ACCOUNTING OF MATERIAL AND MATERIAL COST CONTROL

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MEANING AND CONCEPT OF MATERIAL

Material cost is one of the important elements of cost of product or unit. It constitutes a substantial proportion of the total cost of production.

The first element of the cost of the product is raw material. This is "the cost of commodities supplied to an undertaking." Material form an important part of the cost of a product and therefore proper control over materials is necessary. The term ‘materials’, generally used in manufacturing concerns, refers to raw material used for production, sub-assemblies and fabricated parts."1

Material is an essential element of cost. The entire process of manufacturing would be disrupted, or even stopped if right type of material is not available in right quantity at right time.2

Production of every product requires some form of basic materials. Materials are therefore, indispensable for every production process. Materials constitute the substances or the essential parts of which product is made. They may be classified into three broad categories:

(i) **Raw Materials**: The term raw materials includes materials which are in their natural or raw form e.g. cotton for a textile unit, etc.

(ii) **Semi-finished Materials**: The term semi-finished materials includes materials which are not completely finished in all respect. In other words, some processing till remains to be done before the product can be sold. For instance, a furniture manufacturer may purchase unpolished furniture from market and may sell it after polishing.

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(iii) Finished Materials: The materials comprise finished components which are used as raw materials for manufacturing a product.³

Material refers to all commodities consumed in the manufacturing process. However, it is often used synonymously with the term ‘stores’ which has a wider meaning concerning materials consumed and other items in stocks in the store rooms such as tools, supplies maintenance spare parts etc. The term ‘inventory’ covers stock of raw materials, work-in-progress, finished goods and components. Material is the primary and the first element of cost.

Material may be anything made of matter, constituted of one or more substances. Wood, cement, hydrogen, air and water are all examples of materials. Sometimes the term ‘material’ is used more narrowly to refer to substances or components with certain physical properties that are used as inputs to production or manufacturing. A material can be anything, a finished product in its own right or an unprocessed raw material.⁴

Generally, material cost takes a significant portion of the total cost. The entire process of manufacturing would be disrupted or even stopped if the right type of material is not available in right quantity at the right time. Without the availability of required material, other resources like men and machine would remain idle.⁵

Material cost constitutes a prime part of the total cost of production of manufacturing firms. Proper accounting therefore, for and control

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over materials purchase, consumption and inventories are important for effective management of a business firm.

DIRECT AND INDIRECT MATERIAL

The term ‘materials’ refers to all commodities or components which are consumed in the process of manufacturing. The materials may be classified into direct materials and indirect materials.

1. Direct Material

“All materials which can be allocated to a product or batch of products is direct materials. Such material thus becomes an essential part of the product.”

Direct materials are those which can be identified in the product and which can be measured and directly changed to the products. One more thing is that the direct materials form the main part of prime cost. In simple words, it can be said that direct material cost is the material cost which can be easily identified with the cost center or cost unit, and is allocated accordingly. The direct material may include any material specially purchased for manufacturing a particular item, any material or semi-finished goods or components made use in the manufacturing of particular items, the primary packing materials. Direct materials is material specially identified with a job order or a process. In most instances, this is material that enters into the final manufactured product, but it may also be material obviously traceable to a particular job or operation even though used up in the process of manufacture.


Key points for direct material can be summerised as under:

(i) Direct material is an integrated part of manufacturing unit.

(ii) Value of direct material is comparative by higher than that of other materials.

(iii) Direct material can be related to unit produced. It increases in same ratio as the increase in production. So, these are also known as variable material costs.

(iv) If material is brought for a specific job or process, then that material is direct material.

(v) If the nature of product is such that it cannot be sold without primary packing, then the cost of primary packing will also be treated as cost of direct material.

(vi) If any material is used in a specific cost center then that material will be direct material for that specific cost center although it is indirect from the point of view of total cost of production.

In general, the following are normally classified under direct materials:

(a) Materials purchased for a particular job, product or process.

(b) Primary packing materials.

(c) Materials passing from one operation or process to another.

(d) Semi-finished or finished components purchased for a particular product, job or process.

(e) All raw materials passing from one process to another.

(f) All material components and parts.
Thus, in judging what is a direct material, due consideration must be given to the nature of the material, its use in the manufacturing process and its impact on the total cost of the product. Moreover, direct material is also known as production material, process material, prime cost material and convertible material.

2. Indirect Material

Indirect material is all other material used in the manufacturing process. The cost of indirect material is treated as one of the cost elements of indirect manufacturing expense. Typical indirect material are factory supplies of various sorts such as machine lubricants or janitors supplies. In addition, some materials entering into the final product may be treated as indirect for accounting purposes because of the difficulty or expense of identifying them with specific job order.\(^8\)

Indirect materials indirectly used for conversion from raw materials to finished products. They cannot be easily identified with a particular cost unit.

ICMA England, defines indirect material cost as ‘‘material cost which cannot be allocated, but which can be apportioned to or absorbed by cost center or cost units is known as indirect material.’’ Cost of indirect material is used for the purpose of ancillary to the business and cannot be conveniently assigned to specific physical units in terms as indirect material may be used in factory, office or selling and distribution divisions.

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8. Ibid.
Indirect material forms part of overheads which can be factory overheads, office and administration overheads or selling and distribution overheads. Indirect materials are used to aid the production of such finished product and it is not possible to ascertain the quantity used for production of one finished unit.

Materials which are minor in importance such as small, relatively inexpensive pins or screws, or which do not physically become a part of the finished product such as polishing materials, are called indirect materials or supplies.  

All materials which are used as ancillary to production and which cannot be conveniently signed to specific physical units is termed as indirect material.

Key point for indirect material can be summarized as under:

(i) Indirect material cost does not change in proportion to the production.

(ii) It does not become part of production cost.

(iii) Even if it becomes part of production cost, the cost of indirect material is low than that of direct material.

The cost of indirect materials is collectively ascertained for a department or process and then suitably absorbed over the products on an equitable basis. In fact, these materials are those (i) which are minor in importance, small, and inexpensive and may become a part of the finished product, or (ii) which do not physically become a part of the finished products.

In this way, indirect material cost is ‘the cost of materials which cannot be allocated, but which can be apportioned to or absorbed by cost centers or cost units. The following are the examples of such materials:

(i) Materials which are not considered as direct materials due to their small cost.
(ii) Stores and supplies used in the maintenance of machinery, building etc.
(iii) Stores and supplies used by service departments.”

MATERIAL CONTROL SYSTEM

The term ‘materials control’ is of great importance, encompassing within its scope for all the activities relating to purchasing, receiving and inspection, store-keeping and inventory control, materials handling, accounting and controlling materials in an optimum manner so as to provide a pre-decided service to the customers at a minimum cost. Materials control is thus, concerned with the entire range of functions which effect the flow, conservation and utilization and the quality and cost of materials.

Material form an important part of the cost of product and therefore, proper control over materials is necessary from the time, orders are placed with the suppliers till they are actually consumed in plant and office operation, or have been sold as merchandise. An efficient system of materials control will lead to a significant reduction in production cost.

10. Oswal, Maheshwari and Jain, op.cit., p.22.
11. Ibid.
Thus, materials control involves efficient functioning of the following operations:

(i) Purchasing of materials
(ii) Receiving of materials
(iii) Inspection of materials
(iv) Storage of materials
(v) Issuing of materials
(vi) Maintenance of stores record
(vii) Stock audit.\textsuperscript{12}

Materials Control

‘’Materials control may be defined as the systematic control over the procurement, storage and usage of materials so as to maintain an even flow of materials and at the same time avoiding excessive investment in inventories.’’\textsuperscript{13}

Material control is a systematic control over the purchasing, storing and using the material to minimizing the possible cost. In every manufacturing concern materials constitute an important factor of production. It is an important element of cost and covering 60-70 percent of the total cost of production.

Material cost may be defined as the level of material maintenance so as to ensure uninterrupted production and minimizing the investment of funds.

