

# Analysis of Inventory Management by using Economic Order Quantity Technique

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**ABSTRACT:** Inventory control is prominent function in all firms in any sector. The shareholders wealth is also lying in the warehouse of a firm. Too much or too little holding of inventory is the biggest disadvantage for a firm. To obtain the correct balance between the two extremes, the inventory control must be primarily looked upon. The task of inventory control is to find out the quantity of inventories that fulfil demand by avoiding overstock. A firm ignoring the inventory management system will have the impact on its profitability and may fail in the long run. This study introduces ABC analysis, determines what items should be of priority in the management of firm's growth, and the encountered inventory related costs such as cost of ordering, cost of carrying, economic order quantity, reorder level, stock levels and inventory turnover ratio, which is the firm's inventory turn during a month or year.

**KEYWORDS:** Inventory, inventory control, inventory management system, ABC analysis

## I. INTRODUCTION

Inventory is the important asset for many companies and a company's financial statement in the form of a balance sheet. An efficient management and control of inventory is required because almost 60% firm's money invested into it. Too low and too much level of inventories will bring down the level of profitability of the company. Hence, desired level of inventory must be maintained.

Materials in the industry or firm are the most important thing in which without materials the firm cannot operate. Hence, ABC analysis is an important tool used to identify the items that are required greater attention for control. ABC analysis is the first step to carry out the inventory management where it classifies the items based on their relative importance.

Material management must be carried out by providing right material, right quantity, right time and right place for the production department. If the firm experiences stock out of a critical item, then it results in production halt. Therefore, managing the inventory is more useful in determining the optimum inventory level and maintaining the safety stock.

There are three types of inventory,

- Raw material
- Semi-finished goods
- Finished goods

The raw material is the input for the final product where the raw material inventory are the items that are purchased from the other firm and are converted into finished goods through the production process.

Normally semi-finished goods or the intermediate goods are the various stages of production, intermediate goods are the inventory in which the firm may make and then use semi-finished goods or make and sell or buy then use.

Finished goods are the completed or the final products which are available for sale. The items of such goods are produced by the various production processes but are yet to be sold for the customers.

As inventory a current asset where only financial managers are not involved rather all other functional areas are involved such as marketing, production and purchasing departments.

### Need to hold inventories

#### Transaction motive

It refers the inventory must be maintained to order to facilitate smooth production and sales operations.

### Precautionary motive

The inventory is maintained to provide safeguard when the actual level of inventory is differed. Hence, precautionary measures must be taken if there are any unpredictable changes occur in demand and supply.

### Speculative motive

Speculative motive makes the decision to raise or lower the inventory levels due to the price fluctuations.

## II. OBJECTIVES OF INVENTORY CONTROL

- To analyse the close control items with the help of ABC analysis.
- To measure economic order quantity for the most important component.
- To study about the ordering levels for the most important component.
- To calculate inventory turns ratio.

## III. METHODOLOGY

### ABC analysis

ABC analysis is one of the inventory control technique which is based on a Pareto principle where 80% of the overall consumption value is based on the 20% of the total items. The ABC control technique is based on the small number of items have more material usage and have more value while the large number of items have the small part of money value in the warehouse. ABC analysis is inventory categorizing system which is divided into three categories A, B and C.

**A class items:** It indicates 10% to 20% of the total inventory items represent 70% to 80% of total value consumption. Hence, A class items should be closely monitored. For A class items reorder should be frequently on monthly or daily basis and stock outs should be avoided.

**B class items:** It indicates 30% to 40% of the total inventory items represent 15% to 25% of total value consumption. Hence, B class items should be regularly reviewed.

**C class items:** It indicates 50% to 60% of the total inventory items represent 5% to 10% of total value consumption. Hence, C class items can be review infrequently.

### Steps for classification of items

1. Initially find out unit cost and usage of each component for a particular period.
2. Multiply both unit cost and usage of the component to obtain net value.
3. List out all the components and arranging all the components in descending value.
4. Sum up number of components and calculate percentage value on total inventory and total number of components consumed.
5. Draw a graph of percentage items vs percentage value.
6. From the curve the limits A, B and C categories should be marked off.

### Economic order quantity

The economic order quantity which maintains a balance between two different ordering costs and carrying costs. Economic order quantity is a total number of units which the firm adds to the inventory so that with each order the total costs such as ordering cost and carrying cost is to be minimized.

$$\text{Economic order quantity} = \sqrt{2AO/C}$$

Where,

A = Total units required

O = The ordering cost per order

C = Carrying cost per unit

### Ordering Cost

The expenses incurred on placing and receiving an order is known as ordering cost. The costs include are cost to prepare purchase order, postage cost, telephone calls, salary of purchasing clerk.

Ordering cost = cost per order \* no of orders



**Carrying cost**

Carrying cost or holding cost are the costs associated with holding one unit of raw material. The Costs included are Warehouse rent for keeping up the raw material and finished goods, tax for warehouse, insurance for any unforeseen condition, warehouse staff salaries.

$$\text{Carrying cost} = (\text{EOQ}/2) * \text{carrying cost per unit}$$

**Reorder level**

Reorder level or reorder point is the inventory level where the firm needs to place an order for fresh or new supply of items.

$$\text{Reorder point or level} = (\text{lead time} * \text{avg usage}) + \text{safety stock}$$

$$\text{Safety stock} = (\text{usage} * \text{period of safety stock}) / \text{total working days in a year}$$

$$\text{Average usage} = \text{usage} / \text{total working days in a year}$$

**Stock levels**

A minimum stock level is the inventory level of an item of material, below which the actual stock should not be allowed to fall.

$$\text{Minimum stock level} = \text{Reorder level} - (\text{avg lead time} * \text{avg usage})$$

