (variable) | 5.00 | 50,000 | 5.00 | 40,000 |
| | 100.00 | 10,00,000 | 100.00 | 8,00,000 |
| Factory overhead : | | | | |
| Variable | 20.00 | 2,00,000 | 20.00 | 1,60,000 |
| Fixed | 10.00 | 1,00,000 | 12.50 | 1,00,000 |
| | 130.00 | 13,00,000 | 132.50 | 10,60,000 |
| Administrative expenses: | 5.00 | 50,000 | 6.25 | 50,000 |
| | 135.00 | 13,50,000 | 138.75 | 11,10,000 |
| Selling expenses: | | | | |
| Fixed (20% of 15) | 3.00 | 30,000 | 3.75 | 30,000 |
| Variable (80% of 15) | 12.00 | 1,20,000 | 12.00 | 96,000 |
| Distribution expenses: | | | | |
| Fixed (10% of Rs. 10) | 1.00 | 10,000 | 1.25 | 10,000 |
| Variable (90% of 10) | 9.00 | 90,000 | 9.00 | 72,000 |
| | 160.00 | 16,00,000 | 164.75 | 13,18,000 |

Fixed Budget

It is a budget which is designed to remain unchanged irrespective of the level of activity attained. It does not change with the change in the level of activity. This type of budget are most suited for fixed expenses. It is a single budget with no analysis of cost.

III. Classification according to function: It includes:

1. Functional budgets and
2. Master budgets

Functional budgets are those which are prepared by heads of functional department s for their respective departments and are subsidiary to the master budget. Functional budget may be

Operating budgets or financial budget. Operating budgets are those budgets which relate to the different activities or operations of a firm. These are the primary budgets. Financial budgets are those which incorporate financial decisions of an organization. They show in detail the inflow and outflow of cash and the overall financial position.

Master budget is the summary of all functional budgets. It summarizes sales, production, purchase, labour, finance budgets etc. It is considered as the overall budget of the organization.

Different types of functional budgets:

1. **Sales budget:** It is forecast of total sales expressed in quantities and money. It is prepared by the sales manager. While preparing sales budget we have to consider the past sales data, market conditions, general trade and business conditions etc

Illustration 1

A manufacturing company submits the following figures of product 'Z' for the first quarter of 2010.

| | | |
|------------------|----------|--------|
| Sales (in units) | January | 50,000 |
| | February | 40,000 |
| | March | 60,000 |

Selling price per unit Rs. 100

Sales target of 1st quarter 2011:

Sales quantity increase 20%

Sales price increase 10%

Prepare sales budget for the first quarter of 2011.

Solution:

SALES BUDGET

For the first quarter of 2011

| Months | Units | Price per unit | Value |
|----------|----------|----------------|-------------|
| January | 60,000 | 110 | 66,00,000 |
| February | 48,000 | 110 | 52,80,000 |
| March | 72,000 | 110 | 79,20,000 |
| | 1,80,000 | | 1,98,00,000 |
| | ===== | | ===== |

2. **Production budget:** It is the forecast of the quantity of production for the budget period. It is usually expressed in physical quantity.

Illustration 2

A manufacturing company submits the following figures relating to product X for the first quarter of 2010.

| | | |
|--|--------------|--------------|
| Sales targets: | January | 60,000 units |
| | February | 48,000 units |
| | March | 72,000 units |
| Stock position: 1-1-2010(% of January 2010 sale) | - 50% | |
| Stock position: 31-3-2010 | 40,000 units | |
| Stock position: End January & February | 50% | |
| (% of subsequent month's sales) | | |

You are required to prepare production budget for the first quarter of 2010.