\textsuperscript{12} Maheshwari S.N., ‘’Cost and Management Accounting’’, Sultan Chand & Sons, New Delhi, 2008, p.62.

\textsuperscript{13} ebooks.narotama.ac.id
Thus material control is the proper control of material, which reduces the cost of production, minimizing the investment of fund in the purchase of material, and increases the profitability of the organization.

For any process, we need to go step-by-step and initiate from planning and set controlling. So under material control, first step will be material planning, second will be material purchasing, then its sub function will be storing and under storing we need to receive the material and inspect it. After that we need to issue that, so next function will be issuing. Afterwards comes accounting and the last one will be control.

For a material control, what we need to plan in an organization is that will the purchasing be centralized or decentralized, will the stores be centralized or decentralized, what techniques will be used to ascertain the level of material that is fixing of material level’s using techniques like reorder level EOQ, ABC analysis and the methods used to control the material movements that is perpetual inventory taking, continuous inventory taking.

Centralized purchasing is where we need to purchase all the demand of the organization at one place. It avoids duplication, overlapping, the advantage is that we can get bulk discounts and we can ensure that supply is of adequate quality as required.

The disadvantage is that under centralized purchasing, we need to incur heavy cost, so initial investment is quite substantial and another disadvantage would be that we would not be able to use the localized discounts and other benefits from the suppliers. Under decentralized purchasing system, all departments can fulfill their needs by doing the localized purchasing.
Perpetual Inventory Control: It means we need to account the receipt and issue at every point, that means if 100 units are issued to A, it should be recorded, again if it is issued to B, we have to record it, each moment is recorded and continuous stock taking means physical verification of the material. These are all covered under material planning. Second comes purchasing, purchase process is a very long process in case of a big organization, it involves following processes, firstly we have to identify the requirement, these requirement will be identified and the store keeper will send an indent to the purchase department for the demand by the respective departments. Purchase requisition is a formal request given to purchase department for procuring the material required.

After getting this indent, the purchase department will go for purchasing the material and this indent can be for regular supplies or for special orders.

So indents can be of two types, regular indents or special indents. Once indents are received, now purchase department has to explore the supplier, for exploring supplier, they have to issue tenders that can be issued as advertisement or need to be published in newspaper.

Terms and conditions are mentioned in the tender. After gathering all the tenders from suppliers on the due date, the comparative analysis of the suppliers is made and selection of the best alternative is made.

After that comes the role of stores that is receiving the material and inspecting them, as store department will do the inspection of the goods so received, they will check the standards so set that means they have to do the quality inspection of the goods whether they have come in right quantity, right quality, the delivery time is right and other parameters as
has been said by the stores department in conjunction with the purchase department, we need to ensure that these parameters have been fulfilled.

After receiving the goods into the stores, storekeeper has to send goods received note. This requisition is an evidence of the fact that now the responsibility of the goods is on stores. After stores departments function is over, now the bill needs to be passed, for that purchase order needs to be prepared and it needs to be sent to the finance department for paying the bills. The purchase order has two aspects, legal as well as accounting.

A purchase order is a legal document which will bind both the parties that is supplier and the company to fulfill the contract and for accounting purpose, it will serve as a base for doing the accounting that is issue, quantity, amount, price these all needs to be checked and passed as an entry.

Purchase of Material

Materials purchase is one of the important functions of stores department. The basic objective of the material purchasing is to ensure continuous supply of raw materials to production and maximum reduction of product cost. In other words, the main aim of purchasing is to ensure, not only to procure the raw materials at the lowest price but to reduce the cost of the finished product.

In order to achieve the above said objectives the following aspects and procedure should be adapted:-

Organization of Purchasing: Materials may be purchased based on the size of the concern, nature of materials to be used, nature of operations and management polices etc. A large company will have a
separate purchase department while a small firm on the other hand may have all functions including purchasing; carried out by the owner himself.

Materials may be purchased through Centralized Organization or Decentralized Organization.

Centralized Organization

Under this system, all the materials purchased are centralized. Accordingly all type of materials is purchased through one purchase department.

Advantages of Centralized Purchasing: The following are the advantages of centralized purchasing:

(1) Cheaper rate and favourable trade discounts are possible because of bulk purchasing.

(2) It ensures right quality and quantity because of specialized personnels.

(3) Buying and carrying cost can be reduced because of bulk purchasing.

(4) Blocking of funds in inventories can be avoided.

(5) Effective material purchase control is possible.

Disadvantages of Centralized Purchasing:

(1) Centralized Purchasing involves high initial cost.

(2) Material issue may be delayed because of many formalities.

(3) Purchasing procedure becomes rigid.
(4) There is lack of good housekeeping and material handling because of overcrowding.

(5) It is not suited where the plant is located far away.

Decentralized Purchasing

In decentralized purchasing each department is authorized to make its own purchase. This system is suited where different production units are located at different places far away from each other.

Different purchase departments do the material procurement. It may be concluded that, most business concerns are operating on central purchasing system subject to the terms and conditions of purchases.

Functions of the Purchase Department

The basic objectives of the purchasing department is to ensure not only to procure the raw materials at the cost price but to reduce the cost of finished products. For ensuring this, it will be useful to take into consideration the well-known factors such as right quality, right quantity, right price, right materials, right source, right suppliers, right mode of transports and right attitude etc. This responsibility involves the following procedure to be adopted:

- Purchasing Procedure:
  (1) Bill of Materials.
  (2) Purchase Requisition.
  (3) Selection of Suppliers.
  (4) Purchase Orders.
  (5) Goods Received Note.
(6) Inspection of Materials.

(1) Bill of Materials (Specification of Materials): Bill of Materials is a list of containing all materials required for manufacturing a product. In other words, it is a form, which indicates the quantity, quality, and other specifications of materials required for a particular job or process or operation.

This is a form sent to the purchase department for asking to purchase the said materials required for a particular work order. Materials requiring department prepare at least five copies of bill of materials. Out of these copies one copy is sent to purchase department, to the stores, to the production section, to the cost office and to the office copy for further reference.

(2) Purchase Requisition: It is a form which indicates indent for materials. In any industry, the purchase department places orders for materials based on the purchase requisition form. Usually the purchase requisition form is initiated by the storekeeper for the standard items, the stock which require restocking again and again. Sometimes, it is initiated by other departments for special materials which are not stocked in stores. Whenever any special material is required for production, the purchase requisition form is prepared in three copies. Out of these copies one copy is sent to purchase department, one to the production control department and one to the initiating department.

(3) Selection of Suppliers: On receipt of the purchase requisition, the purchasing department prepares a list of suppliers who deals with the business of the materials to be purchased and is reliable.

It is useful for the purchasing department to call for quotations. If the material to be purchased is of small quantities and is required
urgently, it may be purchased locally. After receiving the quotations, prepare a comparative statement of the rates, terms and conditions mentioned in the tenders.

If required samples may be received from the suppliers who have quoted the lowest rates. After satisfying the above, select the suitable suppliers to place the purchase order for required materials.

(4) Purchase Order: Purchase order is a letter which is sent to the suppliers for asking to supply the specified materials. Purchase order must contain the rates, terms, quantity, quality, time of delivery and other conditions mentioned therein. At least five copies of purchase order are prepared by the purchase section and each copy sent to:

(i) Original to the Suppliers.

(ii) Store keeping Department.

(iii) Account Section.

(iv) Inspection Department.

(v) Retained in the purchase department for further reference.

(5) Goods Received Note: The materials receiving section is responsible to receive the goods and verify the contents of the packages along with Goods Received Note sent by the suppliers. This section should ensure that the goods have been received as per the purchase order and record the same in the Consignment Note. Five copies of the materials received report are generally prepared.

Out of these copies, the original is sent to purchasing department and remaining each copy sent to Stores department, Inspection, Accounts department and one copy retained by it for future reference.
(6) Inspections of Materials: A detailed inspection is carried out after the materials are received. The Inspection Section should ensure that the goods have been received according to purchase order specification. Return of materials to suppliers, if any, damaged, spoiled, excess or not in accordance with orders. If the materials are found to be satisfactory, the bill of the supplier is passed and the payment is made to the suppliers.