A maximum stock level is the inventory level of an item, above which the actual stock should not be allowed to exceed.

$$\text{Maximum stock level} = \text{Reorder level} + \text{EOQ} - (\text{Minimum lead time} * \text{avg usage})$$

**Inventory turnover ratio**

Inventory turnover ratio is the firm’s inventory turns during the month or year. If the inventory turnover ratio is low, then it either implies weak sales or probably having more inventories. If it is high, then it either implies strong sales or having lower inventory.

$$\text{Inventory turns ratio} = \text{cost of goods sold} / \text{avg value of inventory}$$

**IV. EXPERIMENTAL RESULTS & INTERPRETATION**

**ABC analysis**

Table 1: Classification of items using ABC analysis

SI No	No of items	% of items	Consumption value in %	Class of items	Control
1	5	16	74	A	Close control
2	8	26	20	B	Regular review
3	18	58	6	C	Infrequent review
<b>Total</b>	<b>31</b>	<b>100</b>	<b>100</b>		

**Observations**

Class A items: 16% of items contributing 74% of the consumption value

Class B items: 26% of items contributing 20% of the consumption value

Class C items: 58% of items contributing 6% of the consumption value

**Economic order quantity of Crankshaft**

Total units required in a year (A) = 33600

The ordering cost per order (O) = Rs. 3272.23

Carrying cost of unit (c) =Rs 114.96

$$\begin{aligned} \text{EOQ} &= \sqrt{2AO/C} \\ &= \sqrt{2*33600*3272.72/114.96} \\ &= 1383.12 \approx 1384 \end{aligned}$$



$$\begin{aligned} \text{Number of orders} &= A/EOQ \\ &= 33600/1384 \\ &= 25 \text{ orders} \end{aligned}$$

$$\begin{aligned} \text{Carrying cost} &= (EOQ/2) * \text{carrying cost per unit} \\ &= (1384/2) * 114.96 \\ &= 79552.3 \end{aligned}$$

$$\begin{aligned} \text{Ordering cost} &= \text{Cost per order} * \text{no of orders} \\ &= 3272.72 * 25 \\ &= \text{Rs } 81818 \end{aligned}$$

$$\begin{aligned} \text{Total cost} &= \text{Carrying cost} + \text{Ordering cost} \\ &= 79553 + 81818 \\ &= \text{Rs } 161371 \end{aligned}$$

Table 2: Summarisation of result

Term	EOQ technique	Company's current technique
Annual Demand	33600	33600
Order Quantity	1384	2800
No. of order	25	12
Holding Cost (Rs)	79553	160947
Ordering Cost (Rs)	81818	39272
Total Cost (Rs)	161371	200220

**Interpretation**

The Economic order quantity of crankshaft is approximately 1384. While the firm currently orders 2800, it should be decreased to 1384 in order to minimize the holding cost of inventory. The difference between the total cost of EOQ technique and company's current technique is Rs 38849. Hence the total cost saved from EOQ technique is Rs 38849.

$$\begin{aligned} \text{Reorderlevel} &= \text{lead time} * \text{Average usage} + \text{safetystock} \\ &= (8 * 107.69) + 9692.3 \\ &= 10553.84 \end{aligned}$$

$$\begin{aligned} \text{Safetystock} &= \text{usage} * \text{periodofsafetystock} / \text{totalworkingdaysinayear} \\ &= (33600 * 90) / 312 \\ &= 9692.3 \end{aligned}$$

$$\begin{aligned} \text{Averageusage} &= \text{usage} / \text{total working days in ayear} \\ &= 33600 / 312 \\ &= 107.69 \end{aligned}$$

$$\begin{aligned} \text{Minimumstocklevel} &= \text{re-order level} - (\text{Average usage} * \text{Average leadtime}) \\ &= 10553.84 - (107.69 * 9) \\ &= 9584.63 \end{aligned}$$

$$\begin{aligned} \text{Maximumstocklevel} &= \text{re-order level} + \text{EOQ} - (\text{Min usage} * \text{minimum lead time}) \\ &= 10553.84 + 1384 - (107.69 * 8) \\ &= 11076.32 \end{aligned}$$



**Interpretation**

The lead time of the crankshaft component is 8 days and the firm should make a new order when the stock level reaches at 10553.84. The minimum stock level is at 9484.61 where the actual stock level should not be allowed to fall. The maximum stock level is at 11076.32 where the actual stock level should not exceed this level, which leads to increase in the holding cost of inventory.

**Inventory Turnover Ratio**

Table 3: Summarisation of result

Month	Cost of goods sold	Average value of inventory	Inventory turnover ratio
Dec 2019	3554080	658852	5.39
Jan 2020	4157772	653105	6.36
Feb 2020	1237276	248763	4.97

**Interpretation**

The above table shows the inventory turnover ratio of the component crankshaft is increased in Jan 2020 compared to the other two month data. The increased turnover ratio in Jan 2020 month is because of increase in cost of goods sold. The inventory turnover ratio in Jan 2020 is 6.36 and decreased to 4.97 in Feb 2020 due to decrease in sales value of the component.

**V. CONCLUSION**

It is very difficult for the management of the firm to control the costs by focusing on all the items. Therefore ABC analysis has to be carried out to categorize the each item and helps the management to focus highly on the A class items. The EOQ technique is carried out to reduce the total cost of the company’s investment. In most of the cases the firms do not carry out proper inventory management system and the materials are ordered based on their experience or orders whenever the stock is low. Thus results in overstocking or under stocking of the items. Reorder level indicates when the firm needs to put new order. Minimum stock level and maximum stock levels are the level where the stock should not go beyond or exceed the level.

For the higher inventory turns ratio the sales value of the component should be increased meanwhile the value of inventory stored in the warehouse should be reduced.

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