Solution

PRODUCTION BUDGET FOR THE FIRST QUARTER OF 2010

| Month | Sales(Units) | +closing stock (Units) | -Opening stock (in Units) | Production (units) |
|----------|--------------|---------------------------|------------------------------|-----------------------|
| January | 60,000 | 24,000 | 30,000 | 54,000 |
| February | 48,000 | 36,000 | 24,000 | 60,000 |
| March | 72,000 | 40,000 | 36,000 | 76,000 |
| | | | | 1,90,000 |
| | | | | ===== |

- Material budget:** It shows the estimated quantities as well as cost of raw material required for the production of different product during the budget period.
- Purchase budget:** It shows the quantity of different type of materials to be purchased during the budget period taking into consideration the level of activity and the inventory levels.
- Cash budget:** It is prepared only after all the other functional budgets are prepared. It is also known as financial budget. It is a statement showing estimated cash inflows and cash outflows over the budgeted period.

The cash budget is prepared on the basis of the cash forecast. The cash forecast is an estimate showing the availability or otherwise of adequate amount of cash in a future period for meeting the operating expenses and all other commitments. It summarizes the anticipated cash receipts and cash payments for the budget period.

There are three methods for preparing the cash budget. They are:

- The receipts and payment method
- Adjusted Profit and Loss account method
- Balance sheet method.

Example 2(Receipts and Payment method)

A company is expecting to have Rs. 25000 cash in hand on 1st April 2000 and it requires you to prepare an estimate of cash position during the three month, April to June 2000. The following information is supplied to you.

| Months | Sales(Rs) | Purchase(Rs) | Wages(Rs) | Expenses(Rs) |
|----------|-----------|--------------|-----------|--------------|
| February | 70,000 | 40,000 | 8,000 | 6,000 |
| March | 92,000 | 52,000 | 9,000 | 7,000 |
| May | 1,00,000 | 60,000 | 10,000 | 8,000 |
| June | 1,20,000 | 55,000 | 12,000 | 9,000 |

Other information:

- Period of credit allowed by suppliers – two months
- 25% of sale is for cash and the period of credit allowed to customers for credit sale is one month.
- Delay in payment of wages and expenses – one month.
- Income tax of Rs.25,000 is to be paid in June 2000.

Solution:

CASH BUDGET FOR THE PERIOD ENDING JUNE 2000

| | April (Rs.) | May(Rs.) | June(Rs.) | Total(Rs.) |
|-------------------|-------------|----------|-----------|------------|
| Opening balance | 25,000 | 53,000 | 81,000 | ----- |
| Receipts: | | | | |
| Cash sales | 23,000 | 25,000 | 30,000 | 78,000 |
| Cash from debtors | 60,000 | 69,000 | 75,000 | 2,04,000 |
| Total | 83,000 | 94,000 | 1,05,000 | 2,82,000 |
| | ===== | ===== | ===== | ===== |
| Payments: | | | | |
| Creditors | | | | |
| Wages | 40,000 | 50,000 | 52,000 | 1,42,000 |
| Expenses | 8,000 | 9,000 | 10,000 | 27,000 |
| Income Tax | 7,000 | 7,000 | 8,000 | 22,000 |
| Total | --- | ---- | 25,000 | 25,000 |
| | 55,000 | 66,000 | 95,000 | 2,10,000 |
| | ===== | ===== | ===== | ===== |
| Closing balance | 53,000 | 81,000 | 91,000 | ---- |

b. Adjusted Profit and Loss method: Under this method, profit is adjusted by adding back depreciations, provisions, stock and work in progress, capital receipts, decrease in debtors, increase in creditors etc. Similarly, dividends, capital payments, increase in debtors, increase in stock and decrease in creditors are deducted. The adjusted profit will be the estimated cash available. Under this method, the following information becomes necessary.

1. Expected opening balance
2. Net profit for the period
3. Changes in current asset and current liabilities
4. Capital receipts and capital expenditure
5. Payment of dividend

c. Balance sheet method: Under this method, a budgeted balance sheet is prepared for the budgeted period, showing all assets and liabilities except cash. The two sides of the balance sheet are then balanced. The balance then represents cash at bank or overdraft, depending upon whether the assets total is more than that of the liabilities total or the latter is more than that of the former.