ISSUES AND PRICING OF MATERIAL

Issues of Materials

It is the quality of every good system of materials control that no materials can be issued from store rooms except on properly prepared and approved materials requisitions or stores requisitions. The materials requisition is a written order to the storekeeper to deliver materials or supplies to the place and the department designated or to given the materials to the person presenting a properly executed requisition.

The requisitions are prepared in triplicate. One copy is retained by the preparer and two are sent to the storekeeper. Department having standard materials requirement or a comparatively fixed list of materials or supplies generally use a special form of materials requisition called the ‘bills of materials’. The bill of materials is a printed or duplicated form listing all the materials and part necessary for a typical job or production.14

Bill of Material: It is comprehensive list of materials with exact description and specifications, required for a job or other production unit. This also provides information about the required quantities so that

if there is any deviation from the standards, it can easily be detected. It is prepared by the Engineering or Planning Department in a standard form.

Procedure of Issue of Materials

(a) A slip, mentioning the material required, is sent by department which requires the material to the store department, giving all details such as quantity, code no., type etc. Such a slip, which is called as requisition slip, must be signed by the authorized person to avoid frauds and theft.

(b) If the material required for one job is in surplus, the store department will ask that department or job-in-charge to send the specific quantity to another job which is in need of materials. The sender department will prepare a Material Transfer Note. The sending job account is credited and the receiving job account is debited by the quantity and the value of material so transferred. If surplus material is not available with any job, then a fresh stock material is issued from the store.

(c) It is always better from control point of view that any material in hand after completing the job be returned to the store, for which the store department will prepare a ‘Material Return Note’, and on that basis, will give credit to the job from which such material has been received back.\(^{15}\)

Pricing of Material

After determining the quantity of material issued to each job for production purposes during a particular period, it is necessary to calculate its value for cost accounting purposes, since almost every

\(^{15}\) Shah Paresh, op.cit., p.49.
material is purchased at different times at different rates and is mixed together, it is very difficult to ascertain the actual value of the material issued for production purposes.

“’The pricing of material issued to jobs after a complicated affair where materials have been bought from time to time at different prices.””\textsuperscript{16}

The ultimate objective is accounting for all cost factors is to produce accurate and meaningful cost figures which can be used for purposes of control and analysis and eventually by matched against revenues produced in order to determine net operating income.

In materials costing and inventory valuation, the method selected inherently assumes that the meaningful cost to be charged to revenue produced is related to:

(i) the flow of goods for example, materials are used and goods are sold in the order in which they are purchases or produced or,

(ii) the flow of costs for example, the recent costs are applicable to materials issued and should be charged to products completed and sold, with the earlier costs applicable to materials issued and should be charges to products completed and sold, with the earlier costs applicable to items in inventory.\textsuperscript{17}

After the units cost and total cost of incoming materials are entered in the material ledger, the next step is to cost or price these materials as

\textsuperscript{16} Battiboi J.R., “Cost Accounting”, p.52.

\textsuperscript{17} Mats, Curry and Frank, “Cost Accounting”, p.264.
they go from stores to the factory for processing by jobs or lots or by departments.

The material issued for consumption is also to be valued on the basis of the cost of material received as per pricing of the receipts.

Material issued to the production or the user department will be costed at the rate which is worked out as per pricing of receipts. There are several methods in use for pricing of material issued to consuming departments, and which forms a part of the cost of product.

Several methods of pricing issues are:

a. First In First Out (FIFO)
b. Last In First Out (LIFO)
c. Simple Average
d. Weighted Average
e. Periodic Average
f. Moving Average
g. Specific Average
h. Standard Price

In each case, the value assigned at the time of receipt of material is the basis.

(a) FIFO Method

This method assumes that materials are issued for consumption in the same sequence in which it is received. The rate applied to the earliest received material in stock is the basis. Consequently, the materials in stock is valued at the price of later receipts. Thus, the stock is valued at
the current or latest purchase rate. When this method is used, it is necessary to keep a record of quantity and value of every receipt.

It is good method for valuation of stock as stock would be valued at the recent price. However, the method becomes complicated when the rates of materials are highly fluctuating.

(b) LIFO Method

This method is exactly opposite of FIFO. It is based on the hypothesis that materials are stored in leaps, and when required, the last received materials is taken out first. The resulting effect is the stock is valued at earlier purchased prices. In this case also, it is necessary to maintain a record of quantity and value of every receipt.

(c) Simple Average Method

Where there are many variations in purchase prices, this method is used. In this method, the rate value of each receipt before the given issue is averaged. This rate is applied for pricing the issue of material. The demerits of this method are: (i) Complexity and (ii) Value of issue and stock can be unusually high or low, as the issue price is not related to quantity of receipt. Hence, this method is rarely used.

(d) Weighted Average Method

This method overcomes the demerits of simple average method. After every receipt of material, the average rate is calculated by total value and quantity. Thus, the value of issues and stock is always within the range of highest and lowest price paid. The issues and stock, at a given time, is valued at the same price. It avoids price fluctuations.
(e) Periodic Average Method

The simple average method for valuation of issue becomes difficult to operate as the time period and volume of transaction increase. To add all the prices and find their average frequently is a tedious process, and the possibility of committing an error also increases. In this method, the rates of material received during a specific period are considered for the purpose of calculating average rate for pricing issue, and earlier rates are ignored.

(f) Moving Average Method

The moving average method is another method to minimize the difficulty arising in case of simple average method. Under this method, a specific number of rates are considered for the purpose of average. Whenever there is a new receipt, the rate of earliest receipt is ignored.

(g) Specific Rate Method

When a material is purchased for a special purpose and is issued, the rate applicable for that item is considered as the issue price. This rate can be applied under job order method, where the actual issued can be identified with the job.

(h) Standard Rate Method

Where standard costing system is followed the material price is determined in advance before commencement of an accounting period and applied to issues during that accounting period. This rate is not changed in accordance with the rate of receipt of material during the period. Thus, issue under this method is at a predetermined rate.
The pricing of issue is simple, as frequent calculation of ratios is not required.\textsuperscript{18}

**ESSENTIALS OF MATERIAL CONTROL SYSTEM**

Following are the main essentials of a material control system:

- There should be a proper co-operation and co-ordination among the departments dealing with material purchasing, receiving, testing, storing, production planning and accounting.
- There should be a centralized purchasing department.
- There should be a proper perpetual inventory system, which reflects physical movement of stocks and their current balance.
- There should be a good method of classification and codification of materials.
- There should be a standard forms for requisitions, order, issue, return and transfer of materials.
- There should be carefully planned materials storage facilities to avoid losses from damage, evaporation, pilferage, theft and deterioration.
- Materials and supply should be properly stored.
- Stock of different levels should be fixed to ensure that there is no under and over-stocking of materials.
- The quantity of each type of materials to be ordered should be fixed to reduce the ordering and carrying costs.
- There should be an effective system of internal check to ensure that all transactions relating to materials are automatically checked.

\textsuperscript{18} Shah Paresh, op.cit., p.52.
• Receiving and inspecting procedures must be fixed in advance.

OBJECTIVES OF MATERIAL COST CONTROL

Materials control basically aims at efficient purchasing of materials, their efficient storing and efficient use or consumption. Materials control consists of controls at two levels: (i) Quantity controls and (ii) Financial controls.

For instance, the production department in a manufacturing company aims at quantity controls lesser and lesser units should be used in the production department. In contrast, the finance manager is interested in keeping the investments on materials at the lowest point.

The basic objective of effective material control system is to enable management to place an order at the right time, from the right source and to acquire the right quantity of the right quality at the right place. To achieve this objective, the materials management department has to support the objectives of the undertaking as a whole.

Material control is accomplished through functional organization, assignment of responsibility and documentary evidence obtained in various stages of operations from the approval of sales and production budgets to the completion of the products which are ready for sale and shipment.

“Material control involves recording on printed forms all steps and movements which occur in the acquisition and utilization of materials. Effective control also requires the systematic preparation of periodic summaries and reports.”

