CHAPTER EIGHT

INVENTORY MANAGEMENT

Learning objectives:

By the end of this chapter, students will be able to:

1. Define the main terms used for inventory management.
2. Describe the importance of inventory in an organization.
3. Explain the different purposes for keeping inventory.
4. Describe some important business trends that affect inventory.
5. Describe what the economic order quantity is and how to calculate it.
6. Discuss why inventory turn is directly related to order quantity and safety stock.

1. DEFINITION OF INVENTORY

Inventory generally refers to the materials in stock. It is also called the idle resource of an enterprise. Inventories represent those items which are either stocked for sale or they are in the process of manufacturing or they are in the form of materials, which are yet to be utilized.

Inventories serve several functions in an organization. The main function of inventories is to reduce the interdependency of various stages of the production and delivery system. Consider three subsystems of an organization representing the supplier, production, and the market.

The interval between receiving the purchased parts and transforming them into final products varies from industries to industries depending upon the cycle time of manufacture. It is, therefore, necessary to hold inventories of various kinds to act as a buffer between supply and demand for efficient operation of the system. Thus, an effective control on inventory is a must for smooth and efficient running of the production cycle with least interruptions.

Inventory can be defined as “an idle stock of physical goods that contain economic value, and are held in various forms by an organization in its

custody awaiting packing, processing, transformation, use or sale in a future point of time".

2. FUNCTIONS OF INVENTORY

The main functions of inventory within organization are:

- ***To meet anticipated customer demand*.** These inventories are referred to as anticipation stocks because they are held to satisfy planned or expected demand.
- ***To smooth production requirements*.** Firms that experience seasonal patterns in demand often build up inventories during off-season to meet overly high requirements during certain seasonal periods. Companies that process fresh fruits and vegetable deal with seasonal inventories
- ***To decouple operations***. The buffers permit other operations to continue temporarily while the problem is resolved. Firms have used buffers of raw materials to insulate production from disruptions in deliveries from suppliers, and finished goods inventory to buffer sales operations from manufacturing disruptions.

- ***To protect against stock-outs***. Delayed deliveries and unexpected increases in demand increase the risk of shortages. The risk of shortages can be reduced by holding safety stocks, which are stocks in excess of anticipated demand.
- ***To take advantage of order cycles.*** Inventory storage enables a firm to buy and produce in economic lot sizes without having to try to match purchases or production with demand requirements in short run.
- ***To hedge against price increase.*** The ability to store extra goods also allows a firm to take advantage of price discounts for large orders.
- ***To permit operations.*** Production operations take a certain amount of time means that there will generally be some work-in-process inventory.

3. TYPES OF INVENTORY

All organizations will carry some inventory or stock of goods at any one time. This can range from items such as stationery to machinery parts or raw materials. Generally inventory is classified by its location or type.

- **Inventory Classified by Location**

Inventory can be classified by location are classified as raw materials, semi-finished goods, finished goods, and work-in-process (WIP).

1- Raw Materials

Purchased items or extracted materials that are converted via the manufacturing process into components and/or products. These are Iron ore for steel, grain for flour, wood for furniture, raw cotton yarn for cloth and materials used to make the components of the finished product.

2- Semi-finished Goods

Semi-finished goods are items that have been stored uncompleted, awaiting final operations that will adapt them to different uses or customer specifications. Semi-finished goods are made under the instruction of a shop order, using the components issued by a picking order, and stored in the warehouse when finished. Semi-finished goods are not sold to the customers.

3- Finished Goods

A finished good is a product sold as a completed item or repair part, i.e., any item subject to a customer order or sales forecast. Finished goods are stored in the warehouse before they are shipped.

4- Work-In-Process (WIP)

Products in various stages of completion throughout the plant, including all material from raw material that has been released for initial processing up to completely processed material waiting for inspection and acceptance as finished goods. These materials are waiting between operations in the factory.

5- Maintenance, Repair, and Operational Supplies (MRO)

Items used in support of general operations and maintenance such as maintenance supplies, spare parts, and consumables used in the manufacturing process and supporting operations. These items are used in production but do not become part of the product.

