

Chapter-8 Working Capital Management-3

Management of Inventory

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[1] Introductory :

The third component of working capital is inventory. The factory for a very big kitchen which requires hundreds or thousands of items for manufacturing different products. Such items include the stock of raw materials, goods in process, finished goods and other consumable stores. The management of inventory is important because a substantial part of working capital remains invested in inventory and different types of costs are associated with it. Situations like understocking, overstocking, purchasing in small quantities or large quantities etc. always prove to be very costly. Therefore, for reducing the costs and increasing the profitability by optimum investment in inventory, its efficient management is very important. From the view point of scientific storage of different items also inventory management is important.

[2] The Need for Maintaining Inventory :

The need for maintaining inventory arises because of the following reasons :

(1) For Maintaining the Continuity of Business Processes :

For maintaining the continuity of different types of business processes stock of raw materials, semifinished goods and consumable stores are needed. But there is a time gap between the time of need and the time of acquisition. If stock in sufficient quantity is not maintained production process is interrupted and stock-out cost increases. Therefore, in order to maintain the continuity of production process and reduce the stock out-cost it is necessary to maintain inventory of raw materials, semifinished goods and consumable stores.

(2) For Maintaining the Continuity of Sales :

Delivery in time is an important point for consumer satisfaction and repeat orders. It is not possible to manufacture as soon as order is received. For delivery in time it is necessary to maintain the stock of finished goods at a certain level. So that the orders can be satisfied by timely delivery. Otherwise, the goods ordered for the customer may not be available. So, maintaining stock for continuity of production and sale is also known as transaction motive.

(3) Precautionary Motive :

The positions of supply of raw materials and demand for finished goods are always changing. It may happen that shortage of raw materials may interrupt the production. In order to meet such uncertainty a certain level of stock of raw materials should be maintained. On the other hand demand for finished goods may rise, prices are rising, but because of non availability of stock of finished goods the opportunity cannot be made use of. For taking the advantage of market demand also it is needed to maintain certain level of stock of finished goods. Therefore, the stock is maintained as a precautionary motive of taking advantage of increase in demand.

(4) Speculative Motive :

Motive of taking advantage of favourable price changes is known as speculative motive. It aims at making profit from price fluctuations. Accordingly, the level of stock is changed. Suppose, there is a possibility of price rise of raw materials in near future, a higher level of stock may be maintained and vice-a-versa.

(5) To Maintain the Production Processes :

Raw materials have to undergo several processes before it turns out as finished product. In each process a certain quantity of raw materials or semifinished goods remains blocked up which is known as goods in process. It is needed for maintaining the continuity of production processes.

The points discussed above explains why inventory is needed. Sometimes, in order to take the advantage of trade discount, materials more than needed are purchased. It is also necessary to maintain a certain excessive stock of raw materials to cope up with transport bottleneck situations.

Reasons for maintaining the inventory are many. But the inventory has the cost. In order to reduce the cost of inventory like purchase cost, carrying cost, wastage cost, obsolescence cost inventory control is very important.

[3] Objectives of Inventory Management :

The objectives of inventory management or control can be stated as under :

1. To ensure supply of materials for maintaining the continuity of production.
2. To keep sufficient quantity of raw materials during scarcity.
3. To maintain the continuity of sales by keeping sufficient stock of finished goods.
4. To store the different items scientifically i.e. to classify and give code number to each item.
5. To reduce the costs associated with inventory like opportunity cost, insurance cost, wastage, rent of godown, stock outcost etc.

6. To see that optimum level of investment is made in inventory.
7. To make effective use of available capital.

[4] Inventory Control :

In inventory management cost is an important element to be taken care of. The popular proverb "A leak can sink a ship" applies to inventory management. The uncontrolled costs associated with inventory can act as a cancer of the business. Therefore, inventory control occupies an important place in inventory management.

Meaning of Inventory Control :

Inventory control means the task of determining optimum level of inventory and to see that it is maintained at that level. The proper quantity of inventory is maintained at the proper time and uses of inventory. The optimum level is determined taking into account the requirements of the business unit and availability of financial resources and the main objectives are to reduce the cost, maintain safety and keep proper accounting record of acquisitions of materials and their uses.

Inventory control implies two types of controls :

(a) Quantitative Controls and (b) Accounting Control

(a) Quantitative Controls :

Quantitative controls are concerned with planning economic ordering quantity, minimum stock level, maximum stock level, reorder level etc. and seeing that those levels are maintained in practice so that different types of costs can be controlled. It aims at preventing the costs of under or overstocking.

