# ADVANCED COST AND MANAGEMENT ACCOUNTING

## IV Semester – M.Com

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### 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**.**

### 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. <u>A cost should be charged only after it has been incurred:</u> 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. <u>The convention of prudence should be ignored:</u> 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. <u>Abnormal costs should be excluded from cost accounts:</u> 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. <u>Past costs not to be charged to future period:</u> 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. <u>Principles of double entry should be applied wherever necessary:</u> 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 statues. 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) **<u>Costing as an aid to management</u>**:- 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) <u>**Costing as an aid to Creditors**</u>.

   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) <u>**Costing as an aid to employees**</u>.

   Employees have a vital interest in their employer's enterprise in which they are employed. They are benefited by a number of ways by the installation of an efficient system of costing. They are benefited, 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 o f 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.

| Industry/product | Cost unit basis |
| --- | --- |
| 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.
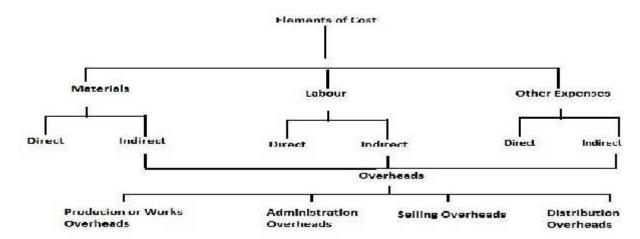
**Types, Methods and Techniques of Costing**

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) *Bach 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.

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 ot 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.

# 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) <u>Direct materials:</u> 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) <u>Indirect materials:</u> 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 it 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. Form 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:-<br>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.

## (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.*

$$Q = \sqrt{\frac{2AB}{CS}}$$

Q = Quantity to be ordered

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

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

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

## 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,

Maximum Stock level = Reordering level + Re-ordering Quantity –

(Minimum consumption x    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 + ½ of Re-order Quantity.

Or ½ (Minimum Stock Level + Maximum Stock Level)

## 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 is 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.

**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.

2) **Last in Last Out (LILO)**

   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.

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 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.

## 6. Average Stock Level

Average stock level represents the average stock held in storage. It is calculated by applying any of the following formulae depending upon the information available:

1. Average Stock Level = 1/2 of (Opening Stock + Closing Stock)
2. Average Stock Level = 1/2 of (Maximum Stock Level + Minimum Stock Level)
3. Average Stock Level = Minimum Stock Level + 1/2 of EOQ

# ILLUSTRATIONS

### Illustration: 1

Find out the ordering level from the following information:

(a) Minimum stock 6,000 units (b) Maximum stock 11,000 units (c) Time required for receiving the material 20 days (d) Daily consumption of materials 200 units.

### Solution:

Re-order Level = Minimum Stock + Consumption during the Time Required for Fresh Delivery

Minimum Stock = 6,000 Units

Consumption during the Time Required for Fresh Delivery = Daily Consumption of Materials x Time Required for Receiving the Material i.e. 200 Units x 20 Days

∴ ROL = 6,000 + (200 Units x 20 Days)

= 6,000 + 4,000 = **10,000 Units**

### Illustration: 2

Calculate the re-ordering level from the following information:

Maximum consumption      4,000 units per day
Minimum consumption      2,750 units per day
Re-order Period      7 to 9 days

### Solution:

Re-order Level = Maximum Consumption x Maximum Re-order Period

Maximum Consumption = 4,000 Units Per Day

Maximum Re-order Period = 9 Days

∴ Re-order Level = 4,000 Units x 9 Days = **36,000 Units**

### Illustration: 3

Material 'X' is used as follows:

Maximum usage in a month      300 units
Minimum usage in a month      200 units
Normal usage in a month      220 units
Re-order period: Maximum 3 months, minimum 1 month
Re-order Quantity: 800 units
Maximum re-order period for emergency purchases 15 days

Calculate-

(a) Re-order level (b) Maximum level (c) Minimum level (d) Average stock level (e) Danger level

**Solution:**

(a) Re-order Level = Maximum Consumption x Maximum Re-order Period

= 300 Units x 3 Months = 900 Units

(b) Maximum Stock Level = Re-order Level + ROQ – (Minimum Consumption x Minimum Re-order Period)

= 900 + 800 – (200 x 1)

= 1,700 – 200 = 1,500 Units

(c) Minimum Stock Level = Re-order Level – (Normal Consumption x Average Re-order Period)

= 900 – (220 x 2)

= 900 – 440 = 460 Units

Average Re-order Period = $\dfrac{\text{Maximum Re-order Period} + \text{Minimum Re-order Period}}{2}$

= $\dfrac{3 + 1}{2}$ = 2 Months

(d) Average Stock Level = $\dfrac{\text{Maximum Stock Level} + \text{Minimum Stock Level}}{2}$

= $\dfrac{1,500 + 460}{2} = \dfrac{1,960}{2}$ = 980 Units

Alternatively, Average Stock Level can be calculated by using the following formula:

Average Stock Level = Minimum Stock Level + 1/2 of ROQ

∴ Average Stock Level = 460 + (1/2 x 800)

= 460 + 400 = 860 Units

(e) Danger Level = Normal Consumption x Maximum Re-order Period for Emergency Purchases

= 220 x 1/2 Month = 110 Units

## Illustration: 4

Calculate minimum stock level, maximum stock level and re-ordering level from the following details:

| | |
|---|---|
| (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 |

*[Madras University, B.Com., Nov. 2006; B.C.S. (Sem.-SY5A), Nov. 2005]*

**Solution:**

1. Re-order Level = Maximum Consumption x Maximum Re-order Period

Maximum Consumption = 150 Units Per Day

Maximum Re-order Period = 15 Days

∴ Re-order Level = 150 x 15 = 2,250 Units

2. Minimum Stock Level = ROL – (Normal Consumption* x Normal Re-order Period)

Re-order Level = 2,250 Units

| | | |
|---|---|---|
| Normal Consumption | = | 120 Units Per Day |
| Normal Re-order Period | = | 12 Days |
| ∴ Minimum Stock Level | = | 2,250 – (120 × 12) |
| | = | 2,250 – 1,440 = **810 Units** |

3. Maximum Stock Level = ROL + ROQ – (Minimum Consumption × Minimum Re-order Period)

| | | |
|---|---|---|
| Re-order Level | = | 2,250 Units |
| Re-order Quantity | = | 1,500 Units |
| Minimum Consumption | = | 100 Units Per Day |
| Minimum Re-order Period | = | 10 Days |
| ∴ Maximum Stock Level | = | 2,250 + 1,500 – (100 × 10) |
| | = | 3,750 – 1,000 = **2,750 Units** |

\* *As normal consumption is available, it has been used instead of average consumption to calculate minimum stock level.*

*Note: In the calculation of stock levels, whether asked at first or not Re-order Level is to be calculated at first because without which other levels couldn't be calculated.*

## Illustration: 5

From the following data for the last twelve months compute re-order level, minimum level and average stock level of a stock item.

Maximum usage in a month 300 Kgs.

Minimum usage in a month 200 Kgs.

Average usage in a month 225 Kgs.

Time lag in the procurement of materials: Maximum - 6 months; Minimum - 2 months; Re-ordering quantity - 750 Kgs.

*[Madras University, B.Com., Nov. 2006, Nov. 2005; B.A. Corp., Oct. 1998]*

## Solution:

1. Re-order Level = Maximum Consumption × Maximum Re-order Period

| | | |
|---|---|---|
| Maximum Consumption | = | 300 Kgs. Per Month |
| Maximum Re-order Period | = | 6 Months |
| ∴ Re-order Level | = | 300 × 6 = **1,800 Kgs.** |

2. Minimum Stock Level = ROL – (Average Consumption* × Average Re-order Period*)

| | | |
|---|---|---|
| Re-order Level | = | 1,800 Kgs. |
| Average Consumption | = | 225 Kgs. Per Month |
| Average Re-order Period | = | $\dfrac{\text{Minimum Re-order Period} + \text{Maximum Re-order Period}}{2}$ |
| | = | $\dfrac{2 + 6}{2} = 4$ Months |

\* *As normal consumption and normal re-order period are not available, average consumption and average re-order period have been applied.*

| | | |
|---|---|---|
| ∴ Minimum Stock Level | = | 1,800 – (225 × 4) |
| | = | 1,800 – 900 = **900 Kgs.** |

3. Maximum Stock Level = ROL + ROQ – (Minimum Consumption × Minimum Re-order Period

| | | |
|---|---|---|
| Re-order Level | = | 1,800 Kgs. |
| Re-order Quantity | = | 750 Kgs. |

| | | |
|---|---|---|
| Minimum Consumption | = | 200 Kgs. |
| Minimum Re-order Period | = | 2 Months |
| ∴ Maximum Stock Level | = | 1,800 + 750 – (200 x 2) |
| | = | 2,550 – 400 = 2,150 Kgs. |

| | | |
|---|---|---|
| 4. Average Stock Level | = | Minimum Stock Level + ½ of ROQ |
| Minimum Stock Level | = | 900 kgs. |
| Re-order Quantity | = | 750 kgs. |
| ∴ Average Stock Level | = | 900 + (½ x 750) |
| | = | 900 + 375 = 1,275 Kgs. |

Alternatively,

Average stock level can be calculated by using the following formula:

$$\text{Average Stock Level} = \frac{\text{Minimum Stock Level} + \text{Maximum Stock Level}}{2}$$

| | | |
|---|---|---|
| Minimum Stock Level | = | 900 Kgs. |
| Maximum Stock Level | = | 2,150 Kgs. |
| ∴ Average Stock Level | = | $\dfrac{900 + 2,150}{2} = \dfrac{3,050}{2} = 1,525$ Kgs. |

## Illustration: 6

From the following information, calculate: (a) Maximum stock level; (b) Minimum stock level; (c) Re-order level; and (d) Average stock level.

| | | |
|---|---|---|
| Minimum consumption | - | 240 units per day |
| Maximum consumption | - | 420 units per day |
| Normal consumption | - | 300 units per day |
| Re-order period | - | 10 - 15 days |
| Normal re-order period | - | 12 days |
| Re-order quantity | - | 3,600 units |

[Madras University, B.Com., April 2005; B.C.S., April 2005]

## Solution:

| | | |
|---|---|---|
| 1. Re-order Level | = | Maximum Consumption x Maximum Re-order Period |
| Maximum Consumption | = | 420 Units Per Day |
| Maximum Re-order Period | = | 15 Days |
| ∴ Re-order Level | = | 420 x 15 = 6,300 Units |
| 2. Minimum Stock Level | = | ROL – (Normal Consumption x Normal Re-order Period) |
| Re-order Level | = | 6,300 Units |
| Normal Consumption | = | 300 Units Per Day |
| Normal Re-order Period | = | 12 Days |
| ∴ Minimum Stock Level | = | 6,300 – (300 x 12) |
| | = | 6,300 – 3,600 = 2,700 Units |
| 3. Maximum Stock Level | = | ROL + ROQ – (Minimum Consumption x Minimum Re-order Period) |
| Re-order Level | = | 6,300 Units |
| Re-order Quantity | = | 3,600 Units |
| Minimum Consumption | = | 240 Units Per Day |
| Minimum Re-order Period | = | 10 Days |

$$\therefore \text{ Maximum Stock Level} = 6,300 + 3,600 - (240 \times 10)$$
$$= 9,900 - 2,400 = \textbf{7,500 Units}$$

4. Average Stock Level = Minimum Stock Level + 1/2 of ROQ

Minimum Stock Level = 2,700 Units

Re-order Quantity = 3,600 Units

$\therefore$ Average Stock Level = 2,700 + 1/2 of 3,600

= 2,700 + 1,800 = **4,500 Units**

Alternatively,

$$\text{Re-order Level} = \frac{\text{Minimum Stock Level + Maximum Stock Level}}{2}$$

$$= \frac{2,700 + 7,500}{2} = \frac{10,200}{2} = \textbf{5,100 Units}$$

## Illustration: 7

Two components A and B are used as follows:

|  |  |
|---|---|
| Minimum usage | 50 units per week each |
| Maximum usage | 150 units per week each |
| Ordering quantities | A - 700 units |
|  | B - 1,050 units |
| Delivery period | A - 4 to 6 weeks |
|  | B - 2 to 4 weeks |

Maximum re-order period for emergency purchases 2 weeks both for A & B.

Calculate for each component:

a) Re-ordering level      b) Maximum level

c) Minimum level         d) Danger level

## Solution:

(a) Re-order Level = Maximum Consumption x Maximum Re-order Period

A = 150 Units x 6 Weeks = **900 Units**

B = 150 Units x 4 Weeks = **600 Units**

(b) Maximum Level = Re-order Level + Re-order Quantity – (Minimum Consumption x Minimum Re-order Period)

A = 900 Units + 700 Units – (50 Units x 4 Weeks)

= 1,600 – 200 = **1,400 Units**

B = 600 Units + 1,050 Units – (50 Units x 2 Weeks)

= 1,650 – 100 = **1,550 Units**

(c) Minimum Level = Re-order Level – (Average Consumption x Average Re-order Period)

A = 900 Units – (100 Units x 5 Weeks)

= 900 – 500 = **400 Units**

B = 600 Units – (100 Units x 3 Weeks)

= 600 – 300 = **300 Units**

Average Consumption both for A and B:

$$= \frac{50 + 150}{2} = \frac{200}{2} = \textbf{100 Units}$$

**Average Re-order Period:**

$$A = \frac{4+6}{2} = 5 \text{ Weeks}$$

$$B = \frac{2+4}{2} = 3 \text{ Weeks}$$

| | | |
|---|---|---|
| (d) Danger Level | = | Minimum Consumption x Maximum Re-order Period for Emergency Purchases |
| A | = | 50 Units x 2 Weeks = **100 Units** |
| B | = | 50 Units x 2 Weeks = **100 Units** |

Alternatively, it can be calculated by using Average Consumption as below:

| | | |
|---|---|---|
| Danger Level | = | Average Consumption x Emergency Re-order Period |
| A | = | 100 x 2 Weeks = **200 Units** |
| B | = | 100 x 2 Weeks = **200 Units** |

## Illustration : 8

Two components 'A' and 'B' are used as follows.

1. Re-ordering quantity : A = 3,000 units
   B = 4,000 units
2. Re-ordering period : A = 4 to 6 weeks
   B = 2 to 4 weeks
1. Normal Usage : 3,000 units per week each
2. Minimum Usage : 1,500 units per week each
3. Maximum Usage : 4,500 units per week each

You are required to calculate for each of the components:

(a) Maximum Stock Level; (b) Minimum Stock Level; (c) Average Stock Level; and (d) Re-order Level.

## Solution:

| | | |
|---|---|---|
| Re-order Level | = | Maximum Consumption x Maximum Re-order Period |
| A | = | 4,500 x 6 = **27,000 Units** |
| B | = | 4,500 x 4 = **18,000 Units** |
| (a) Maximum Stock Level | = | Re-order Level + Re-order Quantity – (Minimum Usage x Minimum Lead Time) |
| A | = | 27,000 + 3,000 – (1,500 x 4) |
| | = | 30,000 – 6,000 = **24,000 Units** |
| B | = | 18,000 + 4,000 – (1,500 x 2) |
| | = | 22,000 – 3,000 = **19,000 Units** |
| (b) Minimum Stock Level | = | Re-order Level – (Normal Consumption x Average Re-order Period) |
| A | = | 27,000 – (3,000 x 5) |
| | = | 27,000 – 15,000 = **12,000 Units** |
| B | = | 18,000 – (3,000 x 3) |
| | = | 18,000 – 9,000 = **9,000 Units** |

**Average Re-order Period:**

$$A = \frac{4+6}{2} = 5 \text{ Weeks}$$

$$B = \frac{2+4}{2} = 3 \text{ Weeks}$$

(c) Average Stock Level $= \dfrac{(\text{Maximum Stock Level} + \text{Minimum Stock Level})}{2}$

$$A = \frac{24,000 + 12,000}{2} = 18,000 \text{ Units}$$

$$B = \frac{19,000 + 9,000}{2} = 14,000 \text{ Units}$$

Alternatively, average stock can be calculated by using the following formula:

Average Stock Level $=$ Minimum Stock $+ 1/2$ of ROQ

$$A = 12,000 + \left(\frac{1}{2} \times 3,000\right)$$

$$= 12,000 + 1,500 = 13,500 \text{ Units}$$

$$B = 9,000 + \left(\frac{1}{2} \times 4,000\right)$$

$$= 9,000 + 2,000 = 11,000 \text{ Units}$$

## Illustration: 9

In manufacturing its product a company uses three materials X, Y and Z in respect of which the following apply:

| Raw Material | Usage Per Unit of Production (lbs) | Re-order Quantity (lbs) | Price Per lb (paise) | Delivery Period (weeks) | Order Level (lbs) | Minimum Level (lbs) |
|---|---|---|---|---|---|---|
| X | 10 | 10,000 | 10 | 1 to 3 | 8,000 | ..... |
| Y | 6 | 5,000 | 30 | 3 to 5 | 4,750 | .... |
| Z | 5 | 10,000 | 15 | 2 to 4 | ..... | 2,000 |

Weekly production varies from 150 to 180 units, averaging 165. What would you expect the quantities of the following to be:

    (a) Minimum Stock of X          (b) Maximum Stock of Y
    (c) Re-order Level of Z          (d) Average Stock level of X?

## Solution:

**(a) Minimum Stock Level of X:**

| | | |
|---|---|---|
| Minimum Stock Level | = | Re-ordering Level – (Average Consumption x Average Delivery Time) |
| Re-order Level | = | 8,000 lbs |
| Average Consumption of X | = | Usage Per Unit of Production x Average Output |
| | = | 10 lbs x 165 Units = 1,650 lbs. |
| Average Delivery Time for X | = | $\dfrac{\text{Maximum Delivery Period} + \text{Minimum Delivery Period}}{2}$ |
| | = | $\dfrac{1+3}{2} = 2$ Weeks |
| $\therefore$ Minimum Stock Level of X | = | 8,000 – (1,650 x 2) |
| | = | 8,000 – 3,300 = 4,700 lbs |

**(b) Maximum Stock Level of Y:**

$$\text{Maximum Stock Level} = \text{Re-order Level} + \text{Re-order Quantity} - (\text{Minimum Consumption*} \times \text{Minimum Delivery Time})$$

$$= 4,750 + 5,000 - (900 \times 3)$$

$$= 9,750 - 2,700 = 7,050 \text{ lbs}$$

*Minimum Consumption of Y = Minimum Output x Usage Per Unit of Output

= 150 Units x 6 = 900 lbs

**(c) Re-order Level of Z:**

Re-order Level = Maximum Consumption x Maximum Delivery Time

Maximum Consumption = Maximum Production in Units x Usage Per Unit of Output

= 180 Units x 5 lbs = 900 lbs

Maximum Delivery Period = 4 Weeks

∴ ROL = 900 lbs x 4 Weeks = 3,600 lbs

**(d) Average Stock Level of X:**

Average Stock Level = Minimum Stock + 1/2 of ROQ

$$= 4,700 + 1/2 \times 10,000 = 9,700 \text{ lbs}$$

## Illustration: 10

Two components M & N are used as follows:

| | |
|---|---|
| Normal usage | : 150 units per week each |
| Minimum usage | : 100 units per week each |
| Maximum usage | : 200 units per week each |
| Re-order Quantity | : M - 900 units, N - 1,250 units |
| Re-order Period | : M - 4 to 6 weeks; N - 2 to 4 weeks |

Calculate different stock levels for M & N.

## Solution:

**1. Calculation of Re-order Level:**

Material M:

Re-order Level = Maximum Consumption x Maximum Re-order Period

Maximum Consumption = 200 Units Per Week

Maximum Re-order Period = 6 Weeks

∴ Re-order Level = 200 Units Per Week x 6 Weeks = **1,200 Units**

Material N:

Re-order Level = 200 Units x 4 Weeks = **800 Units**

**2. Calculation of Minimum Stock Level:**

Minimum Stock Level = ROL – (Normal Consumption x Average Re-order Period)

Material M:

Re-order Level = 1,200 Units

Normal Consumption = 150 Units Per Week

Average Re-order Period = $\dfrac{4 + 6}{2} = 5$ Weeks

∴ Minimum Stock Level M = 1,200 – (150 x 5)

= 1,200 – 750 = **450 Units**

Material N:

Minimum Stock Level of N = 800 – (150 x 3)

= 800 – 450 = **350 Units**

**3. Calculation of Maximum Stock Level:**

Maximum Stock Level = ROL + ROQ – (Minimum Consumption x Minimum Re-order Period)

Material M:

ROL = 1,200 Units

ROQ = 900 Units

Minimum Consumption = 100 Units Per Week

Minimum Re order period = 4 Weeks

∴ Maximum Stock Level = 1,200 + 900 – (100 x 4)

= 2,100 – 400 = **1700 Units**

Material N:

Maximum Stock Level = 800 + 1,250 – (100 x 2)

= 2,050 – 200 = **1,850 Units**

**4. Average Stock Level:**

Average Stock Level = Minimum Stock Level + (1/2 of ROQ)

Material M:

= 450 + (1/2 x 900)

= 450 + 450 = **900 Units**

Alternatively,

$$\text{Average Stock Level} = \frac{\text{Minimum Stock Level + Maximum Stock Level}}{2}$$

$$= \frac{450 + 1,700}{2} = \frac{2,150}{2} = 1,075 \text{ Units}$$

Material N:

Average Stock Level = 350 + (1/2 x 1,250)

= 350 + 625 = **975 Units**

Alternatively,

$$= \frac{\text{Minimum Stock Level + Maximum Stock Level}}{2}$$

$$= \frac{350 + 1,850}{2} = \frac{2,200}{2} = 1,100 \text{ Units}$$

# Illustration: 11

A factory requires 6,000 units of a certain material for a year. Cost of carrying one unit at this material is calculated to ₹ 2 p.a. and it is estimated that the expenses of placing an order and receiving would amount to ₹ 60.

Calculate EOQ with proof.

## Solution:

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

C = 6,000 Units

O = ₹ 60

I = ₹ 2

$$\therefore EOQ = \sqrt{\frac{2 \times 6,000 \times 60}{2}}$$

$$= \sqrt{\frac{7,20,000}{2}} = \sqrt{3,60,000} = 600 \text{ Units}$$

of holding inventory (i), thus in lowering cost of buying...

| No. of Orders (1) | Qty Per Order (6,000 ÷ Column 1) (2) (Units) | Av. Stock Held (Column 2 ÷ 2) (3) (Units) | Cost of Holding Inventory (Column 3 × ₹2) (4) ₹ | Ordering Cost (Column 1 × ₹60) (5) ₹ | Total Cost (Column 4 + Column 5) (6) ₹ |
|---|---|---|---|---|---|
| 4 | 1,500 | 750 | 1,500 | 240 | 1,740 |
| 5 | 1,200 | 600 | 1,200 | 300 | 1,500 |
| 8 | 750 | 375 | 750 | 480 | 1,230 |
| 10 | 600 | 300 | 600 | 600 | 1,200 |
| 15 | 400 | 200 | 400 | 900 | 1,300 |
| 20 | 300 | 150 | 300 | 1,200 | 1,500 |
| 25 | 240 | 120 | 240 | 1,500 | 1,740 |

From the above statement it is clear that at the lot of 600 units the cost of holding and ordering is the least when compared to all the other ordering sizes. Hence, it is considered to be economic order size.

## Illustration: 12

Compute ideal order quantity from the following data:

Consumption of material Z – 6,250 units p.a.
Expenses of placing order and receiving consignment – ₹ 0.50 per order
Cost of storing inventory p.a – ₹ 0.10.

**Solution:**

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

$$C = 6,250 \text{ Units}$$
$$O = ₹ 0.50$$
$$I = ₹ 0.10$$

$$\therefore EOQ = \sqrt{\frac{2 \times 6,250 \times 0.50}{0.10}}$$

$$= \sqrt{\frac{6,250}{0.10}} = \sqrt{62,500} = 250 \text{ Units}$$

## Illustration: 13

From the following figures, calculate Economic Order Quantity and number of orders to be placed in each year.

Annual consumption of materials - 4,000 units
Cost of buying per order - ₹ 5
Cost per unit - ₹ 2 per unit
Storage and carrying cost - 8% on average inventory

**Solution:**

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

$$C = 4{,}000 \text{ Units}$$
$$O = ₹5$$
$$I = 8\% \text{ of } ₹2$$
$$\therefore I = 2 \times \frac{8}{100} = ₹0.16$$

$$\therefore \text{EOQ} = \sqrt{\frac{2 \times 4{,}000 \times 5}{0.16}}$$

$$= \sqrt{\frac{40{,}000}{0.16}} = \sqrt{2{,}50{,}000} = 500 \text{ Units}$$

$$\text{No. of Ordres} = \frac{C}{\text{EOQ}}$$

$$= \frac{4{,}000}{500} = 8 \text{ Orders}$$

## Illustration: 14

Find the economic order quantity from the following particulars:

| | |
|---|---|
| Annual usage | - 4,000 units |
| Cost of material per unit | - ₹20 |
| Cost of placing and receiving one order | - ₹40 |
| Annual carrying cost of one unit | - 10% of inventory value |

**Solution:**

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

$$C = 4{,}000 \text{ Units}$$
$$O = ₹40$$
$$I = 10\% \text{ of } ₹20$$
$$\therefore I = 20 \times \frac{10}{100} = ₹2$$

$$\therefore \text{EOQ} = \sqrt{\frac{2 \times 4{,}000 \times 40}{2}}$$

$$= \sqrt{\frac{3{,}20{,}000}{2}} = \sqrt{1{,}60{,}000} = 400 \text{ Units}$$

## Illustration: 15

From the following particulars calculate the economic order quantity:

| | |
|---|---|
| Annual requirements | 800 units |
| Cost per unit of material | ₹30 |
| Annual return on investments | 10% |
| Rent, insurance, taxes per unit per annum | ₹1 |
| Cost of placing an order | ₹100 |

**Solution:**

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

C = 800 Units

O = ₹ 100

I = Annual Return on Investments + Rent, Insurance, Taxes

∴ I = 10% of ₹ 30 + ₹ 1

$$= \left(30 \times \frac{10}{100}\right) + ₹ 1$$

$$= 3 + 1 = ₹ 4$$

$$\therefore EOQ = \sqrt{\frac{2 \times 800 \times 100}{4}}$$

$$= \sqrt{\frac{1,60,000}{4}} = \sqrt{40,000} = 200 \text{ Units}$$

## Illustration: 16

Find out the economic ordering quantity from the following particulars:

Annual usage : ₹ 1,87,500

Cost of placing and receiving one order : ₹ 60

Annual carrying cost : 10% of inventory value

**Solution:**

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

Where C = Annual Requirement of Materials in Rupees i.e. ₹ 1,20.000

O = Cost of placing one order i.e.₹ 60

I = 10% Carrying Cost i.e.10%

$$\therefore EOQ = \sqrt{\frac{2 \times 1,87,500 \times 60}{10 / 100}}$$

$$= \sqrt{\frac{2 \times 1,87,500 \times 60 \times 100}{10}}$$

$$= \sqrt{\frac{2,250,000,000}{10}} = \sqrt{22,50,00,000} = ₹ 15,000$$

## Illustration: 17

An engineering company consumes 50,000 units of a component per year. The ordering, receiving and handling costs are ₹ 3 per order while the trucking costs are ₹ 12 per order. Further details are as under:

Interest @ ₹ 0.06 per unit per year

Deterioration cost ₹ 0.004 per unit per annum

Storage cost ₹ 1,000 p.a. for 50,000 units

Calculate the EOQ.

