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INVENTORY MANAGEMENT
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INVENTORY MANAGEMENT

6.1 INTRODUCTION

Inventory measured in terms of money, constitutes an important element in the working capital of most business firms except financial ones. Their size and rate of turnover, therefore, influences greatly the size and rate of turnover of working capital ans through them, the income and profit of a business. Thus, inventory management is having considerable significance to all business firms.

L. R. Haward observed that

“The proper management and control of inventory not only solves the acute problem of liquidity but also increases annuals profits and causes substantial reduction in the working capital of the firm”.

Inventory form a link between production and sale of a product. Therefore, it is essential to have a sufficient level of investment in inventories.

D. Schall Lowrence and W. Haley Charles rightly remark,

“Managing the level of investment in inventory is like maintaining the level of water in a bath-tub with an open drain. The water is flowing out continuously. If water is let in too slowly, the tub is soon empty. If water is too fast, the tub overflows. Like the water in the tub, the particular items of inventories keep problems but the level may stay the same. 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 that level.”

6.2 MEANING OF INVENTORY MANAGEMENT

The dictionary meaning of word ‘inventory’ is ‘a detailed list of goods furniture,; etc. stock of goods”. Many understand the word ‘inventory’ as stock of goods. But, the generally accepted meaning of the word goods, in accounting language, it the stock of finished goods only. In a manufacturing firm, however, in addition to stock of finished goods, there will be stocks of partly finished goods, raw materials and stores. The collective name for all these items is “inventory”.

The terms refers “inventory” to the stockpile of the product which a firm is offering for sale and components that make up the product. In other words, inventory
is composed of assets that will be sold in future in the normal course of business operations. To expand the definition of inventory and make it applicable to manufacturing firm as well as merchandising firms, it can be stated that inventory means, the arrogate of those items of tangible personal property which:

1) Are held for sale in the ordinary course of business,
2) Are in the process of production for such sale, and
3) Are to be currently consumed in the production of goods or service to be available for sale.

In the present study, raw material, stores and spare parts, finished and semi-finished goods have been included in inventory. Paper companies in India have also included these items of inventories.

6.3 OBJECTIVES OF INVENTORY MANAGEMENT

The objective of inventory management consists of two counter-balancing parts:

(1) To meet a demand the firm’s investment in inventory and
(2) To meet a demand for the product by efficiently organising the firm’s production and sales operations.

According to I.M. Pandey:

“Both excessive and inadequate inventories are not desirable. Therefore optimum level of inventory will lie between the two danger points of excessive and inadequate inventories”.

In the words of L. R. Howard:

“The efficient management of inventories enables the industries to achieve better working results and reduction in working capital. An undertaking neglecting the management of inventories will be jeopardising its long-term profitability and may fail ultimately. It is possible for an undertaking to reduce its level of inventories to a considerable degree e.g. 10% to 20%, without any adverse affect on production and sales, by using simple inventory planning and control techniques”.

Thus, the aim of inventory management should be avoid excessive and inadequate levels of inventories and to maintain sufficient inventory for smooth production and sales operations. Efforts should be made to place an order duly with
the right sources to acquire the right quantity at the right price and quality. An effective management should.

- Ensure a continuous supply to materials to facilitate uninterrupted production.
- Maintain sufficient stock of raw materials in period of short supply and anticipate price changes.
- Maintain sufficient finished goods inventory for smooth sales operation and efficient customer service.
- Minimise the carrying costs and time.
- Control investment in inventories and keep it at an optimum level.

### 6.4 NEED TO HOLD INVENTORIES

The questions of managing inventories arise only when the company holds inventories. Maintaining inventories involves tying up of the company’s funds and storage and handling costs. If it is expensive to maintain inventories, why do the companies hold inventories? There are three general motives for holding inventories.

1. The transactions motive which emphasises the need to maintain inventories to facilitate smooth production and sales operations.
2. The precautionary motive which necessitates holding of inventories to guard against the risk of unpredictable change in demand and supply forces and other factors.
3. The speculative motive which influences the decision to increase or reduce inventory levels of take advantage of price fluctuations.

On an average above 40% of the current assets are appropriated by inventories of paper companies in India. The dominant position of inventories in working capital of paper companies in India obviously call for maximum efficiency and control of its management. It would, therefore, be relevant to throw light on each component of inventory of paper companies in India to find out the degree of their efficiency. The present chapter draws attrition to management of inventories in paper companies in India.

### 6.5 INVENTORY CONTROL
No inventory management can succeed in keeping down capital investment in inventories, inventory carrying charges and losses due to obsolescence and other causes unless it installs the modern method of scientific inventory control.

**In the words of P. K. Ghosh and G. S. Gupta:**

“Inventory control is concerned with acquisition, storage, handling and use of inventories so as to ensure the availability of inventory whenever needed, provide adequate cushion for contingencies and derive maximum economy and minimise wastage and losses”.

The efficiency of inventory control affects the flexibility of the firm. Two essentially identical firms with same amount of inventory may have significantly different degrees of flexibility in operations, owing to differences in inventory control. Inefficient procedures result in an unbalanced inventory some time out of stock, others overstocked necessitating excessive investment. These inefficiencies ultimately have an adverse effect upon profits. Turning the situation around differences in the efficiency of inventory control for a given level of flexibility affects the level of investment required in investment required. Similarly excessive investment in inventories reduces profits. Thus, the effect of inventory control on flexibility and on the level of investment required in inventories represent two sides of the same coin.

### 6.6 OTHER OBJECTS OF INVENTORY MANAGEMENT

The objectives of inventory control are:

- To minimise the possibility of delay in production through regular supply of raw materials, stores and spares, tools and other equipment and when required.
- To avoid unnecessary capital locked up in inventories, and
- To exercise economies in ordering, the obtaining and storing of materials

**L. R. Howard suggested:**

“Proper control of inventory not only solves the acute problem of liquidity but also increase the annual profit and causes substantial reduction in the working capital of the firm. Effective control on inventories is exercised by introducing various measures of inventory control, such as ABC analysis, recorder points ans a close watch on the movements of inventories”.