(b) Accounting Control :

Accounting aspect of control is concerned with maintaining proper books of accounts of the materials purchased and used. The main objective is to prevent theft and misuse of materials.

The objectives of inventory control are the same as the objectives of inventory management.

[5] Techniques of Inventory Control :

The main techniques of inventory control include economic ordering quantity, minimum stock level, maximum stock level, reorder level, ABC analysis etc.

[5.1] Economic Ordering Quantity (EOQ) :

Economic ordering quantity means the quantity of purchasing which is economically the most advantageous quantity. Such an economic ordering quantity should be worked out and every time, as far as possible, the purchase order should be placed in economic ordering quantity. But the question is how to find out economic ordering quantity? It can be worked out taking into account two types of costs associated with inventory - one is an ordering cost and the other is

carrying cost or maintenance cost of inventory. But the principle of EOQ is based on certain assumptions which are as under :

Assumptions Underlying EOQ :

1. Annual requirements can be forecast.
2. Consumption pattern during the entire period remains constant.
3. There is no delay in placing the order and in receiving the consignment after placing the order.
4. Two types of costs associated with inventory are identifiable ordering cost and carrying cost.
5. Ordering cost per order remains constant irrespective of the size of the order.
6. Maintenance or carrying cost is equal to a certain percentage of the average value of the inventory.

On the basis of above assumptions EOQ can be worked out taking into account the ordering cost and carrying cost.

(a) Ordering Cost :

Ordering cost is also known as set up cost. It includes the costs for placing the order like stationery cost, postage, telephone cost, transportation cost, goods clearing cost, weighing and quality inspection cost etc. Ordering cost is directly connected with the number of purchase order during a specific period. Order of smaller size means more number of orders and more cost and vice-a-versa. More the number of orders there will be the ordering cost and the smaller the number of orders there will be the ordering cost. In other words the smaller the size of order and the more cost and the bigger the size of the order and the less cost. As the size of the order increases the number of order decreases and cost also decreases and as the size of the order decreases the number of orders and ordering cost increases.

(b) Maintenance or Carrying Cost :

The second type of cost associated with inventory is carrying cost. It includes opportunity cost of capital invested, insurance cost, rent cost, cost of deterioration in quality, rent of godown etc. The carrying cost is directly connected with the quantity of inventory. As the stock increases maintenance cost also increases proportionately and as the stock decreases the maintenance cost also decreases proportionately. Maintenance cost behaviour is quite opposite to ordering cost behaviour. The quantity of purchase order at which the total of ordering cost and carrying cost is the minimum is known as economic ordering quantity. Any quantity less than or more than that quantity would be more costly and less profitable. Therefore, it is essential to find out EOQ and place the purchase order in that quantity.

Methods of EOQ :

For determining EOQ there are three alternative methods :

- (a) Trial and Error Method
- (b) Graphic Method and
- (c) Formula Method

(a) Trial and Error Method :

In this method beginning is made with a smaller quantity followed by bigger and bigger ordering quantity. For each quantity ordering cost, maintenance cost and total cost are calculated. Out of different quantities the quantity of which the total cost is the minimum is known as economic ordering quantity. This method is time consuming, clumsy and involves many calculations.

(b) Graphic Method :

In graphic method EOQ is determined, with the help of ordering cost curve, carrying cost curve and total cost curve. On the X axis different quantities are shown and on the Y axis the ordering cost, maintenance cost and the total cost are shown. The ordering cost curve slopes downwards from left to right with increasing quantity. In case of maintenance cost curve it increases proportionately with increasing quantity, therefore, it rises upward. The point at which ordering cost curve and maintenance cost curve intersect each other determine economic ordering quantity because at that point the total cost becomes the minimum.

Some experts believe that marginal changes in the ordering quantity does not affect much the total cost. Therefore, there is not only one economic ordering quantity but a range of quantities. Any quantity falling within that range is an economic ordering quantity. This method is also time consuming and difficult to understand.