*[Madras University, B.A. Corp., Sept. 1996; Adapted]*

**Working Note:**

1. No. of Units $= \dfrac{\text{Annual Consumption in } ₹}{\text{Cost Per Unit of Raw Material}}$

$= \dfrac{2,00,000}{10} = 20,000$ Units

## Illustration: 22

From the following particulars, find out:

(a) How much should be ordered each time?

(b) When should the order be placed?

(c) What should be the inventory level immediately before the material ordered is received?

| | |
|---|---|
| Annual consumption | 12,000 units (360 days) |
| Cost per unit | ₹ 2 |
| Ordering cost | ₹ 12 per order |
| Inventory carrying charge | 12% |
| Normal lead time | 15 days |
| Safety stock | 30 days consumption |

**Solution:**

(a) EOQ $= \sqrt{\dfrac{2CO}{I}}$

$\therefore$ EOQ $= \sqrt{\dfrac{2 \times 12,000 \times 12}{12\% \text{ of } ₹ 2}}$

$= \sqrt{\dfrac{2,88,000}{0.24}} = \sqrt{12,00,000} = 1,095$ Units

(b) Re-order Level $=$ Safety Stock + Lead Time Consumption

$= \left(30 \times \dfrac{12,000}{360}\right) + \left(15 \times \dfrac{12,000}{360}\right)$

$= 1,000 + 500 = 1,500$ Units

(c) Safety Stock $= \dfrac{12,000}{360} \times 30$ Days $= 1,000$ Units

*Notes: (a) The quantity to be ordered is EOQ. Hence for question (a) EOQ is calculated.*

*(b) Order is supposed to be placed at ROL Level. Hence for question (b) ROL is calculated.*

*(c) The inventory level before the material ordered is received is safety stock. Hence for question (c) safety stock is calculated.*

## Illustration: 23

Following information relating to a type of raw material is available:

| | |
|---|---|
| Annual demand | 2,400 units |
| Unit price | ₹2.40 |
| Ordering cost per order | ₹4 |
| Storage cost | 2% p.a. |
| Interest rate | 10% p.a. |
| Lead time | Half month |

Calculate EOQ and total annual inventory cost in respect of the particular raw material.

*[Madras University, B.Com., May 2003]*

# MISCELLANEOUS ILLUSTRATIONS

## I. PROBLEMS ON FIFO & LIFO

### Illustration: 9

The Receipts side of the stores ledger shows the following particulars:

2010

| | | | |
|---|---|---|---|
| Jan. 1 | Opening balance | 500 units @ ₹ 4 |
| " 5 | Received from vendor | 200 units @ ₹ 4.25 |
| " 12 | Received from Vendor | 150 units @ ₹ 4.10 |
| " 20 | Received from vendor | 300 units @ ₹ 4.50 |
| " 25 | Received from vendor | 500 units @ ₹ 4 |

Issues of materials during the month were as follows:

Jan. 4 - 200 Units; Jan. 10 - 400 units; Jan. 15 - 100 units; Jan. 19 - 100 units; Jan. 27 - 200 units; Jan. 30 - 150 units.

Issues are to be priced on the Principle of- (i) 'First In First Out', and (ii) 'Last In First Out'. Write out the stores ledger account in respect of the materials for the month of January 2010.

**Solution:**

**(i) FIFO Method**

### Stores Ledger Account

| Date | Receipts | | | | Issues | | | | Balance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Qty. Units | Rate ₹ | Ps. | Amt. ₹ | Qty. Units | Rate ₹ | Ps. | Amt. ₹ | Qty. Units | Rate ₹ | Ps. | Amt. ₹ |
| 2010 Jan. 1 | | | | | | | | | 500 | 4 | 00 | 2,000 |
| Jan. 4 | | | | | 200 | 4 | 00 | 800 | 300 | 4 | 00 | 1,200 |
| Jan. 5 | 200 | 4 | 25 | 850 | | | | | 300 | 4 | 00 | 1,200 |
| | | | | | | | | | 200 | 4 | 25 | 850 |
| Jan. 10 | | | | | 300 | 4 | 00 | 1,200 | | | | |
| | | | | | 100 | 4 | 25 | 425 | 100 | 4 | 25 | 425 |
| Jan. 12 | 150 | 4 | 10 | 615 | | | | | 100 | 4 | 25 | 425 |
| | | | | | | | | | 150 | 4 | 10 | 615 |
| Jan. 15 | | | | | 100 | 4 | 25 | 425 | 150 | 4 | 10 | 615 |
| Jan. 19 | | | | | 100 | 4 | 10 | 410 | 50 | 4 | 10 | 205 |
| Jan. 20 | 300 | 4 | 50 | 1,350 | | | | | 50 | 4 | 10 | 205 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| Jan. 25 | 500 | 4 | 00 | 2,000 | | | | | 50 | 4 | 10 | 205 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| | | | | | | | | | 500 | 4 | 00 | 2,000 |
| Jan. 27 | | | | | 50 | 4 | 10 | 205 | 150 | 4 | 50 | 675 |
| | | | | | 150 | 4 | 50 | 675 | 500 | 4 | 00 | 2,000 |
| Jan. 30 | | | | | 150 | 4 | 50 | 675 | 500 | 4 | 00 | 2,000 |

## (ii) LIFO Method

### Stores Ledger Account

| Date | Receipts Qty. Units | Rate ₹ | Ps. | Amt. ₹ | Issues Qty. Units | Rate ₹ | Ps. | Amt. ₹ | Balance Qty. Units | Rate ₹ | Ps. | Amt. ₹ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 Jan. 1 | | | | | | | | | 500 | 4 | 00 | 2,000 |
| Jan. 4 | | | | | 200 | 4 | 00 | 800 | 300 | 4 | 00 | 1,200 |
| Jan. 5 | 200 | 4 | 25 | 850 | | | | | 300 | 4 | 00 | 1,200 |
| | | | | | | | | | 200 | 4 | 25 | 850 |
| Jan. 10 | | | | | 200 | 4 | 25 | 850 | | | | |
| | | | | | 200 | 4 | 00 | 800 | 100 | 4 | 00 | 400 |
| Jan. 12 | 150 | 4 | 10 | 615 | | | | | 100 | 4 | 00 | 400 |
| | | | | | | | | | 150 | 4 | 10 | 615 |
| Jan. 15 | | | | | 100 | 4 | 10 | 410 | 100 | 4 | 00 | 400 |
| | | | | | | | | | 50 | 4 | 10 | 205 |
| Jan. 19 | | | | | 50 | 4 | 10 | 205 | | | | |
| | | | | | 50 | 4 | 00 | 200 | 50 | 4 | 00 | 200 |
| Jan. 20 | 300 | 4 | 50 | 1,350 | | | | | 50 | 4 | 00 | 200 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| Jan. 25 | 500 | 4 | 00 | 2,000 | | | | | 50 | 4 | 00 | 200 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| | | | | | | | | | 500 | 4 | 00 | 2,000 |
| Jan. 27 | | | | | 200 | 4 | 00 | 800 | 50 | 4 | 00 | 200 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| | | | | | | | | | 300 | 4 | 00 | 1,200 |
| Jan. 30 | | | | | 150 | 4 | 00 | 600 | 50 | 4 | 00 | 200 |
| | | | | | | | | | 300 | 4 | 50 | 1,350 |
| | | | | | | | | | 150 | 4 | 00 | 600 |

### Illustration: 10

The following is an extract of the record of receipts and issues of sulpher in a chemical factory during June 2010.

June 1   Opening balance 500 tons @ ₹ 200.

"   2   Issue: 70 tons.

"   4   Issue: 100 tons.

"   7   Issue: 80 tons.

"   12   Received from supplier 200 tons @ ₹ 190.

"   14   Returned from department 15 tons.

"   16   Issue: 180 tons.

"   20   Received from supplier 240 tons @ ₹ 190.

"   24   Issue: 300 tons.

Issues are to be priced on the principle of 'First In First Out'. The stock verifier of the factory had found shortage of 10 tons on 22$^{nd}$ June 2010 and left a note accordingly. Draw up a priced stores ledger card for the material, showing the above transactions.

## Solution:

**FIFO Method**

### Stores Ledger

| Date | Receipts Qty. (Tons) | Rate per Ton (₹) | Amt. (₹) | Issues Qty. (Tons) | Rate per Ton (₹) | Amt. (₹) | Balance Qty. (Tons) | Rate per Ton (₹) | Amt. (₹) |
|---|---|---|---|---|---|---|---|---|---|
| 2010 June 1 | | | | | | | 500 | 200 | 1,00,000 |
| " 2 | | | | 70 | 200 | 14,000 | 430 | 200 | 86,000 |
| " 4 | | | | 100 | 200 | 20,000 | 330 | 200 | 66,000 |
| " 7 | | | | 80 | 200 | 16,000 | 250 | 200 | 50,000 |
| " 12 | 200 | 190 | 38,000 | | | | 250 | 200 | 50,000 |
| | | | | | | | 200 | 190 | 38,000 |
| " 14 | 15 | 200[1] | 3,000 | | | | 265[2] | 200 | 53,000 |
| | (Returns from Dept.) | | | | | | 200 | 190 | 38,000 |
| " 16 | | | | 180 | 200 | 36,000 | 85 | 200 | 17,000 |
| | | | | | | | 200 | 190 | 38,000 |
| " 20 | 240 | 190 | 45,600 | | | | 85 | 200 | 17,000 |
| | | | | | | | 440 | 190 | 83,600 |
| " 22 | | | | 10 | 200[3] | 2,000 | 75 | 200 | 15,000 |
| | | | | (Deficiency on Verification) | | | 440 | 190 | 83,600 |
| " 24 | | | | 75 | 200 | 15,000 | 215 | 190 | 40,850 |
| | | | | 225 | 190 | 42,750 | | | |
| " 25 | 320 | 190 | 60,800 | | | | 535 | 190 | 1,01,650 |
| " 26 | | | | 115 | 190 | 21,850 | 420 | 190 | 79,800 |
| " 27 | 35 | 190[4] | 6,650 | | | | 455 | 190 | 86,450 |
| | (Returns from Dept.) | | | | | | | | |
| " 28 | 200 | 190 | 38,000 | | | | 655 | 190 | 1,24,450 |

**Notes:** 1: Returns from department on 14.06.2010 is recorded at ₹200 because recently all the issues were made only at ₹200 only.

2. Returned stock is added at first so that under FIFO principle, they can be issued immediately on the next requisition.

3. The deficiency is treated like an issue and on FIFO principle the earliest rate is taken to record it here.

4. Returns from department is recorded at the latest issue rate.

## Illustration: 11

A firm furnishes the following store transactions for July 2010:

July 1   Opening balance 25 units valued at ₹ 162.50
,, 4   Issue Req. No. 101 - 8 units
,, 6   Receipts from Ravi & Co. GRN No. 26 - 50 units @ ₹ 5.75 per unit
,, 7   Issue Req. No. 102 - 12 units
,, 10   Returned to Ravi & Co. 10 units
,, 12   Issues Req. No. 103 - 15 units
,, 13   Issues Req. No. 104 - 20 units
,, 15   Receipts from Hari & Co. GRN No. 33 - 25 units @ ₹ 6.10 per unit
,, 17   Issues Req. No. 105 - 10 units
,, 19   Received replacement from Ravi & CO. GRN No. 38 - 10 units
,, 20   Returned from department 5 units, purchased from Ravi & Co.
,, 22   Transfer from Job No. 110 to 115 in the department MTR No. 6 - 5 units
,, 26   Issues Req. No. 106 - 10 units
,, 29   Transfer from Dept. A to B MTR No. 10 - 5 units
,, 30   Shortage in stock taking - 2 units

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

## Solution:

### FIFO Method

#### Stores Ledger

| Date | GRN No. | Qty. Units | Rate ₹ | Rate Ps. | Amt. ₹ | Amt. Ps. | Req. No. | Qty. Units | Rate ₹ | Rate Ps. | Amt. ₹ | Amt. Ps. | Qty. Units | Rate ₹ | Rate Ps. | Amt. ₹ | Amt. Ps. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| | | Receipts | | | | | | | Issues | | | | | | Balance | | |
| 2010 July 1 | | | | | | | | | | | | | 25 | 6 | 50 | 162 | 50 |
| ,, 4 | | | | | | | 101 | 8 | 6 | 50 | 52 | 00 | 17 | 6 | 50 | 110 | 50 |
| ,, 6 | 26 | 50 | 5 | 75 | 287 | 50 | | | | | | | 17 | 6 | 50 | 110 | 50 |
| | | | | | | | | | | | | | 50 | 5 | 75 | 287 | 50 |
| ,, 7 | | | | | | | 102 | 12 | 6 | 50 | 78 | 00 | 5 | 6 | 50 | 32 | 50 |
| | | | | | | | | | | | | | 50 | 5 | 75 | 287 | 50 |
| ,, 10 | | | | | | | | 10 | 5 | 75¹ | 57 | 50 | 5 | 6 | 50 | 32 | 50 |
| | | | | | | | (Returns to vendor) | | | | | | 40 | 5 | 75 | 230 | 00 |
| ,, 12 | | | | | | | 103 | 5 | 6 | 50 | 32 | 50 | | | | | |
| | | | | | | | | 10 | 5 | 75 | 57 | 50 | 30 | 5 | 75 | 172 | 50 |
| ,, 13 | | | | | | | 104 | 20 | 5 | 75 | 115 | 00 | 10 | 5 | 75 | 57 | 50 |
| ,, 15 | 33 | 25 | 6 | 10 | 152 | 50 | | | | | | | 10 | 5 | 75 | 57 | 50 |
| | | | | | | | | | | | | | 25 | 6 | 10 | 152 | 50 |

| Date | Receipt Ref. | Qty | Rate | Amount | Issue Ref. | Qty | Rate | Amount | Balance Qty | Rate | Amount |
|---|---|---|---|---|---|---|---|---|---|---|---|
| " 17 | | | | | 105 | 10 | 5 75 | 57 50 | 25 | 6 10 | 152 50 |
| " 19 | 38 | 10 | 5 75 | 57 50 | | | | | 25 | 6 10 | 152 50 |
| | (Replacement) | | | | | | | | 10 | 5 75 | 57 50 |
| " 20 | | 5 | 5 75 | 28 75 | | | | | 5 | 5 75 | 28 75 |
| | (Returns from dept.) | | | | | | | | 25 | 6 10 | 152 50 |
| | | | | | | | | | 10 | 5 75 | 57 50 |
| " 26 | | | | | 106 | 5 | 5 75 | 28 75 | 20 | 6 10 | 122 00 |
| | | | | | | 5 | 6 10 | 30 50 | 10 | 5 75 | 57 50 |
| " 30 | | | | | | 2 | 6 10 | 12 20 | 18 | 6 10 | 109 80 |
| | | | | | | Shortage | | | 10 | 5 75 | 57 50 |

**Notes:** 1. On July 10th 10 units of materials returned to Ravi & Co. are entered in the issue column. It is valued at the rate at which they are purchased originally i.e. ₹5.75. And when they are replaced on 19th they are entered in Receipt column with the same rate i.e. ₹5.75.

2. On July 20th materials returned is 5 units from the department. The original issue price is ₹5.75. Therefore, they are valued at its original issue rate.

3. The transfers on 22nd & 29th July are from one job to another job and from one department to another department respectively; they are not passed through the store and so they need not be entered in the ledger. However, these are entered in the subsidiary registers of stores. Records of such transfer in the transferee and transferor department are also kept to find out the cost of the job accurately.

## Illustration: 12

The following details are given for material A for the month of July 2010:

2010

July 1  Opening stock - 2,000 tons at ₹ 460 per ton.

" 5  Issue to Job No. 1 - 1,400 tons.

" 6  Purchase as per GRN No. 104 - 3,500 tons at ₹ 450 per ton.

" 8  Condemned due to deterioration in quality and transferred to scrap - 300 tons.

" 9  Issue to Job No. 2 - 800 tons.

" 10  Issue to Job No. 3 - 2,100 tons.

" 16  Purchase as per GRN No. 105 - 2,000 tons at ₹ 480.

" 20  Issue to Job No. 4 - 1,200 tons.

" 25  Purchase as per GRN No. 106 - 1,800 tons at ₹ 470.

" 28  Issue to Job No. 5 - 2,800 tons.

" 31  Excess found in stock - 43 tons, reason traced to the use of wrong measure during the month.

Show the Stores Ledger entries assuming- (1) FIFO, and (2) LIFO as the pricing systems.

## II. PROBLEMS ON AVERAGE COST METHODS

### Illustration: 14

The following transactions took place in respect of material X.

| Date | Receipts (Quantity) | Rate ₹ | Issue (Quantity) |
|---|---|---|---|
| 02.03.2010 | 200 | 2.00 | — |
| 10.03.2010 | 300 | 2.40 | — |
| 15.03.2010 | — | — | 250 |
| 18.03.2010 | 250 | 2.60 | — |
| 20.03.2010 | — | — | 200 |

Prepare a Priced Ledger Sheet pricing the issues at:

(a)  Simple average rate; and

(b)  Weighted average rate.

*[I.C.W.A. Inter.; Adapted]*

### Solution:

### (a) Simple Average Method

#### Stores Ledger of Material X

| Date | Receipts Qty. Units | Receipts Rate ₹ | Receipts Rate Ps. | Receipts Amt. ₹ | Issues Qty. Units | Issues Rate ₹ | Issues Rate Ps. | Issues Amt. ₹ | Balance Qty. Units | Balance Rate ₹ | Balance Rate Ps. | Balance Amt. ₹ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02.03.2010 | 200 | 2 | 00 | 400 | | | | | 200 | 2 | 00 | 400 |
| 10.03.2010 | 300 | 2 | 40 | 720 | | | | | 500 | - | | 1,120 |
| 15.03.2010 | | | | | 250 | 2 | 20 | 550 | 250 | - | | 570 |
| 18.03.2010 | 250 | 2 | 60 | 650 | | | | | 500 | - | | 1,220 |
| 20.03.2010 | | | | | 200 | 2 | 50 | 500 | 300 | - | | 720 |

#### Working Notes:

1.  Simple Average Rate on 15th March 2010 $= \dfrac{2.00 + 2.40}{2} = ₹\,2.20$

2.  Simple Average Rate on 20th March 2010 $= \dfrac{2.40 + 2.60}{2} = ₹\,2.50$

## (b) Weighted Average Method

### Stores Ledger of Material X

| Date | Receipts Qty. Units | Receipts Rate ₹ | Receipts Rate Ps. | Receipts Amt. ₹ | Issues Qty. Units | Issues Rate ₹ | Issues Rate Ps. | Issues Amt. ₹ | Balance Qty. Units | Balance Rate ₹ | Balance Rate Ps. | Balance Amt. ₹ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02.03.2010 | 200 | 2 | 00 | 400 | | | | | 200 | 2 | 00 | 400 |
| 10.03.2010 | 300 | 2 | 40 | 720 | | | | | 500 | 2 | 24 | 1,120 |
| 15.03.2010 | | | | | 250 | 2 | 24 | 560 | 250 | 2 | 24 | 560 |
| 18.03.2010 | 250 | 2 | 60 | 650 | | | | | 500 | 2 | 42 | 1,210 |
| 20.03.2010 | | | | | 200 | 2 | 42 | 484 | 300 | 2 | 42 | 726 |

**Working Notes:**

1. Weighted Averge Rate on 15$^{th}$ March 2010 $= \dfrac{\text{Cost of Stock}}{\text{Quantity in Stock}} = \dfrac{1,120}{500} = ₹\,2.24$

2. Weighted Averge Rate on 20$^{th}$ March 2010 $= \dfrac{1,210}{500} = ₹\,2.42$

## Illustration: 15

The following purchases and issues of a material item were made:

| Date | Purchases Units | Purchases Unit Cost (₹) | Issues Units |
|---|---|---|---|
| 01.05.2010 | 150 | 1.50 | — |
| 10.05.2010 | 450 | 1.75 | — |
| 11.05.2010 | 100 | 1.85 | — |
| 12.05.2010 | — | — | 150 |
| 18.05.2010 | — | — | 200 |
| 22.05.2010 | 600 | 1.80 | — |
| 28.05.2010 | — | — | 350 |

Prepare the priced ledger card under- (i) LIFO Method, and (ii) Simple Average Method.

**Solution:**

## (i) LIFO Method

### Stores Ledger

| Date | Receipts Qty. Units | Receipts Rate ₹ | Receipts Rate Ps. | Receipts Amt. ₹ | Receipts Amt. Ps. | Issues Qty. Units | Issues Rate ₹ | Issues Rate Ps. | Issues Amt. ₹ | Issues Amt. Ps. | Balance Qty. Units | Balance Rate ₹ | Balance Rate Ps. | Balance Amt. ₹ | Balance Amt. Ps. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01.05.2010 | 150 | 1 | 50 | 225 | 00 | | | | | | 150 | 1 | 50 | 225 | 00 |
| 10.05.2010 | 450 | 1 | 75 | 787 | 50 | | | | | | 150 | 1 | 50 | 225 | 00 |
| | | | | | | | | | | | 450 | 1 | 75 | 787 | 50 |
| 11.05.2010 | 100 | 1 | 85 | 185 | 00 | | | | | | 150 | 1 | 50 | 225 | 00 |
| | | | | | | | | | | | 450 | 1 | 75 | 787 | 50 |
| | | | | | | | | | | | 100 | 1 | 85 | 185 | 00 |
| 12.05.2010 | | | | | | 100 | 1 | 85 | 185 | 00 | 150 | 1 | 50 | 225 | 00 |
| | | | | | | 50 | 1 | 75 | 87 | 50 | 400 | 1 | 75 | 700 | 00 |
| 18.05.2010 | | | | | | 200 | 1 | 75 | 350 | 00 | 150 | 1 | 50 | 225 | 00 |
| | | | | | | | | | | | 200 | 1 | 75 | 350 | 00 |
| 22.05.2010 | 600 | 1 | 80 | 1,080 | 00 | | | | | | 150 | 1 | 50 | 225 | 00 |
| | | | | | | | | | | | 200 | 1 | 75 | 350 | 00 |
| | | | | | | | | | | | 600 | 1 | 80 | 1,080 | 00 |
| 28.05.2010 | | | | | | 350 | 1 | 80 | 630 | | 150 | 1 | 50 | 225 | 00 |
| | | | | | | | | | | | 200 | 1 | 75 | 350 | 00 |
| | | | | | | | | | | | 250 | 1 | 80 | 450 | 00 |

|  | | | ₹ |
|---|---|---|---|
| Closing Stock = | 150 Units x ₹ 1.50 | = | 225 |
| | 200 Units x ₹ 1.75 | = | 350 |
| | 250 Units x ₹ 1.80 | = | 450 |
| | | | 1,025 |

## (ii) Simple Average Method

### Stores Ledger

| Date | Receipts Qty. Units | Receipts Rate ₹ | Receipts Rate Ps. | Receipts Amt. ₹ | Receipts Amt. Ps. | Issues Qty. Units | Issues Rate ₹ | Issues Rate Ps. | Issues Amt. ₹ | Issues Amt. Ps. | Balance Qty. Units | Balance Rate ₹ | Balance Rate Ps. | Balance Amt. ₹ | Balance Amt. Ps. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01.05.2010 | 150 | 1 | 50 | 225 | 00 | | | | | | 150 | 1 | 50 | 225 | 00 |
| 10.05.2010 | 450 | 1 | 75 | 787 | 50 | | | | | | 600 | | | 1,012 | 50 |
| 11.05.2010 | 100 | 1 | 85 | 185 | 00 | | | | | | 700 | | | 1,197 | 50 |
| 12.05.2010 | | | | | | 150 | 1 | 70 | 255 | 00 | 550 | | | 942 | 50 |
| 18.05.2010 | | | | | | 200 | 1 | 80 | 360 | 00 | 350 | | | 582 | 50 |
| 22.05.2010 | 600 | 1 | 80 | 1,080 | 00 | | | | | | 950 | | | 1,662 | 50 |
| 28.05.2010 | | | | | | 350 | 1 | 80 | 630 | 00 | 600 | | | 1,032 | 50 |

**Working Notes:**

1. Simple Average Rate on 12.05.2010 $= \dfrac{1.50 + 1.75 + 1.85}{3}$

$= \dfrac{5.1}{3} = ₹\ 1.70$

2. Simple Average Rate on 18.05.2010 $= \dfrac{1.75 + 1.85}{2}$

$= \dfrac{3.6}{2} = ₹\ 1.80$

3. Simple Average Rate on 28.05.2010 $= \dfrac{1.75 + 1.85 + 1.80}{3}$

$= \dfrac{5.4}{3} = ₹\ 1.80$

## Illustration: 16

Given below is a statement of stores transactions relating to material M. Write up a columnar "Material Ledger" for this item using weighted average cost method.

2010

June 1    Balance 200 pieces @ ₹ 2.50.

    "   2    Issued (M.R.N. No.83) 40 pieces.

    "   8    Returned to vendors (vide Dr. Note 112) 50 pieces.

    "   12    Received 150 pieces under purchase order No.117 @ ₹ 5 each.

    "   19    Issued (M.R.N. No.242) 60 pieces.

    "   26    Received (under purchased order No.123) 210 pieces @ ₹ 3.20 each.

    "   30    Stock Audit Note shows a shortage of 10 pieces.

**Solution:**

## Weighted Average Cost Method

### Stores Ledger

| Date | GRN No. | Qty. Units | Rate ₹ | Rate Ps. | Amount ₹ | Amount Ps. | Req. No. | Qty. Units | Rate ₹ | Rate Ps. | Amount ₹ | Amount Ps. | Qty. Units | Rate ₹ | Rate Ps. | Amount ₹ | Amount Ps. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| | **Receipts** | | | | | | **Issues** | | | | | | **Balance** | | | | |
| 2010 June 1 | | | | | | | | | | | | | 200 | 2 | 50 | 500 | 00 |
| " 2 | | | | | | | 83 | 40 | 2 | 50 | 100 | 00 | 160 | 2 | 50 | 400 | 00 |
| " 8 | | | | | | | | 50 | 2 | 50 | 125 | 00 | 110 | 2 | 50 | 275 | 00 |
| | | | | | | | | (Rtd. to Vendors) | | | | | | | | | |
| " 12 | 117 | 150 | 5 | 00 | 750 | 00 | | | | | | | 260 | 3 | 94 | 1,025 | 00 |
| " 19 | | | | | | | 242 | 60 | 3 | 94 | 236 | 40 | 200 | 3 | 94 | 788 | 60 |
| " 26 | 123 | 210 | 3 | 20 | 672 | 00 | | | | | | | 410 | 3 | 562 | 1,460 | 60 |
| " 30 | | | | | | | | 10 | 3 | 562 | 35 | 62 | 400 | 3 | 562 | 1,424 | 98 |
| | | | | | | | | (Shortage) | | | | | | | | | |

**Notes:** *Returns to vendors & shortages are priced at latest issue rate.*

minimum. A lower ratio denotes that the item is not consumed in more quantity; it is going out of demand and has led to over stocking.

Materials with low rate of turnover are classified as- 1. Slow moving, 2. Dormant or Non-moving, and 3. Obsolete stock.

**1. Slow Moving Stock:** Slow moving stock is a material, which has a lower rate of turnover. Stock of such material should be carried at barest minimum.

**2. Dormant Stock:** Dormant stock refers to an item having zero turnover ratio. It implies that it is out of demand at present; but it may gain demand in future. Hence, management has to decide as to whether the existing stock should be retained or disposed of immediately to save cost of holding it further. It is a non-moving item.