### 6.7 ABC ANALYSIS OF INVENTORIES
ABC analysis is a basic analytical technique for inventory management which enables top management to direct the effort where the result will be highest. This tool is popularly known as ‘Always Better Control’. This analysis classifies the inventories according to the importance of each component. Usually a firm has to maintain several types of inventories. It is not desirable to keep same degree of control on all the items. The firm should pay maximum attention to those items whose value is the highest. The firm should receive the most effort of the firm identify which items should receive the most effort of the firm in controlling. Thus, the firm should be selective in its approach to control investment in various types of inventories. The high value items are classified as “A items” and would be under the highest control. “C items” represent relatively least value and would be under simple control. “B items” fall in between these two categories and required reasonable attention of management. The ABC plan concentrates an important item and is also known as control by importance and exception.

**Figure 6.1:** ABC Analysis of Inventories

Mechanics of ABC analysis – Prasanna Chandra suggest the following procedure to be used for determining the three categories.

- Rank the items of inventory in a descending order, on the basis of their annual consumption value and number them 1 through n.
- Record the running cumulative totals of annual consumption value and express them as percentage of the total value of consumption.
Express each number in the list, 1 through n, as a percentage of n. (These percentages are actually cumulative percentages.)

Look at the cumulative percentages of consumption value against the cumulative percentages of number and classify items into three broad categories: A, B, and C.

The normal items in most of the organisation empirically show the following pattern:

Category A, representing the most important items generally consists of 15% to 25% of inventory items and accounts for 60% to 70% of annual usage value.

Category B, representing items of moderate importance generally consists of 20% to 30% of inventory items and accounts for 20% to 30% of annual usage value.

Category C, representing least important items generally consists of 40% to 60% of inventory items and accounts for 10% to 15% of annual usage value.

The purpose of ABC analysis: The object of carrying out ABC analysis is to develop policy guidelines for selective control. Normally, once ABC analysis has been done, the board policy guidelines mentioned in the chart as below can be established in respect of each category.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Item ‘A’</th>
<th>Item ‘B’</th>
<th>Item ‘C’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Very Strict</td>
<td>Moderate</td>
<td>Loose</td>
</tr>
<tr>
<td>Requirements</td>
<td>Accurate</td>
<td>Estimates based on past data</td>
<td>Rough estimates for planning</td>
</tr>
<tr>
<td>Posting</td>
<td>Individual</td>
<td>Individual</td>
<td>Group or none</td>
</tr>
<tr>
<td>Check</td>
<td>Close</td>
<td>Some</td>
<td>Little</td>
</tr>
<tr>
<td>Expediting</td>
<td>Regular</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>Safety stock</td>
<td>Very low</td>
<td>Medium</td>
<td>Large</td>
</tr>
</tbody>
</table>

### 6.8 ORDERING SYSTEM OF INVENTORIES

In managing inventories the firm’s objective should be in consonance with the wealth maximisation principle. To achieve this, the firm should determine the optimum level of inventory. Sufficient inventories should be maintained, neither excessive nor inadequate. Efficiently controlled inventories result in unbalanced
inventory and inflexibility the firm may be sometimes out of stock and sometimes may pile up unnecessary stocks. This increases the level of investment and makes the firm unprofitable.

To manage inventories efficiently and effectively answer should be sought to the following two questions:

Q – 1. How much should be ordered?
Q – 2. When should it be ordered?

The first question, how much to order, relates to the problem of determining economic order quantity (EOQ) and is answered with an analysis of the cost maintaining certain level of inventories. The second question, when to order, arises because of uncertainty and is a problem of determining the reorder point.

One basic problem of inventory control is: How much to order? To solve this problem many formulas and model have been developed. All inventory models, no matter how complex, address themselves to the problem of timing and magnitude of replenishment. There are three important system of ordering materials. They are:

- Economic Order Quantity (EOQ) System or Fixed Order Quantity System.
- Fixed Period Order System or Periodic Recording System or Periodic Review System or Replenishment System.
- Single Order and Scheduled Part-deliveries System.

**Economic Order Quantity (EOQ) System**

The economic order quantity is an important concept in the purchase of raw materials and in the storage of finished goods and in-transit inventories. In this system of ordering, the quantity to be ordered is determined with the help of ‘EOQ’ formula which takes into account three factors, viz,

a) Usage of the materials during the given period
b) Ordering cost; and
c) Carrying cost of inventory

The EOQ system strikes a balance between the ordering cost and carrying cost and suggested the optimal order quantity for which order should be placed. The economic order quantity is that inventory level which minimises the total of ordering and inventory costs.

**Ordering costs :-**
It includes use of stationery, postage, telephone and telegrams etc., and other clerical costs. In fact all the expenses of purchase department will be directly affected by the number of orders placed during a certain period. The main activities of purchase department which incur the ordering costs are requisitioning, purchasing, ordering, transporting, receiving, inspecting and storing.

In the purchase of raw materials or other items, these costs represent the clerical costs involved in placing an order as well as certain costs of receiving and checking the goods once they arrive. For finished-goods inventories, ordering costs involve scheduling a production run. For in-transit inventories, ordering costs are likely to involve nothing more than record keeping. The total ordering cost for a period is simply the number of orders for that period the cost per order.

**B. D. Khare suggested :-**

“the ordering cost is expressed as the cost per order and can be calculated by dividing the total ordering cost for a period by the number of orders placed in that period”.