19. Mats, Curry and Frank, op.cit., p.221.
‘Uncontrolled inventory, the industrial cancer is equally, if not more, dangerous and that is why inventories are sometimes mid to be the grave-yard of business.”

The basic objectives of material control is to obtain requisite quantity of material at right price, right quantity, right quality and from right source. The detailed objectives of material control are as follows:

To minimize total cost: Total cost of a material means its purchase cost, its carrying cost and ordering cost. These cost concepts we will learn in detail while learning EOQ techniques.

Regular supply of material: Material control ensures regular supply of material to the factory so the production may not be held up for want of material.

No possibility of overstocking and under stocking: By fixing various stock level as minimum level, maximum level ordering level over stocking and under stocking of material can be avoided.

Minimum Wastage: Proper material management and control reduces wastages of material. Poor stores facilities result deterioration, obsolescence, pilferage, theft, fire, evaporation etc. which directly affect the profitability of the organisation.

Getting Material at Reasonable Prices: While purchasing materials, it is seen that it is purchased at reasonable low prices but the quality is not to be sacrificed in the plan of low prices.

Availability of up-to-date Information: Up-to-dated and readily material information can be made available to the management, for planning and decision making. The store keeper can supply information

because he keeps up-to-dated record of the every item of the store under proper system of material control.

Adoption of Internal Check System

Internal check system is the part of material control. Under this system the employees perform their work on rotational basis by which misappropriation of material is minimized.

The following are some others objectives of material control:

1. To receive materials and store them properly.
2. To ensure proper production and preservation of materials.
3. To make sure proper classification and codification of materials.
4. To provide proper information to the management about stock of materials.
5. To ensure good housekeeping and effective material handlings.
6. To assist in verification and provision of supporting information for effective purchase action.
7. To minimize obsolescence of materials adopted through effective control measures.
8. To ensure the optimum investment in materials to avoid overstocking or understocking of materials.
9. To maintain proper records about materials, receipts, issues and balances.
10. To issue materials as per specifications.
(11) To make sure of the availability of all types of materials.
(12) To ensure proper utilization of floor space.

Inventory consists of stock of raw materials, work-in-progress, spare consumables for production and finished goods for sale. Thus, inventory includes control over raw materials, spare parts, consumables, partly finished goods, and finished goods.

Following are the common techniques of inventory control:

1. Preparation of Inventory Budgets
2. Determination of various levels of materials
3. Economic Order Quantity
4. ABC Analysis
5. Perpetual Inventory System

1. Preparation of Inventory Budgets

Organisations having huge material requirement normally prepare purchase budgets. The purchase budget should be prepared well in advance. The budget for production and consumable material and for capital and maintenance material should be separately prepared.

Sales budget generally provide the basis for preparation of production plans. Therefore, the first step in the preparation of a purchase budget is the establishment of sales budget.

As per the production plan, material schedule is prepared depending upon the amount and return contained in the plan. To determine the net quantities to be procured, necessary adjustments for the stock already held is to be made. They are valued as standard rate or
current market. In this way, material procurement budget is prepared. The budget so prepared should be communicated to all departments concerned so that the actual purchase commitments can be regulated as per budgets.

At periodical intervals actuals are compared with the budgeted figures and reported to management which provide a suitable basis for controlling the purchase of materials,

2. Determination of various Levels of Materials

The store-keeper plays an important role in deciding upon the various levels of materials. In order to ensure that the optimum quantity of materials is purchased, stocked neither less nor more, the store keeper applies scientific techniques of material management. Fixing of certain levels for each item of materials in one of techniques.

These levels are not permanent but require revision according to the change in the factors which determine these levels. The following levels are generally fixed.

(a) Re-order Level
(b) Maximum Level
(c) Minimum Level
(d) Average Level

3. Economic Order Quantity (EOQ)

The economic order quantity, known as EOQ, represents the most favorable quantity to be ordered each time fresh orders are placed.
The quantity to be ordered is called economic order quantity because the purchase of this size of material is most economical. It is helpful to determine in advance as to how much should one buy when the stock level reaches the re-order level. If large quantities are purchased, the carrying costs would be large.

On the other hand, if small quantities are purchased at frequent intervals the ordering costs would be high. The economic order quantity is fixed at such a level as to minimise the cost of ordering and carrying the stock. It is the size of the order which produces the lowest cost of material ordered.

While determining the economic order quantity, the following three cost factors are taken into consideration:

(i) The cost of the material

(ii) The inventory carrying cost

(iii) The ordering cost

Carrying costs are the costs of holding the inventory in the stores. These are:

(i) Rent for the storage space.

(ii) Salaries and wages of the employees engaged in store keeping department.

(iii) Loss due to pilferage and deterioration.

(iv) Insurance charges.

(v) Stationary used in the stores.

(vi) Loss of interest on the capital locked up in materials.
Ordering costs are the costs of placing orders for the purchase of materials. These are:

(i) Salaries and wages of the employees engaged in purchasing department.

(ii) Stationary, postage, telephone expenses, etc. of the purchasing department.

(iii) Depreciation on equipments and furniture used by the purchasing department.

(iv) Rent for the space used by the purchasing department.

While placing orders for purchasing materials, the total cost to be incurred is kept in view. As discussed earlier, if an order is placed for a large quantity at a time, the ordering cost is less but the carrying cost would be more.

On the other hand, if orders are placed for small quantities, the ordering cost is more but the carrying cost would be less; thus the economic order quantity is determined at a point when the ordering costs and the carrying costs are equal. Only at this stage the total of ordering cost and carrying cost is minimum.

Determination of Economic Order Quantity: The economic order quantity is determined by using the following formula:

\[ EOQ = \frac{\sqrt{2CO}}{I} \]

Where, \( EOQ \) = Economic order quantity,

\( C \) = Annual consumption or usage of material in units

\( O \) = Cost of placing one feeder including the cost of receiving the goods
\[ l = \text{Cost of carrying one unit of inventory for one year} \]

Assumption in the Calculation of Economic Order Quantity: The economic order quantity is based on the following assumptions:

- Quantity of the item to be consumed during a particular period is known with certainty.
- The pattern of consumption of material is constant and uniform throughout the period.
- Cost per unit is constant and known and quantity discount is not involved.
- Ordering cost and carrying cost are known and they are fixed per unit and will remain constant throughout the period.

4. ABC Analysis

This technique of inventory control is also known as Always Better Control technique. ABC analysis is an analytical method of control which aims at concentrating efforts on those areas where attention is needed most.

This is a principle of selective control. The emphasis of ABC analysis technique is that the management should concentrate its energy in controlling those items that mostly affect the organisational objects. Manufacturing concerns find it useful to group the materials into three classes on the basis of investment involved.

Materials having higher values but constitute small percentage of total items, are grouped in ‘A’ category. On the other hand, a large percentage of items of materials which represent a smaller percentage of the values, are grouped in ‘C’ category. Items of materials having
moderate value ‘and moderate size are grouped in ‘B’ category. On the basis of physical quantities and value of arterials used, the following table illustrates the above classification:

After the items of materials are classified into A, Band C category, control can be exercised in a selective manner as follows:

(i) Greater care and strict control should be exercised on the items of category ‘A’ as any loss or breakage or wastage of any item of this category many prove to be very costly. Economic order quantity and reorder level should be carefully fixed for such category of items.

(ii) Moderate and relaxed control is required for the items of category ‘B’.

(iii) There is not much need for exercising control over the items of category ‘C’. Periodic or annual verification is required for this category of materials.

