CHAPTER - 4

"AN APPRAISAL OF WORKING CAPITAL MANAGEMENT IN CEMENT INDUSTRY OF GUJARAT STATE"
CHAPTER-4

INVENTORY MANAGEMENT AND CONTROL

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INVENTORY MANAGEMENT AND CONTROL

Inventories occupy the most strategic position in the structure of working capital. It constitutes the largest component of current asset in most business enterprises. In the sphere of working capital, the efficient control of inventory have passed the most serious problem to the cement mills because about two third of the current assets of cement mills are blocked in inventories. The turnover of working capital is largely governed by the turnover of inventory. It is therefore quite natural that inventory which helps in maximize profit occupies the most significant place among current assets.

4.1 Meaning and definition of Inventory:

In Oxford Dictionary inventory is a “detailed list of goods, furniture etc.” The word inventory is known as a stock of goods. The accounting language considers the stock of finished goods only. In a manufacturing organization, however, in addition to the stock of finished goods, there will be stock of partly finished goods, raw materials and stores. The collective name of these all items are known as inventory.

The term ‘inventory’ refer to the stock pile of the production a firm is offering for sale and the components that make up the production.

The inventory means aggregate of those items of tangible personal property which
1. are held for sale in ordinary course of business.
2. are in process of production for such sales.
3. are to be currently consumed in the production of goods or services to be available for sale.

Inventories are expandable physical articles held for resale for use in manufacturing a production or for consumption in carrying on business activity such as merchandise, goods purchased by the business which are ready for sale.

It is the inventory of the trader who does not manufacture it.

Finished goods:-
Goods being manufactured and it is ready for sale.

Materials:-
Articles such as raw materials, semi-finished goods or finished parts, which the business plans to incorporate physically into the finished production.

Supplies:-
Article, which will be consumed by the business in its operations but will not
physically as they are a part of the production.

The supplies may be defined as the material, which is either saleable in the market or usable directly or indirectly in the manufacturing in some other process. It also includes the items, which are ready for making finished goods in some other process or by comparing them either by the concern itself and/or by outside parties. In other words, the term inventory means the material having any one of the following characteristics. It may be

1. Saleable in the market,
2. Directly saleable in the manufacturing process of the business,
3. Usable directly in the manufacturing process of the undertaking,
4. Ready to send to the outside parties for making usable and saleable productions out of it.

Present study includes raw materials, stores and spare parts, finished goods and work-in-process in inventories.

Supplies included office and plant cleaning materials (soap, brooms etc. oil, fuel, light bulbs and the likes. These materials do not directly enter into the production process, but are necessary for production process. Inventory constitutes the most significant part of current assets of a large majority of companies in India. For example on an average inventories are more than 57% of current assets in public Ltd. Companies and about 60.5% in government companies in India. Therefore it is absolutely imperative to manage inventories efficiently and effectively in order to avoid unnecessary investment. An undertaking neglecting the management of inventories will be jeopardizing its long run profitability and may fail ultimately. It is possible for a company to reduce its level of inventories to a considerable degree e.g. 10 to 20% without any adverse effect on production and sales.

4.2 Meaning and definition of Inventory Management

Inventory management is concerned with the determination of the optimal level of investment for each component of inventory and inventory as a whole, the efficient control and review mechanism.

Inventory represents a continuum of possible investments. Its different items carry with them different risk to the firm. Financial Manager ties inventory management to the overall objective of the firm. From the profitability point of view, the optimal level of average inventory and the optimal order quantity must be kept lower. Other things remaining constant, this is possible when the opportunity cost of funds invested in inventory is higher.
Management has to take into consideration factors like inventory carrying costs, ordering costs, costs of stock-outs, the rate of return on the investment, and the cost of capital. In the case of running enterprisers, the decision is also concerned with additional returns and the net effect on the maximization of the value of the firm. The technique of marginal analysis is found suitable in taking such decisions, the classification of costs into fixed, variable and relevant is considered essential. The decision to invest further in inventory should be based on consideration of trade of between the resulting savings associated with excess investment and the total cost of holding added inventory.

Levels of inventory holding are also influenced by the operational flexibility it offers to the firm. A lower inventory level gives less flexibility while a higher inventory level gives greater flexibility. In evaluating the levels of inventories, management must therefore balance the benefits of economies of production, purchasing and increase production demand against the cost of carrying the additional inventory. Other things remaining constant, the greater the efficiency with which the firm manages inventory the lower the required investment and the greater the owners wealth. An important step in inventory management is the determination of investment in each component of inventory, Viz, raw material, work-in-process, finished goods and stores and spares.

It is the vital area of management covering the sum total of activities needed for the acquisition, shortage and use of material. It is a technique of controlling the purchase, use and transformation of material in an optimal manner. The phrase 'optimal' signifies that the productivity is not scarified in controlling the volume of inventory. It signifies that the productivity is not scarified in holding inventory. The management of inventory requires careful planning so that both the excess and the scarcity of inventory in relation to the operational requirement of on undertaking may be avoided, therefore it is essential to have sufficient level of investment in inventories. The basic financial problems are to determine the proper level of investment in inventories and to decide how much inventory must be acquired during each period to maintain sufficient level.

L.R. Howard observes that, “The proper management and control of inventory not only solve the acute problem of liquidity but also increases the annual profit and causes substantial reduction in the working capital of a firm.”

Inventory management involves establishment of an overall level of inventory investment and determination of economic order quantities, safety stocks and reorder point for
every individual item stocked. Evaluating the production, purchasing and increased product
demand against cost of carrying the additional inventory. Given the production methods
maximization of revenues mainly depends on the turnover of working capital, which in turn
is, determined by the turnover of inventory. The higher the rate of turnover, the larger is the
volume of business, which can be conducted, with a given level of inventories.

Inventories of manufacturing enterprises can usually be classified into four-category
viz-raw material, work-in-process, stores & spares and finished goods. The mix of these four
types of inventories caries with the nature of business. The complexity of modern production
and the fact that inventory constitute a substantial portion of working capital of an enterprises
necessitate that investment in inventory be maintained at the minimum level consistent which
maintain continuous flow of production and sales by using simple inventory planning and
control techniques. The reduction in "excessive" inventories carries on a favourable impact
and the company's profitability.

The role of Financial Executive in inventory management may be stated as follows:
1. By understanding the implications of changing inventory policies and positions he has
to anticipate changes in the need for funds.
2. Where finances are a limiting factor, he has to help directly in shaping inventory
policies that are consistent with the realities of the firm's financial position.
3. He has to institute periodic inventory turnover audits for investigating questions like:
   • Are we exercising full vigilance against imbalances of raw material and in process
     inventory that limit the utility of stock to that of the item in shortest supply?
   • Are we employing the shortest procurement lead time assumptions and leanest stock
     levels consistent with safety, recognizing that complete safety has a prohibitive cost?
   • Do we keep the heat on uncompleted production items held in suspension to get them
     into saleable condition?
   • Do we press hard enough to keep production scheduling firm so that unneeded
     materials and inventories should be avoided, Does purchasing get early notification of
     production schedule changes?
   • Do we move vigorously to dispose of goods that are obsolete, surplus or for any other
     reason unusable for production?
   • Are we continually striving to shorten the production cycle? Are we sure that long
     production runs are worth the costs and risks of the extra inventory investment?
• Is design engineering making maximum use of standard materials and components available from suppliers on short notice?
• Are we quick enough to use special pricing to move extremely slow-selling finished item?
• Are we doing all we can to flatten on seasonal sales patterns that bulk up inventories?
• He has to help in the formulation of inventory policies designed to speed up turnover and maximize return on investment.

Types of inventory items.

1. **High Cost Items**

   If a firm is holding relatively expensive and valuable inventory, such as jewelry or a firm making certain kinds of electronic components, the cost of a simple item can be very costly. These items must be closely managed or prevent theft, breakage or other loss.

2. **High Volume or High Profit Items**

   The inventory is important because it accounts for a high volume of sale, it should be managed carefully. The same is true if an item have a high profit margin, and a shortage would be costly in terms of lost profits.

3. **Bottleneck Items**

   In a production process, certain items are needed for many of the firm’s finished foods. If these items are not available, production may be force into shutdown. As an example, an electronics firm may use the same transistor in a number of its components. If this single transistor is not available, production may be force into shutdown or productions would be stopped. This bottleneck at a certain point in the production process could prove very costly.

4.3 **Risks and Cost associated with Inventories**

   When a firm holds goods for future sale, it exposes itself to a number of risks and cost. The effective management of inventory involves a trade-off between having too little and too much inventory. In achieving this trade-off, the financial manager should realize that risks and cost might be closely related. Some cost, such as the purchase price of goods, involve little risks and may be calculated in advance with some accuracy. Other cost such as damage to the goods in the warehouse is incurred only when a risk materializes. Risks may be viewed as possible future costs.

   To examine inventory from the cost side can be identified five categories of costs. The
first three are direct costs, the cost immediately connected to buying and holding goods. The last two are indirect cost, the losses of revenues that vary with differing inventory management decisions.

1. **Material Costs**
   
   Cost of purchasing goods + transportation and handling
   
   I.e. Purchase price (Less discounts) + delivery charges + sale tax

2. **Order Cost**
   
   These are variable cost of placing an order for the goods

3. **Carrying Cost**
   
   Storage cost + Insurance + Obsolescence and Spoilage + damage or theft

4. **Cost of Funds tied up in Inventory**
   
   Whenever a firm commits its resources to inventory it is using funds that otherwise might be available for other purpose. A portion of the inventories financed by trade credit from suppliers and involves no cost. If the firm is considering an expansion of inventory and plans to borrow to obtain funds, the firm will have to pay interest on the additional debt. If the firm finances additional inventory through the sale of common stock, an opportunity cost is involved. The firm has lost the use of funds for other, profit-making purpose. Whatever the source of funds, inventory has a cost in terms of financial resources; excess inventory represents an unneeded cost.

5. **Cost of Running out of Goods**
   
   If the firm is unable to fill an order, it risks losing a sale. If the firm has not sufficient raw materials, it may force a costly shutdown of the production process. Adequate inventory helps reduce additional costs and lost revenue due to shortages.

4.4 **Objectives of Inventory Management**

   The primary objectives of inventory management are:
   
   (i) To minimize the possibility of disruption in the production schedule of a firm for want of raw materials, stock and spares.

   (ii) To keep down capital investment in inventories.

   It is essential to have necessary inventories. Necessary inventory is an ideal resource of a concern. The major dangers of excessive inventories are:
   
   (i) The unnecessary tie up of the firm’s funds and loss of profit,

   (ii) Excessive carrying cost
(iii) The risk of liquidity

The excessive level of inventories consumes the funds of business, which cannot be used for any other purpose and thus involves as opportunity cost. The carrying cost, such as the cost of shortage, handling insurance, recording and inspection, were also increases in proportion to the volume of inventory. This cost will impair the concern profitability further.

On the other hand, a low level of inventories may result in frequent interruptions in the production schedule resulting in under utilization of capacity and lower sales. The aim of inventory management thus should be to avoid excessive inventory and inadequate inventory and to maintain adequate inventory for smooth running of the business operations. Efforts should be made to place orders at the right time with the right source to purchase the right quantity at the right price and quality. The effective inventory management should -

(i) Maintain sufficient stock of raw material in the period of short supply and anticipate price changes.

(ii) Ensure a continuous supply of material to production department facilitating uninterrupted production.

(iii) Minimize the carrying cost and time.

(iv) Maintain sufficient stock of finished goods for smooth sales operations

(v) To ensure that materials are available for use in production and production services as and when required

(vi) To ensure that finished goods are available for delivery to customers to fulfill orders, smooth sales operation and efficient customer service.

(vii) To minimize investment in inventories and minimize the carrying cost and time

(viii) To protect the inventory against deterioration, obsolescence and unauthorized use.

(ix) Maintain sufficient stock of raw material in period of short supply and anticipate price changes.