**Carrying costs:- carrying costs of inventories include the followings**

1. Cost of interest of the money invested in inventories
2. Salaries and wages of employees assigned the duty to look after the receipt, issue and proper storage of the inventories
3. Expenses for the insurance of inventories.
4. Loss on account of obsolescence.
5. Rent of depreciation of go downs.
6. Repair and maintenance charges for equipment used in handling of inventories
7. Other miscellaneous expenses. Inventory carrying charges are proportional to the value of inventory.

Now the EOQ may be represented by the following formulas:

\[
EOQ = \sqrt{\frac{2AD}{C}}
\]

Where EOQ= Economic Order Quantity
A= Total annual requirements in terms of units
O= ordering cost per order in rupees
C= Inventory carrying cost per unit

The economic order quantity can also be shown graphically. Figure 6.2 illustrates the EOQ function. Show in the next page.

In the figure- 6.2 costs-carrying ordering and total are plotted on the vertical axis and the horizontal axis is used to represent the order size. It is clear from the figure that the total carrying costs increase as the order size increase and ordering costs decline with increase in order size because the larger order size means less number of orders. The total costs decline in the first instance, but start rising when the decrease in average ordering cost is more than off-set by the increase in carrying costs. The economic order quantity occurs at the point where the total cost is minimums.

According to Robert N. Anthony :

The technique of EOQ is an example of an old technique that has been made powerful by the addition of better rules for determining the relevant costs and for estimating the rates at which inventory will be used up. For the linear programming type of model that was first used for what is known as the ‘transportation problem’ is also considered to determining the EOQ model.
PERIODIC RECORDING SYSTEM

In this system, the quantity is reviewed periodically and order is placed for an quantity sufficient to replenish inventory. This system is more popular as Re-order point. “It is determined on the basis of requirement of materials during the review period and lead time plus safety stock. Review period is determined by keeping in view the terms and conditions of the suppliers and the average consumptions rate of the firm.

SINGLE ORDER AND SCHEDULED PART-DELIVERIES SYSTEM

In this system, a single order covers a firm’s requirements of materials for a longer period, say for six months or one year, with the instructions to supply materials in a number of instalments at specified intervals. This system ensures continuous supply of materials. The firm does not have to incur high ordering and carrying costs, nor does it have to make heavy investment in inventories. It also involves inconvenience of arranging space for storage. In fact the firm enjoys both the economics of scale and bulk order.

6.9 STRUCTURE OF INVENTORY

The structure of inventory is usually affected by the nature of the business of a firm. A trading firm will have small investment in raw materials, work in progress and stores and spares. A significant portion of its total inventory would consist of finished stock only. Public utilities may have high investment in stores and spares because they provide service. A manufacturing firm has to invest in each component of inventory, viz., raw materials, work in process, finished stock and stores spares. The share of each component in the total inventory varies from industry to industry. However, a proper level has to be maintained among all these components to exercise an effective control over inventories.

In the words of N. K. Agrawal

“All efforts of the management to control inventories should aim at maintaining various components of inventory at economic levels and in proper proportions”

In paper companies, inventory consists of the following four categories

1. Raw Materials
2. Stores and Spare Parts
3. Work-in-Process
4. Finished Goods

The structure of inventory can be analysed in two possible ways. Firstly the share of each component of inventory may be related to ‘aggregate inventory’ and secondly, appropriate indicators about adequacy or inadequacy of each type of inventories may be developed and applied to the actual position obtained in the paper companies. The results so obtained may be compared to the guide-posts set by them. By revealing the changing position of inventory in each paper company and for all the paper companies compositely, the first technique will show the point or segment where the inventory concentrated most, the second technique will, however, straightforwardly directed as to when and where the over stocking had made its on roads.

6.10 ADEQUACY OF INVENTORY

Inventories represent for most of the paper companies the largest single item of working capital and investment as well. Hold an inventory portion more then 60% of total current assets. However, it does not disclose whether the size of inventories kept by companies had been adequate, inadequate or excessive in relation to their requirements. The study group on bank credit observed that, “it was not the function of industry to carry stock in excess of what is required for current operations”

According to James C. Van Horne

“Inventories should be allowed to increase till the resulting saving exceed the total cost of holding the added inventory”.

Although, it is difficult to lay down a single standard to assess, in precise terms, the adequacy or otherwise of the inventory, there are certain ratio tests which provide a good insight into the extent or overstocking or under stocking.

Pareshnath Chattopadhyay is of the view that

“A common determinant is the value of inventory expressed into month’s cost or value of production”.

But in the view of John N. Myer
“The ratio of sales to inventory has sometimes been regarded as indicating the turnover of inventory, or the number of items the inventory is disposed off. Such an assumption however, is incorrect, because the amounts of the two times, as has been stated above, are not computed on the same basis. To obtain a more satisfactory measure of turnover of inventory, the cost of goods sold should be compared with inventory, preferably the average inventory. Here an attempt has been made through analysing inventory turnover ratio to judge the adequacy of inventory as maintained by Paper Companies in India.

6.11 INVENTORY TO WORKING CAPITAL RATIO:

- Meaning:
  This Ratio establishes a relationship between inventory and working capital.

- Objective:
  The objective of computing this ratio is to measure the amount of working capital invested in inventory.

- Components:
  1. Inventory: its refers to raw material, semi finished good and finished goods.
  2. Working Capital = current assets - current liabilities.

- Computation and interpretations:
  This ratio is computed by dividing the inventory and working Capital or net current Assets. This ratio is usually express as a pure ratio e.g. 3:1. In the form of a formula, this ratio may be express as follows:

\[
\text{Inventory to working Capital} = \frac{\text{Inventory}}{\text{Working Capital}}
\]

This ratio indicates that inventory should not over the working capital. Around three quarter i.e.0.75 times of working capital generally preferred. Thus, an enterprise should have neither a very high nor a very low ratio, it should have a satisfactory ratio. To judge whether the ratio is satisfactory or not, it should be compare with its own past ratio or with the ratio of similar firm in the same industry or with the industry average. The inventory to working capital of selected paper in India is given in the Table No-6.1 as follows:
The above mentioned Table No- 6.1 and Graph No- 6.1 show the indicated a fluctuating trends of the Inventory to working capital ratio of selected paper companies in India from 2005-2006 to 2011-2012.