Advantages of ABC Analysis : The advantages of ABC analysis are given below:

- Close and strict control of costly items is ensured.
- Investment in inventory can be regulated and funds can be utilised in the best possible way.
- Economy is achieved in respect of stock carrying cost;
- It helps to keep enough safety stock for ‘C’ category items.
- Clerical cost can be reduced and inventory is maintained at optimum level.
- Scientific and selective control helps in maintenance of high stock turnover rate.21

Analysis of Materials Accounting and Control of the Companies Under Study

1. Raw Material Consumed to Prime Cost Ratio

The raw material plays an important role in the total cost of production. The ratio of raw material to prime cost of the textile units under study has been calculated by using the following formula:

\[
\text{Raw Material Consumed to Prime Cost Ratio} = \frac{\text{Raw Material Consumed}}{\text{Prime Cost}}
\]

The ratio of raw material consumed to prime cost of the companies under study has been calculated and presented in the following Table 3.1.

Table 3.1
Raw Material to Prime Cost Ratio of the Textile Companies
(From 2008-09 to 2012-13)
(Ratio in Times)

<table>
<thead>
<tr>
<th>Year</th>
<th>RSWM</th>
<th>BSL</th>
<th>MSUML</th>
<th>S.T.I.L</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>0.85</td>
<td>0.78</td>
<td>0.88</td>
<td>0.85</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.85</td>
<td>0.76</td>
<td>0.87</td>
<td>0.85</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.86</td>
<td>0.75</td>
<td>0.90</td>
<td>0.87</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.87</td>
<td>0.74</td>
<td>0.91</td>
<td>0.88</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.86</td>
<td>0.75</td>
<td>0.89</td>
<td>0.86</td>
</tr>
<tr>
<td>Average</td>
<td>0.86</td>
<td>0.76</td>
<td>0.89</td>
<td>0.86</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>0.80</td>
<td>1.71</td>
<td>1.70</td>
<td>1.21</td>
</tr>
</tbody>
</table>

Source: Annual Reports & Accounts of the companies under study from 2008-09 to 2012-13.

RSWM: From the Table 3.1, it can be observed that the ratio materials consumed to prime cost of RSWM showed a consistent trend during the whole period of study except in the year 2012-13 otherwise the ratio of materials consumed to prime cost was 0.85 or 0.86 times for the whole period of study. The average of the ratio of material consumed
to prime cost was 0.86 times which is high and the management of the company should try to apply an effective material cost control technique to reduce the cost of raw material used. The coefficient of variation was 0.80 percent showing a consistent trend which should be maintained in future also but after reducing the ratio of material consumed to prime cost.

BSL: The ratio of material consumed to prime cost showed a fluctuating trend during the whole period of study. The average of the ratio was 0.76 times which can be regarded satisfactory. Moreover, it can be noted from the Table that the proportion of material consumed to prime cost remained unaffected whether the production increased signifying that the proportion of material consumed to prime cost was stable per unit. The coefficient of variation was 1.71 percent showing a consistent trend which should be maintained in future also. Further it can be suggested that the management of the company should follow the same practice for materials control in future also.

MSUML: From the table, it can be observed that the ratio of material consumed to prime cost showed a fluctuating trend during the whole period of study. In the year 2008-09, the ratio was 0.88 times, in the year 2011-12 the ratio increased to 0.91 times but in the year 2012-13 the ratio came down to 0.88 times. The average of the ratio was 0.89 times which cannot be regarded satisfactory as it is very high. It is suggested that the management of the company should try to control and reduce the proportion of raw material used to prime cost by applying effective cost control techniques and avoiding the losses of materials. The coefficient of variation was 1.70 percent showing a consistent trend which should be maintained in future also.
STIL: From the table, it can be observed that the ratio of material consumed to prime cost showed a consistent trend during the whole period of study and varied within the range of 0.88 times in 2011-12 to 0.85 in 2008-09. The average of the ratio was 0.86 times which cannot be regarded satisfactory as the high ratio of material consumed shows the inefficiency of the management towards applying the materials cost control techniques. It is therefore, suggested that the management of the company should try to reduce the ratio by using the modern techniques of material cost control. The coefficient of variation was 1.21 percent showing a consistent trend which should be maintained in future but efforts should be made to reduce the ratio of material used to prime cost.

Test of Significance (t-test)

Test of significance has been applied to test the hypothesis. For this purpose, t-test has been applied by comparing one company with another company.

(a) Between RSWM and BSL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to prime cost of RSWM and BSL.

Value of $t = 15.8$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw material consumed to prime cost of RSWM and BSL is significant.
(b) Between RSWM and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to prime cost of RSWM and MSUML.

Value of $t = 3.00$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw material consumed to prime cost of RSWM and MSUML is significant.

(c) Between RSWM and STIL

There is no difference in the average values of raw material consumed to prime cost so the test cannot be applied and we can say that the difference in the ratio of raw material used to prime cost is not significant.

(d) Between BSL and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to prime cost of BSL and MSUML.

Value of $t = 13$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio
of raw material consumed to prime cost of BSL and MSUML is significant.

(e) Between BSL and STIL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to prime cost of BSL and STIL.

Value of $t = 15.8$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw material consumed to prime cost of BSL and STIL is significant.

(f) Between MSUML and STIL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to prime cost of BSL and STIL.

Value of $t = 3.00$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw material consumed to prime cost of MSUML and STIL is significant.
Analysis of Variance (F-Test)

To test the significance of the ratio of raw material consumed to prime cost of the companies under study F-test has been applied and following hypotheses have been tested.

(i) Null Hypothesis \( (H_0) \): There is no significant difference is the raw material consumed to prime cost ratio of the companies under study.

(ii) Null Hypothesis \( (H_0) \): There is no significant difference is the year-wise raw material consumed to prime cost ratio of the companies under study.

Table 3.2
ANOVA TABLE

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum</th>
<th>Degree of Freedom (d.f.)</th>
<th>Variance (Sum /d.f)</th>
<th>F Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Companies (SSC)</td>
<td>0.0517</td>
<td>(c-1)=(4-1)=3</td>
<td>0.0172</td>
<td>( F= 101.18 ) (Between Companies)</td>
</tr>
<tr>
<td>Within Companies (SSR)</td>
<td>0.0006</td>
<td>(r-1)=(5-1)=4</td>
<td>0.00015</td>
<td>( F= 1.13 ) (Within Companies)</td>
</tr>
<tr>
<td>Error (SSE)</td>
<td>0.002</td>
<td>(c-1)(r-1)=12</td>
<td>0.00017</td>
<td></td>
</tr>
</tbody>
</table>

(i) F-Test between the Companies

\[
F = \frac{Higher\ Variance}{Smaller\ Variance} = \frac{0.0172}{0.00017} = 101.18
\]

Critical value of F at 5 percent level of significance \((V_1 = 3 \text{ and } V_2 = 12)\) is 3.49

Decision: Since the calculated value of F is more than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the difference in the raw
material consumed to prime cost ratio of the companies under study is significant.

(ii) F-Test Within the Years

\[
F = \frac{\text{Higher Variance}}{\text{Smaller Variance}} = \frac{0.00017}{0.00015} = 1.13
\]

Critical value of F at 5 percent level of significance \((V_1 = 12\) and \(V_2 = 4\)) is 5.91

Decision: Since the calculated value of F is less than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is accepted and it is concluded that the year wise difference in the raw material consumed to prime cost ratio of the companies under study is not significant.

2. Raw Materials Consumed to Factory Cost Ratio

The ratio of raw material used to factory cost of the textile companies under study has been calculated by using the following formula:

\[
\text{Ratio of Raw Materials Consumed to Factory Cost} = \frac{\text{Raw Materials Consumed}}{\text{Factory Cost}}
\]

The ratio of raw materials consumed to factory cost of the textile companies under study has been shown in the following Table 3.3.
Table 3.3
Raw Materials to Factory Cost Ratio of the Textile Companies
(From 2008-09 to 2012-13)
(Ratio in Times)

<table>
<thead>
<tr>
<th>Years</th>
<th>RSWM</th>
<th>BSL</th>
<th>MSUML</th>
<th>STIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>0.71</td>
<td>0.65</td>
<td>0.73</td>
<td>0.72</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.72</td>
<td>0.63</td>
<td>0.72</td>
<td>0.74</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.76</td>
<td>0.66</td>
<td>0.79</td>
<td>0.76</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.77</td>
<td>0.64</td>
<td>0.81</td>
<td>0.78</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.75</td>
<td>0.65</td>
<td>0.77</td>
<td>0.76</td>
</tr>
<tr>
<td>Average</td>
<td>0.74</td>
<td>0.65</td>
<td>0.76</td>
<td>0.75</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.02</td>
<td>0.01</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>3.04</td>
<td>1.53</td>
<td>4.66</td>
<td>2.93</td>
</tr>
</tbody>
</table>

Source: Annual Reports & Accounts the companies under study for the period from 2008-09 to 2012-13.