(x) Control investment in inventories and keep it an optimum level.

4.5 Problems faced for inventory management

(i) To maintain a large size inventories for efficient and smooth production and sales operation.

(ii) To maintain only a minimum possible inventory because of inventory holding cost and opportunity cost of funds invested in inventory.
Control investment in working capital. It has a significant influence on the profitability of a concern.

4.6 Methodology

In order to examine the size of investment in inventory in a relative manner, use the ratio of ‘inventory to current asset’. In addition to this, compute the ratio of each component of inventory viz, raw material, work in process, finish goods, stores and spares, to the total inventory in order to observe whether overstocking existed in and of those components. Secondly, for assessing efficiency in the use of inventory investment, employ the production inventory figure by dividing it into 12 months. Thirdly to study whether excessive use of cash credit had been made, assume that use has been made only of short-term source of current liabilities, cash credits and working capital loans. Then compare these three source in an individual and cumulative manner with the value of inventory each year and employ the process of elimination in order to detect the extent of excessive financing by means of cash credits and working capital loans severally and jointly.

Motives of Holding Inventory

Holding up of inventories involves tying up of the concern funds and carrying cost. It is expensive to hold inventory.

Motives:

1. Transaction motive
2. Precautionary motive
3. Speculative motive

1. Transaction motive

Inventories are held merely for the purpose of carrying on transaction smoothly, and at the same time, ensuring that the cost of ordering is kept minimal, such a motive is called the Transaction Motive.

2. Precautionary Motive

Sometimes inventories are increased as a hedge or protection against stock-out when it becomes clear to the management that the lead-time for a particular item is likely to increase or there is a possibility of short supply. This increasing of safety stock arises from purely a Precautionary Motive.

3. Speculative Motive

Situation may arise when an all round price increase is expected due to market demand or due to change in cost. In such a situation, the company management is keen to
hold on to the inventories or increase them in order to get a better price for finished goods. Such a motive is known as the Speculative Motive.

In addition to the above three motives, there are some other motives that, why firm holds inventories.

4. **Avoiding loses of sales**

If the firm does not have goods available for sale, it will lose sale. Customers requiring immediate delivery will purchase their goods from the other firm. The ability of the firm to give quick service and to provide prompt delivery is closely tied to the proper management of inventory.

5. **Gaining quantity discount**

If a firm is willing to maintain large inventories in selected production line, it may be able to make bulk purchases of goods at large discount. By paying less for purchasing its goods the firm can increase profits, as long as the cost of maintaining the inventories is less than the amount of the discount received.

6. **Reducing Order Cost**

Every time a firm places, an order, it incurs certain cost. Forms must be typed, checked, approved and mailed when goods arrive, they must be accepted, inspected, counted. The variable cost associated with individual orders can be reduced if the firm places a few large rather than numerous small orders.

A company should maintain adequate stock of material for a continuous supply to the factory for an uninterrupted production. It is not possible for a company to procure raw material whenever it is needed. A time lag exists between demand for material and its supply. Also there exists uncertainty in procuring raw material in time at many occasions. The procurement of material may be delayed because of such factors as strike, transport disruption, short supply etc. therefore the firm should maintain sufficient stock of raw material at a given time to streamline the production. Other factors which may necessitate to purchase and hold raw materials inventories are quantity, discount and anticipative price increases. The firm may purchase larger quantities of raw material that needed for desired production and sales level to obtain quantity discount of bulk purchasing. At times the firm would like to accumulate raw material in anticipation of price rise.

The work in process inventory builds up because of the production cycle. Production cycle is the time span between the introduction of raw material to production and emergence
of finished product at the completion of production cycle. Till the production cycle completes the stock of work in process has be maintained. Efficient firms constantly try to make the production cycle smaller by improving production techniques.

The stock of finished goods has to be held because production and sales are not instantaneous. A firm cannot produce immediately when customer demands the goods. Therefore to supply finished goods on a regular basis then stock has to be maintained for sudden demands from customer. In case the firm’s sales are seasonal in nature, substantial finished goods inventories should be kept to meet the peak demand. Failure to supply products to customers, when demanded, would mean loss of the firm’s sales to the competitors. The basic objective in holding raw material inventories is to separate purchase and production activities and holding finished goods inventory is to separate production and sales activities. If raw materials were not held for purchase it would have to be made continuously at the usage rate in production. This would not only mean high ordering cost and loss of quantity discount, but also production interruption when raw material not procured in time.

Finished goods inventories should be maintain to serve customers on a continuous basics and to meet the fluctuating demands. The level of finished goods inventories would depend upon the coordination between sales and production, a small finished good inventory could be maintained and still customer’s need could be met. Work-in-process inventory is necessary because production is not instantaneous. The larger the production cycle, the larger will be the level of work-in-process inventory.

4.7 Inventory Control

Inventory control is concerned with the acquisition, storage, handling and use of inventories so as to ensure the availability of inventory whenever needed, providing adequate provision for contingencies, deriving maximum economy and minimizing wastage and losses.

Hence Inventory control refers to a system, which ensures the supply of required quantity and quality of inventory at the required time and at the same time prevent unnecessary investment in inventories.

It is one of the most vital phases of material management. Reducing inventories without impairing operating efficiency frees working capital that can be effectively employed elsewhere. Inventory control can make or break a company. This explains the usual saying that “inventories” are the graveyard of a business.
Designing a sound inventory control system is in a large measure for balancing operations. It is the focal point of many seemingly conflicting interests and considerations both short range and long range.

The aim of a sound inventory control system is to secure the best balance between "too much and too little." Too much inventory carries financial rises and too little reacts adversely on continuity of productions and competitive dynamics. The real problem is not the reduction of the size of the inventory as a whole but to secure a scientifically determined balance between several items that make up the inventory.

The efficiency of inventory control affects the flexibility of the firm. Insufficient procedures may result in an unbalanced inventory. Some items out of stock may hold production other overstocked results into excessive investment. These inefficiencies ultimately will have adverse effects upon profits. Turning the situation round, difference in the efficiency of the inventory control for a given situation round, difference in the efficiency of the inventory control for a given level of flexibility affects the level of investment required in inventory. The less efficient is the inventory control, the greater is the investment required "Excessive investment in inventories increase cost and reduces profits, thus, the effects of inventory control of flexibility and on level of investment required in inventories represent two sides of the same coin.”

The material / inventory control means the regulation of the functions of an organization relating to the procurement, storage, and usage of inventory in such a way as to maintain an ever flow of production without excessive investment in material stock. It is also defined as providing the right quantity of material of right quality at the right time and place at the minimum cost. Procurement or purchase control, storage or inventory control, and issuing or usage or consumption control of the materials are three important functions of inventory control.

Control of inventory is exercised by introducing various measures of inventory control, such as ABC analysis fixation of norms of inventory holdings and reorder point and a close watch on the movements of inventories.

4.8 Objectives of Inventory control

1. To make available an assured supply of material and stores and of the right quality also, to keep the cycle of production going without any interruption.
2. To effect purchase of material of the right quality consistent with the standards prescribed in respect of the finished production.
3. To produce material on the most favourable terms with a view to affect the maximum economy in the cost of buying.
4. To prevent unnecessary locking up of working capital consequent upon overstocking of material.
5. To minimize wastage and losses in the course of handling material and their storage.
6. To provide the management with information regarding the cost of materials and the available stock.

4.9 Control procedures
1. Fundamental requirements of a system of inventory control are: fixation of responsibility in respect of every function of material control.
2. Proper co-ordination amongst the department involved in the function of material control.
3. Centralization of the purchasing function.
4. Standardization of control procedures, and the use of standard forms upon which only properly written instructions are acceptable.
5. Scheduling material requirements and the preparation of the materials purchase budget.
6. Classification and codifications of materials.
7. Operation of a system of internal check to insure that the other automatically checks the work of one.
8. Proper storage of material and supplies.
9. Operation of a perpetual inventory system of stores control.
10. Fixation of stock level.
11. Evolving a proper system of accounting to ensure material control.
12. Reporting to management regularly regarding purchase issues of inventory balance, returns to vendor, and defective, spoiled and absolute items.

4.10 ABC Analysis of Inventories

The ABC inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of money value of the total inventory used in the
production process, while a relatively large number of items may from a small part of the money value of stores. The money values are ascertained by multiplying the quantity of material of each item by its unit price.

According to this approach to inventory control high value items are more closely controlled than low value items. Each item of inventory is given A, B, or C denomination depending upon the amount spent for that particular item. “A” or the highest value items should be under the tight control and under responsibility of the most experienced personnel, while “C” or the lowest value may be under simple physical control.

It may also be clear with the help of the following examples:

“A” Category – 5% to 10% of the items represent 70% to 75% of the money value.

“B” Category – 15% to 20% of the items represent 15% to 20% of the money value.

“C” Category – The remaining number of the items show that items represent 5% to 10% of the money value.

The relative position of these items show that items of category A should be under the maximum control, items or category B may not be given that much attention and item C may be under a loose control.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>A item</th>
<th>B item</th>
<th>C item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Tight</td>
<td>Moderate</td>
<td>Loose</td>
</tr>
<tr>
<td>Requirement</td>
<td>Exact</td>
<td>Exact</td>
<td>Estimated</td>
</tr>
<tr>
<td>Check</td>
<td>Close</td>
<td>Some</td>
<td>Little</td>
</tr>
<tr>
<td>Expenditure</td>
<td>Regular</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>Posting</td>
<td>Industrial</td>
<td>Individual</td>
<td>Group/none</td>
</tr>
<tr>
<td>Safety stock</td>
<td>Low</td>
<td>Medium</td>
<td>Large</td>
</tr>
</tbody>
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The importance of this tool lies in the fact that it directs attention to the key items.

Advantages of ABC analysis

(1) It ensures a closer and a more strict control over such items, which are having a sizable investment in there.

(2) It releases working capital, which would otherwise have been locked up for a more profitable channel of investment.

(3) It reduces inventory-carrying cost.

(4) It enables the relaxation of control for the ‘C’ items and thus makes it possible for a sufficient buffer stock to be created.
4.11 Fixation of Norms of Inventory Holdings

Top management or by the materials department could set the norms for inventories. The top management usually sets monetary limits for investment in inventories. The materials department has to allocate this investment to the various items and ensure the smooth operation of the concern. It would be worthwhile if norms of inventories were set by the management by objectives, concept. This concept expects the top management to set the inventory norms (limit) after consultation with the materials department. A number of factors enter into consideration in the determination of stock levels for individual items for the purpose of control and economy. Some of them are

1. lead time for deliveries
2. the rate of consumption
3. requirements of funds
4. Keeping qualities, deterioration, evaporation etc.
5. storage cost
6. availability of space
7. price fluctuations
8. Insurance Cost
9. Obsolescence Price
10. Seasonal Consideration of Price and availability
11. EOQ(Economic order quantity) and
12. Government and other statutory restriction

Any decision involving procurement storage and uses of item will have to be based on an overall appreciation of the influence of the critical ones among them. Material control necessitates the maintenance of inventory of every item of material as low as possible ensuring at the same time, its availability as and when required for production. These twin objectives are achieved only by a proper planning of the inventory levels. If the level of inventory is not properly planned, the results may either be over stocking or up a huge amount of working capital and consequently there is a loss of interest. Further, a higher quantity than what is legitimate would also result in deterioration. Besides there is also the risk of obsolescence if the end product for which the inventory is required goes out of fashion. Again, a large stock necessarily involves an increased cost of carrying such as, insurance, rent
handling charges. Under stocking which is other extreme, is equally undesirable as it results in stock outs and the consequent production holds ups. Stoppage of production in turn, cause idle facility cost. Further, failure to keep up delivery schedules results in the loss of customers and goodwill. These two extreme can be avoided by a proper fixation of two important inventory level viz, the maximum level and the minimum level. The fixation of inventory levels is also known as the demand and supply method of inventory control.