**3. Obsolete Stock:** Material having zero turnover rate without any hope of revival of its demand ma    e regarded as obsolete stock. It must be scrapped or discarded immediately and the resulting loss should be charged to Costing Profit and Loss Account.

## Treatment of Regular Normal Loss in Valuation of Stock

### Illustration: 24

A factory maintains average stock of 2,000 liters of oil for its consumption. Its experience is that the loss due to evaporation is normally 5%. Assuming that the oil was purchased at ₹ 1.90 per liter what price should be treated as value of stock?

### Solution:

**Calculation of Quantity & Value of Stock**

| Particulars | Litres | Amount ₹ |
|---|---|---|
| Materials purchased @ ₹ 1.90 per liter | 2,000 | 3,800 |
| Less: Normal loss due to evaporation (5%) | 100 | - |
| Balance of Material in Stock | 1,900 | 3,800 |
| Cost per Unit of Stock | | 2 |

*Note:* *Here the normal loss of 5% of 2,000 liters due to evaporation is assumed to have nil scrap or saleable value. Its purchase cost of ₹ 190 (i.e. 100 liters x ₹ 1.90) is charged to or absorbed by the good units of 1,900 liters (i.e. 2,000 - 100).*

### Illustration: 25

From the following information available from Bin Cards No. 10 and 11 for the year 2010, calculate Inventory Turnover Ratio and also days for which the average stock of each material is held.

| | Material X ₹ | Material Y ₹ |
|---|---|---|
| Opening stock | 3,25,000 | 9,00,000 |
| Purchases | 12,00,000 | 20,50,000 |
| Closing stock | 1,50,000 | 4,50,000 |

# Solution:

**(a) Calculation of Cost of Materials Consumed:**

| Particulars | Material X ₹ | Material Y ₹ |
|---|---|---|
| Opening stock | 3,25,000 | 9,00,000 |
| Add: Purchases | 12,00,000 | 20,50,000 |
| | 15,25,000 | 29,50,000 |
| Less: Closing stock | 1,50,000 | 4,50,000 |
| Materials Consumed | 13,75,000 | 25,00,000 |

**(b) Calculation of Average Stock Held:**

$$\text{Average Stock Held} = \frac{\text{Opening Stock} + \text{Closing Stock}}{2}$$

$$\text{Material X} = \frac{3,25,000 + 1,50,000}{2}$$

$$= \frac{4,75,000}{2} = ₹ 2,37,500$$

$$\text{Material Y} = \frac{9,00,000 + 4,50,000}{2}$$

$$= \frac{13,50,000}{2} = ₹ 6,75,000$$

**(c) Calculation of Inventory Turnover Ratio:**

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Materials Consumed}}{\text{Cost of Average Stock Held}}$$

$$\text{Material X} = \frac{13,75,000}{2,37,500} = 5.79 \text{ Times}$$

$$\text{Material Y} = \frac{25,00,000}{6,75,000} = 3.70 \text{ Times}$$

Since the Turnover Ratio of X is more than that of Y, X is fast moving and Y is slow moving.

**(d) Calculation of Inventory Turnover in Days:**

$$\text{Inventory Turnover in Days} = \frac{\text{Days during the Period}}{\text{Inventory Turnover Ratio}}$$

$$X = \frac{365}{5.79} = 63 \text{ Days}$$

$$Y = \frac{365}{3.70} = 98.65 \text{ i.e. 99 Days}$$

Thus, average stock of material X is held for 63 days and that of Y is held for 91 days.

It may be noted here that there are different methods of calculating average stock. As such, the inventory ratio may differ from case to case.

# UNIT - II
# 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 *mechanicalmethods*. 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 us 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 it 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.

**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.

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.

**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.

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.

**Total Earnings = T x R + $\dfrac{S-T}{S}$ x T x R**

**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 (Depart-mentalisation 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. **Re-apportionment of Service Department Costs to Production Departments**

Service department costs are to be reapportioned 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 epartment. | - 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 are 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.

## 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.

**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.

**(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.

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 		Overhead Rate = Production Overhead Expenses (Budgeted)

Anticipated Direct Material Cost

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

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

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

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

(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 whichmachines 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:

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

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.

(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:

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

(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 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.

## Specimen Statement Showing the Gross Wages and Net Wages

| Particulars | Amount ₹ | Amount ₹ |
|---|---|---|
| Basic wages | | xxx |
| Overtime wages | | xxx |
| Dearness allowance | | xxx |
| Bonus | | xxx |
| Any other allowance payable in cash like house rent allowance, city compensatory allowance, medical allowance, etc. | | xxx |
| **Gross Wages Earned by a Worker** | | **xxx** |
| Less: Deduction from wages- | | |
| Employee's contribution to P.F | xxx | |
| Employee's contribution to ESI | xxx | |
| Stores deductions | xxx | |
| House rent recovery | xxx | xxx |
| **Net Wages Payable to a Worker** | | **xxx** |

## Specimen Statement Showing the Labour Cost Per Hour and Per Output

| Particulars | Amount ₹ |
|---|---|
| Basic wages | xxx |
| Dearness allowance (DA) | xxx |
| Bonus | xxx |
| Any other allowance payable in cash such as- house rent allowance, city compensatory allowance, medical allowance | xxx |
| Employer's contribution to P.F | xxx |
| Employer's contribution to ESI | xxx |
| Leave salary [Based on normal wages & DA] | xxx |
| Expenditure on amenities | xxx |
| **Total Labour Cost** | **xxx** |
| Working Hours | xxx |
| Total Output | xxx |
| Labour Cost Per Hour (Total Labour Cost / Working Hours) | xxx |
| Labour Cost Per Unit of Output (Total Labour Cost / Total Output) | xxx |

## Illustration: 9

From the following particulars, prepare the labour cost sheet per man-day of 8 hours:

| | | |
|---|---|---|
| (a) | Basic salary | ₹ 20 per day |
| (b) | Dearness allowance | ₹ 2.50 for every point over 100 Cost of Living Index of working class - Current cost of Living Index 700 points. |
| (c) | Leave salary | 10% of (a), (b) |
| (d) | Employer's contribution to Provident Fund | 8% of (a), (b) and (c) |
| (e) | Employer's contribution to State Insurance | 2.5% of (a), (b) and (c) |

**Solution:**

### Statement Showing the Labour Cost Per Man-day of 8 Hours

| Particulars | Amount Per Month (25 Days) ₹ | Rate Per Man-day of 8 Hrs. ₹ | Ps. |
|---|---|---|---|
| (a) Basic salary (25 Days @ ₹ 20) | 500 | 20 | 00 |
| (b) Dearness allowance (600 x ₹ 2.50) | 1,500 | 60 | 00 |
| (c) Leave salary 10% of ₹ 2,000 (i.e. 500 + 1,500) | 200 | 8 | 00 |
| (d) Employer's contribution to P.F.- 8% of ₹ 2,200 (i.e. 500 + 1,500 + 200) | 176 | 7 | 04 |
| (e) Employer's contribution to State Insurance 2.5% of ₹ 2,200 | 55 | 2 | 20 |
| (f) Expenditure on amenities ₹ 200 Per Head | 200 | 8 | 00 |
| Total Labour Cost and Labour Cost Per Man - day of 8 Hours | 2,631 | 105 | 24 |

## Illustration: 10

From the following particulars, prepare the labour cost sheet per man-day of 8 hours:

(a) Basic salary — ₹ 40 per day

(b) Dearness allowance — ₹ 5 for every point over 100, Cost of Living Index of working class - Current cost of Living Index 700 points.

(c) Leave salary — 10% of (a), and (b)

(d) Employer's contribution to Provident Fund — 8% of (a), (b) and (c),

(e) Employer's contribution to Sate Insurance — 2% of (a), (b) and (c).

(f) Expenditure on amenities to labour — ₹ 1,000 per head per mensem.

(g) Number of working days in a month — 25 days of 8 hours each.

**Solution:**

### Statement Showing the Labour Cost Per Man-day of 8 Hours

| Particulars | Amount ₹ | Ps. |
|---|---|---|
| (a) Basic salary | 40 | 00 |
| (b) Dearness allowance ($\frac{5 \times 600}{25}$) | 120 | 00 |
| (c) Leave salary (10% of 40 +120) | 16 | 00 |
| (d) Employer's contribution to Provident Fund (8% of ₹ 176) | 14 | 08 |
| (e) Employer's contribution to ESI (2% of ₹ 176) | 3 | 52 |
| (f) Expenses on amenities to labour (1,000/25) | 40 | 00 |
| Labour Cost Per Man - day of 8 Hours | 233 | 60 |

**Illustration 1**

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

    (a) Separation method

    (b) Replacement method

    (c) Flux method

No. of workers on the payroll:

    At the beginning of the month      900

    At the end of the month      1,100

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

<div align="right">

*[I.C.W.A. Inter, Dec. 1988]*

*[Bharathiar B.Com., Nov. 2004]*

</div>

**Solution :**

Average number of workers during the year

$$= \frac{\text{Number of workers at the beginning of the month + Number of workers at the end of the month}}{2}$$

$$= \frac{900 + 1100}{2} = 1,000$$

(a) *Labour turnover rate by applying separation method*

$$= \frac{\text{No. of separations}}{\text{Average number of workers}} \times 100$$

$$= \frac{10 + 40}{1000} \times 100 = 5\%$$

(b) *Labour turnover rate by applying replacement method*

$$= \frac{\text{Number of workers replaced}}{\text{Average number of workers}} \times 100$$

$$= \frac{25}{1000} \times 100 = 2.5\%$$

**(c) Labour turnover rate by applying flux method**

$$= \frac{\text{No. of additions + No. of separations}}{\text{Average number of workers}} \times 100$$

$$= \frac{150 + 40 + 10}{1000} = 20\%$$

**Note:** Replacement method ignores recruitment for expansion.

Flux method includes all recruitments including for expansions.

## Illustration 2

From the following information calculate the labour turnover rate:

Number of workers at the beginning of the period :  3800

Number of workers at the end of the period : 4200

During the year, 40 workers left while 160 workers are discharged. 600 workers are recruited during the year; of these 150 workers are recruited to fill up vacancies and the rest are engaged on account of an expansion scheme.

*[Thiruvalluvar B.Com., Nov./Dec. 2009]*

*[Bharathidasan, B.Com., April 1988]*

*[Madras, B.Com(gen & AF) April 2009]*

**Solution :**

Average number of workers during the year

$$= \frac{\text{Number of workers at the beginning of the period + Number of workers at the end of the period}}{2}$$

$$= \frac{3800 + 4200}{2} = 4000$$

**(a) Labour turnover by applying replacement method:**

$$= \frac{\text{Number of workers replaced}}{\text{Average number of workers}} \times 100$$

$$= \frac{150}{4000} \times 100 = 3.75\%$$

*(b) Labour turnover by applying separation method:*

$$= \frac{\text{Number of workers separated}}{\text{Average number of workers}} \times 100$$

$$= \frac{40+160}{4000} = \frac{200}{4000} \times 100 = 5\%$$

(c) Labour turnover by applying flux method

$$= \frac{\text{Number of workers replaced + No. of workers separated}}{\text{Average number of workers}} \times 100$$

$$= \frac{600+200}{4000} \times 100 = 20\%$$

# II. COMPUTATION AND TREATMENT OF LABOUR COST

## (A) Allocation of wages

## Illustration 3

Rajan, a worker in a manufacturing unit, is paid at the rate of Rs. 10 per hour. His working hours constitute 42 hours over a 5 days week. Time allowed per day as approved absence for personal needs etc. is 24 minutes.

Rajan's job cards for the week ended 30th Sep. 2010 show that his time during the week is chargeable as under:

Job No.   A−42  =  15 hours

Job No.   K−12  =  20 hours

Job No.   R−3   =  2 hours

The time unaccounted for is due to a power failure.

You are required to show Rajan's wages for the week and how they would be dealt with in cost accounts.

**Solution :**

Wages of worker A :

| | | |
|---|---|---|
| Time wages | = | Hours worked × Rate per hour |
| ∴ A's time wages | = | 200 × 10 = Rs. 2,000. |

Wages of worker B :

| | | |
|---|---|---|
| Piece wages | = | No. of pieces × Rate per piece |
| ∴ B's piece wages | = | 1000 × 3 = Rs. 3,000 |

## Illustration 10

In a factory workers are paid at Rs. 50 per hour. During the month of April 2010, there were 25 working days of 8 hours each.

There is also a 'piece work plan' where in Rs. 10 is to be paid per piece produced.

During the month worker 'x' produced on average 48 pieces per working day.

Ascertain the wages of worker 'x' under

(a) Time wages

(b) Piece wages

**Solution:**

(a) Worker x's wages under time wage system.

Days worked in the month × Hours per day × Wages per hour

= 25 × 8 × 50 = Rs. 10,000

(b) Worker x's wages under piece wage systems

Piece produced × Piece rate

= 48 × 25 × 10 = Rs. 12,000

## (B) Taylor's Differential Piece Rate System

## Illustration 11

Calculate the earnings of workers X and Y under (A) Straight piece rate system and (B) Taylor's differential piece rate system from the following details:

Standard time per unit = 12 minutes

Standard rate per hour = Rs. 60

Differentials to be used 80% and 120%

In a particular day of 8 hours, worker 'X' produced 30 units and worker 'Y' produced 50 units.

**Solution :**

**(1) Level of performance of workers**

Standard production for 12 minutes = 1 unit

$$\text{Standard production per hour} = \frac{60 \text{ minutes}}{12 \text{ minutes}} = 5 \text{ units}$$

Standard production per day of 8 hours = 8 hours × 5 units = 40 units

Worker 'X' who produced 30 units is below standard

Worker 'Y' who produced 50 units is above standard

**(2) Calculation of piece rates**

Standard rate per hour = Rs. 60

$$\text{Straight piece rate} = \frac{\text{Rs. } 60}{5 \text{ units per hour}} = \text{Rs. } 12 \text{ per unit}$$

Low piece rate for below standard production

= Straight piece rate × Lower differential

= Rs. 12 × 80% = Rs. 9.60 per unit

High piece rate for at or above standard production

= Straight piece rate × Higher differential

= Rs. 12 × 120% = Rs. 14.40 per unit.

**(A) Earnings of workers under straight piece rate system**

Earnings = Production of worker × Straight piece rate

Worker X : 30 units × Rs. 12 per unit = Rs. 360

Worker Y : 50 units × Rs. 12 per unit = Rs. 600

**(B) Earnings of workers under Taylor's differential piece rate system**

Earnings = Production of worker × differential piece rate

Worker X = 30 units × Rs. 9.60 per unit

= Rs. 288

Worker Y = 50 units × Rs. 14.40 per unit

= Rs. 720

**Illustration 12**

From the following particulars calculate the earnings of workers A & B under straight piece rate system and Taylor's differential piece rate system.

Standard time allowed 25 units per hour

Normal time rate Rs. 50 per hour

In a day of 8 hours A produced 150 units and B produced 250 units

**Solution :**

### Calculation of Piece Rates

| | |
|---|---|
| Standard production for one hour | = 25 units |
| Standard production for 8 hours | = 8 x 25 = 200 units |
| Rate per hour | = Rs. 50 |

Straight piece rate $= \dfrac{50}{25 \text{ units}} = $ Rs. 2 per unit

Low piece rate $= 2 \times \dfrac{80}{100} \times 1.6$ per unit

High piece rate $= 2 \times \dfrac{120}{100} = 2.4$ per unit

*Note:* Taylor's system does not specify any differentials except saying there should be a high piece rate and a low piece rate. In the absence of differentials in the problems 120% of straight piece rate and 80% of straight piece rate may be assumed for standard and below standard performance.

### Calculation of earnings of workers

**Earnings of 'A'**

Under straight piece rate

Units produced x Rate per unit = 150 x 2.00 = Rs. 300

*Under Taylor's Scheme :*

Standard production is 200 units

Actual production is 150 units

Efficiency is below standard

Piece rate applicable = Low piece rate at 80% differential (i.e.,) Rs. 1.6 per unit

Wages = 150 units x 1.6 per unit = Rs. 240

**Earnings of B**

Under straight piece rate

Units produced x Rate per unit

250 x 2.00 = Rs. 500

*Under Taylor's scheme :*

Standard production 200 units

Actual production 250 units

Efficiency is above standard

Rate applicable is high piece rate at 120% differential (i.e.,) Rs. 2.4 per unit

Wages = 250 x 2.4 = Rs. 600

## (C) Merrick's Multiple or Differential Piece Rate System

### Illustration 13

Calculate the earnings of 3 workers A, B and C under 'Merrick's 'Multiple piece rate system', given the following:

Standard production per day : 150 units

Normal piece rate : Re. 0.50 per unit

Production of workers on a particular day :

A 120 units

B 140 units

C 160 units

### Solution :

Standard output      = 150 units

Piece rate      = Re. 0.50 per unit

**(1) Level of performance of workers**

Worker A's output      =      120 units

$$\text{Worker A's level of performance} = \frac{\text{Actual output}}{\text{Standard output}} \times 100$$

$$= \frac{120}{150} \times 100 = 80\%$$

Worker B's output      = 140 units

$$\text{Worker B's level of performance} = \frac{140}{150} \times 100 = 93.33\%$$

Worker C's output      = 160 units

$$\text{Worker C's level of performance} = \frac{160}{150} \times 100 = 106.67\%$$

**(2) Earnings of workers**

Earnings of worker A:

Normal piece rate is applicable for performance below 83%, A's performance is 80%.

Wages = Units produced × Normal piece rate

     = 120 units × 0.50 = Rs. 60

Earnings of worker B :

110% of normal piece rate is applicable for performance between 83% and 100%

B's performance is 93.33%.

## Illustration: 14

Calculate wages under Halsey system from the following particulars:

| | | |
|---|---|---|
| Time allowed | - | 16 hours |
| Time taken | - | 10 hours |
| Time rate | - | ₹ 2 per hour |

### Solution:

Earnings under Halsey System $= $ Time Taken x Hourly Rate $+ (\frac{50}{100} \times$ Time Saved$) \times$ Hourly Rate

$$= 10 \times 2 + (\frac{50}{100} \times 6^*) \times 2$$

$$= 20 + 6 = ₹ 26$$

*Calculation of Time Saved $= $ Time Allowed - Time Taken

$$= 16 \text{ Hours} - 10 \text{ Hours} = 6 \text{ Hours}$$

## Illustration: 15

| | |
|---|---|
| Standard time | 10 hours |
| Time taken | 8 hours |
| Time rate | ₹ 2.50 per hour |

Calculate the total earnings under Halsey plan.

*[Madurai Kamaraj University, B.Com., Nov. 1992]*

### Solution:

Wages under Halsey Plan $= $ Time Taken x Hourly Rate $+ (\frac{50}{100} \times$ Time Saved$) \times$ Hourly Rate

∴ Wages $= 8 \times 2.50 + (\frac{50}{100} \times 2^*) \times 2.50$

$$= 20 + 2.50 = ₹ 22.50$$

*Calculation of Time Saved $= 10 - 8 = 2 \text{ Hours}$

## Illustration: 16

Standard time allowed for a job is 20 hours and the rate per hour is ₹ 2 plus dearness allowance at 60 paise per hour worked. The actual time taken by the worker is 15 hours. Calculate the earnings under the Halsey plan.

*[Madurai Kamaraj University, B.Com., Apr. 1988]*

### Solution:

Wages under Halsey Plan $= $ Time Taken x (Hourly Rate + Dearness Allowance) $+ (\frac{50}{100} \times$ Time Saved$) \times$ Hourly Rate

$$= 15 \times (2.00 + 0.60) + (\frac{50}{100} \times 5) \times 2$$

$$= 39 + 5 = ₹ 44$$

## Illustration: 17

In a factory the standard output is 40 units per week for a working week of 40 hours. The hourly rate is ₹ 2. Three workers, A, B and C produce 35, 40 and 50 units in a particular week. Find out the earnings of each worker under the Halsey system of wage payment.

**Illustration: 19**

From the following data calculate the total wages of a worker under:

1. Halsey premium plan

     Hourly rate : ₹ 3
     Standard time : 16 hours
     Time taken : 12 hours

2. Under Halsey- Weir premium plan

     Time allowed - 48 hours
     Time taken - 40 hours
     Rate per hour - ₹ 3

**Solution:**

1. **Calculation of Wages Under Halsey System:**

$$\text{Wages} = \text{Time Taken} \times \text{Rate Per Hour} + (\frac{50}{100} \times \text{Time Saved}) \times \text{Rate Per Hour}$$

$$\therefore \text{Wages} = 12 \times 3 + (\frac{50}{100} \times 4) \times 3$$

$$= 36 + 6 = ₹ 42$$

2. **Calculation of Wages Under Halsey-Weir Premium Plan:**

$$\text{Wages} = \text{Time Taken} \times \text{Rate Per Hour} + (\frac{33.33}{100} \times \text{Time Saved}) \times \text{Rate Per Hour}$$

$$\therefore \text{Wages} = 40 \times 3 + (\frac{33.33}{100} \times 8) \times 3$$

$$= 120 + 8 = ₹ 128$$

## 3. Rowan System

James Rowan of Scotland introduced the system. Under this system also, the incentive is paid on the time saved as in the above-mentioned two methods. But a different method is used to calculate the bonus. Under this system, bonus hours are calculated as a proportion of the time taken, which the time saved bears to the time allowed, and they are paid on the basis of the time rate system. The formula applicable to compute wages under this system is as below:

$$\text{Earnings under Rowan System} = \text{Time Taken} \times \text{Time Rate} + (\frac{\text{Time Saved}}{\text{Standard Time}} \times \text{Time Taken}) \times \text{Time Rate}$$

By using abbreviations the above formula can be rewritten as below:

$$= T \times R + (\frac{S - T}{S} \times T) \times R$$

## Advantages of Rowan System

Rowan system has the following points to its credit:

1. This system is more suitable to beginners and slow workers.
2. The employer benefits more from this system. So he provides good working conditions in the factories.
3. It assures the minimum time wages.
4. Standard time is fixed; hence basic rates will not be changed.
5. The employer is protected even if the rate is not properly fixed.
6. It pays higher bonus to workers, when compared to Halsey plan.
7. Since bonus declines at higher efficiency, the worker is not induced to rush work. So over production can be avoided.

## Disadvantages of Rowan System

It suffers from the following disadvantages:

1. This system of wage payment is not easily understood by employees. It is a more complex system.
2. This system is not beneficial to workers at high level of efficiency.

## Illustration: 20

Using the following data, calculate the wages payable to a workman under the Rowan Premium Bonus Plan:

| | | |
|---|---|---|
| Time allowed | : | 40 hours |
| Time taken | : | 32 hours |
| Rate per hour | : | ₹ 5.00 |

**Solution:**

$$\text{Earnings under Rowan Plan} = \text{Time Taken} \times \text{Hourly Rate} + (\frac{\text{Time Saved}}{\text{Standard Time}} \times \text{Time Taken}) \times \text{Hourly Rate}$$

$$= 32 \times 5 + (\frac{8}{40} \times 32) \times 5$$

$$= 160 + 32 = ₹\ 192$$

## Illustration: 21

A worker earns ₹ 2 as bonus on a job, which requires 20 standard hours at ₹ 0.50 per hour, under Halsey incentive system based on 50 : 50 what would be his earnings under Rowan plan?

*[Madras University, B. Com., March 1986]*

**Solution:**

$$\text{Earnings under Rowan Plan} = \text{Time Taken} \times \text{Hourly Rate} + (\frac{\text{Time Saved}}{\text{Standard Time}} \times \text{Time Taken}) \times \text{Hourly Rate}$$

| | | |
|---|---|---|
| Standard Time | = | 20 hours |
| Rate per hour | = | ₹ 0.50 |
| Time Saved | = | ? |

### Calculation of Time Saved

If ₹ 0.25 is bonus in Halsey System then time saved = 1 Hour

If ₹ 2 is bonus then time saved = $\dfrac{1 \text{ Hour}}{0.25}$ × 2.00 = 8 Hours

∴ Actual Hours = 20 - 8 = 12 Hours

∴ Earnings under Rowan Plan = $12 \times 0.50 + (\dfrac{8}{20} \times 12) \times 0.50$

= 6 + 2.40 = ₹ 8.40

## Illustration: 22

In a manufacturing concern employees are paid a bonus in addition to their normal wages at hourly rates. Incentive bonus is calculated in proportion of time saved to time allowed. The following are the details of employee X.

| | |
|---|---|
| Normal wages (₹ per hour) | 4. |
| Completed units of production | 6,000 |
| Time allowed (per 100 units) | 0.8 hours |
| Actual time taken | 42 hours |

You are required to workout the amount of bonus earned and the total amount of wages received.

*[Madras University, B.A. Corp., March 1997]*

### Solution:

Earnings under Rowan Plan = $T \times R + \left(\dfrac{S - T}{S} \times T\right) \times R$

Time Taken = 42 Hours

Rate Per Hour = ₹ 4

Standard Time = $\dfrac{0.8}{100} \times 6{,}000$ = 48 Hours

∴ Time Saved = 48 - 42 = 6 Hours

∴ Earnings under Rowan Plan = $42 \times 4 + (\dfrac{6}{48} \times 42) \times 4$

= 168 + 21 = ₹ 189

## Problems on Halsey and Rowan Plans

## Illustration: 23

Set out a comparative statement showing the effect of paying wages on- 1) Halsey plan, and 2) The Rowan Premium Plan assuming:

| | | |
|---|---|---|
| Standard time | : | 10 hours |
| Hourly wage rate | : | ₹ 5 |
| Time Taken | : | 8 hours |
| Overhead rate per hour | : | ₹ 6 |

## Solution:

### Calculation of Wages:

**1. Halsey Plan**

$$\text{Wages under Halsey Plan} = T \times R + \left(\frac{50}{100} \times (S - T)\right) \times R$$

$$= 8 \times 5 + (50\% \times (10 - 8) \times 5$$

$$= 40 + 5 = ₹ 45$$

**2. Rowan Plan**

$$\text{Wages under Rowan Plan} = T \times R + \left(\frac{S - T}{S}\right) \times T \times R$$

$$= 8 \times 5 + \left(\frac{10 - 8}{10}\right) \times 8 \times 5$$

$$= 40 + 8 = ₹ 48$$

### Calculation of Employer's Saving Due to Time Saved:

**1. Halsey Plan**

| | | |
|---|---|---|
| Savings in Labour | = | 2 Hours x ½ x ₹ 5 = ₹ 5 |
| Savings in Overheads | = | 2 Hours x ₹ 6 = ₹ 12 |
| Total Savings | = | 5 + 12 = ₹ 17 |

**2. Rowan Plan**

| | | |
|---|---|---|
| Savings in Labour | = | Wages for Saved Hours - Bonus |
| | = | 10 - 8 = ₹ 2 |
| Savings in Overheads | = | 2 x 6 = ₹ 12 |
| Total Savings | = | 2 + 12 = ₹ 14 |

## Illustration: 24

The standard time allowed for a job is 50 hours. The hourly rate of wage is ₹ 4.00 plus a dearness allowance of 25 paise per hour worked. The actual time taken by the worker was 40 hours. Calculate the earnings per hour worked under the Halsey Premium Plan and Rowan Plan.