1. International Andhra Pradesh Paper Mills Limited
The table no - 6.1 shows that the inventory to working capital ratio of the International Andhra Pradesh Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory to working capital ratio is 21.67 times in the year 2011 –’12 and the lowest inventory to working capital ratio is 0.97 times in the year of 2009 –’10.

In the year 2005 –’06 the inventory to working capital ratio was 7.25 times, it has been decreased in 2006 –’07 to 2007 –’08 as 1.60 times and 1.21 times which is shown in above table no - 6.1. But in the year 2008 –’09 the inventory to working capital ratio has been increased and reached 1.71 times and in 2009 –’10 it has been decreased and reached at lowest as 0.97 times, then after inventory to working capital ratio has been increased in 2010 –’11 and reached at 1.46 times in selected study period. But the last year of the study period it has been increased and reached 21.67 times in 2011 –’12. It has been also shown in graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 5.12 times, the standard deviation (S.D) is 7.62 times and co-efficient variance (C.V) is 148.76% which is shown in table no - 6.1. Which solvency of International Andhra Pradesh Paper Mills limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

2. Ballarpur Paper Mills Limited

The table no - 6.1 shows that the inventory to working capital ratio of the Ballarpur Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory to working capital ratio is 2.34 times in the year 2011 –’12 and the lowest inventory to working capital ratio is 0.12 times in the year of 2007 –’08.

In the year 2005 –’06 the inventory to working capital ratio was 0.30 times, it has been increased in 2006 –’07 and reached at 0.35 times, it has been decreased in 2007 –’08 and reached at lowest point as 0.12 times. But then after the inventory to working capital ratio continuously increased from 2008 –’09 to 2011 –’12 to 0.13 times, 0.44 times, 0.64 times and 2.34 times for the last four year respectively. It has been also shown in graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 0.62 times, the standard deviation (S.D) is 0.78 times and co-efficient variance (C.V) is 126.50% which is shown in table no - 6.1. Which solvency of Ballarpur Paper Mills limited
because the average inventory to working capital ratio shows satisfactory ratio during the study period.

3. **JK Paper Mills Limited**

   The table no - 6.1 shows that the inventory to working capital ratio of the J. K. Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory to working capital ratio is 0.98 times in the year 2011 –’12 and the lowest inventory to working capital ratio is 0.39 times in the year of 2005 –’06.

   In the year 2005 –’06 the inventory to working capital ratio was 0.39 times and it has been increased in 2006 –’07 to 0.46 times, but it has been increased as 0.51 times in 2007 –’08. In 2008 –’09 it has been also decreased to 0.44 times. In the year 2009 –’10 to 2011 –’12 the inventory to working capital ratio shows in the table continuously increased & decreased as 0.59 times, 0.55 times and 0.98 times respectively. It has been also shown in the graph no – 6.1.

   So, the average (AVG.) inventory to working capital ratio is 0.56 times, the standard deviation (S.D) is 0.20 times and co-efficient variance (C.V) is 35.50% which is shown in table no - 6.1. Which solvency of J. K. Paper Mills Limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

4. **Orient Paper and Industries Limited**

   The table no - 6.1 shows that the inventory to working capital ratio of the Orient Paper and Industries Limited during the study period form 2005 –’06 to 2011 –’12, the maximum inventory to working capital ratio is 0.96 times in the year 2008 –’09 and the minimum inventory to working capital ratio is-10.90 times in the year of 2011 –’12.

   In the present the table no - 6.1 shows the inventory to working capital ratio of Orient Paper and Industries Limited is fluctuating in the whole study period. In 2005 –’06 inventory to working capital ratio was 0.65 times and it has been increased and decreased from 2006 –’07 to 2011 –’12 as 0.62 times, 0.63 times 0.96 times, 0.82 times, 0.64 times, and -10.90 times respectively . It has been also shown in graph no – 6.1.

   So, the average (AVG.) inventory to working capital ratio is -0.94 times, the standard deviation (S.D) is 4.40 times and co-efficient variance (C.V) is -467.63% which is shown in table no - 6.1 are. Which solvency of Orient Paper and Industries
Limited because of the average inventory to working capital ratio shows
dissatisfactory ratio during the study period.

5. Seshasayee Paper and Boards Limited

The table no - 6.1 shows that the inventory to working capital ratio of the
Seshasayee Paper and Boards Limited during the study period form 2005 –’06 to
2011 –’12, the maximum inventory to working capital ratio is 5.67 times in the year
2011 –’12 and the minimum inventory to working capital ratio is 0.17 times in the
year of 2010 –’11.

In the table no - 6.1 shows the inventory to working capital ratio of
Seshasayee Paper and Boards Limited has been fluctuated. It was 0.96 times in 2005-
’06 and it has been continuously decreased next year and reached as 0.73 times in
2006 –’07, but it has been increased at 1.02 times in 2007 –’08, it has been decreased
in 2008 –’09 and reached at 0.73 times, it has been again decreased for next two year
and reached at 0.39 times and at 0.17 times in 2009 –’10 and 2010 –’11. Then after
the next year of the study period it has been up-lifted as 5.67 times in 2011 –’12. It
has been also shown in graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 1.38 times, the
standard deviation (S.D) is 1.91 times and co-efficient variance (C.V) is 138.43%
which is shown in table no - 6.1. Which solvency of Seshasayee Paper and Boards
Limited because of the average inventory to working capital ratio shows satisfactory
ratio during the study period.


