Study of Inventory Management in Manufacturing Industry

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Abstract

Inventory: stock file of all the products that the organization has made for sale and the components that make the product. Every organization requires inventory for smooth running of its activities or we can say processes. The inventory is link between the production and the distribution process. The role of inventory management is to check the availability of material as and when required the quantity of the inventory and if it's possible to minimize the investment in inventory. In today's competitive world of manufacturing companies are searching new ways of improving the industry process, how to satisfy the customer and by following this how they can stay ahead with their competitors in the world of competition. The strategy that can bring these things to life for past decades. This represents that money will be tied up until the inventory leaves the company as purchased products, due to large size of inventories maintained by firms a amount of funds are required. It is therefore absolutely imperative to manage inventories efficiently and effectively in order to ignore the unnecessary investments. A firm who is neglecting the managing of inventories will be at risk at its long run profitability and may fail ultimately. The reduction in excessive inventories carries an appropriable impact on the company's profitability.

Keywords: Inventory management, economic order quantity, safety stock, ABC analysis

Introduction

Inventory is defined as a list of goods and materials which are available in stock for business. In accounting inventory is considered as an asset.

Inventory management is about specifying the size and the placement of stocked inventory. Inventory management is essential for different locations or within multiple locations for a supply network to protect the regular and planned production against running out of materials or goods. The scope of inventory management also concerns with the fine lines between stock up of lead time, carrying costs, forecasting of inventory, physical inventory, space available for inventory, quality management, stock up, returns of defective goods and demand forecast of inventory.

Inventory management deals with:-
(i)   Active control program which deals with the management of sales and purchase department.
(ii)   It helps in providing good understanding of inventory and capacity to control financial cost.
(iii) It will provide control over operating cost.
(iii) It will help in identifying the inventory requirement, stock up techniques and actual and projected inventory status.
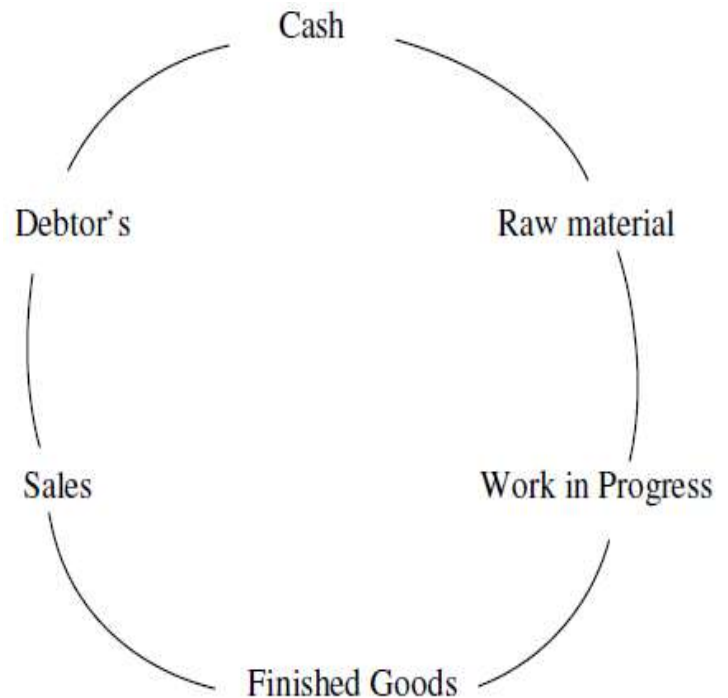
Operating Cycle

It is the process for the conversion to sales after the conversion of resources. A firm demands many years to regain initial investment in fixed assets such as plant and machinery or land buildings or furniture and fixtures etc. On the other side, investment in current assets such as inventory and books debts are recognized during the firms operating cycle, which is in generally less than a year.

The operating cycle is called to be the heart of the working capital. The requirement for working capital or current assets cannot be overvalued as already observed. The main purpose of many business firms is to attain maximum profits, which can be earned depending upon the consequence of the sales among other things. However, sales cannot convert in to cash instantly. There is uniform time difference between sale of goods and receipts of cash. Therefore the requirement of working capital in the form of current assets is to deal with the issues that are arising when the goods are sold.