*[Madurai Kamaraj University, B.Com.]*

## Solution:

**1. Earnings under Halsey Plan:**

$$\text{Wages under Halsey Plan} = T \times R + \left(\frac{50}{100} \times (S - T)\right) \times R$$

$$= 40 \times 4 + \left(\frac{50}{100} \times (50 - 40)\right) \times 4$$

$$= 160 + 20 = ₹ 180$$

| | | |
|---|---|---|
| Dearness Allowance | = | 40 Hrs. x ₹ 0.25 = ₹ 10 |
| Total Earnings | = | ₹ 180 + 10 = ₹ 190 |

**2. Earnings under Rowan Plan:**

$$\text{Wages under Rowan Plan} = T \times R + \left(\frac{S - T}{S} \times T\right) \times R$$

## Illustration 2

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

|  | Rs. |
|---|---|
| Rent and rates | 5,000 |
| Indirect wages | 1,500 |
| Depreciation of machinery | 10,000 |
| General lighting | 600 |
| Power | 1,500 |
| Sundries | 10,000 |

Following further details are available:

|  | Total | A | B | C | D | E |
|---|---|---|---|---|---|---|
| Floor space in square feet | 10,000 | 2,000 | 2,500 | 3,000 | 2,000 | 500 |
| Light points | 60 | 10 | 15 | 20 | 10 | 5 |
| Direct wages (Rs). | 10,000 | 3,000 | 2,000 | 3,000 | 1,500 | 500 |
| H.P of machines | 150 | 60 | 30 | 50 | 10 | — |
| Value of machinery (Rs.) | 2,50,000 | 60,000 | 80,000 | 1,00,000 | 5,000 | 5,000 |

Apportion the cost to various departments on the most equitable basis by preparing a primary departmental distribution summary.

[Madras, B.Com(Gen) Nov. 2007]

[Delhi B.com (Hon)., 1993]

**Solution:**

**Primary overhead distribution summary**

| Item | Basis of Apportionment | Total Rs. | Production Depts. A Rs. | B Rs. | C Rs. | Service Depts. D Rs. | E Rs. |
|---|---|---|---|---|---|---|---|
| Rent and rates | Floor space 4:5:6:4:1 | 5,000 | 1,000 | 1,250 | 1,500 | 1,000 | 250 |
| Indirect wages | Direct wages 6:4:6:3:1 | 1,500 | 450 | 300 | 450 | 225 | 75 |
| Depreciation of machinery | Value of machinery 12:16:20:1:1 | 10,000 | 2,400 | 3,200 | 4,000 | 200 | 200 |
| General lighting | Light points 2:3:4:2:1 | 600 | 100 | 150 | 200 | 100 | 50 |
| Power | H.P. of machines 6:3:5:1:- | 1,500 | 600 | 300 | 500 | 100 | – |
| Sundries | Direct wages 6:4:6:3:1 | 10,000 | 3,000 | 2,000 | 3,000 | 1,500 | 500 |
| Direct wages | Allocation | 2,000 | – | – | – | 1,500 | 500 |
| **Total overhead** | | 30,600 | 7,550 | 7,200 | 9,650 | 4,625 | 1,575 |

**Note:** Direct wages of service departments are also included in the distribution summary since they should also be reapportioned to the production departments and then finally be absorbed by the output. Ignoring the direct wages of service departments will result in 'unabsorbed expenses'

**Illustration 3**

Krishna producing concern is divided into four departments. 'A', 'B', 'C' are production departments and 'D' is a service department. The actual expenses for a period are as follows:

| | Rs. |
|---|---|
| Rent | 10,000 |
| Repairs to plant | 6,000 |
| Depreciation of plant | 4,500 |
| Lighting expenses | 1,000 |
| Supervisory expenses | 15,000 |
| Fire insurance (on stock) | 5,000 |
| Power | 9,000 |
| Employer's liability for insurance | 1,500 |

Overh...

| | Department | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Area (Sq. feet) | 1,500 | 1,100 | 900 | 500 |
| Number of lights | 75 | 11 | 9 | 5 |
| Number of employees | 200 | 150 | 100 | 50 |
| Total wages (Rs.) | 60,000 | 40,000 | 30,000 | 20,000 |
| Value of plant (Rs.) | 2,40,000 | 1,80,000 | 1,20,000 | 60,000 |
| Value of stock (Rs.) | 1,50,000 | 90,000 | 60,000 | — |

Apportion the costs to the various departments on the most equipment method.

*[Bharathiar, BBA., Nov. 2007 ($\frac{1}{5}$ figs)]*

*Madras, B.Com., Corp. March 1995; B.Com, Sep. 1992]*

**Solution:**

### Primary overhead distribution summary

| Item | Basis of Apportionment | Total | Production Depts. | | | Service Depts. |
|---|---|---|---|---|---|---|
| | | | A | B | C | D |
| | | Rs. | Rs. | Rs. | Rs. | Rs. |
| Rent | Area 15:11:9:5 | 10,000 | 3,750 | 2,750 | 2,250 | 1,250 |
| Depreciation of plant | Value of plant 4:3:2:1 | 4,500 | 1,800 | 1,350 | 900 | 450 |
| Repairs of plant | Value of plant 4:3:2:1 | 6,000 | 2,400 | 1,800 | 1,200 | 600 |
| Lighting expenses | Number of lights 75:11:9:5 | 1,000 | 750 | 110 | 90 | 50 |
| Supervisory expenses | No. of employees 4:3:2:1 | 15,000 | 6,000 | 4,500 | 3,000 | 1,500 |
| Fire insurance on stock | Value of stock 5:3:2:- | 5,000 | 2,500 | 1,500 | 1,000 | |
| Power | Value of plant 4:3:2:1 | 9,000 | 3,600 | 2,700 | 1,800 | 900 |
| Employer's liability for Insurance | Number of employees 4:3:2:1 | 1,500 | 600 | 450 | 300 | 150 |
| Wages | Allocation | — | — | — | — | 20,000 |
| **Total overheads** | | 52,000 | 21,400 | 15,160 | 10,540 | 24,900 |

**Note:** (1) ESI (Employees State Insurance) contributions made by employer are usually divided on the basis of department wages. However, employer's liability for insurance is assumed to be different from his legal contribution to ESI. So it is divided on the basis of No. of employees.

(2) Power is divided on plant value basis because the horse power or K.W.H. of the plant and machinery is not given.

(3) Wages of service department should also be included because they should also be re-apportioned to the production departments and finally absorbed by the output.

# III SECONDARY APPORTIONMENT
## (OR)
## SECONDARY DISTRIBUTION OF OVERHEADS

### (A) Direct Reapportionment

### Illustration 4

Calculate the overhead allocable to production departments A and B from the following:

There are two service departments X and Y. X renders service to A and B in the ratio of 3 : 2 and Y renders service to A and B in the ratio of 9 : 1. Overhead as per primary overhead distribution is:

A – Rs. 49,800;  B – Rs. 29,600;  X – Rs. 15,600;  Y – Rs. 10,800.

*[Bharathiar, B.Com(E.Com) Nov. 2007]*

**Solution:**

### Secondary overhead Distribution summary

| Particulars | Total | Production Depts. | | Service Depts. | |
| --- | --- | --- | --- | --- | --- |
| | | A | B | X | Y |
| | | Rs. | Rs. | Rs. | Rs. |
| Overhead as per Primary distribution | 1,05,800 | 49,800 | 29,600 | 15,600 | 10,800 |
| Service department 'X' O.H. 3 : 2 to A & B | – | 9,360 | 6,240 | (–15,600) | |
| Service department 'Y' O.H. 9 : 1 to A & B | – | 9,720 | 1,080 | – | (10,800) |
| Total overhead of Production departments | 1,05,800 | 68,880 | 36,920 | – | – |

## (B) Step Distribution (or) Step Ladder Method

### Illustration 5

A factory has three service departments L, M and N and two production departments - X and Y. The following are the expenses allocated and apportioned to the departments as per primary distribution summary.

| L | M | N | X | Y |
|---|---|---|---|---|
| Rs. | Rs. | Rs. | Rs. | Rs. |
| 10,000 | 8,000 | 12,000 | 30,000 | 40,000 |

The following additional information is also available on the basis of a detailed analysis made.

| | Service Departments | | | Production Departments | |
|---|---|---|---|---|---|
| | L | M | N | X | Y |
| L's service used | — | 20% | 30% | 30% | 20% |
| M's service used | — | — | 40% | 30% | 30% |
| N's service used | — | — | — | 60% | 40% |

Prepare a statement showing apportionment of service department overheads under the step method.

[Kakatiya, B.Com]

### Solution:

**Statement showing secondary distribution of overhead**

| Department | Cost as per Primary apportionment | | | | |
|---|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| L | 10,000 | −10,000 | | | |
| M | 8,000 | 2,000 | −10,000 | | |
| N | 12,000 | 3,000 | 4,000 | −19,000 | |
| X | 30,000 | 3,000 | 3,000 | 11,400 | 47,400 |
| Y | 40,000 | 2,000 | 3,000 | 7,600 | 52,600 |
| | | | | | 1,00,000 |
| Total overhead | 1,00,000 | | | | |

**Notes:** While working the different departments in the statement under the step method, the service departments which service the largest number of the other departments should be written first. For example in the above example 'L' department serves 4 other departments. Similarly in the order of number of other departments served, remaining service departments should be written. Finally, the production departments are written one by one.

## (C) Reciprocal services methods

## (1) Simultaneous equation method

### Illustration 6

A company has three production departments and two service departments their respective expenditures are given below:

| Production Departments | Service Departments |
|---|---|
| A - Rs. 800 | X - Rs. 234 |
| B - Rs. 700 | |
| C - Rs. 500 | Y - Rs. 300 |

Service departments give service in the following manner to various departments.

| Service departments | A | B | C | X | Y |
|---|---|---|---|---|---|
| X | 20% | 40% | 30% | - | 10% |
| Y | 40% | 20% | 20% | 20% | - |

You are required to show the distribution of service department overheads under simultaneous equation method.

*[Madras, B.Com(gen & AF) April 2009; B.Com(CS) (SY5E) April 2007;*
*Periyar, B.Com., B.Com(CA) May 2007]*

**Solution:**

Let 'x' be the total overhead of department 'x' and 'y' be the total overhead of department 'y'.

Then $x = 234 + .2y$

$y = 300 + .1x$

Multiplying both equations with 10 to eliminate decimals,

$$10x = 2,340 + 2y \quad \text{............ (1)}$$
$$10y = 3,000 + x \quad \text{............ (2)}$$

Multiplying equation (1) with 5 to equate y, rearranging the equations and adding them.

$$50x - 10y = 11,700$$
$$-x + 10y = 3,000$$

Adding,

$$49x = 14,700$$

$$x = \frac{14,700}{49} = \text{Rs. } 300$$

Substituting 'x' value in equation (1) we get

$$3,000 = 2,340 + 2y \qquad \therefore y = \frac{660}{2} = \text{Rs. } 330$$

| Particulars | Total Rs. | Production Departments: A Rs. | B Rs. | C Rs. |
|---|---|---|---|---|
| Overhead as per primary apportionment | 2,000 | 800 | 700 | 500 |
| Add: Service Department 'x' overhead (300 X 90% in 20 : 40 : 30) | 270 | 60 | 120 | 90 |
| Add: Service department 'y' overhead (330 X 80% in 40 : 20 : 30) | 264 | 132 | 66 | 66 |
| Total overhead | 2,534 | 992 | 886 | 656 |

## Illustration 7

You are supplied with the following information and are required to work out the secondary distribution of service department overheads under simultaneous equation method.

| Total overhead as per | Production departments | | | Service departments | |
|---|---|---|---|---|---|
| | A | B | C | P | Q |
| Primary distribution (Rs.) | 7,810 | 12,543 | 4,547 | 4,000 | 2,600 |

Expenses of service departments P and Q are apportioned as under:

| | A | B | C | P | Q |
|---|---|---|---|---|---|
| P | 30% | 40% | 20% | – | 10% |
| Q | 10% | 20% | 50% | 20% | – |

*[Madras, B.Com(gen & AF) April 2010 Modified]*

*[C.A. Inter adapted]*

**Solution:**

Let 'x' be the total overhead of department P and 'y' be the total overhead of department Q.

Then $x = 4,000 + .2y$

$y = 2,600 + .1x$

Multiplying both equations to eliminate decimals,

$10x = 40,000 + 2y$ ................(1)

$10y = 26,000 + x$ ................(2)

Multiplying equation (1) with 5 to equalise 'y', rearranging and adding the equations:

$$50x - 10y = 2,00,000 \qquad \ldots\ldots\ldots(3)$$
$$-x + 10y = 26,000 \qquad \ldots\ldots\ldots(4)$$

Adding:

$$49x = 2,26,000$$

$$x = \frac{2,26,000}{49} = \text{Rs. } 4,612.2$$

Substituting '$x$' value in equation (1) we get

$$46,122 = 40,000 + 2y; \qquad 2y = 46,122 - 40,000$$

$$\therefore y = \frac{6,122}{2} = 3,061$$

### Secondary overhead distribution summary

| Particulars | Total | Production Departments | | |
|---|---|---|---|---|
| | | A | B | C |
| | Rs. | Rs. | Rs. | Rs. |
| Overhead as per primary distribution summary | 24,900 | 7,810 | 12,543 | 4,547 |
| Add: Service Dept. 'P's overhead | | | | |
| (4,612 x 90% in 30 : 40 : 20) | 4,151 | 1,384 | 1,845 | 922 |
| Add: Service dept. 'Q's overhead | | | | |
| (3,061 x 80% in 10 : 20 : 50) | 2,449 | 306 | 612 | 1,531 |
| Total overhead | 31,500 | 9,500 | 15,000 | 7,000 |

## (2) Repeated Distribution Method

### Illustration 8

A manufacturing concern has three production departments and two service departments. In July 2008, the departmental expenses where as follows:

| Production Departments | Rs |
|---|---|
| A | 16,000 |
| B | 13,000 |
| C | 14,000 |

Service Departments

| | |
|---|---|
| X | 4,000 |
| y | 6,000 |

The service department expenses are charged out on a percentage basis, viz.,

| | A | B | C | X | Y |
|---|---|---|---|---|---|
| Expenses of department E | 20% | 25% | 35% | – | 20% |
| Expenses of department F | 25% | 25% | 40% | 10% | – |

Prepare a statement of secondary distribution under repeated distribution method.

[Madras, B.Com(CS) (SY5A) Nov. 2008; B.Com(PZ5A) April 2007]

[Bangalore, B.com., Nov. 1995]

Solution:

### Secondary overhead distribution summary

| Particulars | Production departments | | | Service departments | |
|---|---|---|---|---|---|
| | A | B | C | X | Y |
| | Rs. | Rs. | Rs. | Rs. | Rs. |
| Departmental overhead as per primary distribution | 16,000 | 13,000 | 14,000 | 4,000 | 6,000 |
| Department X overhead distributed in the ratio of 4:5:7:4 | 800 | 1,000 | 1,400 | (-4000) | 800 |
| Department Y overhead distributed in the ratio of 5:5:8:2 | 1,700 | 1,700 | 2,720 | 680 | (-6800) |
| Department X overhead distributed in the ratio of 4:5:7:4 | 136 | 170 | 238 | (-680) | 136 |
| Department Y overhead distributed in the ratio of 5:5:8:2 | 34 | 34 | 54 | 14 | (-136) |
| Department X overhead distributed in the ratio of 4:5:7:4 | 4 | 4 | 6 | (-14) | – |
| Total overhead | 18,674 | 15,908 | 18,418 | – | – |

## Illustration 9

In a factory, there are two service departments I and II and three production departments A, B and C. In April 1992, the departmental expenses were

| Departments | A Rs. | B Rs. | C Rs. | I Rs. | II Rs. |
|---|---|---|---|---|---|
| | 6,50,000 | 6,00,000 | 5,00,000 | 1,20,000 | 1,00,000 |

The expenses of the service departments are allotted on a percentage basis as follows:

| | A | B | C | I | II |
|---|---|---|---|---|---|
| I | 30 | 40 | 15 | – | 15 |
| II | 40 | 30 | 25 | 5 | – |

Prepare a statement showing distribution of the expenses of the two service departments on a percentage basis by repeated distribution method.

[B.A. Corp., March 1996]

**Solution:**

### Secondary overhead distribution summary

| Particulars | Production Department A Rs. | B Rs. | C Rs. | Service Departments I Rs. | II Rs. |
|---|---|---|---|---|---|
| Departmental overhead as per primary distribution | 6,50,000 | 6,00,000 | 5,00,000 | 1,20,000 | 1,00,000 |
| Department I expenses apportioned in the ratio of 6:8:3:3 | 36,000 | 48,000 | 18,000 | (– 1,20,000) | 18,000 |
| Department II overhead apportioned in the ratio of 8:6:5:1 | 47,200 | 35,400 | 29,500 | 5,900 | (– 1,18,000) |
| Department I overhead apportioned in the ratio of 6:8:3:3 | 1,770 | 2,360 | 885 | (– 5,900) | 885 |
| Department II overhead apportioned in the ratio of 8:6:5:1 | 354 | 266 | 221 | 44 | (– 885) |
| Department I overhead apportioned in the ratio of 6:8:3:3 | 16 | 20 | 8 | (– 44) | – |
| Total overhead | 7,35,340 | 6,86,046 | 5,48,614 | – | – |

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# UNIT – III

**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 cot 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 o 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 cost 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 min process.
9. When there is work in progress at the end of the period the computation of inventory is made I 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 reordered on the credit side 0f 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 ion every process s converted in terms of completed units.

**Specimen of Process Account**
Process Account

| | Units | Rs. | | Units | Rs. |
|---|---|---|---|---|---|
| To Direct materials | | | By Loss in weight (Normal | | |
| To Direct Wages | | | Loss) | | |
| To Direct Expenses | | | By sale of Scrap | | |
| To Indirect expenses | | | By Next Process | | |
| To Other Expenses (if any) | | | 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 5here 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 $\underline{8250}$ = | | |
| To Production overheads | | 2250 | 41.25 | | |
| (1500x150%) | 200 | 8250 | 200 | 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 $\underline{13150}$ = | | |
| To Direct Expenses | | 300 | 65.75 | | |
| To Production overheads | | 2400 | 200 | | |
| (1600x150%) | | | | | |
| | 200 | 13150 | | 200 | 13150 |

Process III Account

| | Units | Rs. | | Units | Rs. |
|---|---|---|---|---|---|
| To Process II A/c | 200 | 13150 | By Finished stock A/c (Output Transferred ) | 200 | 15800 |
| To Direct materials | | 400 | Cost per unit $\frac{15800}{200} = 79$ | | |
| To Direct Wages | | 900 | | | |
| 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 los includes either waste or scrap r 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 (Transfer ) | 36000 | 36000 |
| To Works Overhead | | 5600 | 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 p.u | 1000 | 1000 |
| To Wages and Materials | | 12000 | By Process C A/c (Transfer ) | 37500 | 56250 |
| To Works Overhead | | 5250 | 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 | | 48000 | 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 3Rs.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 $\underline{140800}$ = 160 |  |  |
|  |  |  | 880 |  |  |
|  | 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 $\underline{151360}$ = 215 |  |  |
|  |  |  | 704 |  |  |
|  | 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 $\underline{198220}$ =132.5 | 1496 |  |
|  |  |  | 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 les than the normal output, the difference is abnormal loss.

Value of Abnormal loss = $\dfrac{\text{Normal cost of normal output}}{\text{Normal output}}$ x Units of Abnormal loss

Normal cost of normal output = Total expenditure (i.e., total debit of process A/c) – Sale Proceeds of scrap (i.e. Value of normal loss)

Normal output = Input – 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 loss-100x10% @Rs.3 each | 10 | 30 |
| To Other expenses |  | 602 | By Abnormal loss (Bal.Fig) | 15 | 262* |
|  |  |  | By Process B A/c (transfer) | 75 | 1310 |
|  | 100 | 1602 |  | 100 | 1602 |

Working Note:

Normal cost of normal output = Total expenditure – Sale Proceeds of scrap

$$= 1602-30 = \underline{1572}$$

Normal output = Input – Units of normal loss

$$= 100 – 10 = \underline{90}$$

Value of Abnormal loss = $\dfrac{\text{Normal cost of normal output}}{\text{Normal output}}$ x Units of Abnormal loss

$$= \dfrac{1572}{90} \text{ x } 15 = \text{Rs. } \underline{262}$$

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.

Value of Abnormal Gain = $\dfrac{\text{Normal cost of normal output}}{\text{Normal output}}$ x Units of Abnormal gain

$$\text{Normal cost of normal output} = \text{Total expenditure} - \text{Sale Proceeds of scrap}$$
$$\text{Normal output} = \text{Input} - \text{Units of normal loss}$$

$$\text{Units of Abnormal gain} = \text{Normal loss} - \text{Actual loss}$$
$$\text{Or} \quad = \text{Actual output} - \text{Normal output}$$

**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=<u>50</u>
2. $\dfrac{(10000+900+500)-600}{1850-50}$ = Rs.<u>6</u>

    1850x6=<u>11100</u>
3. 50x6=<u>30</u>

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

In each case the percentage of loss is computed on te number of units entering the process concerned. The loss of each process possesses a scrap value. The los 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 100+920@Rs.20per 100) | 1020 | 189 |
| To Process C | 920 | 2309 | By Costing P&L A/c |  | 2247 |
|  | 1020 | 2436 |  | 1020 | 2436 |

<div style="text-align: center;">Normal loss A/c</div>

| | 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 |

<div style="text-align: center;">Abnormal Gain A/c</div>

| | 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. <u>127</u>.
Process B:
Value of Abnormal gain = Rs.35804/18525 units x 275 units = Rs. <u>532</u>.
Process C:
 Value of Abnormal loss = Rs.42460/16920 units x 920 units = Rs. <u>2309</u>.

## 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.

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

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

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

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 o 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 | | | |
|---|---|---|---|---|---|---|---|
| | | | | Materials | | Labour & Overhead | |
| Items | Units | Items | Units | Units | % | Units | % |
| Units introduced | 3800 | Units completed & transferred | 3000 | 3000 | 100 | 3000 | 100 |
| | | Work in progress | 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 | | | |
| To Overhead | | 7120 | By Work-in-progress | 800 | 4080 |
| | 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 vale 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 | | 9800 |
| To Overhead | | 1670 | By Balance c/d | 1400 | |
| | | | (Work-in-progress) | | 2070 |
| | | | | 460 | |
| | 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 introdu4ed 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 | 100 | 6000 | 100 |
| Closing WIP | 2000 | 2000 | 100 | 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 | 3200 | 8800 |
| Closing WIP | | |
| Materials       2000x12 | 24000 | |
| Labour          1000x7 | 7000 | |
| Overhead        1000x4 | 4000 | 35000 |
| units completely processed during the period 6000@23 | | 138000 |
| | | 181800 |

Process A/c

| | Units | Rs. | | Units | Rs. |
| --- | --- | --- | --- | --- | --- |
| To Opening WIP | 2000 | 9500 | By Finished stock transferred to next process | | |
| To Materials | 8000 | 96000 | (9500+8800+138000) | 8000 | 156300 |
| To Labour | | 54600 | By Closing WIP | | 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%.
Norma 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 transfer | 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 | 2000 | 3000 |
| Finished goods | 13500x6 | | 81000 |
| Abnormal gain | 2000x6 | | 12000 |
| Closing WIP | | | |
| Materials | 4500x3 | 13500 | |
| Labour | 1500x1 | 1500 | |
| Overhead | 1500x2 | 3000 | 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 | |
| | 22000 | 121000 | | 22000 | 121000 |

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 | | | |
| | 2000 | 12000 | | 2000 | 12000 |

## 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

a. Work not sufficient enough to be certified

b. 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 xxx | |
| To Plant | Xxx | Work        uncertified xxx | Xxx |
| To Overheads | Xxx | By material returned | Xxx |
| To cost of sub contracts | Xxx | By plant xxx | |
| To Notional Profit c/d(B/F) | Xxx | Less:Depreciation        xx | Xxx |
| | | By material lying at site | Xxx |
| | Xxx | | Xxx |
| | | | |
| To Profit and Loss A/C | Xxx | By Notional profit B/d | Xxx |
| To WIP (B/F) | Xxx | | |
| | Xxx | | 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 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 ¼)** : - 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 ¼ but less than ½ 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

   Notional profit x1/3 x $\dfrac{\text{Cash received}}{\text{Work certified}}$

   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.

   Notional profit x2/3 x $\dfrac{\text{Cash received}}{\text{Work certified}}$

   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

   Estimated profit x $\dfrac{\text{Cash received}}{\text{Contract price}}$

   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 | | |
| | 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 | | |
| | ---------- | | --------- |
| | 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 31$^{st}$ 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    3,20000 | |
| To wages | 1,62,000 | Work uncertified    3000 | 3,23,000 |
| To other expenses | 10,000 | By P & L Account | |
| | | Plant lost      3000 | |
| | | Material lost  4000 | 7000 |
| | | By plant returned:      2,000 | |
| | | Less: depreciation      200 | 1,800 |
| | | By material in hand | 2,500 |
| To Notional profit c/d (B. F) | 52800 | By plant at site(30000-3000-2000)        25000 | |
| | | Less: depr    2500 | 22500 |
| | 356800 | | 356800 |
| To        P/L        Account 52800x2/3x80/100 | 28160 | By notional profit B/d | ======== 52 800 |
| Reserve BF | 24640 | | |
| | 52 800 ======== | | 52 800 ======== |

WORK IN PROGRESS ACCOUNT

| | | | |
|---|---|---|---|
| To contract A/c | 3 23,000 | By Contract A/c (reserve) | 24640 |
| | | By Balance c/d | 2,98,360 |
| | 3,23,000 ========= | | 3,23,000 ========= |

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 | 2,44000 |
| 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 | | |
| Wages | 2,44,000 | Work certified | 7, 50,000 |
| Direct expenses | 24,000 | | |
| Machinery purchased | 1,60,000 | | |
| Establishment | 54,000 | | |
| Notional profit | 1,98,000 | | |
| | 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 |
| | 1,98,000 | | ====== |
| | ====== | | |

**Illustration: 21**

The following was the expenses on contract for ₹ 12,00,000 commenced in Jan. 1997:

| | ₹ |
|---|---|
| Materials | 2,40,000 |
| Wages | 3,28,000 |
| Plant | 40,000 |
| Overhead | 17,200 |

Cash received on account of contract to 31.12.1997 was ₹ 4,80,000 being 80% of work certified. Value of materials in hand was ₹ 20,000. Plant had undergone 20% depreciation. Prepare contract account.