Advantages of Cash budget:

1. It helps to ascertain the shortage of cash
2. It helps to identify excess of cash, so that the surplus cash can be invested for a short period
3. It helps to ensure sufficient cash is available when required.

Recent trends in budgeting:

1. **Zero Base Budgeting (ZBB):** According to the official CIMA terminology, zero base budgeting is, “ a method of budgeting which requires each cost element to be specifically justified, as though the activities to which the budget relates were being undertaken for the first time. Without approval, the budget allowance is zero” . Under ZBB the programmes and activities get evaluated and ranked from zero base as if these were launched for first time. In this technique of budgeting the unwanted projects and activities get dropped and wanted and desirable activities and projects get included in the budget.

Features:

- a. It starts from zero
- b. All activities are identified in appropriate decision packages
- c. All programmes are considered totally afresh
- d. A detailed cost benefit analysis of each programme is undertaken
- e. There is an officer responsible for each decision packages
- f. Priorities are established and decision packages are ranked

Advantages of ZBB

1. It considers every time alternative ways of performing the same job. It helps the management to get a critical appraisal of its activities.
2. It is helpful to the management in making optimum allocation of scarce resources
3. ZBB is particularly useful for service departments and Governments
4. It ensures active participation of managers in the budgeting process.
5. It promote high level of motivation at the level of unit managers
6. It focuses on output in relation to value for money.
7. It makes managers cost conscious and helps them in identifying priorities in the overall interest of the organization.

Difference between Traditional budgeting and ZBB

| Traditional budgeting | ZBB |
|---|--|
| <ol style="list-style-type: none"> 1. Begins with previous year's budget 2. Focuses on money 3. Produces a single level of expenditure for an activity 4. Resources are allocated not on the basis of cost benefit analysis 5. Prepared annually | <ol style="list-style-type: none"> 1. Begins with zero a based 2. Focuses on goals and objectives 3. Produces alternative level of expenditure and desired result 4. Resources are allocated on the basis of cost benefit analysis 5. Prepared once in every five years |

2. **Activity base budgeting:** The CIMA official terminology defines activity based budgeting as, "a method of budgeting based on an activity frame work and utilizing cost driver data in the budget setting and variance feedback processes." In the case of traditional budgeting, budgets are established on the basis of budget centers. In the case of activity based budgeting, however, the budget centres are activity based cost pools or cost centres in relation to which budgets are prepared. Separate cost pools are established for each type of activity.
3. **Performance budgeting:** - Performance oriented 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. The following matters will be specified very clearly in such budgeting
 - a. Objectives of the organization and for which funds are requested
 - b. Cost of activities proposed for the achievement of these objectives
 - c. Quantitative measures to measure the performance
 - d. Quantum of work to be performed under each activity.

Advantages of performance budgeting:

1. It improves budget formulation process
2. It enhances accountability of the executives
3. It facilitate more effective performance audit
4. It presents clearly the purpose and objectives for which funds are required

Practical Problems:

I. ABC Company Ltd .has given the following particulars. You are required to prepare a Cash budget for the three months ending 31st Dec. 2010.

| Months | Sales(Rs) | Materials(Rs) | Wages(Rs) | Overhead(Rs) |
|-----------|-----------|---------------|-----------|--------------|
| August | 20,000 | 10200 | 3,800 | 1,900 |
| September | 25,000 | 11000 | 3,900 | 2,100 |
| October | 23,000 | 9800 | 4,000 | 2,300 |
| November | 26,000 | 9000 | 4,200 | 2,400 |
| December | 30,000 | 10800 | 4,500 | 2,500 |

Credit items are:-

1. Debtors/Sales – 10% sales are on cash basis, 50% of the credit sales are collected next month and the balance in the following month.
2. Creditors - - Materials 2 months
 --Wages 1/5 month
 -- Overhead ½ month
3. Cash balance on 1st October 2010 is expected to be Rs. 8,000
4. A machinery will be installed in August, 2010 at a cost of Rs. 1,00,000. The monthly Installment of Rs. 5,000 is payable from October onwards.
5. Dividend at 10% on preference share capital of Rs. 3,00,000 will be paid on 1st December ,2010
6. Advance to be received for sale of vehicles Rs. 20,000 in December
7. Income tax (advance) to be paid in December Rs. 5,000.