- **Inventory Classified by Type**

The type of inventory can also be used to provide a method of identifying why inventory is being held and so suggest policies for reducing its level. Inventory types include the following.

1- Buffer/Safety

This is used to compensate for the uncertainties inherent in the timing or rate of supply and demand between two operational stages. Safety stock is often used to compensate for uncertainties in the timing of supplies from suppliers. It is also used to compensate for uncertainties in supply between operational stages in a process, due to factors such as equipment breakdowns.

2- Cycle

If there is a requirement to produce multiple products from one operation in batches, there is also a need to produce enough to keep a supply while other batches are being produced. This is an example of how differences between the timing of supply and demand can lead to high levels of work-in-progress inventory.

3- De-Coupling

This permits stages in the manufacturing process to be managed and their performance to be measured independently, to run at their own speed and not match the rate of processing by departments at different points in the process.

4- Anticipation

This includes producing to stock to anticipate an increase in demand due to seasonal factors. Speculative policies, such as buying in bulk to take advantage of price discounts, may also increase inventory levels. Accurate forecasting can help ensure anticipated inventory reflects any increase in demand. Bulk-buying policies will need to take into account the full cost of storing inventory.

5- Pipeline/Movement

This is the inventory needed to compensate for the lack of stock while material is being transported between stages, for example the distribution time from a warehouse to a retail outlet. Thus pipeline inventory may be the result of delays in the supply chain between customer and supplier. If an alternative supplier can be found then pipeline inventory can be reduced.

4. IMPORTANCE OF KEEPING INVENTORIES

Keeping stock is a crucial issue for any organization since it enable it to achieve the following:

- **To stabilize production:** The demand for an item fluctuates because of the number of factors, e.g., seasonality, production schedule etc. The inventories (raw materials and components) should be made available to the production as per the demand failing which results in stock out and the production stoppage takes place for want of materials. Hence, the inventory is kept to take care of this fluctuation so that the production is smooth.
- **To take advantage of price discounts**: Usually the manufacturers offer discount for bulk buying and to gain this price advantage the materials are bought in bulk even though it is not required immediately. Thus, inventory is maintained to gain economy in purchasing.
- **To meet the demand during the replenishment period:** The lead time for procurement of materials depends upon many factors like location of the source, demand supply condition, etc. So inventory is maintained to meet the demand during the procurement (replenishment) period.

- **To prevent loss of orders (sales):** In this competitive scenario, one has to meet the delivery schedules at 100 per cent service level, means they cannot afford to miss the delivery schedule which may result in loss of sales. To avoid the organizations have to maintain inventory.
- **To keep pace with changing market conditions:** The organizations have to anticipate the changing market sentiments and they have to stock materials in anticipation of non-availability of materials or sudden increase in prices.
- Sometimes the organizations have to stock materials due to other reasons like suppliers minimum quantity condition, seasonal availability of materials or sudden increase in prices.

5. FACTORS AFFECTING THE LEVEL OF INVENTORY

The level of inventory should be appropriate. The appropriateness of the amount of inventory depends upon a number of factors. Some significant factors affecting the level of inventory are explained as follows:

- **Nature of business**: The level of inventory will depend upon the nature of business whether it is a retail business, wholesale business, manufacturing business or trading business.
- **Inventory turnover**: Inventory turnover refers to the amount of inventory which gets sold and the frequency of its sale. It has a direct impact on the amount of inventory held by a business concern.
- **Nature of type of product**: The product sold by the business may be a perishable product or a durable product. Accordingly, the inventory has to be maintained.
- **Economies of production**: The scale on which the production is done also affects the amount of inventory held. A business may work on large scale in order to get the economies of production.
- **Inventory costs**: More the amount of inventory is held by the business, more will be the operating cost of holding inventory. There has to be a trade-off between the inventory held and the

total cost of inventory which comprises of purchase cost, ordering cost and holding cost.