*[Madras University, B.Com., April 2002]*

**Solution:**

### In the Books of Contractor
### Contract A/c

Dr.                                                          Cr.

| Particulars | Amount ₹ | Particulars | Amount ₹ |
|---|---|---|---|
| To Materials | 2,40,000 | By Material in hand | 20,000 |
| " Wages | 3,28,000 | " Plant    40,000 | |
| " Plant | 40,000 |     **Less:** Depreciation @ 20% 8,000 | 32,000 |
| " Overhead | 17,200 | $\left(40{,}000 \times \dfrac{20}{100}\right)$ | |
| " Notional Profit c/d | 26,800 | " Work-in-progress: | |
| | |     Work certified | 6,00,000 |
| | | $\left(\dfrac{4{,}80{,}000}{80} \times 100\right)$ | |
| | **6,52,000** | | **6,52,000** |
| To Transfer to P & L A/c | 14,293 | By Notional Profit b/d | 26,800 |
| $\left(26{,}800 \times \dfrac{2^*}{3} \times \dfrac{4{,}80{,}000}{6{,}00{,}000}\right)$ | | | |
| " Work-in-progress (Reserve) (B/F) | 12,507 | | |
| | **26,800** | | **26,800** |

\* *Stage of the contract completed was just ¹/₂. So ²/₃ of notional profit is calculated for transfer to P & L A/c.*

## Balance Sheet

| Liabilities | | Amount ₹ | Assets | | Amount ₹ |
|---|---|---|---|---|---|
| Share capital | | 1,20,000 | Land & buildings | | 43,000 |
| Creditors | | 10,000 | Bank balance | | 25,000 |
| P & L A/c | 11,200 | | Plant at site | | 13,500 |
| Less: Plant lost | 5,000 | | Plant in stors | | 4,500 |
| Material lost | 4,000  9,000 | 2,200 | Material at site | | 4,000 |
| | | | Work-in-progress: | | |
| | | | Work certified | 2,50,000 | |
| | | | Work uncertified | 2,000 | |
| | | | | 2,52,000 | |
| | | | Less: Cash received | 2,00,000 | |
| | | | | 52,000 | |
| | | | Less: Work-in-progress | | |
| | | | (Reserve) | 9,800 | 42,200 |
| | | 1,32,200 | | | 1,32,200 |

**Working Note:**

1. Calculation of Value of Plant in Hand at Site:

| | | ₹ |
|---|---|---|
| Plant | | 25,000 |
| Less: Plant Lost | | 5,000 |
| | | 20,000 |
| Less: Plant Returned | | 5,000 |
| **Plant in Hand at Site** | | **15,000** |

## Illustration: 24

You are required to prepare Contract Account showing the profit on the contract on 30th April 1980 from the following particulars.

| | ₹ |
|---|---|
| Contract price | 1,00,000 |
| Material sent to site | 32,250 |
| Labour engaged on site | 27,400 |
| Plant installed at site | 5,650 |
| Work certified | 71,500 |
| Cash received from contractor | 65,000 |
| Value of plant as on 30th April 1980 | 4,100 |
| Cost of work done but not certified | 1,700 |
| Direct expenditure | 1,200 |
| Cost of establishment | 1,625 |
| Wages outstanding at 30th April 1980 | 900 |
| Materials in hand on 30th April 1980 | 700 |
| Direct expenses outstanding on 30th April 1980 | 100 |
| Materials returned to stores | 200 |

[Madras University, B.Com., May 2002]

**Solution:**

**In the Books of Contractor**
**Contract A/c**

Dr.                                                      Cr.

| Particulars | | Amount ₹ | Particulars | Amount ₹ |
|---|---|---|---|---|
| To Materials | | 32,250 | By Work-in-progress: | |
| " Labour | 27,400 | |    Work certified | 71,500 |
|   Add: Outstanding | 900 | 28,300 |    Work uncertified | 1,700 |
| " Plant | | 5,650 | " Materials returned | 200 |
| " Direct expenditure | 1,200 | | " Plant in hand on 30.04.1980 | 4,100 |
|   Add: Outstanding | 100 | 1,300 | " Materials in hand | 700 |
| " Cost of establishment | | 1,625 | | |
| " Notional Profit c/d | | 9,075 | | |
| | | 78,200 | | 78,200 |
| To Profit & Loss A/c | | 5,500 | By Notional Profit b/d | 9,075 |
| $\left(9,075 \times \dfrac{2}{3} \times \dfrac{65,000}{71,500}\right)$ | | | | |
| " Work-in-progress (Reserve) (B/F) | | 3,575 | | |
| | | 9,075 | | 9,075 |

## Illustration: 25

The following particulars related to a contract of Ajit Engineers:

| | ₹ |
|---|---|
| Material sent to site | 85,349 |
| Labour engaged on site | 74,375 |
| Plant installed at site | 15,000 |
| Direct expenditure | 3,167 |
| Establishment charges | 4,126 |
| Materials returned to stores | 549 |
| Work certified | 1,95,000 |
| Cost of work not certified | 4,500 |
| Materials in hand at the end of the year | 1,883 |
| Wages accrued for the year | 2,400 |
| Direct expenses accrued | 240 |
| Value of plant at the end of the year | 11,000 |
| Contract price agreed | 2,50,000 |
| Cash received | 1,80,000 |

You are required to prepare Contract Account, and show how entries will appear in the Balance Sheet of contractor.

**Solution:**

## In the Books of Ajit Engineers
### Contract A/c

| Dr. | | | | | Cr. |
|---|---|---|---|---|---|
| **Particulars** | | **Amount ₹** | **Particulars** | | **Amount ₹** |
| To Materials | | 85,349 | By Materials returned to stores | | 549 |
| " Labour | 74,375 | | " Materials in hand | | 1,883 |
| Add: Wages accrued | 2,400 | 76,775 | " Plant in hand | | 11,000 |
| " Plant installed | | 15,000 | " Work-in-progress: | | |
| " Direct Expenditure | 3,167 | | Work certified | | 1,95,000 |
| Add: Expenses accrued | 240 | 3,407 | Work not certified | | 4,500 |
| " Establishment charges | | 4,126 | | | |
| " Notional Profit c/d | | 28,275 | | | |
| | | 2,12,932 | | | 2,12,932 |
| To Profit & Loss A/c | | 17,400 | By Notional Profit b/d | | 28,275 |
| $\left(28,275 \times \dfrac{2}{3} \times \dfrac{1,80,000}{1,95,000}\right)$ | | | | | |
| " Work-in-progress (Reserve) (B/F) | | 10,875 | | | |
| | | 28,275 | | | 28,275 |

## Balance Sheet of Ajit Engineers for the year ended ..........

| Liabilities | Amount ₹ | Assets | | Amount ₹ |
|---|---|---|---|---|
| Wages outstanding | 2,400 | Work-in-progress: | | |
| Direct expenses | 240 | Work certified | 1,95,000 | |
| Profit & Loss A/c (Net Profit) | 17,400 | Add: Work not certified | 4,500 | |
| | | | 1,99,500 | |
| | | Less: WIP (Reserve) | 10,875 | |
| | | | 1,88,625 | |
| | | Less: Cash received | 1,80,000 | 8,625 |
| | | Materials returned to stores | | 549 |
| | | Materials at site at the end of the year | | 1,883 |
| | | Plant in hand | | 11,000 |

**Illustration: 26**

Leela Ltd. undertook a contract for Beula Ltd. for a total value of ₹ 24 lakhs. It was estimated that the job would be completed by 31st December 2009:

You are asked to prepare the contract account for the year ending 31st December 2009 from the following particulars:

| | ₹ |
|---|---|
| Materials | 3,00,000 |
| Wages | 6,00,000 |
| Overhead charges | 1,20,000 |
| Special Plant | 2,00,000 |

Work certified was for ₹ 16,00,000 and 80% of the same was received in cash. Material lying at site as on 31-12-2009 ₹ 40,000. Depreciate plant by 10%. 5% of the value of material issued and 6% of wages may be taken to have been incurred for the portion of the work completed, but not yet certified. Overheads are charged as a percentage of Direct Wages. Ignore depreciation of plant for use on uncertified portion of work. Ascertain the amount to be transferred to Profit and Loss A/c on the basis of realized profit.

## Solution:

### In the Books of Leela Ltd.
### Contract A/c

Dr.                                                                                           Cr.

| Particulars | Amount ₹ | Particulars | | Amount ₹ |
|---|---|---|---|---|
| To Materials | 3,00,000 | By Materials in hand | | 40,000 |
| " Wages | 6,00,000 | " Work-in-Progress: | | |
| " Overhead charges | 1,20,000 |     Work certified | 16,00,000 | |
| " Special plant | 2,00,000 |     Work uncertified[1] | 58,200 | 16,58,200 |
| " Notional Profit c/d | 6,58,200 | " Plant | 2,00,000 | |
| | |     Less: Depreciation @10% | 20,000 | 1,80,000 |
| | 18,78,200 | | | 18,78,200 |
| To Profit & Loss A/c $\left(6,58,200 \times \dfrac{80}{100} \times \dfrac{2}{3}\right)$ | 3,51,040 | By Notional Profit b/d | | 6,58,200 |
| " Work-in-progress (Reserve) (B/F) | 3,07,160 | | | |
| | 6,58,200 | | | 6,58,200 |

### Working Note:

**1. Calculation of Value of Work Uncertified:**

| | | ₹ |
|---|---|---|
| Materials | $\left(\dfrac{5}{100} \times 3,00,000\right)$ | 15,000 |
| Wages | $\left(\dfrac{6}{100} \times 6,00,000\right)$ | 36,000 |
| Overheads | $\left(\dfrac{1,20,000}{6,00,000} \times 36,000\right)$ | 7,200 |
| **Value of Work Uncertified** | | **58,200** |

# UNIT - IV

# ACCOUNTING FOR MANAGEMENT- INTRODUCTION

Management accounting can be viewed as Management-oriented Accounting. Basically it is the study of managerial aspect of financial accounting," accounting in relation to management function". It is developed mainly to help the management in the discharge of its functions and for taking various decisions.

The Report of the Anglo-American Council of Productivity (1950) has also given a definition of management accounting, which has been widely accepted. According to it, "Management accounting is the presentation of accounting information in such a way as to assist the management in creation of policy and the day to day operation of an undertaking".

According to the Institute of Chartered Accountants of England and Wales "any form of accounting which enables a business to be conducted more efficiently can be regarded as Management Accounting "

The term management accounting is composed of 'management' and 'accounting 'It is the use of Accounting Information for discharging Management functions, especially planning and decision making.

## FUNCTIONS OF MANAGEMENT ACCOUNTING

The basic function of management accounting is to assist the management in performing its functions effectively. The functions of the management are

planning, organizing, directing and controlling. Management accounting helps

in the performance of each of these functions in the following ways:

**(i) Provides data:** Management accounting serves as a vital source of data for management planning. The accounts and documents are a repository of a vast quantity of data about the past progress of the enterprise, which are a must for making forecasts for the future.

**Modifies data:** The accounting data required for managerial decisions is properly compiled and classified. For example, purchase figures for different months may be classified to know total purchases made during each period product-wise, supplier-wise and territory-wise.

**(iii) Analyses and interprets data:** The accounting data is analyzed meaningfully for effective planning and decision-making. For this purpose the data is presented in a comparative form. Ratios are calculated and likely trends are projected.

**(iv) Serves as a means of communicating:** Management accounting provides a means of communicating management plans upward, downward and outward through the organization. Initially, it means identifying the feasibility and consistency of the various segments of the plan. At later stages it keeps all parties informed about the plans that have been agreed upon and their roles in these plans.

**(v) Facilitates control:** Management accounting helps in translating given objectives and strategy into specified goals for attainment by a specified time and secures effective accomplishment of these goals in an efficient manner. All this is made possible through budgetary control and standard costing which is an integral part of management accounting.

**(vi) Uses also qualitative information:** Management accounting does not restrict itself to financial data for helping the management in decision making but also uses such information which may not be capable of being measured in monetary terms. Such information may be collected form special surveys, statistical compilations, engineering records, etc.

**SCOPE OF MANAGEMENT ACCOUNTING**

Management accounting is concerned with presentation of accounting information in the most useful way for the management. Its scope is, therefore, quite vast and includes within its fold almost all aspects of business operations. However, the following areas can rightly be identified as falling within the ambit of management accounting:

**(i) Financial Accounting:** Management accounting is mainly concerned with the rearrangement of the information provided by financial accounting. Hence, management cannot obtain full control and coordination of operations without a properly designed financial accounting system.

**(ii) Cost Accounting:** Standard costing, marginal costing, opportunity cost analysis, differential costing and other cost techniques play a useful role in operation and control of the business undertaking.

**(iii) Revaluation Accounting:** This is concerned with ensuring that capital is maintained intact in real terms and profit is calculated with this fact in mind.

**(iv) Budgetary Control:** This includes framing of budgets, comparison of actual performance with the budgeted performance, computation of variances, finding of their causes, etc**.**

**(v) Inventory Control:** It includes control over inventory from the time it is acquired till its final disposal.

**(vi) Statistical Methods:** Graphs, charts, pictorial presentation, index numbers and other statistical methods make the information more impressive and intelligible.

**(vii) Interim Reporting:** This includes preparation of monthly, quarterly, half-yearly income statements and the related reports, cash flow and funds flow statements, scrap reports, etc.

**(viii) Taxation:** This includes computation of income in accordance with the tax laws, filing of returns and making tax payments.

**(ix) Office Services:** This includes maintenance of proper data processing and other office management services, reporting on best use of mechanical and electronic devices.

**(x) Internal Audit:** Development of a suitable internal audit system for internal control.

**(xi)Management Information System [MIS]:** Management Accounting serves as a centre for collection and dissemination of information.MIS is an essential part of Management Accounting.

**MANAGEMENT ACCOUNTING AND FINANCIAL ACCOUNTING**

Financial accounting and management accounting are closely interrelated since management accounting is to a large extent rearrangement of the data provided by financial accounting. Moreover, all accounting is financial in the sense that all accounting systems are in monetary terms and management is responsible for the contents of the financial accounting statements. In spite of such a close relationship between the two, there are certain fundamental differences. These differences can be laid down as follows:

**(i) Objectives:** Financial accounting is designed to supply information in the form of profit and loss account and balance sheet to external parties like shareholders, creditors, banks, investors and Government. Information is supplied periodically and is usually of such type in which management is not much interested. Management Accounting is designed principally for providing accounting information for internal use of the management. Thus, financial accounting is primarily an external reporting process while management accounting is primarily an internal reporting process.

**(ii) Analyzing performance:** Financial accounting portrays the position of business as a whole. The financial statements like income statement and balance sheet report on overall performance or statues of the business. On the other hand, management accounting directs its attention to the various divisions, departments of the business and reports about the profitability, performance, etc., of each of them.

**(iii) Data used:** Financial accounting is concerned with the monetary record of past events. It is a post-mortem analysis of past activity and, therefore, out the date for management action. Management accounting is accounting for future and, therefore, it supplies data both for present and future duly analyzed in detail in the 'management language' so that it becomes a base for management action.

**(iv) Monetary measurement:** In financial accounting only such economic events find place, which can be described in money. However, the management is equally interested in non-monetary economic events, viz., technical innovations, personnel in the organization, changes in the value of money, etc. These events affect management's decision and, therefore, management accounting cannot afford to ignore them.

**(v) Periodicity of reporting:** The period of reporting is much longer in financial accounting as compared to management accounting. The Income Statement and the Balance Sheet are usually prepared yearly or in some cases half-yearly. Management requires information at frequent intervals and, therefore, financial accounting fails to cater to the needs of the management. In management accounting there is more emphasis on furnishing information quickly and at comparatively short intervals as per the requirements of the management.

**(vi) Precision:** There is less emphasis on precision in case of management accounting as compared to financial accounting since the information is meant for internal consumption.

**(vii) Nature:** Financial accounting is more objective while management accounting is more subjective. This is because management accounting is fundamentally based on judgment rather than on measurement.

**(viii) Legal compulsion:** Financial accounting has more or less become compulsory for every business on account of the legal provisions of one or the other Act. However, a business is free to install or not to install system of management accounting.

## COST ACCOUNTING AND MANAGEMENT ACCOUNTING

Cost accounting is the process of accounting for costs. It embraces the accounting procedures relating to recording of all income and expenditure and the preparation of periodical statements and reports with the object of ascertaining and controlling costs. It is, thus, the formal mechanism by means of which the costs of products or services are ascertained and controlled. On the other hand, management accounting involves collecting, analyzing, interpreting and presenting all accounting information, which is useful to the management. It is closely associated with management control, which comprises planning, executing, measuring and evaluating the performance of an organization. Thus, management accounting draws heavily on cost data and other information derived from cost accounting.

Today cost accounting is generally indistinguishable from the so-called management accounting or internal accounting because it serves multiple purposes. However, management accounting can be distinguished from cost accounting in one important respect.

Management accounting has a wider scope as compared to cost accounting. Cost accounting deals primarily with cost data while management accounting involves the considerations of both cost and revenue. Management accounting is an all inclusive accounting information system, which covers financial accounting, cost accounting, and all aspects of financial management. But it is not a substitute for other accounting functions. It involves a continuous process of reporting cost, financial and other relevant data in an analytical and informative way to management.

We should not be very much concerned with boundaries of cost accounting and management accounting since they are complementary in nature. In the absence of a suitable system of cost accounting, management accountant will not be in a position to have detailed cost information and his function is bound to lose significance. On the other hand, the management accountant cannot effectively use the cost data unless it has been reported to him in a meaningful and informative form.

## OBJECTIVES OF MANAGEMENT ACCOUNTING

The primary objective is to enable the management to maximize profits or minimize losses. The fundamental objective of management accounting is to assist management in their functions.

The other main objectives are:

1. Planning and policy formulation: planning is one of the primary functions of management. It involves forecasting on the basis of available information.

2. Help in the interpretation process: The main object is to present financial information. The financial information must be presented in easily understandable manner.

3. Helps in decision making: Management accounting makes decision making process more modern and scientific by providing significant information relating to various alternatives.

4. Controlling: The actual results are compared with pre determined objectives. The management is able to control performance of each and every individual with the help of management accounting devices.

5. Reporting: This facilitates management to take proper and timely decisions. It presents the different alternative plans before the management in a comparative manner.

6. Motivating: Delegation increases the job satisfaction of employees and encourages them to look forward. so it serves as a motivational devise.

7. Helps in organizing: "return on capital employed" is one of the tools if management accounting. All these aspects are helpful in setting up effective and efficient organization.

8. Coordinating operations: It provides tools which are helpful in coordinating the activities of different sections.

## DISTINCTION BETWEEN FINANCIAL ACCOUNTING AND MANAGEMENT ACCOUNTING

Financial accounting is concerned with the recording of day to day transactions of the business. Management accounting is to provide the quantitative as well as the qualitative to the management.

| FINANCIAL ACCOUNTING | MANAGEMENT ACCOUNTING |
|---|---|
| **Objective** | |
| It gives the periodical reports to owners, creditors and government. | Its assist the internal management. |
| **Nature** | |
| It concerned with historical records. | It concerned with future plans and |

| | policies. |
|---|---|
| **Subject matter** | |
| It deals the business as a whole. | It deals only a limited coverage. |
| **Flexibility** | |
| Here standards are fixed by external parties. | Standards are fixed by management itself. |
| **Legal compulsion** | |
| Statutory for every business. | Adopted on voluntary basis. |
| **Periodicity of reporting** | |
| The period is longer | Its prepared when its required. |
| **Precision** | |
| Transactions are very accurate. | Sometimes approximate figures are used. |
| **Unit of account** | |
| Recognizes whole business. | Results of the divisions. |
| **Coverage** | |
| Covers entire range of business in monetary items. | Non monetary items are considered. |
| **Publication and audit** | |
| Its very essential for the use of public | It.s for management only. |
| **Accounting principles** | |
| It has principles and conventions | No such principles. |

## LIMITATIONS OF MANAGEMENT ACCOUNTING

Management accounting, being comparatively a new discipline, suffers from certain limitations, which limit its effectiveness. These limitations are as follows:

**1. Limitations of basic records:** Management accounting derives its information from financial accounting, cost accounting and other records. The strength and weakness of the management accounting, therefore, depends upon the strength and weakness of these basic records. In other words, their limitations are also the limitations of management accounting.

**2. Persistent efforts**. The conclusions draws by the management accountant are not executed automatically. He has to convince people at all levels. In other words, he must be an efficient salesman in selling his ideas.

**3. Management accounting is only a tool:** Management accounting cannot replace the management. Management accountant is only an adviser to the management. The decision regarding implementing his advice is to be taken by the management. There is always a temptation to take an easy course of arriving at decision by intuition rather than going by the advice of the management accountant.

**4. Wide scope:** Management accounting has a very wide scope incorporating many disciplines. It considers both monetary as well as non-monetary factors. This all brings inexactness and subjectivity in the conclusions obtained through it.

**5. Top-heavy structure:** The installation of management accounting system requires heavy costs on account of an elaborate organization and numerous rules and regulations. It can, therefore, be adopted only by big concerns.

**6. Opposition to change:** Management accounting demands a break away from traditional accounting practices. It calls for a rearrangement of the personnel and their activities, which is generally not like by the people involved.

**7. Evolutionary stage:** Management accounting is still in its initial stage. It has, therefore, the same impediments as a new discipline will have, e.g., fluidity of concepts, raw techniques and imperfect analytical tools. This all creates doubt about the very utility of management accounting.

**RECENT TRENDS IN MANAGEMENT REPORTING**

Reporting is the process of communicating of information to those who need such information relevant for decision making. Some trends in reporting are:

**1. Financial reporting using IFRS**

International Financial Reporting Standards [IFRS] is recognized as global financial reporting standards. From 1st April 2011 Indian Accounting Standards were merged with the new IFRS.IFRS ensures more transparency, consistency and uniformity in accounting policies.

**2. Interim Reporting**

Interim Reporting is the reporting of financial results of any period that is shorter than a fiscal year. SEBI guidelines require companies listed on Stock Exchanges to publish their financial results on quarterly basis.

### 3. Segmental Reporting [AS-7]

It is the reporting of the operation segments of a company in the disclosure accompanying financial statements. AS 17 requires to report a segment if it has at least 10% of the revenue, 10% of the profit or loss, or 10% of the combined assets of the company.

### 4. Corporate Governance Report

The SEBI regulates governance practices of companies listed on Stock Exchanges. These regulations are notified under clause 49 of the Listing Agreements of Stock Exchanges. It prescribes the standards to be followed in the governance of the companies.

### 5. Reporting of Information Relating to Group Companies [AS 21]

AS 21 requires companies to prepare consolidated Financial Statements. It is the presentation of subsidiary companies. The objective of consolidation is to show the performance of the group as if it were a single entity. The inter group transactions are eliminated in the consolidated Financial Statements.

### Meaning of Ratio

A ratio is a simple arithmetical expression of the relationship of one number to another. It may be defined as the indicated quotient of two mathematical expressions. According to Accountant's Handbook by Wixon , Kell and Bedford, a ratio is an expression of the quantitative relationship between two numbers. In simple language ratio is one number expressed in terms of another and can be worked out by dividing one number into the other. A ratio can be expressed in the form of a fraction, number of times, percentage or in proportion.

### Nature of Ratio analysis

Ratio analysis is a technique of analysis and interpretation of financial statements. It is the process of establishing and interpreting various ratios for helping in making certain decisions. It is not an end in itself and is only a means of better understanding of financial strengths and weakness of a firm. A ratio will be meaningful only when it is analysed and interpreted. The following are the four steps involved in ratio analysis.

1. Selection of relevant data from the financial statements depending upon the objective of the analysis.

2. Solution of appropriate ratios from the above data

3. Comparison of the calculated ratios with the ratios of the same firm in the past, or the ratios developed from projected financial statements or the ratios of some other firms or the comparison with ratios of the industry to which the firm belongs.

4. Interpretation of the ratios.

Ratio analysis will be meaningful only when the analyst will consider the following factors while interpreting ratios:

1. Accuracy of financial statements

2. Clear about the objective or Purpose of analysis

3. Selection of appropriate ratios that suits the need of the analyst

4. Use of appropriate standards while analyzing ratios

5. Calibre of the analyst

6. Analyst should understand that the ratios provide only a base

**Use and Significance of Ratio analysis**

Mainly the persons interested in the analysis of the financial statements can be grouped under three heads (i) Owners or investors, (ii) Creditors and (iii) Financial executives. The importance of analysis varies materially with the purpose for which it is calculated. The primary information which seeks to be obtained from these statements differs considerable reflecting the purpose that the statement is to serve.

The significance of these ratios varies for these three groups as their purpose differs widely. These investors are mainly concerned with the earning capacity of the company whereas the creditors including bankers and financial institutions are interesting in knowing the ability of enterprise to meet its financial obligations timely. The financial executives are concerned with evolving analytical tools that will measure and compare costs, efficiency, liquidity and profitability with a view to making intelligent decisions.

{a} Managerial uses of Ratio analysis

1. Helps in decision making

2. Helps in financial forecasting and planning

3. Helps in communicating

4. Helps in co-ordination

5. Helps in control

{b}Utility to Share holders/ Investors

An investor is particularly interested to know about the Long term financial position and profitability position. Ratio analysis will be useful to the investor in making up his mind whether present financial position of the concern warrants further investment or not.

{c}Utility to Creditors

The creditors or suppliers extend short term credit to the concern. They are interested to know whether financial position of the concern warrants their payments at a specified time or not.

{d}utility to the Employees

The employees are also interested in the financial position of the concern especially profitability because their wage increases and amount of fringe benefits are related to the volume of profits earned by the concern.

{e}Utility to government

Government is interested to know the overall strength of the industry. Various financial statements published by industrial units are used to calculate ratios for determining short term, long term and overall financial position of the concerns. Ratio analysis also serves this purpose.

{f}Tax audit requirements

Clause 32 of the Income tax Act requires that the business should calculate Gross Profit/turnover, Net Profit/turnover , stock in trade/ turnover and Material consumed/finished goods produced ratios.

LIMITATIONS OF RATIO ANALYSIS

The ratio analysis is one of the most powerful tools of financial management. Though ratios are simple to calculate and easy to understand, they suffer from some serious limitations.

1. Limited use of a single ratio. A single ratio usually does not convey much of a sense. To make a better interpretation a number of ratios have to be calculated which is likely to confuse the analyst than help him in making any meaningful conclusion.

2. Lack of adequate standards. There are no well accepted standards or rules of thumb for all ratios which can be accepted as norms. It renders interpretation of the ratios difficult.

3. Inherent limitations of accounting. Like financial statements, ratios also suffer from the inherent weakness of accounting records such as their historical nature. Ratios of the past are not necessarily true indicators of the future.

4. Change of accounting procedure. Change in accounting procedure by a firm often makes ratio analysis misleading. E.g., a change in the valuation methods of inventories, from FIFO to LIFO increases the cost of sales and reduces considerably the value of closing stocks which makes stock turnover ratio to be lucrative and an unfavorable gross profit ratio.

5. Window dressing. Financial statements can easily be window dressed to present a better picture of its financial and profitability position to outsiders. Hence, one has to be very careful in making a decision from ratios calculated from such financial statements. But it may be very difficult for an outsider to know about the window dressing made by the firm.

6. Personal bias Ratio are only means of financial analysis and not an end in itself. Ratios have to be interpreted and different people may interpret the same ratio in different ways.

7. Incomparable. Not only industries differ in their nature but also the firms of the similar business widely differ in their size and accounting procedures etc. It makes comparison of ratios difficult and misleading. Moreover, comparisons are made difficult due to differences in definitions of various financial terms used in ratio analysis.

8. Absolute Figures Distortive. Ratios devoid of absolute figures may prove distortive as ratio analysis is primarily a quantitative analysis and not a qualitative analysis

9. Price level changes. While making ratio analysis, no consideration is made to the changes in price levels and this makes the interpretation of ratios invalid.

10. Ratios no substitutes. Ratio analysis is merely a tool of financial statements. Hence, ratios become useless if separated from the statements from which they are computed.

CLASSIFICATION OF RATIOS

The use of ratio analysis is not confined to financial manger only. There are different parties interested in the ratio analysis for knowing the financial position of the firm for different purposes. In view of various users of ratios, there are many types of ratios which be calculated from the information given in the financial statements. The particular purpose of the use determines the particular ratios that might be used for financial analyses

Ratios can be classified on the basis of function, significant and statement of ratios or traditional classification of ratios.