STANDARD COSTING

Meaning of ‘standard’ and ‘standard cost’: In the ordinary language, the term ‘standard’ means a yardstick of measurement. The CIMA terminology defines this term as, “a benchmark measurement of resources usage, set in defined conditions.”

Standard cost is a pre determined operating cost calculated from management’s standards of efficient operation and the relevant necessary expenditure.

Need for Standard Costs: The need for standard cost arises for the following reasons.

1. Cost control
2. Measurement of efficiency
3. Fixation of selling price
4. Economy in cost of costing

Estimated cost: Pre determined costs may either be estimated or standard cost. Estimated cost is a pre determined cost for a future period under normal conditions of operations. It is a prospective costing. Cost estimation is made for submitting tenders or quoting price of a product or a unit of services.

Definition of standard costing:

Standard costing is a technique of cost control. The CIMA official terminology defines it as “a control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulated improved performance.”

In standard costing the actual costs incurred are compared with the standard costs. The difference between the two is called variance.

Features: The following are the important characteristics of the standard costing system

1. Standard costs are set for various elements of total cost
2. It makes a comparison of actual cost with standard cost
3. Main objective of standard costing is to control cost
4. Variances are reported to management for the purpose of decision making

Standard costing and Budgetary control

Both standard costing and budgetary control are similar in principle since both are concerned with setting performance and cost levels for control purposes. Neither of the two techniques can be operated successfully without the other. Budgetary control and standard costing are inseparably linked together.

Distinction between standard costing and budgetary control:

1. Budget is based on past performance, while standard is established on the basis of technical estimates.
2. Budgets consider both income and expenditure whereas standards are for expenditure only.
3. Budgets projects financial accounts, while standard cost project cost accounts
4. In standard costing, variances are analyzed in detail, but such a detailed analysis of variance is not possible in budgetary control.
5. Budget fix minimum limit while standard fix targets.

6. Budgets are used for the forecasting men, money and materials, standards cannot be used for forecasting.
7. Budgetary control technique is applicable to all types of businesses. However standard costing is useful only for manufacturing organizations.
8. The standards are expressed in per unit of production whereas budgets are for specific periods and are expressed in total.
9. Budgetary control does not require standardization of product. But standard costing requires standardization of product.

Objectives of standard costing:

1. Performance measurement
2. Cost control
3. Stock valuation
4. Establishing selling prices
5. Profit planning and decision making
6. Basis of estimating
7. Assisting establishment of budgets

Basic requirements of standard costing:

- a. **Organization structure:** The existence of a sound organization structure with well defined authority relationship is the basic requirement of a standard costing system.
- b. **Technical and engineering studies:** It is very necessary to make thorough study of the production methods and the processes required for production.
- c. **Preparation of manual:** It is also necessary to prepare a detailed manual for the guidance of staff. The manual should describe the system to be introduced and the benefits thereof.
- d. **Type of standards:** It is very necessary to determine the type of standard to be used, whether current, basic or normal standard.
- e. **Co-operation of Executives and staff:-** Without the co-operation of the executives and staff, it is very difficult to run the standard costing system.
- f. **Fixation of standards:** Standard should be set for each element of cost and it should be scientific.

Steps involved in Standard Costing:-

The procedure for establishing standard costing is summarized as follows:-

1. **Establishment of cost centres:** - A cost centre is a location, person or item of equipment for which costs may be ascertained and used for the purpose of cost control. Cost centres are set up for cost ascertainment and cost control.
2. **Classification and codification of accounts:** - It facilitates quick collection and analysis of cost information.
3. **Establishment of standards:** The success of the standard costing system depends up on the reliability and accuracy of standards. Standards are always established scientifically.
4. **Ascertainment of actual cost:** Measuring the actual cost which is incurred in the next step in the standard costing.