Carrying too much or too little of the inventories is detrimental to the company. If too little inventories are maintained, the company will have to encounter frequent stock outs and incur heavy ordering costs. Very large inventories subject the company to heavy ordering costs. Very large inventories subjects the company to heavy inventory carrying cost in addition to unnecessary ties up of capital.

An efficient inventory management, therefore, requires the company to maintain inventories at an optimum level where inventory costs are minimum and as the same time there is no stock out-which may result in loss of salt or stoppage of production. This necessitates the determination of the minimum and maximum level of inventories.

**Minimum Level**

The minimum level of inventories of their reorder point may be determined on the following basis:-

(i) Consumption during leading-time
(ii) Consumption during lead-time plus safety stock
(iii) Stock out costs
(iv) Customer’s irritation and loss of goodwill and production hold costs.

To continue production during “Lead Time” it is essential to maintain some inventories, Lead Time has been defined as the interval between the placing of an order (with a supplier) and the time at which the goods are available to meet the consumer needs.

There are sometimes fluctuations in the lead-time and or in the consumption rate. If no provision is made for these variations, stock out may take place-causing disruption in the production schedule of the company. The stock, which takes care to the fluctuation in demand, varies in lead-time and consumption rate is known as safety stock. Safety stock may be defined as the minimum additional inventory, which serves as a safety margin or buffer or cushion to meet an unanticipated increase in usage resulting from an unusually high demand and or an uncontrollable late receipt of incoming inventory. It can be determined on the basis
of the consumption rate, plus other relevant factors such as transport bottleneck, strikes or shutdowns,

    In the case of uncertainty, the probabilistic approach may be applied to determine the safety margin. To avoid stock out arising out of such eventualities, companies always carry some minimum level of inventories including safety stock. Safety stock may not be static for all the times. A change in the circumstances and in the nature or industry demand, necessitates an adjustment in its level. In this study an effort has been made to examine how the current companies determine their minimum level for re-order inventories, safety stock, whether a level of study is maintained throughout the year or not.

    For each type of inventory a maximum level is set that demand presumably will not exceed as well as a minimum level representative a margin of safety required to prevent out of stock condition. The minimum level also governs the ordering point. An order to sufficient size is placed to bring inventory to the maximum point when the minimum level is reached.

**Maximum Level**

    The upper limit beyond which the quantity of any item is not normally allowed to rise is known as the ‘Maximum Level’. It is the sum total of the minimum quantity, and EOQ. The fixation of the maximum level depends upon a number of factors, such as the storage space available, the nature of the material i.e. chances of deterioration and obsolescence, capital outlay, the time necessary to obtain fresh supplies, the EOQ, the cost of storage and government restriction.

**Re-Order Level**

    Also known as the ‘ordering level’ the reorder level is that level of stock at which a purchase requisition is initiated by the storekeeper for replenishing the stock. This level is set between the maximum and the minimum level in such a way that before the material ordered for is received into the stores, there is sufficient quantity to cover both normal and abnormal circumstances. The fixation of ordering level depends upon two important factors viz, the maximum delivery period and the maximum rate of consumption.

**Re-order Quantity**

    The quantity, which is ordered when the stock of an item falls to the reorder level, is known as the reorder quantity or the EOQ or the economic lot size. Although it is not a stock level as such, there order quantity has a direct bearing upon the stock level in a much as it is necessary to consider the maximum and minimum stock level in determining the quantity to
be ordered. The re-order quantity should be such that, when it is added to the minimum quantity, the maximum level is not exceeded. The re-order quantity depends upon two important factors viz, order costs and inventory carrying costs. It is however, necessary to remember that the ordering cost and inventory carrying cost are opposite to each other. Frequent purchases in small quantities, no doubt reduce carrying cost, but the ordering costs such as the cost inviting tenders of placing order and of receiving and inspection, goes up. If on the other hand purchases are made in large quantities, carrying costs, such as, the interest on capital, rent, insurance, handling charges and losses and wastage, will be more than the ordering costs, the EOQ is therefore determined by balancing these opposing costs.

**Economic Ordering Quantity**

The EOQ refers to the order size that will result in the lowest total of order and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. If affirm places too few order, it must maintain large stocks of good and will have excessive carrying cost. By calculating an economic order quantity, the firm identifies the number of units to order that result in the lowest total of these two costs.

**Economic Ordering Quantity**

\[
\text{EOQ} = \sqrt{\frac{2 \times \text{Ordering cost} \times \text{Carrying Cost}}{\text{Units Per order}}} 
\]

The constraints and assumption are as follow:-

1. **Demand is known**

   Using past data and future plans a reasonably accurate prediction of demand can of demand can often be made. This is expressed in unit sold in a year.

2. **Sales occur at a constant rate**

   This model may be used for goods that are sold in relatively constant amount throughout the year. A more complicated model is needed for firms whose sales fluctuate in response to there seasonal cyclical factors.
3. **Cost of running of goods are ignored**

Cost associated with storage, delays or lost sales are not considered. These costs are considered in the determination of safety level in the re-order point system.

4. **Safety stock level is not considered**

The safety stock level is the minimum level of inventory that the firm wishes to hold as a protection against running out. Since the firm must always be above this level the EOQ need not be considered the safety stock level.

Total Ordering Cost (TOC) = \( \frac{A}{Q} \cdot O \)

Average Inventory = \( \frac{Q}{2} \)

Total Carrying Cost (TCC) = \( \frac{Q}{2} \cdot C \)

Total Inventory Cost = TOC + TCC

Total Cost = \( \frac{A}{2} \cdot O + \frac{QC}{2} \)

Where
- \( A \) = total annual demand
- \( Q \) = Quantity order in units
- \( O \) = Order cost per order
- \( C \) = Carrying cost per unit

The basic formula is EOQ = \( \sqrt{\frac{2(U)(OC)}{CC\%PP}} \)

Where
- \( 2 \) = mathematical factor that occurs during the deriving of the formula
- \( U \) = Units sold per year, a forecast provided by the marketing department.
- \( OC \) = Cost of placing each order for more inventory provided by cost accounting.
- \( CC\% \) = Inventory carrying cost expressed as a% of the average value of the inventory, an estimate usually provided by cost accounting.
- \( PP \) = Purchase price per each unit of inventory supplied by the purchasing department.

**Trial and error approach**

Select a number of possible lot (Order) sizes to purchase, then determine the total cost for each lot size chosen, now select the ordering quantity that minimizes the total cost.

**Quantity Discount and Order Quantity**

The standard EOQ analysis is based on the assumption that the price per unit remains constant irrespective of the order size. When quantity discount are available which is often the
case, price per unit is influenced by the ordered available which is often the case, price per unit is influenced by the ordered quantity. This violates the applicability of the EOQ formulas. This violates the applicability of the EOQ formulas. However the EOQ framework can still be used as a starting point for analyzing the problem.

To determine the optimal order size when quantity discount is available the following procedure may be followed.

1. Determine the order quantity using the standard EOQ formula assuming no quantity discount
2. If Q enables the firm to get quantity discount then it represents the optimal order size.
3. If Q is less than the minimum order size required for quantity discount (call it-G2) compute to change in profit as a result of increasing the order quantity from Q1 to Q2 will as follow:

   \[ \text{Change in profit} = AD + \left( \frac{A}{Q1} - \frac{A}{Q2} \right) - \frac{Q2((P-D)/C)}{2} - \frac{Q1PC}{2} \]

   \( A = \) total demand, \( D = \) discount per unit when quantity discount in available, \( Q1 = \) EOQ assuming no discount, \( Q2 = \) minimum order size required for quantity discount, \( O = \) order cost, \( P = \) purchase price without discount, \( C = \) carrying cost

**Stock Level Subsystem**

This system keeps track of the goods held by the firm, the insurance of goods, and the arrival of order. It is made up of the records accounting for the goods in stock. Thus the stock level subsystems maintain record of the current level of inventory for any period of time, the current level is calculated by taking the beginning inventory, adding the inventory received and subtracting the cost of goods sold. When ever those subsystems reports that an item is at a below the re-order level, the firm will began to place an order for the item.
Uncertainty and safety stock

The demand or usage of inventory is not generally known with certainty usually it fluctuates at a given period of time.

In this case formula is \( (M - X) \)

(Maximum daily usage rate \(X\) \(\) Maximum lead time) – (Average daily usage rate \(X\) \(\) Average lead time)

Re-order Point

The reorder point is the level of inventory at which the firm places an order in the amount of EOQ. If the firm places the order when the inventory reaches the reorder point, the new goods will arrive before the firm runs out of goods to sell.

In designing reorder point subsystem, here items of information are needed as inputs to the subsystem.

1. **Usage rate**: This is the rate per day at which the item is consumed in production or sold to customers. It is expressed in units. It may be calculated by dividing annual sales by 365 days. If the sales are 50,000 units the usage rate is 50,000/365 days.

2. **Lead time**: This is the amount of time between placing an order and receiving goods this information which is usually provided by the purchasing department. The time to allow for an order to arrive may be estimated from a check of the company’s record and the time taken in the past for different suppliers to fill orders.

3. **Safety stock**: The minimum level of inventory may be expressed in terms of several days’ sales. The level can be calculated by multiplying the usage rate and time in the number of days that the firm wants to hold as a protection against shortages.

Reorder point = \( S \times L + J (S \times R \times L) \) Where

- \( S \) = Usage in units per day
- \( L \) = Lead time in days
- \( R \) = Average number of units per order
- \( J \) = Stock out acceptance factor

The foregoing analysis is based on certain simplifying assumption. In the real word some additional consideration ought to be taken into account.

(i) Anticipated scarcity of raw material
(ii) Expected price charge
(iii) Obsolescence risk
(iv) Government restriction on inventory
(v) Competitive market

4.12 Pricing of Raw Materials

When issues are made out of various lots purchased at varying prices, the problem arises as to which of the receipt price should be adopted for valuing the materials requisitions.

1. First in first out

Materials received first will be issued first. The price of the earliest consignment is taken first and when that consignment is exhausted the price of the next consignment is adopted and so on. This method is suitable in times of falling prices, because the material charge to production will be high while the replacement cost of materials will be low.

2. Last in first out

Materials received last will be issued first. The price of the last consignment is taken first and when that consignment is exhausted the price of the second last consignment is adopted and so on. In timing of rising prices this method will show a charge to production, which is closely related to current price level provided that the last purchase is made recently.

3. Weighted average cost method

Under this method material issued is priced at the weighted average cost of material in stock.

\[ WAC = \frac{\text{value of material in stock}}{\text{Quantity in stock}}. \]

4. Standard price method

Under this method a standard price is predetermined. The price of issues predetermined for a stated period taking into account all the factors affecting price such as anticipated market trends, transportation charges, and normal quantity of purchase. Standard price are determined for each material and material requisition are priced at standards at standards irrespective of actual purchase price. Any difference between the standard and actual price results in materials price variance.

5. Current price

Material issued is priced at their replacement or realizable price at the time of issue. The cost at which identical materials could be purchased from the market should be ascertained and use for valuing material issues.
4.13 Perpetual Inventory System

Another method of inventory control is the maintenance of inventory control on a continuous basis. The material are received into the stores, the storekeeper will arrange for the storing of each item in the allotted rack, bin, shelf or other receptacles and attach a card to each bin for the purpose of making entries there in, relating to the receipts, issues and balance. The bin card or the locker card, this becomes a perpetual inventory record for each item of stores. If the stores balance is recorded on continuous basis after every receipt and issue, the record is said to be one of perpetual inventory system. Thus according to Weldon, the perpetual inventory is “A method of recording store balance after every receipt and issue to facilitates regular checking and to obviate closing down for stock locking.”

Stocktaking or stock verification is done mainly with a view to finding out whether the book balances as revealed by the stock records agree with the physical or the ground balance. Although, therefore, stock verification is one of the tools of inventory control, and is done for exercising control over the stock of every item, is an integral part of material control for the purpose of preparing the B/S, the physical verification of stock must be done at the end of year.