On the basis of the functions performed ratios can be classified in to the following types :-

### FUNCTIONAL CLASSIFICATION OF RATIOS

| LIQUIDITY RATIOS | LONG TERM SOLVENCY AND LEVERAGE | ACTIVITY RATIOS OR ASSET MANAGEMENT RATIOS | PROFITABILITY RATIOS |
|---|---|---|---|
| [A]1.Current Ratio | Debt/Equity Ratio | Inventory Turnover Ratio | **In relation to Sales** <br><br> 1.Gross Profit Ratio |
| 2.Liquid(Acid) Ratio or Quick Ratio | Debt to total capital ratio | Debtors Turnover Ratio | 2.Operating Ratio |
| 3.Absolute Liquid or Cash ratio | Interest coverage Ratio | Fixed Assets turnover Ratio | 3.Operating Profit Ratio |
| [B]1.Debtors turnover Ratio | Cash flow/Debt ratio | Total assets turnover ratio | 4.Net profit Ratio |
| 2.Creditors Turnover ratio | Capital Gearing Ratio | Working capital Turnover ratio | 5.Expense Ratio |
| 3.Inventory turnover ratio | | Payables turnover ratio | **In relation to Investments** <br><br> 1.Return on Investments |
| | | Capital employed turnover ratio | 2.Return on capital |
| | | | 3.Return on Equity Capital |
| | | | 4.Return on Total Resources |
| | | | 5.Earnings Per share |
| | | | 6.Price Earning ratio |

# ANALYSIS OF SHORT-TERM FINANCIAL POSITION OR TEST OF LIQUIDITY

The short term creditors of a company like suppliers of goods of credit and commercial banks providing short-term loans are primarily interested in knowing the company's ability to meet its current or short term obligations as and when these become due. The short term obligations of a firm can be met only when there are sufficient liquid assets. Therefore, a firm must ensure that it does not suffer from lack of liquidity or the capacity to pay its current obligations. Even a very high degree of liquidity is not good for the firm because such a situation represents unnecessarily excessive funds of the firm being tied up in current assets. Two types of ratios can be calculated for measuring short term financial position or short term solvency of the firm.

A. Liquidity Ratios B. Current assets movement or Efficiency Ratios

A. Liquidity Ratios

Liquidity refers to the ability of a concern to meet its current obligations as and when these become due. The short term obligations are met by realizing amounts from current, floating or circulating assets. The current assets should either be liquid or near liquidity. These should be convertible into cash for paying obligations of short term nature. The sufficiency or insufficiency of current assets should be assessed by comparing them with short term (current) Liabilities. If current assets can pay off the current liabilities, then liquidity position will be satisfactory. The important liquidity ratios include

1. Current ratio

Current ratio may be defined as the relationship between current assets and current liabilities. This ratio, also known as working capital ratio, is a measure of general liquidity and is most widely used to make the analysis of a short term financial position or liquidity of the firm. It is calculated by dividing the total of current assets by total of the current liabilities.

Current ratio= $\dfrac{Current\ Assets}{Current\ Liabilites}$

Current assets include cash and those assets which can be converted into cash within a short period of time, generally, one year, such as marketable securities, bills receivables, sundry debtors, inventories, work-in-progress etc. Prepaid expenses should also be included in current assts because they represent payments made in advance which will not have to be paid in ear future. Current liabilities are those obligations which are payable within a short period of generally one year and include outstanding expenses, bills payable, sundry

creditors, accrued expenses, short term advances, income tax payable, dividend payable, etc. Bank overdraft should also generally be included in current liabilities because it represents short term arrangement with the bank and is payable within a short period. But where bank overdraft is a permanent or long term arrangement with the bank, it should be excluded.

A relatively high current ratio is an indication that the firm is liquid and has the ability to pay its current obligations in time as and when they become due. An increase in current ratio represents the improvement in the liquidity position of the firm while a decrease in the current ratio indicates that there has been deterioration in the liquidity position of the firm. As a convention a minimum of 2: 1 is considered as the standard current ratio of a firm.

***Illustration 1:*** On December 31, 2010 Company B had total asset of 150,000, equity of 75,000, non-current assets of 50,000 and non-current liabilities of 0,000. Calculate the current ratio.

Solution
To calculate current ratio, we need to calculate current assets and current liabilities first:
Current Assets = Total Asset − Non-Current Assets =150,000 − 50,000 = 100,000
Total Liabilities = Total Assets − Total Equity = 150,000 − 75,000 =75,000
Current Liabilities = 75,000 − 50,000 = 25,000
Current Ratio = 100,000 ÷ 25,000 = 4

Illustration 2

X Ltd. has a current ratio of 3.5:1 and quick ratio of 2:1. If excess of current assets over quick assets represented by stock is Rs. 1, 50,000, calculate current assets and current liabilities.

**Solution**

Let Current Liabilities =  x

Current Assets          = 3.5x

And Quick Assets      = 2x

Stock                   = Current Assets – Quick Assets

1,50,000                = 3.5x – 2x

1,50,000                = 1.5x

x                       = Rs.1,00,000

Current Assets      = 3.5x = 3.5 × 1,00,000 = Rs. 3,50,000.

## 2. Quick Ratio

Quick ratio, also known as Acid Test Ratio or Liquid Ratio, is a more rigorous test of liquidity than the current ratio. The term liquidity refers to the ability of a firm to pay its short term obligations as and when they become due. Quick ratio may be defined as the relationship between quick/liquid assets and current or liquid liabilities. An asset is said to be liquid if it can be converted into cash within a short period without loss of value. In that sense cash in hand and cash at bank are the most liquid assets. The other liquid assets include bills receivable, sundry debtors, marketable securities and short term or temporary investments. Prepaid expenses and Inventories cannot be termed as liquid asset because they cannot be converted into cash without loss of value. A ratio of 1:1 is considered as satisfactory quick ratio.

Quick Ratio = $\dfrac{Quick / Liquid\ Assets}{Current\ Liabilites}$

### Illustration 3

Calculate the current ratio from the following information:

Working capital Rs. 9,60,000; Total debts Rs.20,80,000; Long-term Liabilities Rs.16,00,000; Stock Rs. 4,00,000; prepaid expenses Rs. 80,000.

### Solution

Current Liabilities = Total debt- Long term debt

                 = 20,80,000 – 16,00,000

                 = 4,80,000

Working capital   = Current Assets – Current liability

     9,60,000   = Current Assets – 4,80,000

Current Assets   = 14,40,000

Quick Assets      = Current Assets – (stock + prepaid expenses)

                  =     14,40,000 – (4,00,000 + 80,000)

                  =     9,60,000

Current ratio      = Current Assets / Current liabilities

                  =   14,40,000/4,80,000

                  =   3:1

Quick ratio    =    Quick Assets / Current liabilities

             =    9,60,000/4,80,000

             =    2:1

**Illustration 4**

Calculate quick ratio from the information

Stock Rs .60,000 ; Cash 40,000; Debtors 40,000; Creditors 50,000

Bills Receivable 20,000; Bills Payable 30,000; Advance Tax 4,000

Bank Overdraft 4,000; Debentures Rs. 2,00,000; Accrued interest Rs. 4,000.

**Solution**

| Quick Assets | = | Current Assets – Stock – Advance Tax |
|---|---|---|
| Quick Assets | = | Rs. 1,68,000 – (Rs. 60,000 + Rs. 4,000) = Rs. 1,04,000 |
| Current Liabilities = | | Rs. 84,000 |
| Quick ratio | = | Quick Assets / Current Liabilities |
| | = | Rs. 1,04,000 : Rs. 84,000 |
| | = | 1.23:1 |

3. Absolute Liquid Ratio or Cash Ratio

      Absolute Liquid Ratio is calculated by dividing Absolute Liquid assets by current Liabilities .Absolute Liquid Assets include cash in hand and at bank and marketable securities or temporary investments. The acceptable norm for this ratio is 50% or 0.5 :1 or 1 :2.

**Illustration 5**

Calculate Absolute Liquid ratio from the following information

| Goodwill | 50000 | Cash at Bank | 30000 |
|---|---|---|---|
| Plant and machinery | 400000 | Inventories | 75000 |
| Trade investments | 200000 | Bank overdraft | 70000 |
| Marketable securities | 150000 | Sundry creditors | 60000 |
| Bills receivable | 40000 | Bills payable | 90000 |
| Cash in hand | 45000 | Outstanding expenses | 30000 |

**Solution**

Absolute Liquid Ratio = $\frac{Absolute\ Liquid\ Assets}{Current\ Liabilites}$

Absolute Liquid assets  = Mark. Securities+ Cash in hand and at Bank

= 150000+45000+30000       =       225000

Current Liabilities       =  BOD + Creditors + B/P+O/S Expenses

= 70000+60000+90000+30000              = 250000

Absolute Liquid Ratio = $\frac{Absolute\ Liquid\ Assets}{Current\ Liabilites}$ = $\frac{225000}{250000}$     = 0.9

**Practice Problems**

1. Find out current ratio.

 Gross Debtors Rs. 20,000; Provision for Bad debts Rs. 3,000; Bills receivable Rs. 13,000; Stock twice of net debtors; Cash in hand Rs. 16,000; Advance to suppliers Rs. 15,000; Creditors for goods Rs. 27,000; Bills payable Rs. 8,000; Outstanding expenses Rs. 15,000; Prepaid expenses Rs. 5,000 Investment (Long term) Rs. 12,000;

[Ans. Current Ratio 2:1]

2. Find out current liabilities when current ratio is 2.5:1 and current assets are Rs. 75,000.

[Ans. Current Liabilities Rs. 30,000]

 3. The ratio of current assets (Rs. 6, 00,000) to current liabilities is 1.5:1. The accountant of this firm is interested in maintaining a current ratio of 2:1 by paying some part of current liabilities. You are required to suggest him the amount of current liabilities which must be paid for this purpose.

[Ans. Rs. 2, 00,000]

4. A firm had current liabilities of Rs. 90,000. It then acquired stock-in-trade at a cost of Rs. 10,000 on credit. After this acquisition the current ratio was 2:1. Determine the size of current assets and working capital after and before the stock was acquired.

[Ans. C.A. Rs. 2,00,000, Rs. 1,90,000; W.C. Rs. 1,00,000, Rs. 1,00,000]

5.A Ltd. company has a current ratio of 3.5:1 and acid test ratio of 2:1. If the inventory is Rs. 30,000, find out its total current assets and total current liabilities.

[Ans. Current Assets Rs. 70,000; Current Liabilities Rs. 20,000]

6.Given: Current ratio 2.8; Acid test ratio 1.5; Working capital = Rs. 1,62,000.

Find out: Current assets;, Current liabilities; Liquid Assets.

[Ans. A) Rs. 2,52,000; (b) Rs. 90,000; (c) 1,35,000]

ANALYSIS OF SOLVENCY – SOLVENCY RATIOS

The term solvency refers to the ability of a firm to meet all liabilities in full in the event of liquidation. It is the long- term liquidity of the firm. The Balance sheet discloses the long term financial position in the form of sources and applications of long term funds in the business. The important measures of solvency and analysis of capital structure are

1. Debt-Equity Ratio

A firm uses both equity and debt for financing its assets. The ratio of these two sources of funds is turned as Debt Equity Ratio.

Debt Equity Ratio = $\dfrac{Total\ borrowed\ funds}{Owned\ funds}$

Total Borrowed funds include both long term and short term borrowings or current liabilities. It is the aggregate of bonds, debentures, bank loans and all the current liabilities.

Owned funds include equity capital, preference capital and all items of reserve and surplus.

The standard norm of Debt-Equity ratio is 2:1. It indicates that total borrowed fund can be two times of equity or owned funds. The intention is to maximize the return of equity share holders by taking, advantage of cheap borrowed funds.

2. Capital Gearing Ratio

This ratio indicates the relationship between fixed interest bearing securities and equity shareholders funds.

Capital Gearing Ratio = $\dfrac{Fixed\ Income\ bearing\ securites}{Equity\ Shareholders\ funds}$

Fixed income bearing securities are Debentures, Bonds and Preference shares.

Equity shareholders funds include Equity share capital and Reserves and Surpluses.

A firm is said to be highly geared when it uses more of fixed income bearing securities like bonds, debentures and preference share capital..  It indicates the risk perception of investors is high. If the ratio is less than one, the firm is said to be low geared. The position of creditors is more safe when the firm is low geared.

3. Propreitory ratio/ Equity Ratio

It is the ratio of shareholders funds to Total Assets of the firm. It indicates the relative contribution of owners or shareholders in financing total assets. This ratio is also called net worth to Total Assets Ratio. This ratio establishes the relationship between shareholder's funds to total assets of the firm.

Proprietary ratio/ Equity Ratio $\frac{Shareholders\ funds}{Total\ Assets}$

Where shareholders funds = Equity share capital+ preference share capital+ undistributed profits+ reserves and surpluses

Total assets = Total resources of the concern

4. Solvency Ratio

It is the ratio of total borrowed funds to total assets (also equal to total liabilities). It indicates the relative contribution of outsiders in financing the assets of the firm. It is calculated as :-

Solvency ratio = $\frac{Total\ Borrowed\ funds}{Total\ Assets}$

Or Solvency Ratio = 100- Equity Ratio

A high ratio indicates that the firm is depending more on outsiders' funds in financing assets. The position of creditors is not safe in the event of winding up.

5. Ratio of Fixed assets to Net worth.

The ratio shows the relationship between net fixed assets and Net worth

i.e, Ratio of Fixed assets to Net worth = $\frac{Net\ Fixed\ Assets}{Net\ Worth}$

6. Funded Debt to capitalization

This ratio indicates the contribution of owners in financing fixed assets. If the ratio is less than one, it is considered as ideal. It means that the whole of fixed assets and a part of working capital are financed from shareholders funds. If the ratio is more than one, it means that a part of the fixed assets is financed using borrowed funds.

$$\text{Funded Debt to capitalization} = \frac{Long\ term\ debt}{Total\ Assets\ or\ Total\ Liabilites}$$

**Illustration 6**

The following Balance sheets of ABC Limited is given. Calculate.

(a) Current Ratio

(b) Acid Test Ratio

(c) Debt- Equity Ratio

(d) Proprietary ratio

(e) Capital gearing ratio

(f) Fixed assets to shareholders Funds Ratio

**Balance sheet as at 31st March 2012**

| Liabilities | Amount | Assets | Amount |
|---|---|---|---|
| Equity share capital | 150000 | Fixed Assets | 150000 |
| 5% Preference share capital | 20000 | Inventory | 50000 |
| General Reserve | 25000 | debtors | 25000 |
| Profit and Loss A/c | 20000 | cash | 90000 |
| 6% Debentures | 55000 | | |
| Creditors | 45000 | | |
| | 315000 | | 315000 |

Solution

(a) Current ratio = current assets / current liabilities = 165000/45000 = 3.67 :1

Current assets = inventory + debtors + cash = 50000+25000+90000 = 165000

[b] Liquid ratio = liquid liabilities / current liabilities

Liquid assets -= current assets – inventory = 165000-50000 = 115000

Liquid ratio = 165000/45000 = 2.56 :1

[c] debt equity ratio = outsiders funds / shareholders funds

Outsiders funds = debentures + creditors = 55000+45000 = 100000

Shareholders' funds = equity capital + preference capital + reserves+ profit and loss account

$\qquad$ = $\qquad$ 150000+20000+25000+20000 = 215000

Debt equity ratio = 100000/215000 = 0.46 :1

[d]Proprietary ratio = Shareholder's Funds / Total Assets

Shareholder's Funds = 215000 / 315000 = 0.68 :1

[e] Capital gearing ratio = $\dfrac{Fixed\ Income\ bearing\ Securities}{Equity\ Shareholders\ fund}$

= 75000/195000 = 0.38 :1

[f] Fixed assets to shareholders funds = $\dfrac{Fixed\ Assets}{Shareholders\ fund}$

$\qquad$ = $\qquad$ 150000/215000 = 0.69 :1

**Activity Ratios**

Activity ratios, sometimes referred to as operating ratios or management ratios, measure the efficiency with which a business uses its assets, such as inventories, accounts receivable, and fixed (or capital) assets. The more commonly used operating ratios are the average collection period, the inventory turnover, the fixed assets turnover, and the total assets turnover.

These ratios indicate the efficiency of management in the use of resources, both short term and long term. The overall performance of a company is evaluated on the basis of its ability to make sales using minimum resources. Turnover ratios reflect the speed at which assets are utilized in effecting sales. A higher turnover ratio means efficient use of funds by management in generating more sales. The important turnover ratios are :

1. Inventory turnover ratio

2. Debtors turnover ratio

3. Creditors turnover ratio

4. Total assets turnover ratio

5. fixed assets turnover ratio

6. Working capital turnover ratio

1. Inventory turnover ratio

**Inventory Turnover**:   This ratio measures the number of times a company's investment in inventory is turned over during a given year. The higher the turnover ratio, the better, since a company with a high turnover requires a smaller investment in inventory than one producing the same level of sales with a low turnover rate. Company management has to be sure, however, to keep inventory at a level that is just right in order not to miss sales.

This ratio indicates the efficiency in turning over inventory and can be compared with the experience of other companies in the same industry. It also provides some indication as to the adequacy of a company's inventory for the volume of business being handled. If a company has an inventory turnover rate that is above the industry average, it means that a better balance is being maintained between inventory and cost of goods sold. As a result, there will be less risk for the business of being caught with top-heavy inventory in the event of a decline in the price of raw materials or finished products.

$$\frac{Cost\ of\ good\ s\ sold}{Inventory}$$

Some companies calculate the inventory turnover by using sales instead of cost of goods sold as the numerator. This may be less appropriate because sales include a profit markup which is absent from inventory.

Inventory includes all types of stocks like raw materials, work in progress, finished goods, consumable stores, spares etc. Inventory turnover ratio is the relationship of cost of goods sold to average inventory. It is computed as:

Inventory turnover ratio = cost of goods sold/ average inventory

Cost of goods sold = net sales – gross profit

Cost of goods sold = opening stock +net purchases + direct expenses – closing stock

Average inventory = opening inventory +closing inventory/2

**DEBTORS TURNOVER RATIO**

A concern may sell goods on cash as well as on credit. Credit is one of the important elements of sales promotion. The volume of sales can be increased by following a liberal credit policy.

The effect of a liberal credit policy may result in tying up substantial funds of a firm in the form of trade debtors (or receivables). Trade debtors are expected to be converted into cash within a short period of time and are included in current assets. Hence, the liquidity position of concern to pay its short term obligations in time depends upon the quality of its trade debtors.

**Debtors turnover ratio** or **accounts receivable turnover ratio** indicates the velocity of debt collection of a firm. In simple words it indicates the number of times average debtors (receivable) are turned over during a year.

**Debtors Turnover Ratio = Net Credit Sales / Average Trade Debtors**

The two basic components of accounts receivable turnover ratio are net credit annual sales and average trade debtors. The trade debtors for the purpose of this ratio include the amount of Trade Debtors & Bills Receivables. The average receivables are found by adding the opening receivables and closing balance of receivables and dividing the total by two. It should be noted that provision for bad and doubtful debts should not be deducted since this may give an impression that some amount of receivables has been collected. But when the information about opening and closing balances of trade debtors and credit sales is not available, then the debtors turnover ratio can be calculated by dividing the total sales by the balance of debtors (inclusive of bills receivables) given. and formula can be written as follows.

**Debtors Turnover Ratio = Total Sales / Debtors**

Accounts receivable turnover ratio or debtors turnover ratio indicates the number of times the debtors are turned over a year. The higher the value of debtors turnover the more efficient is the management of debtors or more liquid the debtors are. Similarly, low debtors turnover ratio implies inefficient management of debtors or less liquid debtors. It is the reliable measure of the time of cash flow from credit sales. There is no rule of thumb which may be used as a norm to interpret the ratio as it may be different from firm to firm.

Illustration 7

Credit sales 25,000; Return inwards1,000; Debtors 3,000; Bills Receivables 1,000.

Calculate debtors turnover ratio

Debtors Turnover Ratio = Net Credit Sales / Average Trade Debtors

= 24,000 / 4,000

**= 6 Times**

**Average Collection Period Ratio:**

Average Collection Period. This ratio measures how long a firm's average sales remains in the hands of its customers. A longer collection period automatically creates a larger investment in assets.

The average collection period is calculated in two steps. The first step is calculating the average daily sales, which is done by dividing the total annual net sales by 365 days. The second step is dividing the average daily sales into accounts receivable.

Accounts
receivable

Average daily
sales

**The Debtors/Receivable Turnover ratio when calculated in terms of days is known as Average Collection Period or Debtors Collection Period Ratio.**

The average collection period ratio represents the average number of days for which a firm has to wait before its debtors are converted into cash.

Following formula is used to calculate average collection period:

**(Trade Debtors × No. of Working Days) / Net Credit Sales**

Illustration 8

Credit sales 25,000; Return inwards 1,000; Debtors 3,000; Bills Receivables 1,000.

**Calculate average collection period.**

**Solution:**

Average collection period can be calculated as follows:

Average Collection Period = (Trade Debtors × No. of Working Days) / Net Credit Sales

4,000 × 360 / 24,000 = 60 Days

Debtors and bills receivables are added.
For calculating this ratio usually the number of working days in a year is assumed to be 360.

This ratio measures the quality of debtors. A short collection period implies prompt payment by debtors. It reduces the chances of bad debts. Similarly, a longer collection period implies too liberal and inefficient credit collection performance. It is difficult to provide a standard collection period of debtors.

**Creditors / Accounts Payable Turnover Ratio:**

This ratio is similar to the debtor's turnover ratio. It compares creditors with the total credit purchases.

It signifies the credit period enjoyed by the firm in paying creditors. Accounts payable include both sundry creditors and bills payable. Same as debtor's turnover ratio, **creditors turnover ratio** can be calculated in two forms, creditors turnover ratio and average payment period.

Following formula is used to calculate creditors turnover ratio:

Creditors Turnover Ratio = Credit Purchase / Average Trade Creditors

**Average payment period ratio** gives the average credit period enjoyed from the creditors. It can be calculated using the following formula:

Average Payment Period = Trade Creditors / Average Daily Credit Purchase

Average Daily Credit Purchase= Credit Purchase / No. of working days in a year

Or

Average Payment Period = (Trade Creditors × No. of Working Days) / Net Credit Purchase

*(In case information about credit purchase is not available total purchases may be assumed to be credit purchase.)*

The average payment period ratio represents the number of days by the firm to pay its creditors. A high creditor's turnover ratio or a lower credit period ratio signifies that the creditors are being paid promptly. This situation enhances the credit worthiness of the company. However a very favorable ratio to this effect also shows that the business is not taking the full advantage of credit facilities allowed by the creditors.

**Fixed Assets Turnover**:  The fixed (or capital) assets turnover ratio measures how intensively a firm's fixed assets such as land, buildings, and equipment are used to generate sales. A low fixed assets turnover implies that a firm has too much investment in fixed assets relative to sales; it is basically a measure of productivity. $\dfrac{Sales}{Fixed\ Assets}$

Fixed assets turnover ratio is also known as sales to fixed assets ratio. This ratio measures the efficiency and profit earning capacity of the concern.

Higher the ratio, greater is the intensive utilization of fixed assets. Lower ratio means under-utilization of fixed assets. The ratio is calculated by using following formula:

Fixed assets turnover ratio turnover ratio is also calculated by the following formula:

**Fixed Assets Turnover Ratio = Cost of Sales / Net Fixed Asset**

If a business shows a weakness in this ratio, its plant may be operating below capacity and the manage should be looking at the possibility of selling the less productive assets.

**Total Assets Turnover**. This ratio takes into account both net fixed asset; and current assets. It also gives an indication of the efficiency with which assets are used; a low ratio means that excessive assets are employed to generate sales and/or that some assets (fixed or current assets) should be liquidated or reduced. $\dfrac{Sales}{Total\ Assets}$

**Working Capital Turnover Ratio:**

Working capital turnover ratio indicates the velocity of the utilization of net working capital.

This ratio represents the number of times the working capital is turned over in the course of year and is calculated as follows:

Following formula is used to calculate working capital turnover ratio

Working Capital Turnover Ratio = Cost of Sales / Net Working Capital

The two components of the ratio are cost of sales and the net working capital. If the information about cost of sales is not available the figure of sales may be taken as the numerator. Net working capital is found by deduction from the total of the current assets the total of the current liabilities.

## Illustration 9

| | |
|---|---|
| Cash | 10,000 |
| Bills Receivables | 5,000 |
| Sundry Debtors | 25,000 |
| Stock | 20,000 |
| Sundry Creditors | 30,000 |
| Cost of sales | 150,000 |

**Calculate working capital turnover ratio**

Solution:-

Working Capital Turnover Ratio = Cost of Sales / Net Working Capital

Current Assets =  10,000 +  5,000 +  25,000 +  20,000 =  60,000

Current Liabilities =  30,000

Net Working Capital = Current assets – Current liabilities

=  60,000 –  30,000 =  30,000

So the working Capital Turnover Ratio = 150,000 / 30,000  = **5 times**

The working capital turnover ratio measures the efficiency with which the working capital is being used by a firm. A high ratio indicates efficient utilization of working capital and a low ratio indicates otherwise. But a very high working capital turnover ratio may also mean lack of sufficient working capital which is not a good situation.

**PROFITABILITY RATIOS**

Profitability ratios may be classified in to two types :

In this type of analysis profit is related to the volume of operation or sales. The important measures of operating profitability are :

1. Gross profit ratio

2. Operating profit ratio

3. Operating ratio

4. Net profit ratio

**1. Gross Profit Ratio (GP Ratio)::**

**Gross profit ratio (GP ratio)** is the ratio of **gross profit to net sales** expressed as a percentage. It expresses the relationship between gross profit and sales.

The basic components for the ***solution of gross profit ratio*** are gross profit and net sales. Net sales mean those sales minus sales returns. Gross profit would be the difference between net sales and cost of goods sold. Cost of goods sold in the case of a trading concern would be equal to opening stock plus purchases, minus closing stock plus all direct expenses relating to purchases. In the case of manufacturing concern, it would be equal to the sum of the cost of raw materials, wages, direct expenses and all manufacturing expenses. In other words, generally the expenses charged to profit and loss account or operating expenses are excluded from the solution of cost of goods sold.

Following formula is used to calculate gross profit ratios:

**[Gross Profit Ratio = (Gross profit / Net sales) × 100]**

Illustration 10

Total sales =  520,000; Sales returns =  20,000; Cost of goods sold  400,000

**Required: Calculate gross profit ratio.**

Solution :

**Gross profit** = [(520,000 – 20,000) – 400,000]

= 100,000

**Gross Profit Ratio** = (100,000 / 500,000) × 100

= 20%

Gross profit ratio may be indicated to what extent the selling prices of goods per unit may be reduced without incurring losses on operations. It reflects efficiency with which a firm produces its products. As the gross profit is found by deducting cost of goods sold from net sales, higher the gross profit better it is. There is no standard GP ratio for evaluation. It may vary from business to business. However, the gross profit earned should be sufficient to recover all operating expenses and to build up reserves after paying all fixed interest charges and dividends.

**Causes/reasons of increase or decrease in gross profit ratio:**

It should be observed that an increase in the GP ratio may be due to the following factors.

1. Increase in the selling price of goods sold without any corresponding increase in the cost of goods sold.

2. Decrease in cost of goods sold without corresponding decrease in selling price.

3. Omission of purchase invoices from accounts.

4. Under valuation of opening stock or overvaluation of closing stock.

On the other hand, the decrease in the gross profit ratio may be due to the following factors.

1. Decrease in the selling price of goods, without corresponding decrease in the cost of goods sold.

2. Increase in the cost of goods sold without any increase in selling price.

3. Unfavorable purchasing or markup policies.

4. Inability of management to improve sales volume, or omission of sales.

5. Over valuation of opening stock or under valuation of closing stock

Hence, an analysis of **_gross profit margin_** should be carried out in the light of the information relating to purchasing, mark-ups and markdowns, credit and collections as well as merchandising policies.