5. **Comparison of Standard cost and Actual cost.**
6. **Analysis of Variances**
7. **Reporting of variance**

Types of standards

1. **Basic standards:** A standard established for use over a long period is known as the basic standard. It remains unaltered over a long period. Its use is to show long term trends, and it operates in a similar way to index numbers. It is also known as the 'bogey, standard. This standard is used for items or costs which are likely to remain constant over a long period.
2. **Current standard:** A standard established for use over a short period of time and related to current conditions, is known as the 'current standard'. This standard shows what the performance should be under current conditions. Conditions during which period the standard is used are known as current conditions.
3. **Ideal standards & Expected standards:-** Ideal standard is that which can be attained under the most favourable conditions, while expected standard is that which is expected to be attained during a specified budget period. It is a target which is attainable and can be achieved if the expected conditions operate during the period for which the standard is set.
4. **Normal standard:** This standard is defined as "the average standard which it is anticipated can be attained over a future period of time, preferably long enough to cover one trade cycle." It is difficult to follow normal standards in practice as it is not possible to forecast performance with a reasonable degree of accuracy for a long period of time.

Analysis of Variances:

Variance is the difference between a standard cost and the comparable actual cost incurred during a period. It is the deviation of actual cost from the standard cost. In other words, the deviation of the actual cost or profit or sales from the standard cost or profit or sales is known as variance. If the actual cost is less than the standard, the difference is known as favourable or positive variance and it is symbol of efficiency. If the actual cost is more than the standard cost, the difference is known as unfavorable variance. Analysis of variance means carrying out the appropriate investigation to identify the reasons for the variance.

Another way of classifying variance may be controllable and uncontrollable variances. If a variance is due to inefficiency of a cost centre, it is said to be controllable variance. Such variance can be corrected by taking a suitable action. A variance due to external reasons like increase in prices of material, labour etc it is a case of uncontrollable variances.

Types of variances

Analysis of variances may be done in respect of each element of cost and sales. It includes

1. Direct material variance
2. Direct labour variance
3. Overhead variance
4. Sales variance

MATERIAL VARIANCES

It includes:

- a. **Material Cost Variance (MCV):** It is the difference between the standard cost of materials allowed for the output achieved and the actual cost of materials used. It may be expressed as:

$$\text{MCV} = \text{Standard cost of materials for actual output} - \text{Actual cost of materials used}$$

$$\text{Std. cost of material} = \text{std qty} \times \text{std price per unit}$$

$$\text{Actual cost of material} = \text{Actual qty} \times \text{actual price}$$
- b. **Material Price Variance (MPV):** It is that portion of the material cost variance which is due to the difference between the standard cost of materials used for the output achieved and the actual cost of materials used.

$$\text{MPV} = \text{Actual qty} \times (\text{std price} - \text{Actual price})$$
- c. **Material Usage Variance or Material Quantity Variance (MQV):** It is that portion of material cost variance which is due to the difference between the standard quantity of materials specified for the actual output and the actual quantity of materials used.

$$\text{MUV} = \text{Std price per unit} (\text{Std qty} - \text{Actual qty})$$
- d. **Material Mix Variance (MMV):** It is that portion of the material usage variance which is due to the difference between standard and actual composition of a mixture. It is calculated as the difference between the standard price of the standard mix standard price of the actual mix.
 In case of material mix variance, two situations may arise: Actual weight of mix and the A. Standard weight of mix do not differ: - In this case material mix variance is calculated by applying the following formula

$$\text{MMV} = \text{Std price} (\text{Std qty} \times \text{Actual qty})$$
 If the standard is revised due to shortage of a particular type of material, the material mix variance is calculated as follows:

$$\text{MMV} = \text{Std price} (\text{Revised std qty} - \text{Actual qty})$$
- B. Actual weight of mix differ from standard weight weight of mix:- In such a case, material mix variance is calculated as follows:

$$\frac{\text{Total weight of actual mix}}{\text{Total weight of std mix}} \times \text{Std cost of std mix} - \text{Std cost of actual mix}$$

- e. **Material Yield Variance :-** It is that portion of the material usage variance which is due to the difference between the standard yield specified and the actual yield obtained. This variance measures the abnormal loss or saving of material.