Therefore, enough working capital requires supporting of sales activity. Technically this is referring to the operating of cash cycle. The continuous flow form cash to supply to inventory to accounts receivable and back into cash is called operating cycle.

The operating cycle of manufacturing company contains three phases described below:-

1. Acquisition of resources
2. Manufacturing products
3. Sale of product

Fig 1: Operating cycle

TYPES OF INVENTORIES
Inventories play a vital role in a business or depending on nature of the businesses. The inventories may be classified as:-

(I) Raw Materials
Materials and components required for the use in making up a product. The basic inputs are required for the conversion to finished products through manufacturing process. Raw material are those inventories, which have been acquired and reserved for future production.

(II) Work in process
Materials and components that have started their conversion to finished goods. Materials issued to the shop floor, which have not yet transformed into finished products are called as

value added materials to the extent of labor cost incurred.

(III) Finished Goods

A finished goods is a completed part that is ready to sale as per the customer order. These goods have been inspected and have passed for final inspection so that they can be transferred out to work-in-process and into finished goods. From this point, finished goods can be sold to end user, can be sold to retailers, can be sold to wholesalers, can be sent to distribution centers, or held in expectation as per the customer order.

NEED OR INVENTORY CONTROL

1. **Transaction motive:**
    Every firm has to preserve some level of inventory to meet the day-to-day transaction of sales, production process, customer demand etc. The finished goods as well as raw material are kept as materials for smooth production process in the firm.

2. **Precautionary motive:**
    A firm should keep some of the inventory for unexpected circumstances like loss due to   natural calamities in a specific area, strikes, lay outs etc that may occur so, the firm should have some of the finished goods as well as raw-materials to meet the circumstances.

3. **Speculative motive:**
    The firm may keep some inventory in order to capitalize an opportunity to make profit due to price fluctuations.

ESSENTIALS OF INVENTORY CONTROL

The essential for inventory control are specified below:-

- A firm requires inventory control system to successfully manage its inventory.

- Proper classification of materials with codification, material standardization and simplification should be done.

- The operation of a system of internal check to ensure that all transactions related with material and equipment are checked by properly authorized and independent persons.

- The operation of a system of imperishable inventory so that it is possible to determine at any time, the amount and value of each kind of material in stock.

- A suitable method for valuation of materials is necessary because it will affect the cost of jobs and the value of closing stock of materials.

Costs involved in Inventory

Every firm try to sustain their inventory depending upon the requirements and the other features for holding such inventory so that some cost can be incurred there which are as follows .

- **Carrying Cost**
  This is the cost incurred in keeping or sustaining an inventory per unit of raw materials, work-in-process or finished goods. Here there are two basic cost involved.
  Total carrying cost = (carrying cost per unit) X (Average inventory)
  a) Cost of Storage
  It includes cost of storing per unit of raw materials by the firm. This cost includes the storage of materials like spaces for rent occupied by stock, security of stock, cost of infrastructure, cost of insurance, warehousing costs, handling cost etc.
  b) Cost of Financing
  The cost includes the cost of funds that is invested in the inventories. It includes

the required rate of return for the investments in inventory also including the storage cost. The carrying cost involves both real cost and opportunity cost related to the funds. The total carrying cost is entirely inconstant and rise indirectly proportional to the level of inventories carried.

- **Cost of Ordering**

  The cost of ordering includes the cost of asset i.e. inventories. It is the cost of producing and executing of an order including cost for paper work and contacting with the supplier.

  The ordering cost is inversely proportional to annual inventory of a firm. The ordering cost may have a fixed element, which is not affected by the order size and a inconstant elements, which changes according to the order size.

  Total Ordering Cost = (No of orders) X (cost per order).

- **Cost of Stock out**

  It is also known as hidden cost. The stock out is the situation where the firm does not have units of an item in stores but there is an demand for that item either by the customers or by the production department. The stock out introduce to zero level inventories so, there is a cost of stock out that the firm faces for a situation of lost sales or back orders. The stock outs are quite often expensive.