RSWM: The ratio of material consumed to factory cost showed an increasing trend during the whole period of study except in the year 2012-13. The highest proportion was in the year 2011-12 when it was 0.77 times and the lowest proportion was in the year 2008-09 when it was 0.71 times. The increasing trend was because of the reason that the material consumed as well as the factory cost showed an increasing trend. The average of the ratio was 0.74 times which can be regarded satisfactory. It can be noted from the above table that the proportion of material used to factory cost ratio almost remained same irrespective of the production which signifies that the management of the company maintained the relationship of material used and factory cost per unit of the product. The coefficient of variation was 3.04 percent denoting a consistent trend which should be maintained in future also.

BSL: It can be observed from the Table 3.3 that the ratio of materials consumed to factory cost of Banswara Syntex Limited showed
an increasing cum decreasing trend during the whole period of study. Initially during the year 2008-09 this ratio was 0.65 times which decreased to 0.63 times in 2009-10 but increased to 0.66 times in 2010-11. This ratio decreased to 0.64 times in 2011-12 but marginally increased to 0.65 times in 2012-13. The cost of raw materials consumed and the factory cost of the company showed an increasing trend but the fluctuating trend was due to the reason that there was no consistency in the rate of increase in factory cost. The average of the ratio was 0.65 times which can be regarded reasonable. Further, it can be noted from the table that the proportion of materials used to factory cost ratio remained almost same during the period of study which signifies that the management of the company tried the keep this ratio intact with the cost per unit. It signifies an effective control on cost. It is suggested that the management of the company should try to continue with the same policy. The coefficient of variation was 1.53 percent showing a consistent trend which should be maintained in future.

MSUML: It is evident from the table that the ratio of materials consumed to factory cost showed a fluctuating trend during the whole period of study. During the year 2008-09, the ratio was 0.73 times which marginally decreased to 0.72 times in 2009-10 but increased to 0.79 times in 2010-11. The ratio of materials consumed to factory cost further increased to 0.81 times in 2011-12 and decreased to 0.77 times in 2012-13. The cost of raw materials consumed and the factory cost of the company showed an increasing trend during the period of study except in the year 2012-13 because of which the ratio had decreased. The average of the ratio was 0.76 times which is slightly high and the
management of the company should try to control it. The coefficient of variation was 4.66 percent showing a consistent trend which should be maintained in future..

STIL: It can be visualized from the table that the ratio of materials consumed to factory cost in STIL showed an increasing trend during the period of study except in the year 2012-13. The ratio of materials consumed to factory cost varied within the range of 0.78 times in 2011-2 to 0.72 times in 2008-09. During the year 2012-13, the ratio had decreased to 0.76 times despite an increasing trend of materials used and factory cost but in this year the rate of increase in factory cost was higher than that of increase in the cost of raw materials consumed. The average of the ratio was 0.75 times which can be regarded satisfactory. But it can be suggested that the management of the company should try to control the factory overheads. The coefficient of variation was 2.94 percent showing a consistent trend which should be maintained in future.

On the whole it can be said that the average ratio of raw materials used to factory cost was highest in MSUML at 0.76 times followed by STIL at 0.75 times, RSWM at 0.74 times and 0.65 times in BSL. There was not much difference in the ratio among the companies under study. The average of the raw material consumed to factory cost can be regarded satisfactory for all the companies under study.

Test of Significance (t-test)

Test of significance has been applied to test the hypothesis. For this purpose t test has been applied by comparing one company with another company.
(a) Between RSWM and BSL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to factory cost of RSWM and BSL.

Value of $t = 8.99$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to factory cost RSWM and BSL is significant.

(b) Between RSWM and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to factory cost of RSWM and MSUML.

Value of $t = 1.02$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to factory cost of RSWM and MSUML is not significant.

(c) Between RSWM and STIL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to factory cost of RSWM and STIL.

Value of $t = 0.79$
Critical Value of \( t \) at 5 percent level of significance (for \( V=8 \)) is 2.306

Decision: The null hypothesis is accepted because the computed value of \( t \) is less than the critical value of \( t \) at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to factory cost of RSWM and STIL is not significant.

(d) Between BSL and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to factory cost of BSL and MSUML.

Value of \( t = 6.00 \)

Critical Value of \( t \) at 5 percent level of significance (for \( V=8 \)) is 2.306

Decision: The null hypothesis is rejected because the computed value of \( t \) is more than the critical value of \( t \) at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to factory cost of BSL and MSUML is significant.

(e) Between BSL and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to factory cost of BSL and STIL.

Value of \( t = 10.00 \)

Critical Value of \( t \) at 5 percent level of significance (for \( V=8 \)) is 2.306

Decision: The null hypothesis is rejected because the computed value of \( t \) is more than the critical value of \( t \) at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio
of raw materials consumed to factory cost of BSL and STIL is significant.

(f) Between MSUML and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to factory cost of BSL and STIL.

Value of $t = 0.51$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to factory cost of MSUML and STIL is not significant.

Analysis of Variance (F-Test)

To test the significance of ratio of raw materials used to factory cost of the textiles companies under study F-test has been applied and following hypothesis has been tested

(i) Null Hypothesis ($H_0$) : There is no significant difference is the raw materials consumed to factory cost ratio of the companies under study

(ii) Null Hypothesis ($H_0$): There is no significant difference is the year-wise cost of raw materials used to factory cost ratio of the companies under study.
Table 3.4
ANOVA TABLE

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum</th>
<th>Degree of Freedom (d.f.)</th>
<th>Variance (Sum /d.f.)</th>
<th>F Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Companies (SSC)</td>
<td>0.043</td>
<td>(c-1)=(4-1)=3</td>
<td>0.01433</td>
<td>F= 57.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Between Companies)</td>
</tr>
<tr>
<td>Within Companies (SSR)</td>
<td>0.007</td>
<td>(r-1)=(5-1)=4</td>
<td>0.00175</td>
<td>F=7.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Within Companies)</td>
</tr>
<tr>
<td>Error (SSE)</td>
<td>0.003</td>
<td>(c-1)(r-1)=12</td>
<td>0.00025</td>
<td></td>
</tr>
</tbody>
</table>

(i) F-Test between the Companies

\[ F = \frac{\text{Higher Variance}}{\text{Smaller Variance}} = \frac{0.01433}{0.00025} = 57.32 \]

Critical value of F at 5 percent level of significance \((V_1 = 3 \text{ and } V_2 = 12)\) is 3.49

Decision: Since the calculated value of F is more than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the difference in the ratio of raw materials used to factory cost of the textile companies under study is significant.

(ii) F-Test Within the Years

\[ F = \frac{\text{Higher Variance}}{\text{Smaller Variance}} = \frac{0.00175}{0.00025} = 7.00 \]

Critical value of F at 5 percent level of significance \((V_1 = 4 \text{ and } V_2 = 12)\) is 3.26

Decision: Since the calculated value of F is less than the critical value of F at 5 percent level of significance, therefore the Null
Hypothesis is accepted and it is concluded that the difference in the gross profit ratio of the companies under study is significant.