(c) Formula Method :

Looking to the limitations of the above two methods as a shortcut, formula method has been developed. With the help of the following formula we can determine EOQ quickly and very

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Looking to the limitations of the above two methods as a shortcut, formula method has been developed. With the help of the following formula we can determine EOQ quickly and very easily.

$$EOQ = \sqrt{\frac{2AO}{CI}}$$

where in,

EOQ = Economic ordering – quantity

A = Annual Requirements

O = Ordering cost

C = Cost per unit

I = Percentage of maintenance cost

Illustration : The annual requirements of a manufacturing unit are 8000 units, ordering cost per order is Rs. 400 and the maintenance cost is 25 p.c. The cost per unit is Rs. 40. Find out EOQ.

$$\begin{aligned} EOQ &= \sqrt{\frac{2AO}{CI}} \\ &= \sqrt{\frac{2 \times 8000 \times 400}{40 \times \frac{25}{100}}} \\ &= \sqrt{\frac{2 \times 8000 \times 400}{10}} \\ &= \sqrt{6,40,000} \\ EOQ &= \mathbf{800 \text{ units}} \end{aligned}$$

Economic Ordering Quantity and Trade Discount :

Sometimes, a supplier offers trade discount for purchasing in certain quantity or more than that. Under such circumstances question arises as to in which quantity to purchase? In economic ordering quantity? or in quantity eligible for trade discount? If the EOQ is less than the quantity eligible for trade discount then purchasing in EOQ results into loss of trade discount. In this situation it is necessary to work out the maintenance cost of quantity eligible for trade discount and the loss of trade discount. If the benefit of trade discount is greater than the maintenance cost then it is advisable to purchase in quantity eligible for trade discount and not in economic ordering quantity.

Some items are seasonal. During the season they are available in plenty and at cheaper rates. Some items are in short supply and prices are constantly rising. These are the situations in which we cannot afford to stick to EOQ. Therefore, EOQ is not a substitute for practical wisdom. Concept of EOQ is applicable where the supply is available through out the year, prices are steady and problems of transport bottleneck do not arise.

Inflation and EOQ :

EOQ is affected by the rate of inflation. Because of inflation the value of inventory increases. Therefore, maintenance cost to that extent is reduced. EOQ should be calculated taking into account the reduced cost of maintenance.

Another opinion is that because of inflation carrying cost also increases. Therefore, its effect is likely to be negligible. There is some truth in this argument, however, we cannot ignore inflation rate while working out EOQ.

[5.2] Reordering Point :

Reordering level is another technique of inventory control. For reducing cost it is essential to purchase in time - not too early and not too late. For purchasing in time it is necessary to determine the reorder level. Reorder level is the level at which fresh order for purchasing is placed. While determining the reorder point daily consumption or usage and time gap between placing an order and receipt of consignment are taken into account. Where the time gap or lead time is not certain and frequently changing safety stock is also taken into account. The formula for reorder point is :

$$\text{Reorder point} = \text{Lead time} \times \text{Daily usage} + \text{safety stock}$$

The following formula is also used for finding out order point :

$$\text{Reorder point} = \text{Maximum daily usage} \times \text{Maximum lead time}$$

Illustration - 1 :

Daily usage is 500 tons and lead time is 10 days. The company keeps the safety stock equal to three days consumption. Determine reorder point.

Ans:

$$\begin{aligned}\text{Reorder point} &= \text{Daily usage} \times \text{Lead time} + \text{Safety stock} \\ &= 500 \text{ tons} \times 10 \text{ days} + 500 \text{ tons} \times 3 \text{ – days} \\ &= 5000 \text{ tons} + 1500 \text{ Tons} = 6500 \text{ Tons}\end{aligned}$$

$$\text{Reorder point} = 6500 \text{ Tons.}$$

Illustration - 2 :

Daily usage minimum 300 units and maximum 400 units. The lead time minimum 10 days and maximum 15 days. Determine the reorder point.

Ans:

$$\begin{aligned}\text{Reorder point} &= \text{Maximum Lead Time} \times \text{Maximum daily usage} \\ &= 15 \text{ days} \times 400 \text{ units} = 6000 \text{ units.}\end{aligned}$$

$$\text{Reorder point} = 6000 \text{ units}$$

Illustration - 3 :

The Pavan Auto Ltd. expects the consumption of **6000 units** of a product during the next year. The cost of processing the order is **Rs. 60**. Price per unit is **Rs. 20** and the yearly carrying cost is **10 p.c.** of purchase price. The lead time is **10 days** and the company has a policy of carrying safety stock of **4 days consumption**. Calculate EOQ and reorder point.

Ans:

Ans :

$$EOQ = \sqrt{\frac{2AO}{CI}}$$

Wherein A = Annual requirements

O = Ordering cost per order

C = Cost or price per unit

I = P.C. of maintenance cost

$$EOQ = \sqrt{\frac{2 \times 6000 \times 60}{20 \times \frac{10}{100}}}$$

$$= \sqrt{\frac{2 \times 6000 \times 60}{2}}$$

$$= \sqrt{3,60,000}$$

$$= 600 \text{ units}$$

$$\therefore EOQ = 600 \text{ units}$$

$$\text{Reorder point} = \text{Lead Time} \times \text{Daily usage} + \text{safety - Stock}$$

$$\text{Daily usage} = \frac{6000 \text{ units}}{365 \text{ days}} = 16 \text{ units (Rounded off)}$$

$$\therefore \text{Reorder point} = 10 \text{ days} \times 16 \text{ units} + 4 \text{ days} \times 16 \text{ units} \\ = 160 + 64 = 224 \text{ units}$$

$$\text{Reorder point} = 224 \text{ units}$$

Illustration - 4 :

The finance department of Surya Ltd. provides you the following information.