  In case of finished goods, even the goodwill of the firm can be affected due to customers dissatisfaction they may lose business, where as in raw materials or work in process the production process can be stopped because it is

expensive as employees will be paid for the time they haven't worked in producing goods.

The carrying cost and the ordering cost are reverse forces so they determine the level of inventors in a firm.

Total Cost = (Cost of items purchased) + (Total Carrying and ordering cost)

ISSUE PRICING METHODS

The following are the pricing methods:-

- **First in First out (FIFO)**

  This is the price paid for the material which is firstly taken into stock from where the material has to be priced that has been drawn.

  Under this procedure stock of materials may not be used up in sequential order but for pricing purpose it is suspected that items which are present there for so long in stocks should be used up first. The method is most suitable for slow – moving material and comparatively high unit cost.

- **Last in first out (LIFO)**

  This is the price that is paid for the material which is lastly taken into stock from where the materials have to be priced that has been drawn. This method also ensure that material should be issued at the actual cost.

  It is based upon the principle that costs should be related to current price level as close as possible. Under this method production cost is calculated on the basis of the replacement cost.

- **Weighted average price**

  This is the price which is calculated by Z dividing the total cost of material in the stock from where the material has to be priced that have been drawn, by the

total quantity of material present in the stock.

This method is different from all other methods because here price issue is calculated on receipts of materials but not on issue of materials. As soon as new lot is received quickly a new price is calculated.

- **Standard price**

  It is the predefined price on the basis of specification of all factors affecting price like the quantity of materials and normally purchased after that rate of discount is compared with the existing price including or excluding freight and warehouse charges.

  A standard price for each material is set and the actual price paid is compared with the standard price. If paid exceeds the standard a loss will be realized if not profit will be obtained.

Analysis

In analysis certain techniques were used for the calculation which is described below.

Techniques Of inventory

Following are techniques that are used for the calculation of inventory so that we can have a control over inventory.
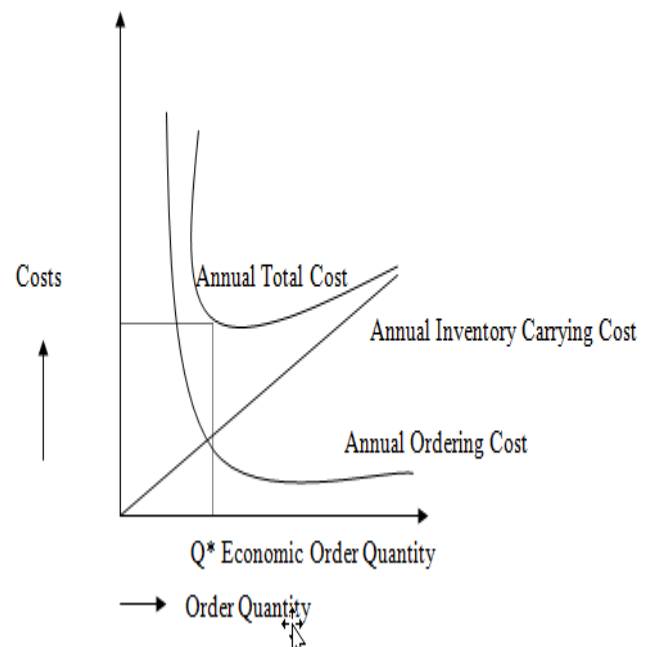
- **ECONOMIC ORDER QUANTITY**

  The conclusion about how much to order and when to order has a great importance for inventory management. The quantity that has to be purchased neither be small nor large because costs of ordering and carrying cost of materials are very high. Economic order quantity is the size of the lot to be purchased which is economically feasible. The quantity of materials which can be purchased at minimum costs. Generally economic order

quantity is defined as the point where the inventory carrying costs is equal to the ordering costs. To determine the economic order quantity it is assumed that cost of managing the inventory is made up of two parts i.e., ordering cost and carrying cost.