The table no - 6.1 shows that the inventory to working capital ratio of the
Sirpur Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the
maximum inventory to working capital ratio is 98.00 times in the year 2005 –’06 and
the minimum inventory to working capital ratio is -3.49 times in the year of 2007 –
’08.

In the year 2005 –’06 the inventory to working capital ratio was 98.00 times.
Inventory to working capital ratio has been decreased 1.57 times in 2006 –’07 and it is
dercreased as -3.49 times in 2007 –’08. it has been increased in 2008 –’09 at 1.31
times but, again inventory to working capital ratio has been decreased from 2009 –’10
in 1.16 times. It has been increased in last year for the study period form 2010 –’11
as 3.02 times and 2011 –’12 as -2.56 times. It has been also shown in the graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 14.14 times, the standard deviation (S.D) is 37.05 times and co-efficient variance (C.V) is 261.97% which is shown in table no - 6.1. Which solvency of Sirpur Paper Mills Limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

7. South India Paper Mills Limited

The table no - 6.1 and graph no – 6.1 shows that the inventory to working capital ratio of the South India Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory to working capital ratio is 0.91 times in the year 2011 –’12 and the minimum inventory to working capital ratio is 0.40 times in the year of 2008 –’09.

In the table no - 6.1 shows the inventory to working capital ratio of South India Paper Mills Limited. In the year form 2005 – ’06 inventory to working capital ratio was as 0.55 times. It has been decreased in year 2006 –’07 as 0.42 times. But the next year it has been increased as 0.47 times in 2007 –’08. But 2008 –’09 to 2011 – ’12, It has been increased during this study period as 0.40 times, 0.49 times, 0.53 times, and 0.91 times respectively. It has been also shown in graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 0.54 times, the standard deviation (S.D) is 0.17 times and co-efficient variance (C.V) is 31.85% which is shown in table no - 6.1. Which solvency of South India Paper Mills Limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

8. Star Paper Mills Limited

The table no - 6.1 shows that the inventory to working capital ratio of the Star Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory to working capital ratio is 40.56 times in the year 2009 –’10 and the minimum inventory to working capital ratio is -4.05 times in the year of 2005 –’06.

The table no - 6.1 shows the inventory to working capital ratio has been increased & decreased from 2005 – ’06 to 2011 –’12 as -4.05 times, 3.03 times, 2.66 times, 2.42 times, 40.56 times, 6.05 times and -1.04 times respectively. It has been also shown in graph no – 6.1.
So, the average (AVG.) inventory to working capital ratio is 7.09 times, the standard deviation (S.D) is 15.11 times and co-efficient variance (C.V) is 213.06% which is shown in table no - 6.1. Which solvency of Star Paper Mills limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.


The table no - 6.1 shows that the inventory to working capital ratio of the T. N. Newsprint Paper Mills Limited the study period form 2005 –'06 to 2011 –'12, the maximum inventory to working capital ratio is 1.84 times in the year 2007 –'08 and the minimum inventory to working capital ratio is -0.71 times in the year of 2011 –'12.

The above table no - 6.1 show fluctuated trend in inventory to working capital ratio from 2005 – '06 to 2011 –'12. In 2005 –'06 the inventory to working capital ratio was 0.73 times. It has been increased in the year 2006 –'07 at 1.43 times. But then after it has been increased in 2007 –'08 at 1.84 times. But it has been decreased in the year 2008 –'09 and increased at 0.93 times. For the next year in 2009 –'10 it has been decreased at 0.65 times, in 2010 –‘11 there was no change and it was 0.65 times and 2011 –'12 it has been decreased to -0.71 times. It has been also shown in graph no – 6.1.

So, the average (AVG.) inventory to working capital ratio is 0.79 times, the standard deviation (S.D) is 0.80 times and co-efficient variance (C.V) is 101.38% which is shown in table no - 6.1. Which solvency of T. N. Newsprint Paper Mills Limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

10. West Coast Paper Mills Limited

The table no - 6.1 shows that the inventory to working capital ratio of the West Coast Paper Mills Limited the study period form 2005 –'06 to 2011 –'12, the maximum inventory to working capital ratio is 1.09 times in the year 2005 –'06 and the minimum inventory to working capital ratio is -1.65 times in the year 2011 –'12.

In the West Coast Paper Mills Limited inventory to working capital ratio has been decreased study period from 2005 – '06 to 2008 –’09, An inventory to working capital ratio has been shown 1.09 times 0.71 times, 0.43 times, and 0.35 times. But then after the inventory to working capital ratio has been increased at 0.59 times in
2009 –’10. But again it has been decreased in at 0.53 times in 2010 –’11. At the last year of the study period the inventory to working capital ratio has been decreased at -1.65 times in 2011 –’12. It has been also shown in the graph no - 6.1.

So, the average (AVG.) inventory to working capital ratio is 0.29 times, the standard deviation (S.D) is 0.89 times and co-efficient variance (C.V) is 304.35% which is shown in table no - 6.1. Which solvency of West Coast Paper Mills Limited because the average inventory to working capital ratio shows satisfactory ratio during the study period.

**ANOVA TEST OF INVENTORY TO WORKING CAPITAL RATIO**

**Hypothesis:**

- **H₀: Null Hypothesis:**
  - There is no significant difference in Inventory to working capital ratio of selected paper companies of India.

- **H₁: Alternative Hypothesis:**
  - There is significant difference in Inventory to working capital ratio of selected paper companies of India.