Illustration I. From the following information, compute Price, usage and mix variances.

| | Standard | | | Actual | | |
|------------|----------|-------|-------|--------|-------|-------|
| | Qty | Price | Total | Qty | Price | Total |
| Material A | 10 | 3 | 30 | 15 | 4 | 60 |
| Material B | 15 | 4 | 60 | 25 | 3 | 75 |
| Material C | 25 | 2 | 50 | 35 | 2 | 70 |
| | ----- | | | ----- | | |
| | 50 | | 140 | 75 | | 205 |
| | === | | === | === | | ===== |

Solution:

1. Material price variance:

Actual usage (Std price - Actual Price)

Material A = 15 (3 - 4) = Rs. 15 adverse

Material B = 25 (4 - 3) = Rs. 25 Favourable

Material C = 35 (2 - 2) = Nil

Total Price variance Rs. 10 Favourable

=====

2. Material Usage variance:

Standard rate (Std usage – actual usage)

Material A = 3 (10 - 15) = Rs. 15 Adverse

Material B = 4 (15 - 25) = Rs. 40 Adverse

Material C = 2 (25 - 35) = Rs. 20 Adverse

Total material usage Variance=Rs. 75 Adverse

3. Material Mix Variance:

Total weight of actual mix

----- x Std cost of std mix - Std cost of actual mix

Total weight of std mix

15+25+35

----- x 10 x Rs. 15 x Rs. 4 + 25 x Rs. 2) - 15 x Rs. 3 + 25 x Rs. 4 + 35 x Rs. 2

10+15+25

=75/50 x Rs. 140 – Rs. 215

= Rs. 210 – Rs. 215 = Rs. 5 Adverse

Illustration 2. It is estimated that a product requires 50 units of material at the rate of Rs. 3 per unit. The actual consumption of material for manufacturing the same product came to 60 units at the rate of Rs. 2.9 per unit. Calculate

1. Material cost variance
2. Material price variance
3. Material usage variance

Solution:

1. Material cost variance = Std cost – Actual cost

Std cost = Std qty x Std price per unit = 50 x 3 = 150

Actual cost = Actual qty x Actual price per unit = 60 x 2.90 = 174

Material Cost Variance = 150 – 174 = 24 un favourable

2. Material Price Variance = Actual qty x (Std price – actual price)

60 x (3 – 2.90) = 6 favourable

3. Material usage variance = Std price x (Std qty – Actual qty)

3 x (50 - 60) = Rs. 30 unfavourable

Labour Variance: When standard cost of labour differs from actual wage cost, the labour variance arises. The following are the important types of labour variances

1. **Labour cost variance:** It is the difference between standard cost of labour allowed for actual output achieved and the actual cost of labour.

$$\text{LCV} = \text{Std cost of labour} - \text{Actual cost labour}$$
2. **Labour rate variance:** It is that part of labour cost variance, which arises due to the difference between standard rate specified and the actual rate paid.

$$\text{LRV} = \text{Actual time} \times (\text{Std rate} - \text{Actual rate})$$
3. **Labour Efficiency Variance:** It is that portion of labour cost variance which arises due to the difference between standard labour hours specified for the activity achieved and the actual labour hours expended.

$$\text{LEV} = \text{Standard rate} \times (\text{Standard time for actual output} - \text{Actual time})$$

It arises because of the following reasons:

- a. Use of incorrect grade of labour
- b. Insufficient training
- c. Bad supervision
- d. Incorrect instructions
- e. Bad working conditions
- f. Worker's dissatisfaction
- g. Defective equipment and machinery
- h. Wrong item of equipments
- i. Excessive labour turn over, and
- j. Fixation of incorrect standards.