FORMULA FOR CALCULATING ECONOMIC ORDER QUANTITY (EOQ)

$$EOQ = \sqrt{\frac{2 * Demand * Re\text{-}order\ Cost}{Carrying\ Cost}}$$

The cost relationships are shown in the figure which is shown below:-

Fig 2: Graph of EOQ

- **SAFETY STOCK**

  The economic order quantity formula is based on the assumption of demand that should be known and acknowledged so that the lead time is constant and does not vary. In actual practical conditions, there is an uncertainty with respect to both demand as well as lead time. The total forecasted demand may be more or less than the actual demand so it is possible that lead time may vary from estimated time. In order to minimize the effect of uncertainty due to demand and the lead time, a firm should maintain safety stock, reserve stocks or buffer stocks.

  The safety stock is defined as the additional stock of material or we can say the extra stock that has to be maintained in order to meet the unexpected increase in demand arising out of uncontrollable factors.

  In simple words it tells about which is to be used to protect the inventory against uncertainties. Because it is difficult to predict the exact amount of safety stock to be maintained, by using statistical methods and simulation, it is possible to determine the level of safety stock to be sustained.

- **DETERMINATION OF SAFETY STOCK**

  If the level of safety stock is sustained at high, it locks up all the capital and therefore there is a possibility of risk of degeneration. On the other hand, if it is low there is a risk of stock out because of that production may stop. When variation in lead time is foremost, the safety stock can be computed as:

Safety Stock = (Maximum Lead time-Normal Lead time) * Demand
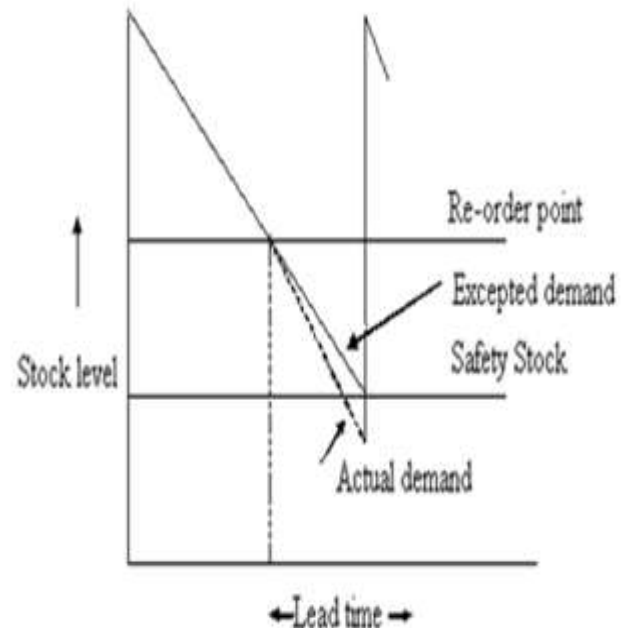
Fig 3 Graph of safety stock

The usage level of inventory depends upon the level of safety stocks. Larger the safety stocks, lesser the risk of stock out and higher the usage level. Sometimes higher the usage levels that are not desirable as they result in increase of costs thus, fixing up a safety stock level is critical. According to the past date regarding the demand and lead time the reliability of suppliers and usage level which is desired for managing of safety stock can be determined with accuracy.

- **THE RE-ORDER LEVEL**

  The re-order level is the level where the minimum level is set if it reaches out there then we need to order the material so that the level can be kept full. The re-order level depends upon

1. Duration of time between the placing of an order and receiving the supply of inventory.
2. The inventory is constantly being used up that's why it is called as the usage rate.

The reorder level can be determined as follows:

$$\textbf{R}= M+TU$$

R = Reorder level

M = Minimum level of inventory

T = time gap/delivery time

U = Usage Rate

- **ABC Analysis**

 It is called as Always Better Control and it depends upon:-

 * It is based on the proposition of the managerial items and efforts are insufficient and limited.

 * Some items of inventory are more important than others.

ABC analysis classifies various inventory into three categories of priority that allocates the managerial efforts into proportion of the priority. In Class A most of the important items are categorized into this class.

Those of medium importance are classified as class - B and rest of the items are classified into class - C.