- **Financial position**: Sometimes, the credit terms of the supplier are rigid and credit period is very short. Then, according the financial situation of the business the inventory has to be held.
- **Period of operating cycle**: If the operating cycle period is long, then the money realization from the sale of inventory will also take a long duration. Thus, the inventory managed should be in line with the working capital requirement and the period of operating cycle.
- **Attitude of management**: The attitude and philosophy of top management may support zero inventory concept or believe in maintaining huge inventory level. Accordingly, the inventory policy will be designed for the business.

6. RESULTS OF INADEQUATE CONTROL OF INVENTORY

Inadequate control of inventories can result into two categories:

1. Under stocking results in missed deliveries, lost sales, dissatisfied customers and production bottlenecks.

2. Overstocking unnecessarily ties up funds that might be more productive

Therefore, any organization should identify the main concerns of inventory management in order to overcome the results of inadequate control of inventories. The main two concerns are: ***First***, level of customer service to have the right goods, in sufficient quantities, in the right place, and at the right time. And the ***second*** is the cost of ordering and carrying inventories.

7. INVENTORY COST (THREE BASIC COSTS)

The three basic cots of inventory are:

1. **Holding or Carrying Cost:** is the costs to carry an item in inventory for a length of time usually a year. Cost includes interest, insurance, taxes, depreciation, obsolescence, deterioration, spoilage, pilferage, breakage, etc.
2. **Ordering Cost:** is cost of ordering and receiving inventory. These include determining how much is needed, preparing invoices, inspecting goods upon arrival for quality and quantity, and moving the goods to temporary storage.

3. **Storage Cost:** is cost resulting when demand exceeds the supply of inventory on hand. These costs can include the opportunity cost of not making a sale, loss of customer goodwill, late charges, and similar costs.

8. WHAT IS INVENTORY MANAGEMENT?

Inventory management is the practice overseeing and controlling of the ordering, storage and use of components that a company uses in the production of the items it sells. A component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to point of sale. Inventory control means efficient management of capital invested in raw materials and supplies, work- in – progress and finished goods.

9. OBJECTIVES OF INVENTORY MANAGEMENT

The objective of inventory management is to maintain inventory at an appropriate level to avoid excess or shortage of inventory. Inventory management systems reduce the cost of carrying inventory and ensure that the supply of raw material and finished goods remains continuous

throughout the business operations. The objectives specifically may be divided into two categories mentioned below:

B. Operating objectives: They are related to the operating activities of the business like purchase, production, sales etc. They include:

1. To ensure continuous supply of materials.
2. To ensure uninterrupted production process.
3. To minimize the risks and losses incurred due to shortage of inventory.
4. To ensure better customer services.
5. Avoiding of stock out danger.

B. Financial Objectives: They include:

1. To minimize the capital investment in the inventory.
2. To minimize inventory costs.
3. Economy in purchase.

C. Apart from the above objectives, inventory management also emphasize to bring down the adverse impacts of holding excess inventory. Holding excess inventory lead to the following consequences:

1. Unnecessary investment of funds and reduction in profit.
2. Increase in holding costs.
3. Loss of liquidity.
4. Deterioration in inventory.

10. REQUIREMENTS FOR EFFECTIVE INVENTORY MANAGEMENT

To be effective, management must have the following:

a) A system to keep track of the inventory on the hand on order.

b) A reliable forecast of demand that includes an indication of possible forecast error.

c) Knowledge of lead times and lead time variability.

d) Reasonable estimates of inventory holding costs, ordering costs, and shortage costs.

e) A classification system for inventory items.

11. INVENTORY CONTROL TECHNIQUES

In any organization, depending on the type of business, inventory is maintained. When the number of items in inventory is large and then large amount of money is needed to create such inventory, it becomes

the concern of the management to have a proper control over its ordering, procurement, maintenance and consumption. The control can be for order quality and order frequency.

The main techniques of inventory control are: (1) ABC analysis, (2) HML analysis, (3) VED analysis, (4) FSN analysis, (5) SDE analysis, (6) GOLF analysis and (7) SOS analysis.