**Level of Significance: 5%**

<table>
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<th>Table :- 6.1.1</th>
<th>Inventory To Working Capital Ratio - ANOVA: Single Factor</th>
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<td>Within Groups</td>
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Degree of freedom = 70-1 = 69

Table Value of ‘F’ = 2.0401

Calculate Value of ‘F’ = 0.89337

\[ F_{calculate} < F_{table} \]
\[ 0.89337 < 2.0401 \]

Table No - 6.1.2 indicates the calculate value of ‘F’ is 0.89337 and the table value of ‘F’ at 5% level of significance is 2.0401 so, the calculate value of ‘F’ which is less than the table value. It indicates that the Null Hypothesis is accepted and Alternate Hypothesis is rejected. It indicates that there is no significant in inventory to working capital ratio of selected paper companies in India.

6.12 STOCK (INVENTORY) TURNOVER RATIO:

Meaning:

This Ratio establishes a relationship between Cost of Goods Sold and Average Stock

Objective:

The objective of computing this ratio is to determine the efficiency with which the Stock is converted into sales

Components:

1. Cost of Goods sold = Net sales – Gross Profit
2. Average Stock = (opening Stock + closing Stock)/2

Computation and interpretations:

This ratio is computed by dividing the cost of goods sold by the average Stock. This ratio is usually express as an ‘x’ number of times. In the form of a formula, this ratio may be express as follows:

\[ \text{Stock Turnover Ratio} = \frac{\text{Cost of Goods sold}}{\text{Average Inventory}} \]

This ratio indicates the speed with which the Stock is converted into sales. In general, a high ratio indicate efficient performance since an improvement in the ratio shows that either the same volume of sales has been minted with a lower investment in stocks, or the volume of sales has increased without any increase in the amount of stock. A too high ratio may be the result
of very low Stock levels which may result in frequent stock-outs and thus the firm may incur high stock out costs. Thus, a firm should have a satisfactory ratio. To judge whether the ratio is satisfactory or not, it should be compared with its own past ratio or with the ratio of similar firms in the same industry or with the industry average.

Table : 6.2
Inventory Turnover Ratio (in times) period from 2005 –’06 to 2011 –’12

<table>
<thead>
<tr>
<th>YEAR</th>
<th>IAAPP</th>
<th>BILT</th>
<th>JKPM</th>
<th>OPI</th>
<th>SPBL</th>
<th>SPML</th>
<th>SIPL</th>
<th>SPMLD</th>
<th>TNNPL</th>
<th>WCPML</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-'06</td>
<td>5.32</td>
<td>6.41</td>
<td>8.18</td>
<td>9.50</td>
<td>7.88</td>
<td>8.92</td>
<td>9.94</td>
<td>5.61</td>
<td>6.34</td>
<td>4.14</td>
</tr>
<tr>
<td>2006-'07</td>
<td>5.72</td>
<td>7.01</td>
<td>8.13</td>
<td>11.45</td>
<td>7.96</td>
<td>8.91</td>
<td>10.77</td>
<td>7.03</td>
<td>6.15</td>
<td>4.79</td>
</tr>
<tr>
<td>2007-'08</td>
<td>5.96</td>
<td>4.18</td>
<td>5.60</td>
<td>13.06</td>
<td>7.27</td>
<td>9.33</td>
<td>11.43</td>
<td>8.79</td>
<td>6.18</td>
<td>5.03</td>
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<tr>
<td>2008-'09</td>
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<td>7.56</td>
<td>9.07</td>
<td>14.41</td>
<td>7.08</td>
<td>12.84</td>
<td>10.65</td>
<td>8.47</td>
<td>6.30</td>
<td>4.83</td>
</tr>
<tr>
<td>2010-'11</td>
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<td>4.73</td>
<td>9.67</td>
<td>12.45</td>
<td>12.26</td>
<td>11.13</td>
<td>8.86</td>
<td>8.36</td>
<td>6.33</td>
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<tr>
<td>2011-'12</td>
<td>4.72</td>
<td>4.19</td>
<td>9.20</td>
<td>13.88</td>
<td>9.33</td>
<td>10.18</td>
<td>8.12</td>
<td>7.48</td>
<td>5.72</td>
<td>5.18</td>
</tr>
<tr>
<td>Average</td>
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<td>5.82</td>
<td>8.42</td>
<td>12.46</td>
<td>8.65</td>
<td>10.21</td>
<td>9.84</td>
<td>7.74</td>
<td>6.10</td>
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<tr>
<td>S.D.</td>
<td>0.44</td>
<td>1.41</td>
<td>1.36</td>
<td>1.63</td>
<td>1.78</td>
<td>1.41</td>
<td>1.19</td>
<td>1.13</td>
<td>0.28</td>
<td>0.60</td>
</tr>
<tr>
<td>Min</td>
<td>4.72</td>
<td>4.18</td>
<td>5.60</td>
<td>9.50</td>
<td>7.08</td>
<td>8.91</td>
<td>8.12</td>
<td>5.61</td>
<td>5.69</td>
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<td>7.56</td>
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<td>11.43</td>
<td>8.79</td>
<td>6.34</td>
<td>5.60</td>
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</table>

Graph : 7.2
Inventory Turnover Ratio (in times) period from 2005 –’06 to 2011 –’12
The above mentioned Table No- 6.2 and Graph No- 6.2 show the indicated a fluctuating trends of the Inventory (stock) turnover ratio of selected paper companies in India from 2005-2006 to 2011-2012.

1. **International Andhra Pradesh Paper Mills Limited**

The table no - 6.2 shows that the inventory (stock) turnover ratio of the International Andhra Pradesh Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory (stock) turnover ratio is 5.96 times in the year 2007 –’08 and the lowest inventory (stock) turnover ratio is 4.72 times in the year of 2011 –’12.

In the year 2005 –’06 the inventory (stock) turnover ratio was 5.32 times, which has been increased in 2006 –’07 to 2007 –’08 as 5.72 times and 5.96 times shown in the above table no - 6.2. But in the year 2008 –’09 to 2011 –’12 the inventory (stock) turnover ratio has been decreased as 5.23 times, 5.17 times, 4.87 times, and 4.72 times respectively. It has been also shown in graph no – 6.2.