The financial manager has to monitor the items that belong to different groups into the order of priority and depending upon the consumptions of the inventory.

The items with the highest values are given first priority and are more controlled then the low value item. The rational limits are as follows.

Category	% of items	% of total cost of materials
A	5-10	70-85
B	10-20	10-20
C	70-85	5-10

Table 1 ABC Category

- **Procedure**

 Following is the procedure of doing ABC analysis.

 1. Firstly, you need to write the items including the annual demand and cost of that item.
 2. Then calculate the total cost and the percentage of that cost.

Fig 4 Values with items

4. After prioritizing from high to low you need to calculate the total percentage of the items so that you can categorize the items into classes.

Fig 6 Total % of each class

5. Categorize the items into classes.

3. Items with the highest value are given top priority.

Fig 5 Prioritizing the items

	A	B	C	D	E	F
1	ITEM	ANNUAL DEMAND	COST/UNIT	DEMAND*COST	TOTAL COST	% OF TOTAL COST
2	G	300	1500	450000	0.413793103	41.37%
3	F	500	500	250000	0.229885057	22.98%
4	A	3000	50	150000	0.137931034	13.79%
5	C	1500	45	67500	0.062068966	6.20%
6	D	6000	10	60000	0.055172414	5.51%
7	B	4000	12	48000	0.044137931	4.41%
8	E	1000	20	20000	0.018390805	1.83%
9	I	1750	10	17500	0.016091954	1.60%
10	J	2500	5	12500	1.041666667	1.14%
11	H	600	20	12000	0.011034483	1.10%
12					1087500	

Fig 7 Items have been categorized

- **VED ANALYSIS**

  VED is called as Vital, Essential and Desirable analysis which is done mainly for the controlling of spare parts and keeping in view of the criticality to the production of materials.

  Vital spares are the spares that are stock out for which even for a short time it will stop the production. Essential spares are the spares in which the absence of any component cannot be tolerated for more than a few hours a day. Desirable spares are those, which are needed, but their absence for even a week is agreeable but it will also lead to stoppage of production.

Material	Class	Value	Priority	Material
10%	A	70%	V 10% E 20% D 70%	70% 20% 10%
20%	B	20%	V 10% E 20% D 70%	70% 20% 10%
70%	C	10%	V 10% E 20% D 70%	70% 20% 10%

Table 2 VED Category

Conclusions and Recommendations

Conclusion

Inventory management has to keep accurate records of goods. It is important for keeping cost down. The better inventory management will surely help in solving problems the company would be facing with respect to inventory and will help in reducing huge investment or blocking of money in inventory. Through this study we concluded that companies can follow economic order quantity for optimum purchase and can maintain safety stock for components in order to avoid stock out conditions and helps in continuous production flow. This will reduce the cost and will increase the profit. There should be tight control over stocks based upon ABC analysis.

If we could properly execute and follow the all the techniques of inventory management, we will be able to enhance the profit with minimum cost.

Recommendations

There are certain recommendations which have been recommended are:-

1. When EOQ is calculated and it suggest that company should obtain inventory requirements by placing order to supplier frequently rather that one time stocking up.
2. In order to reduce the outlay and to maintain inventories at optimum level so it becomes necessary to implement proper planning among all functional departments.
3. If we reduce the receivables time, the operating cycle time will also be reduced.
4. If we reduce the inventory cost like carrying cost, ordering cost it is suggested that company should apply EOQ models to the entire inventory.

Limitations

There are some limitations which has been thought after studying the information. The limitations are:-

a) The entire study is on manufacturing industry.
b) The hypothesis made in EOQ and safety stock restricts the use of formula, the inventory items are not predictable.
c) ABC analysis is not one time effort and it has to be reviewed and recategorised periodically.

Future Scope

The future scope of this topic can be
1. This will help the company to plan about inventory i.e. what to order, when to order and how much to order.
2. This helps in deciding operating policy and volume of inventory.
3. It will help in making policies for executive in inventory.
4. It will also help in categorizing the goods i.e. high, medium and low usable items.
5. It helps in dealing with forecasting of inventory.

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