Such verification at the end of the year is known as the periodical stock taking as against the continuous stocktaking, which, is done throughout the year. The periodic stock taking method usually adopted by concerns which cannot maintain perpetual inventory records due to the nature of the items which are usually stored in open yards and not in bins and as a such, bin cards can not be employed for them, or do not want to maintain such records and employ stock verification staff to do the work of stock checking through out the year. Under this method of stocktaking, the verification of the whole of the stock and its valuation are accomplished only one at the close of the financial year and difference in stock is adjusted only once. As such, the stock in hand would tend to be accurate for the balance sheet purposes. It is also possible to find out slow moving items. Nevertheless, the periodic inventory has its own disadvantage. In the first place, it becomes necessary to close down the factory on the day of stock taking. Secondly, discrepancies in stock cannot be corrected by an executive action immediately as and when they occur. Thirdly, since all the items are checked only once in a particular day, a surprise verification will not be possible. Lastly, reason for the discrepancies cannot be found out because of the long interval between two consecutive verifications.
These disadvantages of the periodical inventory system are overcome in the case of the perpetual inventory system. Under this method of continuous stock verification the purpose of verification is carried on throughout the year by a specially trained staff. This duty is to verify a few selected items in details so that each item is checked up a number of times during the year. The day and time of checking not being known to the staff, they are taken by a surprise. As such, not only secrecy of the items to be verified can not maintain, a manipulation of every type can be prevented. Discrepancies are located, reason are ascertained, the necessary adjustment are made in the accounting records, and correlative action is take then and there to prevent their recurrence, the advantages of a continuous stocktaking where perpetual inventory records are maintained may thus be summarized as follows.

(i) The elaborate and costly work involved in periodic stock taking can be avoided
(ii) The stock verification can be done without the necessity of closing down the factory.
(iii) The preparation of interim financial statements becomes possible
(iv) Discrepancies are easily located and corrected immediately.
(v) It ensures a reliable check on the stores.
(vi) It exercises a moral influence on the stores staff.
(vii) Fast and slow moving items can be distinguished and the fixation of proper stock levels prevents not only over-stocking, but under stocking also.
(viii) A perpetual inventory record of the nature of the bin cards enables the storekeeper to keep an eye on the stock levels, and replenish the stock of every item whenever the limit falls to the recorder level.
(ix) It provides a reliable information to the management of the number of units, and the value of every items of stores,
(x) It ensures secrecy of the items that are verified.

4.14 Stock Discrepancies

The maintenance of stores records on a continuous basis and making stock verification continuously could not, under normal circumstances, cause any discrepancy between the book balance and the ground balance. However discrepancies arise owing to various reasons and hence, it is necessary to know what those reasons are and the adjustment of discrepancies is done. It is usual to classify the various reasons under two group viz, avoidable and
unavoidable causes.

Avoidable:-

(i) An improper storage resulting in a mix-up of materials of different quality and grade.

(ii) Wrong counting, weighting and measuring.

(iii) Use of wrong measure resulting in over issues or under issues.

(iv) Careless handling resulting in breakage and damage.

(v) Documentation errors, such as omissions of recording receipt and issuance or errors in recording receipt, issues or striking the balance.

(vi) Pilferage and theft.

Unavoidable:-

(i) Natural causes, such as shrinkage and evaporation, deterioration, absorption of moisture etc.

(ii) Breaking the bulk, in case of materials purchased in bulk and issues made in small quantities.

(iii) Unforeseen losses arising due to accidents, fires etc.

Adjustment of Discrepancies:-

It has already been mentioned that the bin card, which is a stores record is essentially a perpetual inventory record. It should, however, be noted in this context that the stores ledger, another stores record maintained not by the storekeeper but by the store ledger section. Both bin card and the store ledger are written up with the same basic documents yet, each acts as the check upon the other, and as such, the stores ledger is also a perpetual inventory record. Under perpetual inventory system, therefore it is very necessary that not only the ground balance be shown in the bin cards but also shown in the stores ledger. Before dealing with the discrepancy between the ground balance and book balance, it is necessary to reconcile all the three balances. It may happen that the bin card balance agrees with the stores ledger balance, but both disagree with physical balance. It is also possible that the bin card balance disagrees with the stores ledger balance. When store verification is done throughout the year barring certain natural causes giving rise to surpluses, discrepancies and deficiencies in the ground balance, correct balance is always the physical balance. Consequently the difference between the physical balance and the book balance represent either a surplus or a deficiency. If the bin card balance differs from the store ledger balance the difference should first be reconciled...
and then adjusted to the physical balance. In the course of continuous stock taking the physical balance is first be verified, compared with the bin card balance, and any difference will be adjusted as surplus or deficiency, the bin card balance will then be compared with the store ledger balance and any difference between the two balances will be adjusted through the accounting mechanism.

4.15 Factors influence the level of each component of Inventory:-

4.15.1 Raw Material Inventory

1. The volume of safety stock against material shortages that interrupt production.
2. Considerations of economy in purchase.
3. The outlook for future movements in the price of materials.
4. Anticipated volume of usage and consumption.
5. The efficiency of procurement and inventory control functions.
6. The operating costs of carrying the stocks.
7. The costs and availability of funds for investment in inventory.
8. Storage capacity.
9. Re-component cycle.
10. indigenous or foreign
11. The lead-time of supply.
12. Formalities for importing.

4.15.2 Working-in-process Inventory:-

1. The length and the volume of the complete production process.
2. Management policies affecting length of process time.
3. Length of process in runs.
4. Action that speeds up the production process, e.g., adding second or third production shifts.
5. Management’s skills in production scheduling and control.
6. Sales expectations.
7. Level of sales and new orders.
8. Price level of raw materials used, wages and other items that enter production cost and the value added in production.
9. Customer requirements.
10. Customer requirements.
11. Usual period of aging.

**4.15.3 Finished Goods Inventory:-**
1. The policy of the management to gear the production to meet the firm order in hand.
2. The policy to produce for anticipated orders and stock keeping.
3. Goods required or the purpose of minimum and safety stocks.
4. Sales policies of the firm,
5. need for maintaining stability in production
6. Price fluctuation for the product.
7. Durability, spoilage and obsolescence.
8. Distribution system.
9. Availability of raw material on seasonal basis while customer’s demand spread throughout the year.
10. Storage capacity.

**4.15.4 Stores and Spares Inventory:-**
1. Nature of the product to be manufactured and its lead-time of manufacture.
2. State of technology involved.
3. Consumption’s patterns
4. Lead time of supply.
5. Indigenous or foreign.
6. Minimum and safety stock and ordering quantities,
7. Capacity utilization.
8. Importing formalities

Some of the important inventory policies relates to –
1. Minimum, maximum and optimum stocks;
2. safety stocks, order quantities, order levels and anticipated stocks;
3. waste, scrap spoilage and defective;
4. policies relating to alternative use;
5. policies relating to order filling;

**4.16 Measure of effectiveness of Inventory Management**
1. Size of Inventory/ Total Current assets
2. Size of Raw material Inventory = Raw material inventory/ Total inventory
3. Size of Work in Process Inventory = Work in process inventory/ total Inventory
4. Size of Stores and Spares parts Inventory = Stores and Spares parts inventory/ Total Inventory.
5. Size of finished Goods Inventory = Finished goods inventory/Total inventory
6. Overall inventory turn over ratio = Cost of goods sold/ average total inventories at cost
7. raw material inventory turnover ratio = Annual consumption of Raw material / Average Raw material inventory
8. Work-in-process inventory turnover ratio = Cost of manufacture / average work-in-process inventory at cost
9. finished Goods inventory turnover ratio = Cost of goods sold / average finished stock
10. Stores and spare parts inventory turnover ratio = stores and spares consumed / average stock of stores and spares
11. age of finished goods inventory = 365 /finished goods inventory turnover ratio
12. Average age of raw material inventory = 365 / Raw material inventory turnover ratio
13. Average age of work-in-process inventory =365 / work-in-process inventory turnover ratio
14. Age of stores and spare parts inventory = 365 / stores and spare parts inventory turnover ratio
15. Inventory holding period = 365 / Inventory turn over ratio.

4.17 Control and review:-

The efficiency of inventory control affects the flexibility of the firm. There are several tools of inventory control. Some of these are:

(1) The economic order quantity, which enables determination of optimal size of order to place on the basis of demand or usage of the inventory.
(2) The technique of safety stocks to overcome problems of uncertainty.
(3) The order point formula, which indicates, the optimal point at which to reorder a particular item of inventory.

Together, these tools provide the means for determining an optimal average level of inventory for the firm.

Ratio analysis has a wider application as a measure of inventory control among most manufacturing firms. Some of the important ratios are explained below:

(1) Inventory to Sales (Total Inventory/sales for the Period)
The ratio explains variations in the level of investment. An increase in inventory levels, substantially beyond that which might be expected from an increase in sales, may reflect such phenomena as the result of a conscious policy shift to higher stock levels, of unintended accumulation of unsold stocks, and of inventory speculation, or simply stocking in anticipation of an almost certain surge of orders.

(2) Inventory Turnover (Cost of Goods sold/ Average Inventory)

The ratio suggests that the rapidity with which the inventory is turned over into receivables through sales. Generally, the higher the inventory turnover, the more efficient the management of a firm is. However, a relatively high inventory turnover ratio may be the result of too low a level of inventory and frequent stock outs. Therefore, the ratio must be judged in relation to the past and expected future ratios of the firm and in relations of similar firms or the industry average or both.

(3) Sales to Inventory (Annual Net Sales / Inventory at the End of Fiscal Period)

The ratio indicates the volume of sales in relation to the amount of capital invested in inventories. When inventory for a firm is larger in relation to sales (the condition which causes it to have a lower net sales-to inventory ratio than other firms) the firm’s rate of return is less since it has more working capital tied up in inventories than has the firm with a higher ratio.

(4) Inventory to Current Assets (Total Inventory/Total Current Assets)

The ratio indicates the amount of investment in inventory per rupee of current assets investment. Generally an increasing proportion of inventory is indicative of inefficient inventory management. The ratio may also indicate the state of liquidity position of concern. The lower the inventory to current assets lowers the liquidity as compared to other current assets, viz., receivables, cash and marketable securities.

(5) Inventories Expressed in Terms of Number of Days Sales (Inventory/ sales x 365)

The ratio indicates the size of inventory in terms of number of days sales. For this purpose first the sales per day are calculated and inventory is divided by the amount of sales per day. The increasing inventory in terms of number of days sales may indicate either accumulation of inventory or decline in sales. Inventory for this purpose is assumed
to include finished goods only. While the former situation signifies poor inventory management, the latter indicates the poor performance of the marketing department.

(6) Sundry Creditors to Inventory (Sundry Creditors/Inventory)

The ratio reveals the extent to which inventories are produced through credit purchases. Inventories for this purpose are assumed to include raw materials and stores and spares only. If the ratio is less than unity, it reveals that the credit available is lower than the total inventory required. It also explains the extent of inventory procured through cash purchases. Indirectly it emphasizes the inventory financing policy of the firm. If the ratio is more than one, it explains that the entire inventory is purchased on credit.

(7) Inventory to Net Working Capital (Inventory/Net Working Capital)

The ratio explains the amount of inventory per rupee of equity / long-term financed portion of current assets. A higher ratio may mean greater amount of net working capital investment in inventory.