3. Materials Consumed to Cost of Production

The raw materials consumed to cost of production ratio of the textile companies under study has by using the following formula

\[
\frac{\text{Ratio of Materials Consumed to Cost of Production}}{\text{Cost of Production}} = \frac{\text{Raw Materials Consumed}}{\text{Cost of Production}}
\]

Table 3.5

Raw Material to Cost of Production Ratio of Textile Companies  
(From 2008-09 to 2012-13)  
(Ratio in Times)

<table>
<thead>
<tr>
<th>Year</th>
<th>RSWM</th>
<th>BSL</th>
<th>MSUML</th>
<th>STIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>0.70</td>
<td>0.64</td>
<td>0.72</td>
<td>0.70</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.71</td>
<td>0.62</td>
<td>0.71</td>
<td>0.73</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.75</td>
<td>0.65</td>
<td>0.78</td>
<td>0.75</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.76</td>
<td>0.63</td>
<td>0.81</td>
<td>0.77</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.74</td>
<td>0.64</td>
<td>0.76</td>
<td>0.75</td>
</tr>
<tr>
<td>Average</td>
<td>0.73</td>
<td>0.63</td>
<td>0.76</td>
<td>0.74</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.02</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>2.74</td>
<td>1.59</td>
<td>3.94</td>
<td>2.70</td>
</tr>
</tbody>
</table>

Source: Annual Reports & Accounts the companies under study for the period from 2008-09 to 2012-13.

RSWM: The ratio of materials consumed to cost of production showed a fluctuating trend during the whole period of study. The ratio of raw material consumed to cost of production during the year 2008-09 was 0.70 times which increased to 0.71 times in the year 2009-10. This proportion increased to 0.75 times in 2010-11 and to 0.76 times in 2011-12. The ratio decreased to 0.74 times in 2012-13. Both the raw
material consumed and the cost of production showed an increasing trend because of increasing level of the production but the increasing trend of the ratio signifies that the material consumed was higher than the required which should be avoided. The average of the ratio was 0.73 times which can be regarded satisfactory but to control the cost of raw material used an effective inventory control should be followed and increasing trend of the ratio should be controlled. The coefficient of variation was 2.74 showing a consistent trend which should be maintained in future also.

BSL: It can be observed from the Table 3.5 that the ratio of material consumed to cost of production in BSL showed a fluctuating but consistent trend during the whole period of study. The highest proportion was in the year 2010-11 when it was 0.65 times and the lowest proportion was in the year 2009-10 when it was 0.62 times. The average of the ratio was 0.63 times which can be regarded satisfactory and a consistent trend of the ratio reveals that the per unit proportion of raw material consumed to cost of production remained same denoting a sound inventory management of the company. The coefficient of variation was 1.59 percent showing a consistent trend because of the consistency in the ratio and it is suggested that the same policy should be continued by the management to keep the cost of raw materials used under control.

MSUML: The ratio of material consumed to cost of production in MSUML showed a fluctuating trend during the whole period of study. Initially during the year 2008-09, the ratio of raw material used to cost of production was 0.72 times which marginally decreased to 0.71 times in 2009-10 but increased to 0.78 times in 2010-11 and then to 0.81 times in
2011-12. In these years, the increase in cost of raw material used was more than the rate of increase in the cost of production denoting an excessive use of raw material which should be controlled. During the year 2012-13, the ratio of raw material used to cost of production decreased to 0.76 times because in this year there was a decrease in the production of the company. The average of the ratio was 0.76 times which can be regarded satisfactory but it is suggested that the management of the company should try to make an effective use of raw material and avoid the wastage and unnecessary cost of raw material. The coefficient of variation was 3.94 percent showing a consistent trend that should be maintained and it is suggested that the increasing trend of the ratio should be kept under control.

STIL: The ratio of material consumed to cost of production in STIL showed an increasing trend during the whole period of study except in the year 2012-13. The highest proportion was in the year 2011-12 when it was 0.77 times and the lowest proportion was in the year 2009-10 when it was 0.73 times. During the year 2012-13, the ratio decreased to 0.75 despite the increasing trend of cost of raw material consumed and cost of production. The average of the ratio was 0.74 times which can be regarded satisfactory but the increasing trend of the ratio of raw material consumed to cost of production should be kept under control as it signifies the higher cost of raw material consumed. The coefficient of variation was 2.70 percent showing a consistent trend which should be kept in future also but after decreasing the ratio.

An overall analysis of the ratio of raw material consumed to cost of production shows that the ratio remained almost same for all the companies under study except for BSL. It is suggested that the
management of RSWM, MSUML and STIL should try to reduce the ratio while the management of BSL should try to maintain the same ratio in future.

Test of Significance (t-test)

Test of significance i.e. t-test has been applied to test the hypothesis. For this purpose the t-test has been used between one company and another company as follows-

(a) Between RSWM and BSL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of production of RSWM and BSL.

Value of $t = 10.00$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production RSWM and BSL is significant.

(b) Between RSWM and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of production of RSWM and MSUML.

Value of $t = 1.866$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of
significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production of RSWM and MSUML is not significant.

(c) Between RSWM and STIL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to cost of production of RSWM and STIL.

Value of \( t = 0.79 \)

Critical Value of \( t \) at 5 percent level of significance (for \( V=8 \)) is 2.306

Decision: The null hypothesis is accepted because the computed value of \( t \) is less than the critical value of \( t \) at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production of RSWM and STIL is not significant.

(d) Between BSL and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of production of BSL and MSUML

Value of \( t = 9.21 \)

Critical Value of \( t \) at 5 percent level of significance (for \( V=8 \)) is 2.306

Decision: The null hypothesis is rejected because the computed value of \( t \) is more than the critical value of \( t \) at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production of BSL and MSUML is significant.
(e) Between BSL and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of production of BSL and STIL.

Value of $t = 11.00$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production of BSL and STIL is significant.

(f) Between MSUML and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of production of BSL and STIL.

Value of $t = 1.244$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of production of MSUML and STIL is not significant.

Analysis of Variance (F-Test)

To test the significance of gross profit ratio of the companies under study F-test has been applied and following hypotheses have been tested.
(i) Null Hypothesis \((H_0)\) : There is no significant difference is the value of raw material consumed and the cost of production ratio of the companies under study.

(ii) Null Hypothesis \((H_0)\): There is no significant difference is the year-wise cost of raw materials consumed to cost of production ratio of the companies under study.

Table 3.6
ANOVA TABLE

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum</th>
<th>Degree of Freedom (d.f.)</th>
<th>Variance (Sum/d.f)</th>
<th>F Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Companies (SSC)</td>
<td>0.044</td>
<td>(c-1)=(4-1)=3</td>
<td>0.0147</td>
<td>F= 58.8 (Between Companies)</td>
</tr>
<tr>
<td>Within Companies (SSR)</td>
<td>0.008</td>
<td>(r-1)=(5-1)=4</td>
<td>0.0020</td>
<td>F=8.00 (Within Companies)</td>
</tr>
<tr>
<td>Error(SSE)</td>
<td>0.003</td>
<td>(c-1)(r-1)=12</td>
<td>0.00025</td>
<td></td>
</tr>
</tbody>
</table>

(i) F-Test between the Companies

\[
F = \frac{Higher\ Variance}{Smaller\ Variance} = \frac{0.0147}{0.00025} = 58.8
\]

Critical value of \(F\) at 5 percent level of significance \((V_1 = 3 \text{ and } V_2 = 12)\) is 3.49

Decision: Since the calculated value of \(F\) is more than the critical value of \(F\) at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the difference in the materials consumed to cost of production ratio of the companies under study is significant.
(ii) F-Test Within the Companies

\[ F = \frac{\text{Higher Variance}}{\text{Smaller Variance}} = \frac{0.002}{0.00025} = 8.00 \]

Critical value of F at 5 percent level of significance \((V_1 = 4 \text{ and } V_2 = 12)\) is 3.26

Decision: Since the calculated value of F is more than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the year wise difference in the materials consumed to cost of production ratio of the companies under study is significant.