**Net Profit Ratio (NP Ratio):**

**Net profit ratio** is the ratio of net profit (after taxes) to net sales. It is expressed as percentage.

The two basic components of the ***net profit ratio*** are the net profit and sales. The net profits are obtained after deducting income-tax and, generally, non-operating expenses and incomes are excluded from the net profits for calculating this ratio. Thus, incomes such as interest on investments outside the business, profit on sales of fixed assets and losses on sales of fixed assets, etc are excluded.

**Net Profit Ratio = (Net profit / Net sales) × 100**

Illustration 11

Total sales = 520,000; Sales returns =   20,000; Net profit  40,000

**Calculate net profit ratio.**

Solution:

**Net sales** = (520,000 – 20,000) = 500,000

**Net Profit Ratio** = [(40,000 / 500,000) × 100]

$\qquad\qquad$ = 8%

NP ratio is used to measure the overall profitability and hence it is very useful to proprietors. The ratio is very useful as if the net profit is not sufficient, the firm shall not be able to achieve a satisfactory return on its investment.

This ratio also indicates the firm's capacity to face adverse economic conditions such as price competition, low demand, etc. Obviously, higher the ratio the better is the profitability. But while interpreting the ratio it should be kept in mind that the performance of profits also be seen in relation to investments or capital of the firm and not only in relation to sales.

**Operating Ratio:**

**Operating ratio** is the ratio of cost of goods sold plus operating expenses to net sales. It is generally expressed in percentage.

Operating ratio measures the cost of operations per   Rs. of sales. This is closely related to the ratio of operating profit to net sales.

The two basic components for the solution of ***operating ratio*** are operating cost (cost of goods sold plus operating expenses) and net sales. Operating expenses

normally include (a) administrative and office expenses and (b) selling and distribution expenses. Financial charges such as interest, provision for taxation etc. are generally excluded from operating expenses.

**Operating Ratio = [(Cost of goods sold + Operating expenses) / Net sales] × 100**

Illustration 12

Cost of goods sold is 180,000 and other operating expenses are 30,000 and net sales is 300,000.

**Calculate operating ratio.**

Solution:

Operating ratio = [(180,000 + 30,000) / 300,000] × 100

$$= [210,000 / 300,000] \times 100$$

$$= 70\%$$

Operating ratio shows the operational efficiency of the business. Lower operating ratio shows higher operating profit and vice versa. An operating ratio ranging between 75% and 80% is generally considered as standard for manufacturing concerns. This ratio is considered to be a yardstick of operating efficiency but it should be used cautiously because it may be affected by a number of uncontrollable factors beyond the control of the firm. Moreover, in some firms, non-operating expenses from a substantial part of the total expenses and in such cases operating ratio may give misleading results.

Operating profit Ratio or Operating Margin Ratio

The operating profit of a business is the profit after meeting all operating expenses incurred in the regular course of operations. It is a measure of operating efficiency of a business. The ratio is calculated by dividing operating profit or earnings before interest and taxes [EBIT] by Net Sales

Operating profit Ratio $= \dfrac{Operating\ profit\ or\ EBIT}{Net\ Sales} \times 100$

**Expense Ratio:**

**Expense ratios** indicate the relationship of various expenses to net sales. The operating ratio reveals the average total variations in expenses. But some of the expenses may be increasing while some may be falling. Hence, expense ratios are

calculated by dividing each item of expenses or group of expense with the net sales to analyze the cause of variation of the operating ratio.

The ratio can be calculated for individual items of expense or a group of items of a particular type of expense like cost of sales ratio, administrative expense ratio, selling expense ratio, materials consumed ratio, etc. The lower the operating ratio, the larger is the profitability and higher the operating ratio, lower is the profitability.

While interpreting *expense ratio*, it must be remembered that for a fixed expense like rent, the ratio will fall if the sales increase and for a variable expense, the ratio in proportion to sales shall remain nearly the same.

Following formula is used for the solution of expense ratio:

**Particular Expense = (Particular expense / Net sales) × 100**

Illustration 13

Administrative expenses are 2,500, selling expenses are 3,200 and sales are 25,00,000.

**Calculate expense ratio.**

**Solution :**

Administrative expenses ratio = (2,500 / 25,00,000) × 100

$$= 0.1\%$$

Selling expense ratio = (3,200 / 25,00,000) × 100

$$= 0.128\%$$

[b] OVERALL PROFITABILITY RATIOS

It is the analysis of profitability in relation to the volume of capital employed or investment in the business. Management and shareholders are interested in ascertaining the return on capital employed, return on shareholders' funds etc. the important tests applied to measure overall profitability are :

1.  Return on total assets

2.  Return on capital employed

3.  Return on shareholder's equity

4.  Return on equity capital

**Return on Shareholders' Investment or Net Worth Ratio:**

It is the ratio of net profit to share holder's investment. It is the relationship between net profit (after interest and tax) and share holder's/proprietor's fund.

This ratio establishes the profitability from the share holders' point of view. The ratio is generally calculated in percentage.

The two basic components of this ratio are net profits and shareholder's funds. Shareholder's funds include equity share capital, (preference share capital) and all reserves and surplus belonging to shareholders. Net profit means net income after payment of interest and income tax because those will be the only profits available for share holders.

**[Return on share holder's investment = {Net profit (after interest and tax) / Share holder's fund} × 100]**

Illustration 14

Suppose net income in an organization is 60,000 where as shareholder's investments or funds are 400,000.

**Calculate return on shareholders' investment or net worth**

Return on share holders' investment = (60,000 / 400,000) × 100 = 15%

This means that the return on shareholders' funds is 15 percent/Rs.

This ratio is one of the most important ratios used for measuring the overall efficiency of a firm. As the primary objective of business is to maximize its earnings, this ratio indicates the extent to which this primary objective of businesses being achieved. This ratio is of great importance to the present and prospective shareholders as well as the management of the company. As the ratio reveals how well the resources of the firm are being used, higher the ratio, better are the results. The inter firm comparison of this ratio determines whether the investments in the firm are attractive or not as the investors would like to invest only where the return is higher.

**Return on Equity Capital (ROEC) Ratio**

In real sense, ordinary shareholders are the real owners of the company. They assume the highest risk in the company. (Preference share holders have a preference over ordinary shareholders in the payment of dividend as well as capital.

Preference share holders get a fixed rate of dividend irrespective of the quantum of profits of the company). The rate of dividends varies with the availability of profits in case of ordinary shares only. Thus ordinary shareholders are more interested in the profitability of a company and the performance of a company should be judged on the basis of return on equity capital of the company. Return on equity capital which is the relationship between profits of a company and its equity, can be calculated as follows:

Formula of return on equity capital ratio is:

**Return on Equity Capital = [(Net profit after tax − Preference dividend) / Equity share capital] × 100**

Equity share capital should be the total called-up value of equity shares. As the profit used for the solutions are the final profits available to equity shareholders as dividend, therefore the preference dividend and taxes are deducted in order to arrive at such profits.

Illustration 15

**Calculate return on equity share capital from the following information:**

Equity share capital):  1,000,000 ; 9% Preference share capital:  500,000; Taxation rate: 50% of net profit; Net profit before tax:  400,000.

**Solution :**

**Return on Equity Capital (ROEC) ratio** = [(400,000 − 200,000 − 45,000) / 1000,000 )× 100]

= 15.5%

This ratio is more meaningful to the equity shareholders who are interested to know profits earned by the company and those profits which can be made available to pay dividends to them. Interpretation of the ratio is similar to the interpretation of [return on shareholder's investments](#) and higher the ratio better is.

**Return on Capital Employed Ratio (ROCE Ratio)**

The prime objective of making investments in any business is to obtain satisfactory return on capital invested. Hence, the return on capital employed is used as a measure of success of a business in realizing  this objective.

Return on capital employed establishes the relationship between the profit and the capital employed. It indicates the percentage of return on capital employed in the business and it can be used to show the overall profitability and efficiency of the business.

**Capital employed** and operating profits are the main items. Capital employed may be defined in a number of ways. However, two widely accepted definitions are "**gross capital employed**" and "**net capital employed**". Gross capital employed usually means the total assets, fixed as well as current, used in business, while net capital employed refers to total assets minus liabilities. On the other hand, it refers to total of capital, capital reserves, revenue reserves (including profit and loss account balance), debentures and long term loans.

Solution of Capital Employed:

**Method--1.** If it is calculated from the assets side, It can be worked out by adding the following:

1. The fixed assets should be included at their net values, either at original cost or at replacement cost after deducting depreciation. In days of inflation, it is better to include fixed assets at replacement cost which is the current market value of the assets.

2. Investments inside the business

3. All current assets such as cash in hand, cash at bank, sundry debtors, bills receivable, stock, etc.

4. To find out net capital employed, current liabilities are deducted from the total of the assets as calculated above.

**Gross capital employed = Fixed assets + Investments + Current assets**

**Net capital employed = Fixed assets + Investments + Working capital .**

**Working capital = current assets − current liabilities.**

**Method--2.** Alternatively, capital employed can be calculated from the liabilities side of a balance sheet. If it is calculated from the liabilities side, it will include the following items:

***Share capital:***
Issued share capital (Equity + Preference)
***Reserves and Surplus:***
General reserve

Capital reserve
Profit and Loss account
Debentures
Other long term loans

Some people suggest that average capital employed should be used in order to give effect of the capital investment throughout the year. It is argued that the profit earned remain in the business throughout the year and are distributed by way of dividends only at the end of the year. Average capital may be calculated by dividing the opening and closing capital employed by two. It can also be worked out by deducting half of the profit from capital employed.

**Computation of profit for return on capital employed:**

The profits for the purpose of calculating return on capital employed should be computed according to the concept of "capital employed used". The profits taken must be the profits earned on the capital employed in the business. Thus, net profit has to be adjusted for the following:

- Net profit should be taken before the payment of tax or provision for taxation because tax is paid after the profits have been earned and has no relation to the earning capacity of the business.

- If the capital employed is gross capital employed then net profit should be considered before payment of interest on long-term as well as short-term borrowings.

- If the capital employed is used in the sense of net capital employed than only interest on long term borrowings should be added back to the net profits and not interest on short term borrowings as current liabilities are deducted while calculating net capital employed.

- If any asset has been excluded while computing capital employed, any income arising from these assets should also be excluded while calculating net profits. For illustration, interest on investments outside business should be excluded.

- Net profits should be adjusted for any abnormal, non recurring, non operating gains or losses such as profits and losses on sales of fixed assets.

- Net profits should be adjusted for depreciation based on replacement cost, if assets have been added at replacement cost.

**Return on Capital Employed=(Adjusted net profits /Capital employed)×100**

*Net profit before interest and tax minus income from investments.*

**Return on capital employed ratio** is considered to be the best measure of profitability in order to assess the overall performance of the business. It indicates how well the management has used the investment made by owners and creditors into the business. It is commonly used as a basis for various managerial decisions. As the primary objective of business is to earn profit, higher the return on capital employed, the more efficient the firm is in using its funds. The ratio can be found for a number of years so as to find a trend as to whether the profitability of the company is improving or otherwise.

**Return on Total Assets**

Return on total Assets is also called Return on Investment or ROI. It is calculated by dividing operating profit by total tangible assets.

Return on total Assets = Operating Profit  x100

Total Tangible Assets

A high ratio implies better overall performance of the business or efficient use of total assets

**MARKET TEST RATIOS**

Market test ratios are used by shareholders and investors to evaluate the performance of a company in the market place. These ratios include

- Dividend Yield Ratio

- Dividend Payout Ratio

- Earnings Per Share (EPS) Ratio

- Price Earnings Ratio (PE Ratio)

- Coverage Ratios

**Dividend Yield Ratio:**

**Dividend yield ratio** is the relationship between dividends per share and the market value of the shares.

Share holders are real owners of a company and they are interested in real sense in the earnings distributed and paid to them as dividend. Therefore, *dividend yield ratio* is calculated to evaluate the relationship between dividends per share paid and the market value of the shares.

Following formula is used for the solution of dividend yield ratio:

**Dividend Yield Ratio = Dividend Per Share / Market Value Per Share**

### Illustration 16

For illustration, if a company declares dividend at 20% on its shares, each having a paid up value of 8.00 and market value of 25.00.

**Calculate dividend yield ratio:**

**Solution :**

Dividend Per Share = (20 / 100) × 8

$\qquad$ = 1.60

Dividend Yield Ratio = (1.60 / 25) × 100

$\qquad$ = 6.4%

This ratio helps as intending investor is knowing the effective return he is going to get on the proposed investment.

**Dividend Payout Ratio:**

**Dividend payout ratio** is calculated to find the extent to which earnings per share have been used for paying dividend and to know what portion of earnings has been retained in the business. It is an important ratio because ploughing back of profits enables a company to grow and pay more dividends in future.

Following formula is used for the solution of dividend payout ratio

**Dividend Payout Ratio = Dividend per Equity Share / Earnings per Share**

A complementary of this ratio is **retained earnings ratio**. Retained earning ratio is calculated by using the following formula:

Retained Earning Ratio = Retained Earning Per Equity Share / Earning Per Equity Share

**Illustration 17**

**Calculate dividend payout ratio and retained earnings** from the following data:

| | | | |
|---|---|---|---|
| Net Profit | 10,000 | No. of equity shares | 3,000 |
| Provision for taxation | 5,000 | Dividend per equity share | 0.40 |
| Preference dividend | 2,000 | | |

Payout Ratio = ( 0.40 /  1) × 100

$\qquad$ = 40%

Retained Earnings Ratio = ( 0.60 / 1) × 100

$\qquad\qquad$ = 60%

The payout ratio and the retained earning ratio are the indicators of the amount of earnings that have been ploughed back in the business. The lower the payout ratio, the higher will be the amount of earnings ploughed back in the business and vice versa. A lower payout ratio or higher retained earnings ratio means a stronger financial position of the company.

**Earnings per Share (EPS) Ratio**

**Earnings per share ratio (EPS Ratio)** is a small variation of <u>return on equity capital ratio</u> and is calculated by dividing the net profit after taxes and preference dividend by the total number of equity shares.

The formula of earnings per share is:

**Earnings per share (EPS) Ratio = (Net profit after tax – Preference dividend) / No. of equity shares (common shares)**

Illustration 18

Equity share capital ( 1):  1,000,000; 9% Preference share capital:  500,000; Taxation rate: 50% of net profit; Net profit before tax:  400,000.

**Calculate earnings per share ratio.**

**Solution:**

EPS = 1,55,000 / 10,000

$\qquad$ =  15.50 per share.

The earnings per share is a good measure of profitability and when compared with EPS of similar companies, it gives a view of the comparative

earnings or earnings power of the firm. EPS ratio calculated for a number of years indicates whether or not the earning power of the company has increased.

**Price Earnings Ratio (PE Ratio)**

**Price earnings ratio (P/E ratio)** is the ratio between market price per equity share and earning per share.

The ratio is calculated to make an estimate of appreciation in the value of a share of a company and is widely used by investors to decide whether or not to buy shares in a particular company.

Following formula is used to calculate price earnings ratio:

**Price Earnings Ratio = Market price per equity share / Earnings per share**

Illustration 18

The market price of a share is 30 and earnings per share is 5.

**Calculate price earnings ratio.**

Solution:

Price earnings ratio = 30 / 5

= 6

The market value of every one Rs. of earning is six times or 6. The ratio is useful in financial forecasting. It also helps in knowing whether the share of a company are under or overvalued. For illustration, if the earning per share of AB limited is 20, its market price 140 and earnings ratio of similar companies is 8, it means that the market value of a share of AB Limited should be 160 (i.e., 8 × 20). The share of AB Limited is, therefore, undervalued in the market by 20. In case the price earnings ratio of similar companies is only 6, the value of the share of AB Limited should have been 120 (i.e., 6 × 20), thus the share is overvalued by 20.

*Price earnings ratio* helps the investor in deciding whether to buy or not to buy the shares of a particular company at a particular market price.

Generally, higher the price earnings ratio the better it is. If the P/E ratio falls, the management should look into the causes that have resulted into the fall of this ratio.

**Coverage Ratios**

It includes interest coverage ratio, preference share dividend coverage ratio and equity dividend coverage ratio

Debt Service Ratio or Interest Coverage Ratio:

**Interest coverage ratio** is also known as **debt service ratio** or **debt service coverage ratio**.

This ratio relates the fixed interest charges to the income earned by the business. It indicates whether the business has earned sufficient profits to pay periodically the interest charges. It is calculated by using the following formula.

**Interest Coverage Ratio = Net Profit before Interest and Tax / Fixed Interest Charges**

Illustration 19

If the net profit (after taxes) of a firm is 75,000 and its fixed interest charges on long-term borrowings are 10,000. The rate of income tax is 50%.

**Calculate debt service ratio / interest coverage ratio**

**Solution:**

Interest Coverage Ratio = (75,000 + 75,000 + 10,000) / 10,000

= 16 times

Income after interest is 7,5000 + income tax 75,000

The *interest coverage ratio* is very important from the lender's point of view. It indicates the number of times interest is covered by the profits available to pay interest charges.

It is an index of the financial strength of an enterprise. A high debt service ratio or interest coverage ratio assures the lenders a regular and periodical interest income. But the weakness of the ratio may create some problems to the financial manager in raising funds from debt sources.

**Preference share dividend cover = Profit after tax / Preference share dividend**

**Equity dividend cover = profit after tax – preference share dividend / equity share dividend**

## Capital Gearing Ratio

Closely related to solvency ratio is the **capital gearing ratio**. *Capital gearing ratio* is mainly used to analyze the capital structure of a company.

The term capital structure refers to the relationship between the various long-term form of financing such as debentures, preference and equity share capital including reserves and surpluses. Leverage of capital structure ratios are calculated to test the long-term financial position of a firm.

The term "capital gearing" or "leverage" normally refers to the proportion of relationship between equity share capital including reserves and surpluses to preference share capital and other fixed interest bearing funds or loans. In other words it is the proportion between the fixed interest or dividend bearing funds and non fixed interest or dividend bearing funds. Equity share capital includes equity share capital and all reserves and surpluses items that belong to shareholders. Fixed interest bearing funds includes debentures, preference share capital and other long-term loans.

**[Capital Gearing Ratio = Equity Share Capital / Fixed Interest Bearing Funds]**

Illustration 20

### Calculate capital gearing ratio from the following data:

|  | 1991 1992 | |
| --- | --- | --- |
| Equity Share Capital |  |  |
| Reserves & Surplus | 300,000 | 200,000 |
| Long Term Loans | 250,000 | 300,000 |
| 6% Debentures | 250,000 | 400,000 |

**Solution:**

Capital Gearing Ratio 1992 = (500,000 + 300,000) / (250,000 + 250,000)

= 8 : 5 (Low Gear)

1993 = (400,000 + 200,000) / (300,000 + 400,000)

6 : 7 (High Gear)

It may be noted that gearing is an inverse ratio to the equity share capital.

Highly Geared------------Low Equity Share Capital

Low Geared---------------High Equity Share Capital

Capital gearing ratio is important to the company and the prospective investors. It must be carefully planned as it affects the company's capacity to maintain a uniform dividend policy during difficult trading periods. It reveals the suitability of company's capitalization.

## CONSTRUCTION OF FINANCIAL STATEMENTS FROM RATIOS

Ratios are worked out from financial statements ie, Profit and loss account and Balance sheet. In a reverse approach, one can prepare the Financial statements in a concise or summarized form from the ratios and additional information.

In order to prepare Balance sheet or Profit and Loss account, students must have a clear idea regarding the contents of a typical balance sheet and profit and loss account. Using the given information and ratios students may work out the missing figures in a logical sequence.

Illustration 21

From the following information you are asked to prepare a Balance sheet

1. Current liabilities                          100000
2. Reserves and surplus                     50000
3. Bills payable                                40000
4. Debtors                                        35000
5. Current ratio                                1.75
6. Acid test ratio                             1.15
7. Fixed assets to proprietors fund     0.75
8. Ratio of fixed assets to current assets    3

Solution:

### Balance Sheet

| liabilities | Rs | assets | Rs |
|---|---|---|---|
| Share capital | 650000 | Fixed assets | 525000 |
| Reserves and surplus | 50000 | Current assets | |
| Current liabilities | | Stock | 60000 |
| Sundry creditors | 60000 | Debtors Cash | 35000 |
| Bills payable | 40000 | Miscellaneous | 80000 |
| | | Expenditure [bal.fig] | 100000 |
| | 800000 | | 800000 |

## 1. Current assets

Current ratio = current assets / current liabilities = 1.75

Current assets = 1.75 x current liabilities = 1.75 x 100000 = 175000

2.Liquid assets

Acid test ratio = liquid assets / current liabilities = 1.15

Liquid assets = 1.15x current liabilities = 1.15 x 100000 = 115000

3.stock

Stock = current assets – liquid assets

175000-115000 = 60000

4.cash balance = current assets – [ stock + debtors]

= 1750000-[60000+35000] = 80000

5. Fixed assets

Ratio of fixed assets to current assets = fixed assets / current assets = 3

Fixed assets = 3x current assets = 3x 175000 = 525000

6. Propreitors funds

Fixed assets to proprietors funds = fixed assets / proprietors funds = 0.75

Prop. Funds = fixed assets / 0.75 = 525000/0.75 = 700000

7. Share capital

Prop. Fund = s. capital + reserves and surplus

Share capital = prop. Funds – reserves and surplus = 700000-50000=650000

Sundry creditors = current liabilities – bills payable

= 100000-40000=60000

9. Miscellaneous expenditure

Balance on the asset side of balance sheet may be treated as miscellaneous expenditure

**Illustration 22**

Prepare a balance sheet from the following data

|   |   |   |
|---|---|---|
| a. | Current ratio | 1.4 |
| b. | Liquid ratio | 1.0 |
| c. | Stock turnover ratio | 8 [ based on closing stock] |
| d. | Gross profit ratio | 20% |
| e. | Debt collection period | 1.5 months |
| f. | Reserves and surplus to capital | 0.6 |
| g. | Fixed assets turnover ratio | 1.6 |
| h. | Capital gearing ratio | 0.5 |
| i. | Fixed assets to net worth | 1.25 |
| j. | Sales for the year | Rs.1000000 |

Solution

1. Cost of sales

   GP = 20% of sales = 1000000x20/100 = 200000

   Cost of sales = sales –GP = 1000000-200000=800000

2. Closing stock

   STR = Cost of sales/ closing stock = 8 times

   Closing stock = 800000/8 = 100000

3. Current assets and current liabilities

   CR = 1.4  And LR = 1.0

   Let current liabilities be x, current assets will be 1.4x and liquid assets will be 1.4x and liquid  liabilities will be 1x

   Stock = current assets – liquid assets

   100000 = 1.4x-1x

   0.4x = 100000

X = 100000/0.4 = 250000

Current liabilities = 250000

Current assets = 1.4x250000= 350000

4. Debtors

Debt collection period = debtors/credit sales x12 = 1.5

Debtors = 1000000x1.5/12 = 125000

5. Cash and bank

=liquid assets – debtors

LR = LA/CL = 1

Liquid assets are equal to current liabilities = 250000

Cash and bank = 250000-125000 = 125000

6. Fixed assets T/o ratio

= 1.6

Fixed assets = 800000/1.6= 500000

7. Net worth

Fixed assets /NW = 1.25

Net worth = 400000

8. Share capital

Res. And surplus to capital = 0.6

If capital is x reserves and surplus will be 0.6x and net worth will be 1.6x

400000= x+0.6x

X = 250000

Share capital = 250000

9. Reserves and surplus = 250000x0.6 = 150000

10.     Long term debt

Capital gearing ratio =LT debt /Equity capl + R & S = 0.5

Long term debt = [250000+150000] x0.5 = 200000

## Balance sheet

| Liabilities | Rs. | Assets | Rs |
|---|---|---|---|
| Share capital | 250000 | Fixed asset | 500000 |
| Reserves and surplus | 150000 | Stock | 100000 |
| Long term debt | 200000 | Debtors | 125000 |
| Current liabilities | 250000 | Cash and bank balance | 125000 |
| | | | |
| | 850000 | | 850000 |

# MARGINAL COSTING

The basic objectives of Cost Accounting are cost ascertainment and cost control. In order to help management in cost control and decision making, cost accounting has developed certain tools and techniques. Marginal costing and Break even analysis are important techniques used for cost control and decision making.

## Marginal Cost

The term Marginal cost means the additional cost incurred for producing an additional unit of output. It is the addition made to total cost when the output is increased by one unit.

Marginal cost of nth unit = Total cost of nth unit- total cost of n-1 unit.

Eg. When 100 units are produced, the total cost is Rs. 5000.When the output is increased by one unit, i.e, 101 units, total cost is Rs.5040.Then marginal cost of 101th unit is Rs. 40[5040-5000]

Marginal cost is also equal to the total variable cost of production or it is the aggregate of prime cost and variable overheads. The chartered Institute of Management Accountants [CIMA] England defines Marginal as "the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit

## MARGINAL COSTING

It is the technique of costing in which only marginal costs or variable  are charged to output or production. The cost of the output includes only variable costs .Fixed costs are not charged to output. These are regarded as 'Period Costs'. These are incurred for a period. Therefore, these fixed costs are directly transferred to Costing Profit and Loss Account.

According to CIMA, marginal costing is "the ascertainment, by differentiating between fixed and variable costs, of marginal costs and of the effect on profit of changes in volume or type of output.

Under marginal costing, it is assumed that all costs can be classified into fixed and variable costs. Fixed costs remain constant irrespective of the volume of output. Variable costs change in direct proportion with the volume of output. The variable or marginal cost per unit remains constant at all levels of output

# FEATURES OF MARGINAL COSTING [ASSUMPTIONS IN MARGINAL COSTING]

1. All costs can be classified into fixed and variable elements. Semi variable costs are also segregated into fixed and variable elements.

2. The total variable costs change in direct proportion with units of output. It follows a linear relation with volume of output and sales.

3. The total fixed costs remain constant at all levels of output. These are incurred for a period and have no relation with output.

4. Only variable costs are treated as product costs and are charged to output, product, process or operation

5. Fixed costs are treated as 'Period costs' and are directly transferred to Costing Profit and Loss Account.

6. The closing stock is also valued at marginal cost and not at total cost.

7. The relative profitability of product or department is based on the contribution it gives and not based on the profit

8. It is also assumed that the selling price per unit remains the same i.e, any number of units can be sold at the current market price.

9. The product or sales mix remains constant over a period of time.

## CONCEPT OF CONTRIBUTION

Contribution is the excess of sales over marginal cost. It is not purely profit. It is the profit before recovery of fixed assets. Fixed costs are first met out of contribution and only the remaining amount is regarded as profit. Contribution is an index of profitability. It has a fixed relationship with sales. Larger the sales more will be the contribution and vice versa.

Contribution = Sales – Marginal cost

**Marginal cost equation**

Sales-Marginal cost = Contribution

Contribution = Fixed costs + Profit

Therefore, Fixed cost = Contribution – Profit'

## PROFIT VOLUME RATIO [P/V RATIO].

Contribution is an absolute measure of profitability but it cannot be used for comparison of two products or departments. Therefore, the contribution is related to volume of sales. It is called Contribution / Sales Ratio or Profit/Volume Ratio [P/V Ratio]

P/V Ratio = $\underline{\text{Contribution}}$ x

Sales

When the P/V Ratio is higher, profitability of the product will also be higher. It is an index of relative profitability of products or departments.