ANALYSIS, INTERPRITETION AND COMPERATIVE STUDY OF INVENTORY RATIOS:

(1) Size of the Inventory:

Table 4.1

<table>
<thead>
<tr>
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<td>0.40</td>
<td>0.36</td>
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</table>

Computed from annual reports

Five companies under studies have kept at different levels of inventory during the study period from 2000-01 to 2008-09. Table No.4.1 indicates a clear picture of inventory kept by the five companies. The size of inventory of all the cement companies shows fluctuating trend throughout the study period except UCL. That shows decreasing
trend. The minimum size of inventory in ACL is 0.037 (2006-07), GSCL is 0.24 (2002-03), SIL is 0.15 (2007-08), SCL is 0.16 (2007-08), SDCL is 0.27 (2008-09 and UCL is 0.00 (2000-01). The maximum size of inventory in ACL is 0.55 (2005-06), GSCL is 0.41 (2005-06), SIL is 0.38 (2000-01), SCL is 0.43 (2003-04), SDCL is 0.53 (2003-04) and UCL is 0.51 (2008-09).

Size of Inventory

Null Hypothesis:
There is no any significant difference in Size of Inventory cement units under study.

Alternative hypothesis:
There is significant difference in Size of Inventory cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table no.4.2

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<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
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<td>0.861452</td>
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</table>

Table No.4.2 showed the F calculated value > F critical (at 5% significance level),
the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Size of Inventory of cement companies does not differ significantly.

(2) Size of Raw Materials:

Table 4.3

<table>
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<td>0.74</td>
<td>0.81</td>
<td>0.92</td>
<td>0.92</td>
<td>0.80</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>n.a</td>
<td>1.12</td>
<td>1.05</td>
<td>0.94</td>
<td>0.90</td>
<td>1.08</td>
<td>1.05</td>
<td>0.77</td>
</tr>
<tr>
<td>Avg.</td>
<td>0.65</td>
<td>0.70</td>
<td>0.86</td>
<td>0.82</td>
<td>0.78</td>
<td>0.74</td>
<td>0.86</td>
<td>0.89</td>
<td>0.87</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Computed from annual reports

From cement companies under study have kept different level of raw material inventory during the study period from 2000-01 to 2008-09. Table 4.3 shows a clear picture of raw material inventory kept by the five companies. The size of raw material inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum size of raw material inventory in ACL is 0.74 (2000-01), GSCL is 0.44 (2000-01), SIL is 0.60 (2007-08), SCL is 0.77 (2000-01), SDCL is 0.67 (2001-02 and UCL is 0.00 (2000-01). The maximum size of inventory in ACL is 0.99 (2004-05), GSCL is 0.63 (2006-07), SIL is 1.18 (2002-03), SCL is 0.99 (2004-05), SDCL is 0.92 (2007-08) and UCL is 0.1.12 (2003-04).
Null Hypothesis: There is no any significant difference in Size of Raw Material inventory of cement units under study.

Alternative hypothesis: There is significant difference in Size of Raw Material inventory of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table no.4.4
Size of Raw Material inventory (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>0.33</td>
<td>8.00</td>
<td>0.04</td>
<td>0.66</td>
<td>0.72</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2.69</td>
<td>43.00</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.02</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.4 suggests that the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Size of Raw Material inventory of cement companies does not differ significantly.

(3) Size of Stores and Spare Inventory:

Table 4.5
Size of stores and spares inventory

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>0.97</td>
<td>0.98</td>
<td>1.44</td>
<td>1.54</td>
<td>1.60</td>
<td>2.12</td>
<td>2.77</td>
<td>3.88</td>
<td>6.57</td>
<td>2.43</td>
</tr>
<tr>
<td>GSCL</td>
<td>0.08</td>
<td>0.09</td>
<td>0.09</td>
<td>0.13</td>
<td>0.17</td>
<td>N.A</td>
<td>0.27</td>
<td>0.86</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>SIL</td>
<td>0.00</td>
<td>0.00</td>
<td>0.12</td>
<td>0.10</td>
<td>0.25</td>
<td>0.34</td>
<td>0.38</td>
<td>0.38</td>
<td>0.86</td>
<td>0.24</td>
</tr>
<tr>
<td>SCL</td>
<td>0.09</td>
<td>0.08</td>
<td>0.11</td>
<td>0.10</td>
<td>0.14</td>
<td>0.14</td>
<td>0.14</td>
<td>0.14</td>
<td>0.14</td>
<td>0.11</td>
</tr>
<tr>
<td>SDCL</td>
<td>0.11</td>
<td>0.18</td>
<td>0.17</td>
<td>0.08</td>
<td>0.19</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
<td>0.16</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>N.A</td>
<td>1.31</td>
<td>1.65</td>
<td>2.01</td>
<td>2.75</td>
<td>4.08</td>
<td>3.79</td>
<td>1.95</td>
</tr>
<tr>
<td><strong>Avg.</strong></td>
<td>0.21</td>
<td>0.22</td>
<td>0.38</td>
<td>0.55</td>
<td>0.63</td>
<td>0.78</td>
<td>1.05</td>
<td>1.73</td>
<td>1.97</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Computed from annual reports

From cement companies under study have kept different level of Size of stores and spares inventory during the study period from 2000-01 to 2008-09. Table 4.5 shows a clear picture of stores and spares inventory kept by the five companies. Of stores and spares inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum size of raw material inventory in ACL is 0.97 (2000-01), GSCL is 0.08 (2001-02), SIL is 0.10 (2003-04), SCL is 0.08 (2001-02), SDCL is 0.08 (2005-06) and
UCL is 0.00 (2000-01). The maximum size of inventory in ACL is 6.57 (2008-09), GSCL is 0.27 (2008-09), SIL is 0.86 (2008-09), SCL is 0.14 (2007-08), SDCL is 0.19 (2006-07) and UCL is 4.08 (2007-08).

**Size of stores and spares inventory**

![Chart-4.3](chart.png)

**Null Hypothesis:** There is no any significant difference in Size of stores and spares inventory of cement units under study.

**Alternative hypothesis:** There is significant difference in Size of stores and spare in inventory of cement units under study.

**Level of Significance: 5 percent**

**Critical value:** 2.16

**Degree of freedom:** 51

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>18.40</td>
<td>8.00</td>
<td>2.30</td>
<td>1.34</td>
<td>0.25</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>73.94</td>
<td>43.00</td>
<td>1.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>92.34</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.6 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Size of stores and spares inventory of cement companies does not differ significantly.
(4) Size of Work in Process Inventory:

Table 4.7

Size of work in process inventory

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>0.18</td>
<td>0.22</td>
<td>0.12</td>
<td>0.13</td>
<td>0.20</td>
<td>0.16</td>
<td>0.11</td>
<td>0.15</td>
<td>0.13</td>
<td>0.52</td>
</tr>
<tr>
<td>GSCL</td>
<td>0.24</td>
<td>0.40</td>
<td>0.14</td>
<td>0.15</td>
<td>0.13</td>
<td>0.21</td>
<td>0.11</td>
<td>n.b</td>
<td>0.09</td>
<td>0.04</td>
</tr>
<tr>
<td>SIL</td>
<td>0.19</td>
<td>0.18</td>
<td>0.12</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>SCL</td>
<td>0.26</td>
<td>0.12</td>
<td>0.21</td>
<td>0.20</td>
<td>0.19</td>
<td>0.22</td>
<td>0.13</td>
<td>0.13</td>
<td>0.29</td>
<td>0.05</td>
</tr>
<tr>
<td>SDCL</td>
<td>0.41</td>
<td>0.27</td>
<td>0.25</td>
<td>0.15</td>
<td>0.09</td>
<td>0.20</td>
<td>0.20</td>
<td>0.16</td>
<td>0.24</td>
<td>0.07</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>n.b</td>
<td>0.20</td>
<td>0.21</td>
<td>0.28</td>
<td>0.17</td>
<td>0.17</td>
<td>0.26</td>
<td>0.17</td>
</tr>
<tr>
<td>Avg.</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.14</td>
<td>0.20</td>
<td>0.28</td>
<td>0.23</td>
<td>0.40</td>
<td>0.54</td>
<td>0.23</td>
</tr>
</tbody>
</table>

Computed from annual reports

From cement companies under study have kept different level of Size of work in process inventory during the study period from 2000-01 to 2008-09. Table 4.7 indicates a clear picture of work in process inventory kept by the five companies. Of work in process inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum size of raw material inventory in ACL is 0.11 (2006-07), GSCL is 0.11 (2006-07), SIL is 0.00 (2004-05, 2005-06, 2006-07), SCL is 0.13 (2006-07), SDCL is 2004-05 (2005-06) and UCL is 0.00(2000-01). The maximum size of inventory in ACL is 0.22 (2001-02), GSCL is 0.40 (2001-02), SIL is 0.19 (2000-01), SCL is 0.26 (2000-01), SDCL is 0.41 (2000-01) and UCL is 0.28 (2005-06).

Size of work in process inventory

Null Hypothesis: There is no any significant difference in Size of work in process inventory of cement units under study.

Alternative hypothesis: There is significant difference in Size of work in process inventory of cement units under study.
Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>0.05</td>
<td>8.00</td>
<td>0.01</td>
<td>0.68</td>
<td>0.71</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>0.41</td>
<td>43.00</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.46</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.8 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Size of work in process inventory of cement companies does not differ significantly.

(5) Size of Finished Goods Inventory:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>0.12</td>
<td>0.12</td>
<td>0.14</td>
<td>0.14</td>
<td>0.09</td>
<td>0.11</td>
<td>0.09</td>
<td>0.09</td>
<td>0.08</td>
<td>0.11</td>
</tr>
<tr>
<td>GSCL</td>
<td>0.33</td>
<td>0.03</td>
<td>0.22</td>
<td>0.28</td>
<td>0.34</td>
<td>0.24</td>
<td>0.32</td>
<td>n.a</td>
<td>0.1152</td>
<td>0.23</td>
</tr>
<tr>
<td>SIL</td>
<td>0.21</td>
<td>0.24</td>
<td>0.08</td>
<td>0.49</td>
<td>0.55</td>
<td>0.43</td>
<td>0.28</td>
<td>0.42</td>
<td>0.13</td>
<td>0.32</td>
</tr>
<tr>
<td>SCL</td>
<td>0.20</td>
<td>0.12</td>
<td>0.10</td>
<td>0.10</td>
<td>0.11</td>
<td>0.18</td>
<td>0.19</td>
<td>0.21</td>
<td>0.21</td>
<td>0.15</td>
</tr>
<tr>
<td>SDCL</td>
<td>0.08</td>
<td>0.12</td>
<td>0.11</td>
<td>0.11</td>
<td>0.21</td>
<td>0.18</td>
<td>0.11</td>
<td>0.15</td>
<td>0.09</td>
<td>0.13</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>n.a</td>
<td>0.1851</td>
<td>0.17</td>
<td>0.16</td>
<td>0.14</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>Avg.</td>
<td>0.16</td>
<td>0.11</td>
<td>0.13</td>
<td>0.22</td>
<td>0.25</td>
<td>0.21</td>
<td>0.19</td>
<td>0.19</td>
<td>0.12</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Computed from annual reports

From cement companies under study have kept different level of Size of finished goods inventory during the study period from 2000-01 to 2008-09. Table 4.9 shows a clear picture of work of process inventory kept by the five companies. Of finished goods inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum size of finished goods inventory in ACL is 0.09 (2006-07, 2004-05), GSCL is 0.03 (2001-02), SIL is 0.08 (2002-03), SCL is 0.10 (2003-04), SDCL is 0.09 (2008-09) and UCL is 0.00 (2000-01). The maximum size of finished goods inventory in ACL is 0.14 (2003-04), GSCL is 0.34 (2004-05), SIL is 0.55 (2004-05), SCL is 0.21 (2008-09), SDCL is 0.15 (2007-08) and UCL is 0.1851 (2003-04).
Null Hypothesis: There is no any significant difference in Size of finished goods inventory of cement units under study.

Alternative hypothesis: There is significant difference in Size of finished goods inventory of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No.4.10
Size of finished goods inventory (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>0.11</td>
<td>8.00</td>
<td>0.01</td>
<td>1.05</td>
<td>0.41</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>0.57</td>
<td>43.00</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.68</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.10 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Size of finished goods inventory of cement companies does not differ significantly.