Illustration: I

Calculate labour cost variance from the following data:

| | |
|-----------------|----------------|
| Standard hours: | 40 |
| Rate : | Rs. 3 per hour |
| Actual hours : | 60 |
| Rate : | Rs. 4 per hour |

Solution:

$$\begin{aligned} \text{Labour cost Variance} &= \text{Standard cost of labour} - \text{Actual cost of labour} \\ &= (40 \times 3) - (60 \times 4) \\ &= 120 - 240 = \text{Rs. 120 Adverse} \end{aligned}$$

Illustration II

The standard and actual figures of a firm are as under

| | |
|-----------------------------|-----------|
| Standard time for the job : | 1000 hrs |
| Standard rate per hour : | Re.0.50 |
| Actual time taken : | 900 hours |
| Actual wages paid : | Rs.360 |

Compute labour variances.

Solution:

$$\begin{aligned}\text{Labour Cost Variance} &= \text{Standard cost of labour} - \text{Actual cost of labour} \\ &= (1000 \times 0.50) - (900 \times 0.40) \\ &= 500 - 360 \\ &= \text{Rs. 140 Fav}\end{aligned}$$

$$\begin{aligned}\text{Labour Mix Variance} &= \text{Actual time} \times (\text{Standard rate} - \text{Actual rate}) \\ &= 900 \times (0.50 - 0.40) \\ &= \text{Rs. 90 Fav}\end{aligned}$$

$$\begin{aligned}\text{Labour efficiency Variance} &= \text{Standard rate} \times (\text{Standard time for actual output} - \text{Actual time}) \\ &= 0.50 \times (1000 - 900) \\ &= \text{Rs. 50 Fav.}\end{aligned}$$

Overhead Variances:

The term overhead, which comprises indirect materials, indirect labour and indirect expenses, may relate to factory, office or selling and distribution. It is the sum of variable overhead variance and fixed overhead variance. In other words, it is the difference between standard overhead cost charged to production and the actual overhead cost incurred.

Variable overhead Cost variance: This represents the difference between the standard cost of variable overhead allowed for actual output and the actual variable overhead incurred during the period. Variable overhead cost variance is made up of variable overhead expenditure variance and variable overhead efficiency variance.

It is computed by the application of the following formula:

- a. When OH rate per unit is used

$$\begin{aligned}\text{VOH Cost Variance} &= (\text{Actual output} \times \text{Std variable OH rate per unit}) - \text{Actual Variable OH} \\ \text{Std. VOH rate per unit} &= \text{Std variable OH}\end{aligned}$$

Std out put

- b. When OH rate per hour is used

$$\begin{aligned}\text{VOH Cost Variance} &= (\text{Std hours for actual output} \times \text{Std variable OH rate per hour}) - \text{Actual VOH} \\ \text{Std VOH rate per hour} &= \text{Std VOH}\end{aligned}$$

Std hours

Variable Over head Expenditure Variance:

It is the difference between the standard variable OH rate per hour and the actual variable OH rate per hour, multiplied by the actual hours worked.

$$\begin{aligned}\text{Variable OH expenditure Variance} &= (\text{Actual hours worked} \times \text{Std Variable OH rate per hour}) - \text{Actual variable OH}\end{aligned}$$

OR

$$(\text{Std output for actual hours} \times \text{Std OH rate per unit}) - \text{Actual variable OH}$$

Variable OH efficiency Variance: It is the difference between the variable overhead allowed for production and the variable overhead absorbed through production.

Variable OH Efficiency Variance = Std Variable OH rate per hour (Std hours for actual production – Actual hours)

If actual hours is less, it is favourable variance and vice versa.