Sales = $\dfrac{\text{Contribution}}{\text{P/V Ratio}}$

Contribution = Sales x P/V Ratio

P/V Ratio can also be find out by the following formula :-

P/V Ratio = $\underline{\text{Change in Profit x100}}$
            Change in Sales

Or P/V Ratio = $\underline{\text{Fixed Cost}}$ x 100
               Break even sales

## Marginal cost statement

The Marginal cost statement is a profitability statement prepared according to marginal costing principles. It is prepared in the following format.

| | | |
|---|---|---|
| Sales | | Xx |
| Less:  Variable/Marginal cost | | |
| Direct Labour | | |
| Direct Expenses | | |
| Variable Factory overheads | | |
| Variable Administration overheads | | |
| Variable Selling and distribution overheads | | |
| Contribution | | |
| Less Fixed Costs | | |
| Profit | | |

Illustration 1.

You are given the following information relating to a company for the year 2012

| | |
|---|---|
| Output | 20000 units |
| Selling price per unit | Rs.12 |
| Direct materials per unit | Rs.5 |
| Direct Labour per unit | Rs.2 |
| Variable overhears per unit | Rs.1 |
| Fixed cost per year | Rs.60000 |

Calculate [1] Total Marginal cost      [2] Contribution    [3]Profit      [4]P/V Ratio

Solution:-

| MARGINAL COST STATEMENT | | | |
|---|---|---|---|
| Output 20000  Units          Sales | 12 | **240000** | |
| Less: Marginal Cost | | | |
| Direct Materials | 5 | 100000 | |
| Direct Labour | 2 | 40000 | |
| Direct Expenses | 1 | 20000 | |
| **Total Marginal Cost** | 8 | 160000 | |
| **Contribution** | **4** | **80000** | |
| Less:    Fixed Costs | | 60000 | |
| **Profit** | | **20000** | |

P/V Ratio = $\underline{\text{Contribution}\quad \times 100}$      = $\underline{80000} \times 100$      = 33.33%
            Sales                            240000

**Advantages of Marginal Costing**

Following are the advantages of Marginal costing

1. It is simple to understand and easy to apply to any firm

2. There is no arbitrary apportionment of fixed cost in this system. Fixed costs are transferred to costing profit and Loss account.

3. It also prevents the illegal carry forward in stock valuation of some proportion of current years fixed cost.

4. The effect of different sales mix on profit can be ascertained and management can adopt the optimum sales mix

5. It is used in control of cost by concentrating on variable cost of production.

6. It helps in profit planning by break even and cost volume profit analysis

7. It helps management to take a number of short term decisions like pricing, output, closing down of department, sales mix, make or buy etc..

**Disadvantages**

Important disadvantages of marginal costing are ;

1. All Assumptions of marginal costing are not appropriate. The assumption fixed cost remains constant for all levels may not hold good in the long run.

2. The assumption that changes in direct proportion with the volume of also do not hold good under all circumstances.

3. It is difficult to segregate all costs into fixed and variable elements.

4. The exclusion of fixed costs in ascertaining cost of production may give misleading results and lead to non recovery of total costs.

5. The exclusion of fixed costs from inventories affect profit and financial statements may not reflect true and fair view of financial affairs.

**Marginal costing and Absorption costing**

Marginal costing is the practice of charging only variable costs to cost of production, leaving fixed costs to be charged to the costing profit and loss account.

In Absorption costing or Total costing all types of costs are charged to output or process. While variable costs are wholly allocated to output or production, fixed costs are apportioned and a portion is charged to output or production.

The profits disclosed under the two methods will be the same, provided there is no closing stock. But in the event of closing stock, the profits disclosed will be different under the two methods. This is due to the practice followed in stock

valuation. In marginal costing stock is valued at marginal cost, whereas in total costing it is valued at total cost.

## DIFFERENCE BETWEEN MARGINAL COSTING AND ABSORPTION COSTING

1. Marginal costing is the practice of charging only variable costs to products, outputs or processes and absorption costing variable and fixed cost to products, outputs or processes

2. There is no apportionment of fixed costs and they are charged to profit and loss account under marginal costing. But fixed costs are apportioned and charged to outputs or processes under absorption costing.

3. Under marginal costing, inventories or stocks are valued at marginal costs and under absorption costing they are valued at total costs.

4. Under marginal costing, the profitability of a product or department is judged on the basis of the contribution that it gives but under absorption costing it is judged on the basis of the ultimate profit that it gives.

5. Under marginal costing, profit is ascertained by deducting fixed costs from contribution and under absorption costing it is ascertained by deducting total costs from sales.

## BREAK EVEN ANALYSIS

Every business is interested in ascertaining the breakeven point. It is the level of operation where total revenue or sales are equal to total cost. It is the point of no profit or no loss. The contribution received at Breakeven point is just sufficient to meet the fixed costs, leaving nothing as profit. The firm ceases to incur losses at this point or it starts to earn a profit from this point. Breakeven point can be expressed in algebraic method or graphical method.

### Algebraic Method

Breakeven point may be expressed in terms of number of units to be produced, or in terms of volume of sales or in terms of the capacity of operation. It can be calculated by the following formula.

1.Break even point in units = $\dfrac{\text{Total Fixed costs}}{\text{Contribution per unit}}$

2.Break even point in value = $\dfrac{\text{Total Fixed costs}}{\text{P/V Ratio}}$    or    $\dfrac{\text{Total Fixed cost}}{\text{Contribution}}$ x sales

3.Break even point (in % of capacity utilization) = $\dfrac{\text{Total Fixed Costs}}{\text{Contribution}}$ x 100

Illustration 2

From the following information calculate

1. P/V Ratio

2. Breakeven point in Units

3. Breakeven point in Value

Given :

Selling price per unit Rs.20

Variable cost per unit Rs.12

Fixed costs          Rs.32000

1. P/V Ratio = Contribution/Sales x 100 = 20-12/20x100 = 40 %

2. Breakeven point in units = Fixed costs/ Contribution per unit = 32000/8= 4000 units

3. Breakeven point in value = $\dfrac{\text{Fixed costs}}{\text{P/V Ratio}}$ = 32000/40 x100 = Rs.80000

**Target Profit**

      The Break even analysis can guide an organization to determine the volume of sales required to earn a desired level of profit. The firm can decide upon the target return or profit in advance. To achieve this profit, efforts would be taken to increase the volume of sales. The volume of sales required to achieve the desired level of profit may be computed as follows :-

Number of units to be sold = $\dfrac{\text{Fixed costs + desired Profit}}{\text{Contribution per unit}}$

Sales volume required = $\dfrac{\text{Fixed costs+ Desired Profits}}{\text{P/V Ratio}}$

Illustration 3

Product A is sold at a unit selling price of Rs. 40 and the variable cost incurred per unit is Rs.32.The firm's fixed cost are Rx.40000.Find out

1. The number of units to be produced to break even

2. The number of units to be sold to earn a profit of Rs.10000

**Solution**

Contribution = SP-VC

= 40-32 = 8 per unit

1. Number of units to be produced to Break even

BEP= Fixed cost/ Contribution per unit = 40000/8 = 5000 units.

2. Number of units to be sold to earn a profit of Rs.10000

$\dfrac{\text{Fixed Cost + Desired Profit}}{\text{Contribution per unit}}$ = 40000+10000/8 = 6250 units

**Break Even Chart [Graphic Method]**

It is the graphical presentation of breakeven point. It shows the relationship between sales volume, variable and fixed costs. It also shows the profit or loss at different levels of output or volume of sales.

**Construction of Break even Chart**

A Break even chart shows the total sales line, total cost line and the point of intersection called the breakeven point. It is constructed using a database of variable costs, fixed costs, total costs and sales at different levels of output.

The units of output or sales revenue are plotted along the X axis, using suitable scale of measurement. The costs and sales are plotted along the Y axis. The fixed costs line is plotted first. It forms a parallel line to the X axis indicating that the fixed cost remain constant at all levels of output. The variable cost line is plotted next, starting from zero it progresses continuously indicating that the variable cost increase with the volume fixed cost line of sales. The total cost line is plotted above the variable cost line. It starts from the fixed cost line on the Y axis and follows the same pattern of variable cost line. The sales line is plotted finally. It starts from the zero and progresses continuously, indicating that the sales increase with larger units of output. The point of intersection of sales line and total cost line indicates the Break even point. A vertical line drawn to the X axis from this point shows the volume of output required to Break even.

## ANGLE OF INCIDENCE

It is the angle caused by the intersection of the total sales line and total cost line at the Break even point. The width of the angle represents the rate of profitability i.e, the larger the angle the greater will be the profit the business is making on additional sales

## MARGIN OF SAFETY

Margin of safety represents the strength of the business to face an adverse market condition. It is the excess of actual sales over break even sales. Higher the Margin of safety, better the position of the firm.

Margin of safety = Actual sales- Break even sales

Margin of safety = Profit / P/V Ratio

Or Profit = margin of safety x P/V Ratio

Illustration 5

Calculate BEP and Margin of safety from the following?

Sales 50000 units @ Rs.6 per unit

Prime cost Rs. 3 per unit

Variable overhead Rs. 1 per unit

Fixed costs Rs.75000 per annum

Solution :-

BEP = $\frac{\text{Fixed Cost}}{\text{SP- VC per unit}}$ = $\frac{75000}{6-4}$ = 37500 units

BEP in value = 37500 x 6 = 225000

Margin of safety = Actual sales – BE sales

= [50000x6]-225000= Rs.75000

Illustration 6

The following data have been obtained from the records of a manufacturing firm.

|            | Period I | Period II |
|------------|----------|-----------|
| Sales      | 300000   | 320000    |
| Total cost | 260000   | 272000    |

Calculate

1. Break even sales

2. Profit when sales are Rs.360000.

3. Sales required to earn a profit of Rs.50000

Solution:

P/V Ratio = <u>Change in Profit</u>   x 100

Change in Sales

Change in profit = 48000-40000= 8000

Change in Sales = 320000-300000 = Rs.20000

P/V Ratio = 8000/20000x 100 = 40%

Contribution = Sales x P/V Ratio

Period I = 300000 x 40/100 = Rs.120000

Fixed cost = Contribution – Profit = 120000- 40000 = Rs.80000

1. BEP = Fixed cost /P/V Ratio  = 8000/40 x 100  = 200000

2. Profit when sales are Rs.360000

Contribution = 360000x40/100 = 144000

Profit = Contribution – Fixed cost = 144000-80000=Rs.64000

3.Sales required to earn a profit of Rs.50000

Contribution required = Fixed cost + Profit required = 80000+50000 = 130000

Sales = Contribution requires/ P/V ratio

  = 130000/40x100 = Rs.325000

## CASH BREAK EVEN POINT

Total fixed costs include depreciation. Depreciation is a non cash expense. Therefore, cash break even point is the number of units to be produced to give a contribution equal to cash fixed costs.

Cash Break even point $= \dfrac{\text{Fixed cost – Depreciation}}{\text{Contribution per unit}}$

Illustration 7

Calculate cash Break even point for the following

Selling price per unit Rs.40

Variable cost per unit Rs.32

Fixed cost [including depreciation of Rs.20000] Rs.60000 per annum

Solution

Contribution per unit = S- VC = 40-32 = 8

Cash break even point $= \dfrac{\text{Fixed cost – depreciation}}{\text{Contribution per unit}}$

= 60000-20000/8        = 5000 units

## COMPOSITE BREAK EVEN POINT

In the case of companies producing more than one product an over all or composite break even point is calculated.

Composite Break even point $= \dfrac{\text{Total Fixed Costs}}{\text{Composite P/V Ratio}}$

Composite P/V Ratio $= \dfrac{\text{Total contribution}}{\text{Total Sales of all products}}$ x 100

## Cost-Volume Profit Analysis [ CVP Analysis]

It is the study of the impact of a change in cost , price and volume on profit. Break even analysis is a narrow interpretation of cost volume profit analysis. But it is mainly confined to finding out the Break even point. In CVP analysis the relationship between cost, volume and profit is studied in detail. It helps management in profit planning, decision making and cost control.

## Assumptions in CVP analysis

The assumptions in CVP analysis are the same as that under marginal costing.

- Cost can be classified into fixed and variable components.

- Total fixed cost remain constant at all levels of output

- The variable cost change in direct proportion with the volume of output

- The product mix remains constant

- The selling price per unit remains the same at all the levels of sales

- There is synchronization of output and sales, i.e, what ever output is produced , the same is sold during that period.

## PROFIT VOLUME CHART OR [P/V CHART]

It shows the amount of profit or loss at different levels of output. When the output is zero, total loss will be equal to fixed costs. The fixed costs are recovered gradually when the volume of output is increased. When the output reaches the Break even point, the whole fixed costs are recovered. The firm incurs no loss or earns no profit. Thereafter, the firm makes a profit and the amount of profit increases with the increase in sales volume.

## CONSTRUCTION OF P/V CHART

The same data used for drawing a Break even chart may be used for constructing a P/V chart. The following steps may be followed for constructing a P/V chart.

1. Sales or units of output are plotted along the X axis

2. The Y axis is used for marking fixed costs losses and profits

3. Points of Profits or losses are marked at different levels of sales and these points are joined to get the profit or loss line.

4. The point where the profit or loss line intersects the X axis is marked as the Break even point.

5. The angle at the BEP measures the angle of incidence

6. The distance between BEP and actual sales on the X axis measures the margin of safety

Illustration 7

Draw a Profit/ Volume graph from the following data and find out the BEP?

Sales for the year [ 20000units]    Rs.2000000

Variable Costs                Rs.1600000

Fixed costs for the year        Rs.200000

What would be the profits when the output is 22000 units?

.

## MANAGERIAL USES OF MARGINAL COSTING AND BREAK EVEN ANALYSIS

Marginal costing and Beak even analysis are very useful to management. The important uses of marginal costing and Break Even analysis are the following

### 1. Profit Planning

The first step in profit planning is the ascertainment of Break even point. It is the level of operation when there is no profit no loss. Once BEP is found out the management can decide upon the required level of sales to earn a particular amount of profit.

### 2. Cost control

Cost control is an important function of management. In marginal costing all costs are classified into fixed and variable elements. Fixed costs are generally non controllable in nature. But variable costs can be controlled by managerial actions.Therefore, managerial attention is drawn towards the control of variable costs in marginal costing.

### 3. Decision making

Marginal costing helps to take important managerial decisions like ;-

1. Fixation of selling price under different market conditions

2. Whether to accept a special order or not

3. Whether to accept  an export order or not

4. Selection of suitable product or sales mix

5. Make or buy decisions

6. Whether to discontinue a product or not

7. Closing down of a department

8. Merger of plant capacities

9. Key factor or limiting factor

10. Shut down or continue

**4. Fixation of selling price**

Selling price is actually the profit plus cost. But under severe competition or in a depressed market, it may not be possible to earn a uniform profit on sales. Some times the price may be fixed even below the cost. In marginal costing any product which gives the positive contribution is profitable and recommended in the long run.

Illustration 8

ABC Ltd is working below the normal capacity due to adverse market conditions. The present sales and costs of the firm are:

Normal capacity    5000 units

Actual output                         3000 units

Direct Materials    Rs.30000

Direct Labour               Rs.12000

Variable overheads        Rs.3000

Fixed overheads    Rs.25000

Selling price per unit     Rs.20

It is difficult to sell additional units in the market over the present level of output . The company has received enquiries for supply of additional units below the current market price. You are advises to suggest the minimum price to be charged for additional units?

**Calculation of Marginal cost**

Direct Materials              Rs.30000

Direct Labour                       Rs.12000

Variable overheads                Rs.3000

**Marginal Cost                    Rs.45000**

Marginal cost per unit = 45000/3000  = Rs.15

Therefore, the minimum price to be charged is Rs.15.Any price above the marginal cost will reduce the present loss by recovery of fixed costs.

Accepting Special Offer / Export Offer

Sometimes a firm may receive an offer for supply of additional units at a price lower than the current selling price. According to Marginal costing technique, any price quoted above marginal cost can be accepted. This is because the firm is already selling maximum units in the domestic market and making a profit. If the new offer is accepted, the contribution from such offer is purely profit and therefore the total profit of the firm is increased. However, before accepting the offer, it should be confirmed that it is within the capacity and there is no increase in fixed costs as a result of increasing the output

Illustration 10

MNP ltd is working at 60% of capacity producing 6000 units of output. The following details are available from its cost records.

Direct materials          Rs.24000

Direct labour             Rs.12000

Variable overheads        Rs.6000

Fixed overheads           Rs.15000

The output is sold at a price of Rs 10 per unit. The company receives an offer to export 4000 units @Rs.8.50 per unit. Should the export order be accepted

Solution

| Output 60% of capacity 6000 units | Per unit Rs. | Total' Rs. |
|---|---|---|
| Sales 6000 units @ Rs.10 | 10 | 60000 |
| Less: Marginal costs | | |
| Direct materials | 4 | 24000 |
| Direct labour | 2 | 12000 |
| Variable overhead | 1 | 6000 |
| Total marginal cost | 7 | 42000 |
| Contribution | 3 | **18000** |
| Less : Fixed over heads | | 15000 |
| Profit | | **3000** |

The marginal cost of the product is Rs. 7 per unit. Since the price quoted by the exporters is higher than the marginal cost, the export offer should be accepted. There is a contribution of Rs.1.50 per unit [ 8.50-7] from every unit of export. Therefore, the total profit will increase by Rs.6000 [ 4000 units x1.50 ] by accepting the offer as shown below.

**Profitability statement [ after accepting export offer]**

| Capacity 100 % output 10000 units | Per unit Rs. | Total Rs. |
|---|---|---|
| Sales: Domestic 6000@ Rs.10 Export 4000@Rs.8.50 | 10 8.5 | 60000 34000 |
| | | 94000 |
| Less: marginal cost Direct materials | 4 | 40000 |
| Direct labour | 2 | 20000 |
| Variable overheads | 1 | 10000 |
| Total marginal cost | | 70000 |
| Contribution | | 24000 |
| Less; fixed costs | | **15000** |
| Profit | | **9000** |

**Selection of a Product/ sales mix**

The marginal costing technique is useful for deciding the optimum product/sales mix. The product which shows higher P/V ratio is more profitable. Therefore, the company should produce maximum units of that product which shows the highest P/V ratio so as to maximize profits.

Illustration 11

ABC Ltd produces and sells two products A and B. the cost and sales data are given as

|  | Product A | product B |
|---|---|---|
| Selling price | 20 | 30 |
| Direct material | 10 | 15 |
| Direct labour | 4 | 5 |

Fixed overheads Rs.1200

Variable overheads are absorbed at 50% of direct labour

The proposed sales mix are

a. 100 units of A and 200 units of B

b. 150 units of A and 150 units of B

c. 200 units of A and 100 units of B

Recommend which of the above sales mix the company should adopt

Solution

**Marginal cost statement**

|  | PRODUCT A | PRODUCT B |
|---|---|---|
| SELLING PRICE | 20 | 30 |
| Less: marginal costs | | |
| Direct materials | 10 | 15 |
| Direct labour | 4 | 5 |
| Variable overheads | 2 | 2.5 |
| [50% of direct labour] | | |
|  | 16 | 22.5 |
| Contribution | 4 | 7.5 |
| P/V ratio = contribution/sales x 100 | 20% | 25% |

Since product B gives a higher P/V ratio . sales mix with the highest units of product B should be adopted . therefore the proposal [a], 100 units of A and 200 units of B is recommended. The profit will be the maximum as shown below

[a]100 units of A and 200 units of B

| | | |
|---|---|---|
| Contribution A 100 x 4 | = | 400 |
| B 200x7.5 | = | 1500 |
| | | --------------- |
| | | 1900 |
| Less: fixed cost | | 1200 |
| | | ---------------- |
| Profit | | 700 |

[b]150 units of A and 150 units of B

| | | |
|---|---|---|
| Contribution A 150 x 4 | = | 600 |
| B 150x7.5 | = | 1125 |
| | | --------------- |
| | | 1725 |
| Less: fixed cost | | 1200 |
| | | ---------------- |
| Profit | | 525 |

[c] 200 units of A and 100 units of B

| | | |
|---|---|---|
| Contribution A 200 x 4 | = | 800 |
| B 100x7.5 | = | 750 |
| | | --------------- |
| | | 1550 |
| Less: fixed cost | | 1200 |
| | | ---------------- |
| Profit | | 350 |

**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 $1^{st}$ 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 |
| | | | | ======= |

3. **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.

4. **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.

5. **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:
   a. The receipts and payment method
   b. Adjusted Profit and Loss account method
   c. Balance sheet method.

**Example 2(Receipts and Payment method)**

A company is expecting to have Rs. 25000cash in hand on 1$^{st}$ 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:

1. Period of credit allowed by suppliers – two months
2. 25% of sale is for cash and the period of credit allowed to customers for credit sale is one month.
3. Delay in payment of wages and expenses – one month.
4. 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 |
|---|---|
| 1. Begins with previous year's budget <br> 2. Focuses on money <br> 3. Produces a single level of expenditure for an activity <br> 4. Resources are allocated not on the basis of cost benefit analysis <br> 5. Prepared annually | 1. Begins with zero a based <br> 2. Focuses on goals and objectives <br> 3. Produces alternative level of expenditure and desired result <br> 4. Resources are allocated on the basis of cost benefit analysis <br> 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:

MCV=Standard cost of materials for actual output – Actual cost of materials used

Std. cost of material = std qty x std price per unit

Actual cost of material = Actual qty x 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.

MPV = Actual qty x (std price – 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.

MUV = Std price per unit (Std qty – 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.
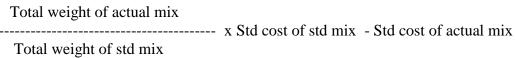
In case of material mix variance, two situations may arise: Actual weight of mix and the A. Standard weight of mix do not differ: - In this case material mix variance is calculated by applying the following formula

MMV= Std price (Std qty x Actual qty)

If the standard is revised due to shortage of a particular type of material, the material mix variance is calculated as follows:

MMV= Std price (Revised std qty – 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 Rs4 + 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)
   3x (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.
   LCV = Std cost of labour – 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.
   LRV = Actual time x (Std rate – 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.
   LEV = Standard rate x (Standard time for actual output – 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:**

Labour cost Variance = Standard cost of labour – Actual cost of labour
= (40x3) – (60x4)
=120 – 240 =Rs. 120 Adverse

## 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:

Labour Cost Variance:= Standard cost of labour – Actual cost of labour

$\qquad$ = (1000x0.50) – (900 x 0.40)

$\qquad$ =500 – 360

$\qquad$ = Rs. 140 Fav

Labour Mix Variance = Actual time x (Standard rate – Actual rate)

$\qquad$ = 900x (0.50 – 0.40)

$\qquad$ = Rs. 90 Fav

Labour efficiency Variance   = Standard rate x (Standard time  for actual output – Actual time)

$\qquad$ =0.50 x (1000 – 900)

$\qquad$ = Rs. 50 Fav.


**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

VOH Cost Variance = (Actual output x Std variable OH rate per unit) – Actual Variable OH

Std. VOH rate per unit = Std variable OH

$\qquad$ --------------------

$\qquad$ Std out put

b. When OH rate per hour is used

VOH Cost Variance =(Std hours for actual output x Std variable OH rate per hour) – Actual VOH

Std  VOH rate per hour = Std VOH

$\qquad$ ----------------

$\qquad$ 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.

$\qquad$ Variable OH expenditure Variance = (Actual hours worked x Std Variable OH rate per hour) – Actual variable OH

$\qquad$ OR

(Std output for actual hours x Std OH rate per unit) – 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 x 125

                                           = Rs. 3125

Std OH rate per hour:

Total std hours                            = 150 units x 10 =1500 hrs

Rate per hour                              = 3750/1500 = Rs. 2.5

Actual OH rate per hour                    = 3600/2250 hrs = Rs. 1.6

Std. hours for actual production =  125 units x 10 hours = 1250 hrs

1. VOH Cost Variance = (Actual output x Std variable OH rate per unit) – Actual Variable OH
   = (125 x 25) – 3600
   =3125 – 3600 = 475 Adverse
2. Variable Overhead Expenditure Variance =  (Actual hours worked x Std Variable OH rate per hour) – Actual variable OH
   = (2250 x2.5) – 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

Fixed OH cost Variance = Std. fixed OH for actual Output – 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.

Fixed Overhead expenditure variance = Budgeted fixed OH – 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.

Fixed Overhead Volume Variance = Std. fixed overhead for actual output – 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 = Rs. 400 A

2. Fixed Overhead expenditure Variance = Budgeted fixed overhead – Actual fixed overhead
          = 27,000 - 28,000 = Rs. 1000 A

3. Fixed Overhead Volume Variance = Std fixed overhead for actual output – Budgeted fixed overheads
          = 27600 - 27000 = Rs. 600 F

Note: Std. overhead for actual output (9200 units) = 27000/9000 x 9200

                                          = Rs. 27600

## Illustration

Kunal Products produces and sells a product for which total capacity of 2,000 units exists. The following expenses are for the production of 1,000 units of the product which is sold at Rs. 130 per unit.

|  | Per unit Rs. |
|---|---|
| Direct materials | 20 |
| Direct wages | 30 |
| Administration overheads. (constant) | 20 |
| Selling expenses (50% fixed) | 10 |
| Distribution expenses (25% fixed) | 20 |
|  | 100 |

You are required to prepare a flexible budget for the production and sale of 1,200 units, 1,600 units and 2,000 units, showing clearly the marginal (variable) cost and total cost at each level.

**Solution:**

### Flexible Budget

| Particulars | 1,000 units Per unit Rs. | 1,000 units Total Rs. | 1,200 units Per unit Rs. | 1,200 units Total Rs. | 1,600 units Per unit Rs. | 1,600 units Total Rs. | 2,000 units Per unit Rs. | 2,000 units Total Rs. |
|---|---|---|---|---|---|---|---|---|
| **Variable costs:** |  |  |  |  |  |  |  |  |
| Direct materials | 20 | 20,000 | 20.00 | 24,000 | 20 | 32,000 | 20 | 40,000 |
| Direct wages | 30 | 30,000 | 30.00 | 36,000 | 30 | 48,000 | 30 | 60,000 |
| Selling exp. (10 × 50%) | 5 | 5,000 | 5.00 | 6,000 | 5 | 8,000 | 5 | 10,000 |
| Distribution exp. (20 × 75%) | 15 | 15,000 | 15.00 | 18,000 | 15 | 24,000 | 15 | 30,000 |
| Marginal (variable) cost (A) | 70 | 70,000 | 70.00 | 84,000 | 70 | 1,12,000 | 70 | 1,40,000 |
| **Fixed costs** |  |  |  |  |  |  |  |  |
| Administration overheads | 20 | 20,000 | 16.67 | 20,000 | 12.500 | 20,000 | 10 | 20,000 |
| Selling exp. (10 × 50%) | 5 | 5,000 | 4.17 | 5,000 | 3.125 | 5,000 | 2.5 | 5,000 |
| Distribution expenses (20 × 25%) | 5 | 5,000 | 4.17 | 5,000 | 3.125 | 5,000 | 2.5 | 5,000 |
| Total fixed cost (B) | 30 | 30,000 | 25.00 | 30,000 | 18.75 | 30,000 | 15 | 30,000 |
| Total cost (A + B) = C | 100 | 1,00,000 | 95.00 | 1,14,000 | 88.75 | 1,42,000 | 85 | 1,70,000 |
| Sales .... (D) | 130 | 1,30,000 | 130.00 | 1,56,000 | 130 | 2,08,000 | 130 | 2,60,000 |
| Profit (D – C) | 30 | 30,000 | 35.00 | 42,000 | 41.25 | 66,000 | 45 | 90,000 |

**Note:** (1) Since marginal (variable) cost is specifically asked for each level in the question, semi variable costs are divided into fixed and variable portions and all the costs are shown under variable and fixed heads.

(2) Variable expenses per unit and fixed expenses in total remain the same for each