So, the average (AVG.) inventory (stock) turnover ratio is 5.28 times, the standard deviation (S.D) is 0.44 times and co-efficient variance (C.V) is 8.29% which is shown in table no - 6.2. Which solvency of International Andhra Pradesh Paper Mills limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

2. **Ballarpur Paper Mills Limited**

The table no - 6.2 shows that the inventory (stock) turnover ratio of the Ballarpur Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory (stock) turnover ratio is 7.56 times in the year 2008 –’09 and the lowest inventory (stock) turnover ratio is 4.18 times in the year of 2007 –’08.

In the year 2005 –’06 the inventory (stock) turnover ratio was 6.41 times, which has been increased in 2006 –’07 and reached at 7.01 times, it has been decreased in 2007 –’08 and reached at lowest point as 4.18 times. But then after the inventory (stock) turnover ratio continuously increased and reached at highest point as 7.56 times in 2008 –’09. But last three year from 2009 –’10 to 2011 –’12, it has been decreased as 6.62 times, 4.73 times, and 4.19 times respectively. It has been also shown in graph no – 6.2.

So, the average (AVG.) inventory (stock) turnover ratio is 5.82 times, the standard deviation (S.D) is 1.41 times and co-efficient variance (C.V) is 24.28%
which is shown in table no - 6.2. Which solvency of Ballarpur Paper Mills limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

3. **JK Paper Mills Limited**

The table no - 6.2 shows that the inventory (stock) turnover ratio of the J. K. Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the highest inventory (stock) turnover ratio is 9.67 times in the year 2010 –’11 and the lowest inventory (stock) turnover ratio is 45.07 times in the year of 2007 –’08.

In the year 2005 –’06 the inventory (stock) turnover ratio was 8.18 times and it has been decreased in 2006 –’07 as 8.13 times, but it has been again decreased as 5.60 times in 2007 –’08. In 2008 –’09 it has been also increased as 9.07 times. In the year 2009 –’10 to 2011 –’12 the inventory (stock) turnover ratio trend shown in the table no - 6.2 continuously increased & decreased as 9.06 times, 9.67 times and 9.20 times respectively. It has been also shown in the graph no - 6.2.

So, the average (AVG.) inventory (stock) turnover ratio is 8.42 times, the standard deviation (S.D) is 1.36 times and co-efficient variance (C.V) is 16.17% which is shown in table no - 6.2. Which solvency of J. K. Paper Mills Limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

4. **Orient Paper and Industries Limited**

The table no - 6.2 shows that the inventory (stock) turnover ratio of the Orient Paper and Industries Limited during the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 14.41 times in the year 2008 –’09 and the minimum inventory (stock) turnover ratio is 9.50 times in the year of 2005 –’06.

In the present the table no - 6.2 shows the inventory (stock) turnover ratio of Orient Paper and Industries Limited is fluctuating in the whole study period. In 2005 –’06 to 2008 –’09 inventory (stock) turnover ratio has been increased as 9.50 times 11.45 times, 13.06 times and 14.41 times. But from 2009 –’10 to 2010 –’11 it has been decreased as 12.46 times and 12.45 times respectively. But last year it has been increased and reached at 13.88 times in 2011 –’12. It has been also shown in graph no – 6.2.
So, the average (AVG.) inventory (stock) turnover ratio is 12.46 times, the standard deviation (S.D) is 1.63 times and co-efficient variance (C.V) is 13.09% which shows in table no - 6.2. Which solvency of Orient Paper and Industries Limited because of the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

5. Seshasayee Paper and Boards Limited

The table no - 6.2 shows that the inventory (stock) turnover ratio of the Seshasayee Paper and Boards Limited during the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 12.26 times in the year 2010 –’11 and the minimum inventory (stock) turnover ratio is 7.08 times in the year of 2008 –’09.

In the table no - 6.2 shows the inventory (stock) turnover ratio of Seshasayee Paper and Boards Limited is like zigzag trend. It has been 7.88 times in 2005–’06 and it has been continuously increased next year and reached at 7.96 times in 2006 –’07, but it has been decreased at 7.27 times in 2007 –’08, it has been again decreased in 2008 –’09 and reached at 7.08 times, it has been increased for next two year and reached at 8.76 times and 12.26 times in 2009 –’10 and 2010 –’11. Then after the next year of the study period it has been declined as 9.33 times in 2011 –’12. It has been also shown in graph no – 6.2.

So, the average (AVG.) inventory (stock) turnover ratio is 8.65 times, the standard deviation (S.D) is 1.78 times and co-efficient variance (C.V) is 20.53% which is shown in table no - 6.2. Which solvency of Seshasayee Paper and Boards Limited because of the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.


The table no - 6.2 shows that the inventory (stock) turnover ratio of the Sirpur Paper Mills Limited during the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 12.84 times in the year 2008 –’09 and the minimum inventory (stock) turnover ratio is 8.91 times in the year of 2006 –’07.

In the year 005 –’06 the inventory (stock) turnover ratio was 8.92 times. Inventory (stock) turnover ratio has been decreased 8.91 times in year 2006 –’07 and it has been increased 9.33 times in year 2007 –’08. Which has been again increased in 2008 –’09 at 12.84 times but, again inventory (stock) turnover ratio has been
decreased from 2009 –’10 at 10.19 times. It has been increased 11.13 times in 2010 –’11 and it has been decreased at 10.18 times in year 2011 –’12. It has been also shown in the graph no – 6.2.