(7) Raw Materials Turnover:
The ratio explains variations in the level of investment. An increase in inventory levels, substantially beyond that which might be expected from an increase in sales, may reflect such phenomena as the result of a conscious policy shift to higher stock levels, of unintended accumulation of unsold stocks, and of inventory speculation, or simply stocking in anticipation of an almost certain surge of orders.
Table No. 4.11 Raw materials turnover

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>1.17</td>
<td>1.4</td>
<td>1.29</td>
<td>1.46</td>
<td>1.42</td>
<td>1.56</td>
<td>2.74</td>
<td>2</td>
<td>1.72</td>
</tr>
<tr>
<td>GSCL</td>
<td>0.77</td>
<td>1.21</td>
<td>1.25</td>
<td>1.49</td>
<td>1.14</td>
<td>1.37</td>
<td>1.46</td>
<td>n.b</td>
<td>1.75</td>
</tr>
<tr>
<td>SIL</td>
<td>10.74</td>
<td>6.98</td>
<td>2.07</td>
<td>3.09</td>
<td>3.93</td>
<td>3.62</td>
<td>2.73</td>
<td>2.6</td>
<td>1.21</td>
</tr>
<tr>
<td>SCL</td>
<td>1.11</td>
<td>1.08</td>
<td>1.62</td>
<td>1.41</td>
<td>1.67</td>
<td>1.9</td>
<td>2.33</td>
<td>2.44</td>
<td>4.74</td>
</tr>
<tr>
<td>SDCL</td>
<td>1.12</td>
<td>1.89</td>
<td>2.15</td>
<td>2.04</td>
<td>1.24</td>
<td>3.43</td>
<td>3.32</td>
<td>2.16</td>
<td>2.32</td>
</tr>
<tr>
<td>UCL</td>
<td>NA</td>
<td>Err</td>
<td>NA</td>
<td>NA</td>
<td>2.89</td>
<td>2.62</td>
<td>3.18</td>
<td>2.68</td>
<td>2.79</td>
</tr>
<tr>
<td>Avg.</td>
<td>2.982</td>
<td>2.512</td>
<td>1.676</td>
<td>1.898</td>
<td>2.0483</td>
<td>2.4167</td>
<td>2.6267</td>
<td>2.376</td>
<td>2.4217</td>
</tr>
</tbody>
</table>

Computed from annual reports

Raw materials turnover selected cement companies from 2000-01 to 2008-09 are shown in the Table. No. 4.11 Raw materials turnover ACL showed fluctuating trend with an average of 1.65. The ratio was 1.17 in 2000-01 and it went up to 2.74 in 2006-07. The ratio was the higher of 2.74 in 2007-08 and the lowest was in 1.17 in 2000-01. The Raw materials turnover of GSCL ranged between 0.77 in 2000-01 and 1.75 in 2008-09. The ratio was on an average of 1.305. The ratio of SIL ranged between 10.74 in 2000-01 and 2.07 in 2002-03 with an average of 4.1078. The ratio of SCL was showing fluctuating trend throughout the study period with an average of 2.033. The ratio SDCL was also indicating highly fluctuating trend with an average of 2.19. The range was 1.12 and 3.43 during the study period. Raw materials turnover ratio of UCL was minimal of 2.62 during the year of 2005-06 and 3.18 during the year of 2006-07 with an average of 2.81.

**Raw materials turnover**

![Chart 4.6](image-url)
Null Hypothesis: There is no any significant difference in Raw materials turnover Of cement units under study.

Alternative hypothesis: There is significant difference in Raw materials turnover Of cement units under study.

Level of Significance: 5 percent

Critical value: 2.16

Degree of freedom: 51

Table No.4.12
Raw materials turnover (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>6.47</td>
<td>8.00</td>
<td>0.81</td>
<td>0.26</td>
<td>0.98</td>
<td>2.18</td>
</tr>
<tr>
<td>Within Groups</td>
<td>124.82</td>
<td>40.00</td>
<td>3.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>131.29</td>
<td>48.00</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Table No.4.12 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Raw materials turnover of cement companies does not differ significantly.

(8) Finished Goods Turnover:

Table 4.13
Finished Goods Turnover

<table>
<thead>
<tr>
<th></th>
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<td>71.0</td>
<td>40.5</td>
<td>30.4</td>
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<tr>
<td>GSCL</td>
<td>8.6</td>
<td>7.3</td>
<td>6.5</td>
<td>6.2</td>
<td>8.0</td>
<td>14.2</td>
<td>17.4</td>
<td>NA</td>
<td>27.5</td>
<td>11.9</td>
</tr>
<tr>
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<td>4.9</td>
<td>4.0</td>
<td>12.4</td>
<td>26.3</td>
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<td>100.2</td>
<td>119.6</td>
<td>194.7</td>
<td>58.9</td>
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<td>SCL</td>
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<td>6.4</td>
<td>9.1</td>
<td>9.5</td>
<td>10.6</td>
<td>10.5</td>
<td>10.8</td>
<td>12.6</td>
<td>23.9</td>
<td>11.1</td>
</tr>
<tr>
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<td>8.0</td>
<td>11.9</td>
<td>11.4</td>
<td>14.2</td>
<td>17.9</td>
<td>19.1</td>
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<td>Err</td>
<td>NA</td>
<td>NA</td>
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<td>19.5</td>
<td>25.4</td>
<td>25.7</td>
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<td>23.0</td>
</tr>
<tr>
<td>Avg.</td>
<td>14.3</td>
<td>12.0</td>
<td>13.3</td>
<td>15.9</td>
<td>17.8</td>
<td>27.1</td>
<td>40.4</td>
<td>43.5</td>
<td>54.6</td>
<td>26.5</td>
</tr>
</tbody>
</table>

Computed from annual reports

From cement companies under study have kept different level of Finished Goods Turnover during the study period from 2000-01 to 2008-09. Table No. 4.13 gives a clear
picture of Finished Goods Turnover kept by the five companies. Finished Goods Turnover of all the cement companies shows fluctuating trend throughout the study period. The minimum Finished Goods Turnover in ACL is 30.4 (2008-09), GSCL is 6.2 (2003-04), SIL is 4.0 (2002-03), SCL is 6.4 (2001-02), SDCL is 8.0 (2001-02) and UCL is 15.1 (2004-05). The maximum Finished Goods Turnover in ACL is 48.4 (2005-06), GSCL is 27.5 (2008-09), SIL is 194.7 (2008-09), SCL is 23.9 (2008-09), SDCL is 21.8 (2008-09) and UCL is 29.5 (2008-09).

**Finished Goods Turnover**

![Chart 4.7](image)

Null Hypothesis: There is no any significant difference in Finished Goods Turnover Of cement units under study.

Alternative hypothesis: There is significant difference in Finished Goods Turnover Of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

<table>
<thead>
<tr>
<th>Table No.4.14</th>
<th>Finished Goods Turnover (ANOVA Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source of Variation</strong></td>
<td><strong>SS</strong></td>
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<tr>
<td>Between Groups</td>
<td>6.47</td>
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<tr>
<td>Within Groups</td>
<td>124.82</td>
</tr>
<tr>
<td>Total</td>
<td>131.29</td>
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</table>
Table No. 4.14 shows the F calculated value $> F$ critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded that Finished Goods Turnover of cement companies does not differ significantly.

(9) Stores and Spares Part Inventory Turnover:

Table no. 4.15

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>GSCL</td>
<td>17.59</td>
<td>19.59</td>
<td>19.60</td>
<td>17.60</td>
<td>15.87</td>
<td>25.39</td>
<td>26.50</td>
<td>NA</td>
<td>23.99</td>
<td>20.77</td>
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<tr>
<td>SIL</td>
<td>552.81</td>
<td>684.44</td>
<td>4.13</td>
<td>17.36</td>
<td>38.51</td>
<td>25.94</td>
<td>25.57</td>
<td>24.48</td>
<td>10.21</td>
<td>153.72</td>
</tr>
<tr>
<td>SCL</td>
<td>21.79</td>
<td>24.00</td>
<td>25.52</td>
<td>19.49</td>
<td>22.05</td>
<td>22.23</td>
<td>29.73</td>
<td>32.14</td>
<td>55.24</td>
<td>28.02</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>NA</td>
<td>20.62</td>
<td>18.49</td>
<td>18.83</td>
<td>19.93</td>
<td>15.41</td>
<td>18.89</td>
<td>18.08</td>
</tr>
<tr>
<td><strong>Avg.</strong></td>
<td>125.82</td>
<td>150.75</td>
<td>14.56</td>
<td>16.33</td>
<td>19.26</td>
<td>23.02</td>
<td>23.74</td>
<td>20.96</td>
<td>23.01</td>
<td>46.38</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

Stores and spares part inventory turnover selected cement companies from 2000-01 to 2008-09 are shown in the Table. No. 4.15 Stores and spares part inventory ACL showed fluctuating trend with an average of 14.84. The ratio was 13.37 in 2000-01 and it went up to 14.78 in 2001-02. The ratio was the highest of 25.32 in 2006-07 and the lowest was in 10.99 in 2000-01. The Stores and spares part inventory turnover of GSCL ranged between 15.87 in 2004-05 and 684.44 in 2001-02. The ratio was on an average of 20.77. The ratio of SIL ranged between 4.13 in 2002-03 and 2.07 in 2002-03 with an average of 153.72. The ratio of SCL was showing fluctuating trend throughout the study period with an average of 28.02. The ratio SDCL was also indicating highly fluctuating trend with an average of 16.13. The range was 6.28 and 31.48 during the study period. Stores and spares part inventory turnover ratio of UCL was minimal of 15.41 during the year of 2007-08 and 20.62 during the year of 2003-04 with an average of 18.08.
Stores and spares part inventory turnover

Null Hypothesis: There is no any significant difference in Stores and spares part inventory turnover of cement units under study.

Alternative hypothesis: There is significant difference in Stores and spares part inventory turnover of cement units under study.

Level of Significance: 5 percent

Critical value: 2.16

Degree of freedom: 51

Table No.4.16

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>85017.69</td>
<td>8.00</td>
<td>10627.21</td>
<td>0.74</td>
<td>0.66</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>619070.08</td>
<td>43.00</td>
<td>14396.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>704087.78</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.16 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Stores and spares part inventory turnover of cement companies does not differ significantly.
(10) Work in Progress Turnover:

Table No. 4.17

Work in progress turnover

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>49.29</td>
<td>40.47</td>
<td>61.85</td>
<td>69.83</td>
<td>44.37</td>
<td>60.81</td>
<td>153.04</td>
<td>74.43</td>
<td>59.09</td>
<td>41.50</td>
</tr>
<tr>
<td>GSCL</td>
<td>30.34</td>
<td>26.18</td>
<td>82.92</td>
<td>61.73</td>
<td>59.70</td>
<td>61.69</td>
<td>130.08</td>
<td>n.a</td>
<td>206.94</td>
<td>11.90</td>
</tr>
<tr>
<td>SIL</td>
<td>44.90</td>
<td>30.95</td>
<td>14.36</td>
<td>435.82</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>58.90</td>
</tr>
<tr>
<td>SCL</td>
<td>27.59</td>
<td>92.45</td>
<td>46.89</td>
<td>44.62</td>
<td>49.36</td>
<td>42.76</td>
<td>67.50</td>
<td>94.66</td>
<td>69.55</td>
<td>11.10</td>
</tr>
<tr>
<td>SDCL</td>
<td>16.06</td>
<td>21.62</td>
<td>28.32</td>
<td>42.22</td>
<td>44.53</td>
<td>80.12</td>
<td>43.37</td>
<td>45.74</td>
<td>33.66</td>
<td>13.30</td>
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<tr>
<td>UCL</td>
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<td>0.00</td>
<td>0.00</td>
<td>61.11</td>
<td>51.52</td>
<td>35.72</td>
<td>72.54</td>
<td>61.41</td>
<td>40.46</td>
<td>23.00</td>
</tr>
<tr>
<td>Avg.</td>
<td>14.30</td>
<td>12.00</td>
<td>13.30</td>
<td>15.90</td>
<td>17.80</td>
<td>27.10</td>
<td>40.40</td>
<td>43.50</td>
<td>54.60</td>
<td>26.50</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of Work in progress turnover during the study period from 2000-01 to 2008-09. Table No. 4.17 gives a clear picture of Work in progress turnover kept by the five companies. In progress turnover of all the cement companies shows fluctuating trend throughout the study period. The minimum in progress turnover in ACL is 40.47 (2001-02), GSCL is 26.18 (2001-02), SIL is 14.36 (2002-03), SCL is 27.59 (2001-02), SDCL is 45.74 (2007-08) and UCL is 40.46 (2008-09). The maximum Finished Goods Turnover in ACL is 153.04 (2008-09), GSCL is 206.94 (2008-09), SIL is 435.82 (2003-04), SCL is 94.66 (2007-08), SDCL is 45.74 (2007-08) and UCL is 72.54 (2006-07).