1. Annual requirements **16,000 units**.
2. Ordering cost per order is **Rs. 80**.
3. The carrying or storage cost per unit is **Rs. 4**.

Calculate EOQ and number of orders in a year.

Calculate EOQ and number of orders in a year.

$$EOQ = \sqrt{\frac{2 \times 16,000 \times 80}{4}} \\ = \sqrt{6,40,000} = 800 \text{ units.}$$

$$EOQ = 800 \text{ units.}$$

$$\text{Number of orders} = \frac{\text{Annual Requirements}}{EOQ} \\ = \frac{16000}{800} = 20 \text{ Orders in } \underline{\hspace{2cm}} \text{ a year}$$

[5.6] ABC Analysis :

We know that a factory is just like a big kitchen which requires hundreds of times for the production of different products. Some items are very costly while some are very cheap. It means it is not necessary to exercise strict control over all items. Exercise of uniform control over all the items proves to be very costly. Therefore, the modern trend is to classify the inventory into three classes. All the precious items are placed in class-A, middle range value items in class-B and all the items of nominal values are placed in class-C. Such classification of inventory items into A, B and C groups is known as **ABC analysis** technique of inventory control. In amusement it is also called “**Always Better Control.**”

ABC analysis technique enables us to exercise control as per principle of exception. Strict and effective control is exercised on exceptionally costly items of class A and for C class items strict and costly control is not essential. As a result, control becomes less costly and more effective.

In ABC analysis the proportion of the quantity of a particular item in the total quantity is determined in terms of percentage. In the same way the proportion of value of each item in the total value is determined in terms of percentage. On completion of classification and valuation generally the following picture emerges:

Class	Proportion in total quantity (P.C.)	Proportion of value in total value (P.C.)
A	15	70
B	30	20
C	55	10
Total	100	100

As we observe in the above table about 15 p.c. of the items of class A account for about 70 p.c. of total value of inventory, class B accounts about 30 p.c. of quantity and 20 p.c. of total value and class C about 55 p.c. of the total quantity and only about 10 p.c. of the total value of inventory. From such value it is about easy to judge which class requires strict and effective control and which class requires nominal or negligible control? Why?

The answer to the above questions is very clear. Class A items require desired attention and strict control because all the items are precious. Loss of anyone or over storage proves to be very costly. Class-C items require nominal control because its items are of negligible value. Their loss or over storage does not have much impact on the total cost. In this way ABC analysis enables us to exercise control as per principle of control by exception and economise the cost of control and makes the control effective.

The Process of ABC Analysis :

For making use of ABC analysis as a control technique classification of different items is the pre-requisite. For classification one has to undergo the following process :

1. First of all a list of different items is prepared and value of each item is determined.

2. In the second stage the number of items are multiplied by their price to find out the total value.
3. In the third stage, on the basis of value each item is given the serial numbered. The item with the highest value is given No. 1.
4. After assigning the serial number the percentage of quantity and value of each item are determined.
5. In the last stage the items of the list are classified into A, B and C class on the basis of their value. At the end of classification a picture almost similar to above table will emerge.

Advantages :

1. As per principle of control by exception an effective control system is created for precious items.
2. It affords economies in cost of control by avoiding detailed control over a large number of items of nominal value falling in class C.
3. Control becomes effective because it concentrates on limited items.
4. Safety of precious items is assured.
5. For production class A item and class C item are needed. But because of shortage class C item is not available. In this situation it is of no use to store class A item and increase the cost.

ABC Analysis leads us to believe that small items of nominal value are not important from the view point of control. But in reality it is not so. Sometimes even a small item plays an important role to keep the production system on. In this connection the following proverb indicates the importance of small items.

“Because of the want of a nail the shoe was lost, the horse was lost and the whole battle was lost.”

Therefore, such small but important items should also be paid proper attention.

Exercise

1. State the need for maintaining inventory.
2. What are the objectives of inventory management?
3. Explain economic ordering quantity.
4. What is reordering point? What is its importance?
5. Explain ABC analysis with its advantages.