4. Raw Materials Consumed to Cost of Sales

This ratio shows that what proportion of raw material consumed bears to the cost of sales. The raw materials consumed to cost of sales ratio has been calculated by using the following formula-

\[ \text{Ratio of Materials Consumed to Cost of Sales} = \frac{\text{Raw Materials Consumed}}{\text{Cost of Sales}} \]

The ratio of raw materials consumed to cost of sales has been shown in the following Table 3.7.
Table 3.7
Raw Material Consumed to Cost of Sales Ratio of Textile Companies
(From 2008-09 to 2012-13)

(Ratio in Times)

<table>
<thead>
<tr>
<th>Year</th>
<th>RSWM</th>
<th>BSL</th>
<th>MSUML</th>
<th>STIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-09</td>
<td>0.69</td>
<td>0.66</td>
<td>0.72</td>
<td>0.68</td>
</tr>
<tr>
<td>2008-10</td>
<td>0.70</td>
<td>0.63</td>
<td>0.70</td>
<td>0.73</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.76</td>
<td>0.67</td>
<td>0.79</td>
<td>0.76</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.77</td>
<td>0.66</td>
<td>0.80</td>
<td>0.79</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.76</td>
<td>0.64</td>
<td>0.75</td>
<td>0.74</td>
</tr>
<tr>
<td>Average</td>
<td>0.74</td>
<td>0.65</td>
<td>0.75</td>
<td>0.74</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.03</td>
<td>0.01</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>4.05</td>
<td>1.54</td>
<td>5.33</td>
<td>5.40</td>
</tr>
</tbody>
</table>

Source: Annual Reports & Accounts the companies under study for the period from 2008-09 to 2012-13.

RSWM: It can be noted from the Table 3.7 that the ratio of material consumed to cost of sales showed an increasing trend during the whole period of study except in the year 2012-12 though both the cost of raw materials consumed and the cost of sales showed an increasing trend but during the year 2012-13 the increase in cost of sales was greater than the cost of raw materials consumed During the year 2008-09, the raw materials consumed to cost of sales ratio was 0.69 times which continuously increased and inclined to 0.77 times in 2011-12 but decreased to 0.76 times in 2012-13. The average of the ratio was 0.74 times which cannot be regarded satisfactory as it signifies a higher proportion. It is suggested that the management of the company should try to control and reduce the proportion of raw materials consumed otherwise it will affect the selling price as well as profitability of the company The coefficient of variation was 4.05 percent showing a consistent trend which should be maintained in future also. Further it can
be suggested that the management of the company should procure adequate raw material resources with proper production planning.

BSL: It is evident from the table that the ratio of material consumed to cost of sales showed an increasing cum decreasing trend during the whole period of study despite an increasing trend in both the cost of raw material consumed and cost of sales. The decreasing trend of the ratio shows that the management had controlled the cost of raw materials consumed. The highest proportion was in the year 2010-11 when it was 0.67 times and the lowest proportion was in the year 2009-10 when it was 0.63 times. The average of the ratio was 0.65 times which can be regarded satisfactory. Moreover it can be noted from the above that the proportion of materials consumed to cost of sales change whether the production increased. The coefficient of variation was 1.54 percent showing a consistent trend which should be maintained in future also.

MSUML: As shown by the table it can be visualized that the ratio of material consumed to cost of sales showed an increasing trend during the whole period of study except in the year 2012-13. The highest proportion was in the year 2011-12 when it was 0.80 times and the lowest proportion was in the year 2009-10 when it was 0.70 times. The ratio during the year 2012-13 had decreased because in this year the value of raw materials and cost of sales had decreased. The average of the ratio was 0.75 times which is a little higher and the management of the company should try to control the increasing trend. The coefficient of variation was 5.33 percent showing a consistent trend which should be maintained in future also. Further it can be suggested that the management of the company should try a follow a systematic production policy to keep the cost under control.
STIL: The ratio of materials consumed to cost of sales in STIL showed an increasing trend during the whole period of study except in the year 2012-13. During the year 2008-09 the ratio of raw materials consumed to cost of sales was 0.68 times which continuously increased and reached to 0.79 times in 2011-12. During the year 2012-13 the ratio came down to 0.74 times though there was an increase in both the cost of materials consumed and cost of sales. The average of the ratio was 0.74 times which is on the higher side and should be controlled. The coefficient of variation was 5.40 percent denoting a consistent trend which should be maintained in future also. However, it is suggested that the management of the company should adopt an effective control on the consumption of materials and avoid the unnecessary losses of materials.

An interfirm comparison suggests that the ratio of cost of raw materials consumed to cost of sales was almost same for all the companies under study except for BSL. The proportion of raw materials used to cost of sales in RSWM, MSUML and STIL ranged abound 75 percent which should be reduced otherwise in BSL this ratio was 65 percent which can be regarded appropriate and should be maintained in future also.

Test of Significance (t-test)

Test of significance has been applied to test the hypothesis. For this purpose t test has been applied by comparing one company with another company.
(a) Between RSWM and BSL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of sales of RSWM and BSL.

Value of $t = 6.376$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of RSWM and BSL is significant.

(b) Between RSWM and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of sales of RSWM and MSMUL.

Value of $t = 0.447$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of RSWM and MSUML is not significant.

(c) Between RSWM and STIL

Null Hypothesis: There is no significant difference in the ratio of raw material consumed to cost of sales of RSWM and STIL.

Value of $t = 0.00$
Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of RSWM and STIL is not significant.

(d) Between BSL and MSUML

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of sales of BSL and MSUML.

Value of $t = 5.429$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of BSL and MSUML is significant.

(e) Between BSL and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of sales of BSL and STIL.

Value of $t = 4.886$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is rejected because the computed value of $t$ is more than the critical value of $t$ at 5 percent level of
significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of BSL and STIL is significant.

(f) Between MSUML and STIL

Null Hypothesis: There is no significant difference in the ratio of raw materials consumed to cost of sales of BSL and STIL.

Value of $t = 0.395$

Critical Value of $t$ at 5 percent level of significance (for $V=8$) is 2.306

Decision: The null hypothesis is accepted because the computed value of $t$ is less than the critical value of $t$ at 5 percent level of significance. Hence, it can be concluded that the difference in the ratio of raw materials consumed to cost of sales of MSUML and STIL is not significant.

Analysis of Variance (F-Test)

To test the significance of ratio of raw materials consumed to cost of sales of the companies under study F-test has been applied and following hypothesis has been tested.

(i) Null Hypothesis ($H_0$) : There is no significant difference in the ratio of raw materials consumed to cost of sales of the companies under study.

(ii) Null Hypothesis ($H_0$): There is no significant difference in the year-wise ratio of raw materials consumed to cost of sales of the companies under study.
Table 3.8
ANOVA TABLE

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum</th>
<th>Degree of Freedom (d.f.)</th>
<th>Variance (Sum /d.f)</th>
<th>F Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Companies (SSC)</td>
<td>0.031</td>
<td>(c-1)=(4-1)=3</td>
<td>0.0103</td>
<td>F= 25.75 (Between Companies)</td>
</tr>
<tr>
<td>Within Companies (SSR)</td>
<td>0.015</td>
<td>(r-1)=(5-1)=4</td>
<td>0.0038</td>
<td>F= 9.50 (Within Companies)</td>
</tr>
<tr>
<td>Error (SSE)</td>
<td>0.005</td>
<td>(c-1)(r-1)=12</td>
<td>0.0004</td>
<td></td>
</tr>
</tbody>
</table>

(i) F-Test between the Companies

\[
F = \frac{Higher Variance}{Smaller Variance} = \frac{0.0103}{0.0004} = 100.75
\]

Critical value of F at 5 percent level of significance (\(V_1 = 3\) and \(V_2 = 12\)) is 3.49

Decision: Since the calculated value of F is more than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the difference in the cost if raw materials consumed to cost of sales ratio of the companies under study is significant.

(ii) F-Test Within the Years

\[
F = \frac{Higher Variance}{Smaller Variance} = \frac{0.0038}{0.0004} = 9.50
\]

Critical value of F at 5 percent level of significance (\(V_1 = 4\) and \(V_2 = 12\)) is 3.26

Decision: Since the calculated value of F is more than the critical value of F at 5 percent level of significance, therefore the Null Hypothesis is rejected and it is concluded that the year-wise difference in the cost of raw materials consumed to cost of sales ratio of the companies under study is significant.

****