Chart 4.9

Null Hypothesis: There is no any significant difference in Work in progress turnover of
Alternative hypothesis: There is significant difference in Work in progress turnover of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No.4.18
Work in progress turnover (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>38434.85</td>
<td>8</td>
<td>4804.36</td>
<td>1.14</td>
<td>0.35</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>185011.86</td>
<td>44</td>
<td>4204.82</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>223446.71</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.18 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Work in progress turnover of cement companies does not differ significantly.

(11) Raw Materials Holding Period:

Table No. 4.19 Raw material holding period

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</thead>
<tbody>
<tr>
<td>ACL</td>
<td>187.83</td>
<td>207.18</td>
<td>187.73</td>
<td>192.2</td>
<td>171.64</td>
<td>102.64</td>
<td>147.62</td>
<td>175.9</td>
<td>175.07</td>
<td></td>
</tr>
<tr>
<td>GSCL</td>
<td>234.2</td>
<td>202.9</td>
<td>208.81</td>
<td>181.36</td>
<td>227.23</td>
<td>172.01</td>
<td>157.34</td>
<td>NA</td>
<td>143.82</td>
<td>190.07</td>
</tr>
<tr>
<td>SIL</td>
<td>33.98</td>
<td>52.26</td>
<td>176.61</td>
<td>118.05</td>
<td>92.88</td>
<td>100.91</td>
<td>133.8</td>
<td>140.54</td>
<td>302.65</td>
<td>127.96</td>
</tr>
<tr>
<td>SCL</td>
<td>233.81</td>
<td>238.5</td>
<td>170.24</td>
<td>204.47</td>
<td>179.61</td>
<td>162.28</td>
<td>141.53</td>
<td>132.22</td>
<td>69.35</td>
<td>169.71</td>
</tr>
<tr>
<td>SDCL</td>
<td>204.65</td>
<td>193.49</td>
<td>169.68</td>
<td>178.91</td>
<td>293.31</td>
<td>106.26</td>
<td>109.88</td>
<td>169.29</td>
<td>157.54</td>
<td>175.89</td>
</tr>
<tr>
<td>UCL</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>126.3</td>
<td>139.58</td>
<td>114.64</td>
<td>136.12</td>
<td>130.92</td>
<td>92.51</td>
</tr>
<tr>
<td>Avg.</td>
<td>14.30</td>
<td>12.00</td>
<td>13.30</td>
<td>15.90</td>
<td>17.80</td>
<td>27.10</td>
<td>40.40</td>
<td>43.50</td>
<td>54.60</td>
<td>26.54</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of Raw materials holding period during the study period from 2000-01 to 2008-09. Table No. 4.19 indicates a clear picture of Raw material holding period kept by the five companies. In Raw materials holding period of all the cement companies shows fluctuating trend throughout the study period. The minimum in progress turnover in ACL is 102.64 (2006-07,) GSCL is 143.82 (2008-09), SIL is 33.98 (2000-01), SCL is 69.35 (2008-09), SDCL is 106.26 (2005-
06) and UCL is 126.3 (2004-05). The maximum Raw material holding period in ACL is 202.9 (2000-01), GSCL is 234.2 (2000-01), SIL is 302.65 (2008-09), SCL is 233.85 (2001-02), SDCL is 204.65 (2000-01) and UCL is 139.58 (2005-06).

Chart 4.10

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>19621.02</td>
<td>8.00</td>
<td>2452.63</td>
<td>0.61</td>
<td>0.77</td>
<td>2.17</td>
</tr>
<tr>
<td>Within Groups</td>
<td>169642.56</td>
<td>42.00</td>
<td>4039.11</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>189263.58</td>
<td>50.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.20 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Raw materials holding period of cement companies does not differ significantly.
(12) Finished Goods Holding Period:

Table No 4.21

Finished Goods holding period

<table>
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<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>7.27</td>
<td>5.81</td>
<td>6.86</td>
<td>6.54</td>
<td>5.36</td>
<td>4.47</td>
<td>2.5</td>
<td>3.25</td>
<td>4.07</td>
<td>5.13</td>
</tr>
<tr>
<td>GSCL</td>
<td>15.27</td>
<td>6.72</td>
<td>3.79</td>
<td>8.23</td>
<td>11.67</td>
<td>8.84</td>
<td>7.49</td>
<td>n.a</td>
<td>4.13</td>
<td>8.27</td>
</tr>
<tr>
<td>SIL</td>
<td>9.47</td>
<td>14.8</td>
<td>18.54</td>
<td>18.25</td>
<td>13.95</td>
<td>12.59</td>
<td>9.44</td>
<td>10.27</td>
<td>10.14</td>
<td>13.05</td>
</tr>
<tr>
<td>SCL</td>
<td>7.54</td>
<td>6.4</td>
<td>3.29</td>
<td>3.74</td>
<td>3.42</td>
<td>4.58</td>
<td>6.33</td>
<td>5.76</td>
<td>3.5</td>
<td>4.95</td>
</tr>
<tr>
<td>SDCL</td>
<td>4.26</td>
<td>5.99</td>
<td>5.85</td>
<td>5.61</td>
<td>14.46</td>
<td>7.34</td>
<td>4.8</td>
<td>6.81</td>
<td>5.67</td>
<td>6.75</td>
</tr>
<tr>
<td>UCL</td>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>5.99</td>
<td>5.91</td>
<td>4.8</td>
<td>4.1</td>
<td>3.81</td>
<td>3.52</td>
</tr>
<tr>
<td><strong>Avg.</strong></td>
<td>14.30</td>
<td>12.00</td>
<td>13.30</td>
<td>15.90</td>
<td>17.80</td>
<td>27.10</td>
<td>40.40</td>
<td>43.50</td>
<td>54.60</td>
<td>26.54</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of finished goods holding period during the study period from 2000-01 to 2008-09. Table No 4.21 indicates a clear picture of finished holding period kept by the five companies. In Finished goods holding period of all the cement companies shows fluctuating trend throughout the study period. The minimum Finished goods holding period in ACL is 2.5 (2006-07), GSCL is 3.79 (2002-03), SIL is 9.44 (2006-07), SCL is 3.29 (2002-03), SDCL is 4.26 (2000-01) and UCL is 4.1 (2007-08). The maximum Raw material holding period in ACL is 7.27 (2000-01), GSCL is 15.27 (2000-01), SIL is 18.54 (2002-03), SCL is 7.54 (2000-01), SDCL is 14.46 (2004-05) and UCL is 5.99 (2004-05).
Null Hypothesis: There is no any significant difference in finished holding period of cement units under study.

Alternative hypothesis: There is significant difference in finished holding period of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No.4.22
Finished Goods Holding Period (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>73.36</td>
<td>8.00</td>
<td>9.17</td>
<td>0.49</td>
<td>0.85</td>
<td>2.17</td>
</tr>
<tr>
<td>Within Groups</td>
<td>782.68</td>
<td>42.00</td>
<td>18.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>856.04</td>
<td>50.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.22 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Finished goods holding period of cement companies does not differ significantly.

(13) Work in Progress Holding Period:

Table No 4.23
Work in progress holding period

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>13.09</td>
<td>21.67</td>
<td>18.47</td>
<td>12.7</td>
<td>17.63</td>
<td>15.51</td>
<td>7.24</td>
<td>11.59</td>
<td>13.89</td>
</tr>
<tr>
<td>SIL</td>
<td>9.59</td>
<td>14.95</td>
<td>27.65</td>
<td>7.02</td>
<td>0.5</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>SCL</td>
<td>35.8</td>
<td>17.78</td>
<td>11.3</td>
<td>15.7</td>
<td>13.31</td>
<td>12.41</td>
<td>9.87</td>
<td>7.65</td>
<td>7.24</td>
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<tr>
<td>SDCL</td>
<td>42.25</td>
<td>51.5</td>
<td>24.5</td>
<td>19.37</td>
<td>15.83</td>
<td>7.55</td>
<td>12.76</td>
<td>14.67</td>
<td>14.62</td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>na</td>
<td>na</td>
<td>14.4</td>
<td>20.99</td>
<td>16.02</td>
<td>13.81</td>
<td>16.74</td>
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<tr>
<td>Avg.</td>
<td>14.30</td>
<td>12.00</td>
<td>13.30</td>
<td>15.90</td>
<td>17.80</td>
<td>27.10</td>
<td>40.40</td>
<td>43.50</td>
<td>54.60</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

Work in progress holding period of selected cement companies from 2000-01 to 2008-09 are shown in the Table No 4.23 Work in progress holding period ACL showed fluctuating trend with an average of 41.50. The ratio was 13.09 in 2000-01 and it went up
to 21.67 in 2001-02. The ratio was the highest of 21.67 in 2001-02 and the lowest was in 7.24 in 2006-07. The Work in progress holding period of GSCL ranged between 4.1 in 2008-09 and 24.38 in 2001-02. The ratio was on an average of 11.9. The ratio of SIL ranged between 0.00 in 2008-09 and 27.65 in 2002-03 with an average of 58.9. The ratio of SCL was showing fluctuating trend throughout the study period with an average of 11.1. The ratio SDCL was also indicating highly fluctuating trend with an average of 13.3. The range was 7.55 and 51.5 during the study period. Work in progress holding period ratio of UCL was minimal of 13.81 during the year of 2007-08 and 20.99 during the year of 2005-06 with an average of 23.

Null Hypothesis: There is no any significant difference in Work in progress holding period of cement units under study.

Alternative hypothesis: There is significant difference in Work in progress holding period of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No.4.24

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>73.36</td>
<td>8.00</td>
<td>9.17</td>
<td>0.49</td>
<td>0.85</td>
<td>2.17</td>
</tr>
<tr>
<td>Within Groups</td>
<td>782.68</td>
<td>42.00</td>
<td>18.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>856.04</td>
<td>50.00</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table No.4.24 shows the F calculated value > F critical (at 5% significance level), the
null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Work in progress holding period of cement companies does not differ significantly.