So, the average (AVG.) inventory (stock) turnover ratio is 10.21 times, the standard deviation (S.D) is 1.41 times and co-efficient variance (C.V) is 13.79% which is a show in table no - 6.2. Which solvency of Sirpur Paper Mills Limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

7. South India Paper Mills Limited

The table no - 6.2 and graph no – 6.2 shows that the inventory (stock) turnover ratio of the South India Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 11.43 times in the year 2007 –’08 and the minimum inventory (stock) turnover ratio is 8.12 times in the year of 2011 –’12.

In the table - 6.2 and graph no – 6.2 show the inventory (stock) turnover ratio of South India Paper Mills Limited. In the year form 2005 – ’06 to 2007 –’08 inventory (stock) turnover ratios have been increased as 9.94 times, 10.77 times and 11.43 times. It has been decreased from 2008 –’09 to 2011 –’12 as 10.65 times, 9.11 times, 8.86 times, and 8.12 times respectively.

So, the average (AVG.) inventory (stock) turnover ratio is 9.84 times, the standard deviation (S.D) is 1.19 times and co-efficient variance (C.V) is 12.10% which is shown in table no - 6.2. Which solvency of South India Paper Mills Limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

8. Star Paper Mills Limited

The table no - 6.2 shows that the inventory (stock) turnover ratio of the Star Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 8.79 times in the year 2007 –’08 and the minimum inventory (stock) turnover ratio is 5.61 times in the year of 2005 –’06.

The table no - 6.2 and graph no – 6.2 show the inventory (stock) turnover ratio has been increased from 2005 – ’06 to 2007 –’08 as 5.61 times, 7.03 times and 8.79 times. Then after the last four year of the study period the inventory (stock) turnover
ratio has been decreased as 8.74 times, 8.45 times, 8.36 times and 7.48 times respectively.

So, the average (AVG.) inventory (stock) turnover ratio is 7.74 times, the standard deviation (S.D) is 1.13 times and co-efficient variance (C.V) is 14.57% which is shown in table no - 6.2. Which solvency of Star Paper Mills limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.


The table no - 6.2 shows that the inventory (stock) turnover ratio of the T. N. Newsprint Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 6.34 times in the year 2005 –’06 and the minimum inventory (stock) turnover ratio is 5.69 times in the year of 2011 –’12.

The above table no - 6.2 and graph – 6.2 show that the fluctuated trend in inventory (stock) turnover ratio from 2005 – ’06 to 2011 –’12 as 6.34 times, 6.15 times, 6.18 times, 6.30 times, 5.69 times, 6.33 times and 5.72 times respectively.

So, the average (AVG.) inventory (stock) turnover ratio is 6.10 times, the standard deviation (S.D) is 0.28 times and co-efficient variance (C.V) is 4.61% which is shown in table no - 6.2. Which solvency of T. N. Newsprint Paper Mills Limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

10. West Coast Paper Mills Limited

The table no - 6.2 shows that the inventory (stock) turnover ratio of the West Coast Paper Mills Limited the study period form 2005 –’06 to 2011 –’12, the maximum inventory (stock) turnover ratio is 5.60 times in the year 2010 –’11 and the minimum inventory (stock) turnover ratio is 3.87 times in the year 2009 –’10.

In the West Coast Paper Mills Limited inventory (stock) turnover ratio has been increased study period from 2005 – ’06 to 2007 –’08, An inventory (stock) turnover ratio was 4.14 times, 4.79 times and 50.3 times. But then after the inventory (stock) turnover ratio has been increased at 4.83 times and 3.87 times from 2008 – ’09 to 2009 –’10. But again it has been increased in at 5.60 times in 2010 –’11. At the last year of the study period the inventory (stock) turnover ratio has been decreased at 5.18 times in year 2011 –’12. It has been also shown in the graph no - 6.2.
So, the average (AVG.) inventory (stock) turnover ratio is 4.78 times, the standard deviation (S.D) is 0.60 times and co-efficient variance (C.V) is 12.51% which is shown in table no - 6.2. Which solvency of West Coast Paper Mills Limited because the average inventory (stock) turnover ratio shows satisfactory ratio during the study period.

**ANOVA TEST OF INVENTORY (STOCK) TURNOVER RATIO :**

**Ho: Null Hypothesis:**
- There is no significant difference in Inventory (stock) turnover ratio of selected paper companies of India.

**H1: Alternative Hypothesis:**
- There is significant difference in Inventory (stock) turnover ratio of selected paper companies of India.

**Level of Significance: 5%**

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<th>MS</th>
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<td>42.7272</td>
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<td>Within Groups</td>
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- Degree of freedom = 70-1= 69
- Table Value of ‘F’ =2.0401
Calculate Value of ‘F’ = 28.5574

\[ F_{\text{calculate}} > F_{\text{table}} \]
\[ 28.5574 > 2.0401 \]
\[ F_{\text{calculate}} > F_{\text{table}} \]

Table No-6.2.2 indicates the calculate value of ‘F’ is 28.5574 and the table value of ‘F’ at 5% level of significance is 2.0401 so, the calculate value of ‘F’ which is greater than the table value. It indicates that the Null Hypothesis is rejected and Alternate Hypothesis is accepted. It indicates that there is significant in inventory (stock) turnover ratio of selected paper companies in India.

7.12 CONCLUSION

In the present chapter inventory management researcher was discuss the various theory of the inventory like as ABC analysis etc. In this chapter researcher presented two ratio of inventory related and use one way ANOVA test for the testing hypothesis. These two ratios were as under:

1. Inventory to working capital turnover ratio.
2. Stock (Inventory) turnover ratio
7.13 REFERENCES

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8. L.R. Haward, op.cit., pp. 92 -93,

9. I. M. Pandey, op.cit. pp.338


14. L.R. Haward, op.cit., pp. 92


18. I. M. Pandey, op.cit. pp.338
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27. Annual report of Ballarpur Industries Limited from 2005 –’06 to 2011 – ’12 and www.bilt.com
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