Illustration

From the following data for the month of Feb., Calculate OH variances.

| | |
|-----------------------------------|-------------|
| Budgeted production for the month | - 150 units |
| Budgeted variable OHs | - Rs. 3750 |
| Std time for one unit | - 10 hrs |
| Actual production for the month | - 125 units |
| Actual variable OHs | -Rs. 3 600/ |
| Actual hours worked | - 2250 hrs |

Solution

Std OHs for actual production (125 units) = $3750/150 \times 125$
= Rs. 3125

Std OH rate per hour:

Total std hours = $150 \text{ units} \times 10 = 1500 \text{ hrs}$

Rate per hour = $3750/1500 = \text{Rs. } 2.5$

Actual OH rate per hour = $3600/2250 \text{ hrs} = \text{Rs. } 1.6$

Std. hours for actual production = $125 \text{ units} \times 10 \text{ hours} = 1250 \text{ hrs}$

1. VOH Cost Variance = (Actual output x Std variable OH rate per unit) – Actual Variable OH
= $(125 \times 2.5) - 3600$
= $3125 - 3600 = 475 \text{ Adverse}$
2. Variable Overhead Expenditure Variance = (Actual hours worked x Std Variable OH rate per hour) – Actual variable OH
= $(2250 \times 2.5) - 3600$
= Rs. 2025 F
3. Variable Overhead Efficiency Variance = Std Variable OH rate per hour(Std hours for actual production – Actual hours)
= $2.5 (1250 - 2250)$
= Rs. 2500 A

Fixed Over head variance:

It is the difference between standard fixed overhead allowed for actual output and the actual fixed overhead incurred. Fixed overhead cost variance is calculated by using the following equation

$$\text{Fixed OH cost Variance} = \text{Std. fixed OH for actual Output} - \text{Actual fixed OH}$$

If actual OH is less, it is favourable variance and vice versa. Fixed OH cost variance is divided into two – fixed overhead expenditure variance and fixed overhead volume variance.

Fixed OH Expenditure variance: It is the difference between budgeted fixed overhead and actual fixed overhead.

$$\text{Fixed Overhead expenditure variance} = \text{Budgeted fixed OH} - \text{Actual Fixed OH}$$

Fixed OH volume Variance: It is the difference between Std fixed OH allowed for actual output and the budgeted fixed overhead for the period.

$$\text{Fixed Overhead Volume Variance} = \text{Std. fixed overhead for actual output} - \text{Budgeted fixed Overheads.}$$

Illustration:

From the following data relating to June 2011, Calculate fixed OH variances:

| | |
|---------------------------------|---------------|
| Budgeted hours for the month | = 180 hrs |
| Budgeted output for the month | = 9,000 units |
| Budgeted fixed overheads | = Rs. 27,000 |
| Actual production for the month | = 9,200 units |
| Actual hours for production | = 175 units |
| Actual fixed overheads | = Rs. 28,000 |

Solution:

1. Fixed overhead cost variance = Std fixed overhead for actual output – Actual fixed overhead
 $= 27600 - 28000 = \text{Rs. } 400 \text{ A}$
2. Fixed Overhead expenditure Variance = Budgeted fixed overhead – Actual fixed overhead
 $= 27,000 - 28,000 = \text{Rs. } 1000 \text{ A}$
3. Fixed Overhead Volume Variance = Std fixed overhead for actual output – Budgeted fixed overheads
 $= 27600 - 27000 = \text{Rs. } 600 \text{ F}$

Note: Std. overhead for actual output (9200 units) = $27000/9000 \times 9200$

$$= \text{Rs. } 27600$$

Reference Books:

1. S.P. Jain & K.L. Narang
2. N.K. Prasad: Cost Accounting
3. Nigam & Sharma: Cost Accounting
4. Khanna Pandey & Ahuja: Practical Costing
5. M.L. Agarwal: Cost Accounting
6. Jain & Narang: Cost Accounting
7. S.P. Iyengar: Cost Accounting
8. S.N. Maheshwari: Cost Accounting
9. Horngren: Cost Accounting: A Managerial Emphasis
10. M. N. Arora: Cost Accounting
11. Dutta: Cost Accounting