(14) Inventory Holding Period:

Table No 4.25

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>41</td>
<td>41</td>
<td>48</td>
<td>40</td>
<td>40</td>
<td>38</td>
<td>21</td>
<td>33</td>
<td>48</td>
<td>42</td>
</tr>
<tr>
<td>GSCL</td>
<td>50</td>
<td>34</td>
<td>31</td>
<td>38</td>
<td>46</td>
<td>28</td>
<td>26</td>
<td>n.a</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>SIL</td>
<td>44</td>
<td>64</td>
<td>212</td>
<td>61</td>
<td>26</td>
<td>52</td>
<td>22</td>
<td>27</td>
<td>42</td>
<td>59</td>
</tr>
<tr>
<td>SCL</td>
<td>52</td>
<td>34</td>
<td>37</td>
<td>41</td>
<td>40</td>
<td>38</td>
<td>43</td>
<td>30</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>SDCL</td>
<td>55</td>
<td>62</td>
<td>51</td>
<td>59</td>
<td>96</td>
<td>42</td>
<td>49</td>
<td>46</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>UCL</td>
<td>0.00</td>
<td>0.00</td>
<td>n.a</td>
<td>30</td>
<td>34</td>
<td>37</td>
<td>29</td>
<td>35</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Avg.</td>
<td>14</td>
<td>12</td>
<td>13</td>
<td>16</td>
<td>18</td>
<td>27</td>
<td>40</td>
<td>44</td>
<td>55</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of Inventory holding period during the study period from 2000-01 to 2008-09. Table No 4.25 indicates a clear picture of finished holding period kept by the five companies. In Inventory holding period of all the cement companies shows fluctuating trend throughout the study period. The minimum Inventory holding period in ACL is 21 (2006-07), GSCL is 20 (2008-09), SIL is 22 (2006-07), SCL is 18 (2002-03), SDCL is 23 (2000-01) and UCL is 29 (2006-07). The maximum Inventory holding period in ACL is 48 (2002-03), GSCL is 50 (2000-01), SIL is 212 (2002-03), SCL is 52 (2000-01), SDCL is 96 (2004-05) and UCL is 37 (2005-06).
**Null Hypothesis:** There is no any significant difference in Inventory holding period of cement units under study.

**Alternative hypothesis:** There is significant difference in Inventory holding period of cement units under study.

**Level of Significance:** 5 percent

**Critical value:** 2.16

**Degree of freedom:** 51

<table>
<thead>
<tr>
<th>Table No.4.26</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory holding period (ANOVA Test)</strong></td>
</tr>
<tr>
<td><strong>Source of Variation</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Between Groups</td>
</tr>
<tr>
<td>Within Groups</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Table No.4.26 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Inventory holding period of cement companies does not differ significantly.

**15) Inventory turnover (cost of goods sold/ Average inventory)**

The ratio tells us the rapidity with which the inventory is turned over in to receivable through sales. Generally, the higher the inventory turnover, the more efficient the management of a firm is. However, a relatively high inventory turnover ratio may be the result of too low a level of inventory and frequent stock outs. Therefore, the ratio must be judged in relation to the past and expected future ratios of the firm and in relations of similar firms or the industry average or both.

<table>
<thead>
<tr>
<th>Table No.4.27</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory turnover</strong></td>
</tr>
<tr>
<td><strong>Comp /Year</strong></td>
</tr>
<tr>
<td>ACL</td>
</tr>
<tr>
<td>GSCL</td>
</tr>
<tr>
<td>SIL</td>
</tr>
<tr>
<td>SCL</td>
</tr>
<tr>
<td>SDCL</td>
</tr>
<tr>
<td>UCL</td>
</tr>
<tr>
<td>Avg.</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports
From cement companies under study have kept different level of Inventory turnover during the study period from 2000-01 to 2008-09. Table No.4.27 gives a clear picture of Inventory turnover kept by the five companies. In Inventory turnover of all the cement companies shows fluctuating trend throughout the study period. The minimum Inventory turnover in ACL is 7.55 (2008-09), GSCL is 7.34 (2000-01), SIL is 1.72 (2002-03), SCL is 7.05 (2000-01), SDCL is 3.8 (2004-05) and UCL is 10 (2008-09). The maximum Inventory turnover in ACL is 17.19 (2006-07), GSCL is 18.08 (2008-09), SIL is 16.58 (2006-07), SCL is 20.23 (2008-09), SDCL is 16.02 (2005-06) and UCL is 13 (2006-07).

**Null Hypothesis:** There is no any significant difference in Inventory turnover Of cement units under study.

**Alternative hypothesis:** There is significant difference in Inventory turnover Of cement units under study.

**Level of Significance:** 5 percent

**Critical value:** 2.16

**Degree of freedom:** 51

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>281.78</td>
<td>8.00</td>
<td>35.22</td>
<td>2.69</td>
<td>0.02</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>562.63</td>
<td>43.00</td>
<td>13.08</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>844.40</td>
<td>51.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.28 Inventory turnover (ANOVA Test)
Table No.4.28 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is rejected and alternative hypothesis is accepted and hence it is concluded Inventory turnover of cement companies does differ significantly.

(16) **Sales to inventory (annual net sales / inventory at end of fiscal period.)**

The ratio indicates the volume of sales in relation to the amount of capital invested in inventories. When inventory for a firm is larger in relation to sales (the condition which causes it to have lower net sales to inventory ratio than other firm) the firm's rate of return is less since it has more working capital tied up in inventories than has the firm with higher ratio.

**Table No.4.29**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>-0.73</td>
<td>1.97</td>
<td>0.81</td>
<td>3.82</td>
<td>35.92</td>
<td>2.08</td>
<td>0.88</td>
<td>1.17</td>
<td>1.00</td>
<td>5.21</td>
</tr>
<tr>
<td>GSCL</td>
<td>-0.59</td>
<td>-0.65</td>
<td>0.44</td>
<td>0.64</td>
<td>2.08</td>
<td>-28.24</td>
<td>0.86</td>
<td>n.a</td>
<td>37.07</td>
<td>1.45</td>
</tr>
<tr>
<td>SIL</td>
<td>3.51</td>
<td>0.49</td>
<td>-0.77</td>
<td>-1.08</td>
<td>9.58</td>
<td>0.33</td>
<td>0.27</td>
<td>0.23</td>
<td>0.72</td>
<td>1.48</td>
</tr>
<tr>
<td>SCL</td>
<td>-0.64</td>
<td>-0.28</td>
<td>-0.23</td>
<td>-0.17</td>
<td>-0.11</td>
<td>-0.13</td>
<td>-0.55</td>
<td>-3.05</td>
<td>-0.45</td>
<td>-0.62</td>
</tr>
<tr>
<td>SDCL</td>
<td>-1.01</td>
<td>-0.50</td>
<td>-0.40</td>
<td>-0.28</td>
<td>-0.85</td>
<td>-3.31</td>
<td>0.96</td>
<td>1.03</td>
<td>0.37</td>
<td>-0.44</td>
</tr>
<tr>
<td>UCL</td>
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<td>0.00</td>
<td>n.a</td>
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<td>1</td>
<td>1</td>
<td>-4</td>
<td>-20</td>
<td>-2.19</td>
</tr>
<tr>
<td>Avg.</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1</td>
<td>8</td>
<td>-5</td>
<td>1</td>
<td>-1</td>
<td>3</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of Sales to total inventory during the study period from 2000-01 to 2008-09. Table No.4.29 indicates a clear picture of Sales to total inventory kept by the five companies. In Sales to total inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum Sales to total inventory in ACL is -0.73 (2000-01), GSCL is -28.24 (2005-06), SIL is -1.08 (2003-04), SCL is -3.05 (2007-08), SDCL is -3.31 (2005-06) and UCL is -20 (2008-09). The maximum Sales to total inventory in ACL is 35.92 (2004-05), GSCL is 37.07 (2008-09), SIL is 9.58 (2004-05), SCL is -0.11 (2004-05), SDCL is 1.03 (2007-08) and UCL is 3.00 (2004-05).
Null Hypothesis: There is no any significant difference in Sales to total inventory of cement units under study.

Alternative hypothesis: There is significant difference in Sales to total inventory of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No. 4.30
Sales to total inventory (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>573.18</td>
<td>8.00</td>
<td>71.65</td>
<td>0.89</td>
<td>0.53</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>3445.67</td>
<td>43.00</td>
<td>80.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4018.85</td>
<td>51.00</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table No.4.30 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Sales to total inventory of cement companies does not differ significantly.

(17) Sundry creditor to inventory (Sundry creditor / inventory)

The ratio reveals the extent to which inventories are produced through credit purchases. Inventories for this purpose are assumed to include raw materials and stores and spares only. If the ratio is less than unity, it reveals that the credit available is lower than the total inventory required. It also explains the extent of inventory procured through cash
purchases. Indirectly it emphasizes the inventory financing policy of the firm. If the ratio is more than one, it explains that the entire inventory is purchased on credit.

Table No.4.31

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>0.86</td>
<td>1.04</td>
<td>0.54</td>
<td>0.61</td>
<td>0.85</td>
<td>0.70</td>
<td>1.08</td>
<td>0.99</td>
<td>0.94</td>
<td>0.846</td>
</tr>
<tr>
<td>GSCL</td>
<td>1.34</td>
<td>1.21</td>
<td>1.42</td>
<td>1.83</td>
<td>1.56</td>
<td>2.07</td>
<td>1.41</td>
<td>n.a</td>
<td>1.6471</td>
<td>1.561</td>
</tr>
<tr>
<td>SIL</td>
<td>0.26</td>
<td>0.40</td>
<td>1.17</td>
<td>0.94</td>
<td>0.33</td>
<td>0.32</td>
<td>0.57</td>
<td>0.54</td>
<td>0.54</td>
<td>0.563</td>
</tr>
<tr>
<td>SCL</td>
<td>1.10</td>
<td>1.80</td>
<td>1.46</td>
<td>1.24</td>
<td>1.84</td>
<td>1.44</td>
<td>0.92</td>
<td>0.57</td>
<td>0.89</td>
<td>1.251</td>
</tr>
<tr>
<td>SDCL</td>
<td>0.46</td>
<td>1.60</td>
<td>2.27</td>
<td>1.32</td>
<td>2.03</td>
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<td>0.32</td>
<td>0.64</td>
<td>0.54</td>
<td>1.268</td>
</tr>
<tr>
<td>UCL</td>
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<td>0.00</td>
<td>n.a</td>
<td>0.8205</td>
<td>0.787</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.701</td>
</tr>
<tr>
<td><strong>Avg.</strong></td>
<td>0.67</td>
<td>1.01</td>
<td>1.37</td>
<td>1.13</td>
<td>1.23</td>
<td>1.28</td>
<td>0.88</td>
<td>0.75</td>
<td>0.94</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Source: Computed from annual reports

From cement companies under study have kept different level of Sundry creditor to inventory during the study period from 2000-01 to 2008-09. Table No.4.31 indicates a clear picture of Sundry creditor to inventory kept by the five companies. In Sundry creditor to inventory of all the cement companies shows fluctuating trend throughout the study period. The minimum Sundry creditor to inventory in ACL is 0.54 (2002-03,) GSCL is 1.21 (2001-02), SIL is 0.26 (2000-01), SCL is 0.57 (2007-08), SDCL is 0.32 (2006-07) and UCL is 0.787 (2004-05). The maximum Sales to Sundry creditor to inventory in ACL is 1.08 (2006-07), GSCL is 2.07 (2005-06), SIL is 1.17 (2002-03), SCL is 1.84 (2004-05), SDCL is 2.27 (2002-03) and UCL is 1.00 (2008-09).

Sundry creditor to inventory

![Chart 4.16](image-url)
Null Hypothesis: There is no any significant difference in Sundry creditor to inventory of cement units under study.

Alternative hypothesis: There is significant difference in Sundry creditor to inventory of cement units under study.

Level of Significance: 5 percent
Critical value: 2.16
Degree of freedom: 51

Table No.4.32
Sundry creditor to inventory (ANOVA Test)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>F crit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2.63</td>
<td>8.00</td>
<td>0.33</td>
<td>1.09</td>
<td>0.39</td>
<td>2.16</td>
</tr>
<tr>
<td>Within Groups</td>
<td>12.99</td>
<td>43.00</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15.61</td>
<td>51.00</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Table No.4.32 shows the F calculated value > F critical (at 5% significance level), the null hypothesis is accepted and alternative hypothesis is rejected and hence it is concluded Sundry creditor to inventory of cement companies does not differ significantly.

*****
References:

10. R.S.Chadda, inventory management in India, (Bombay Allied Publishers, 1971.)
11. RS Chadda provides the following useful guidelines for selective control (Chadda R.S; Inventory management in India.)
13. S.Venu, Lokudyog (1972)