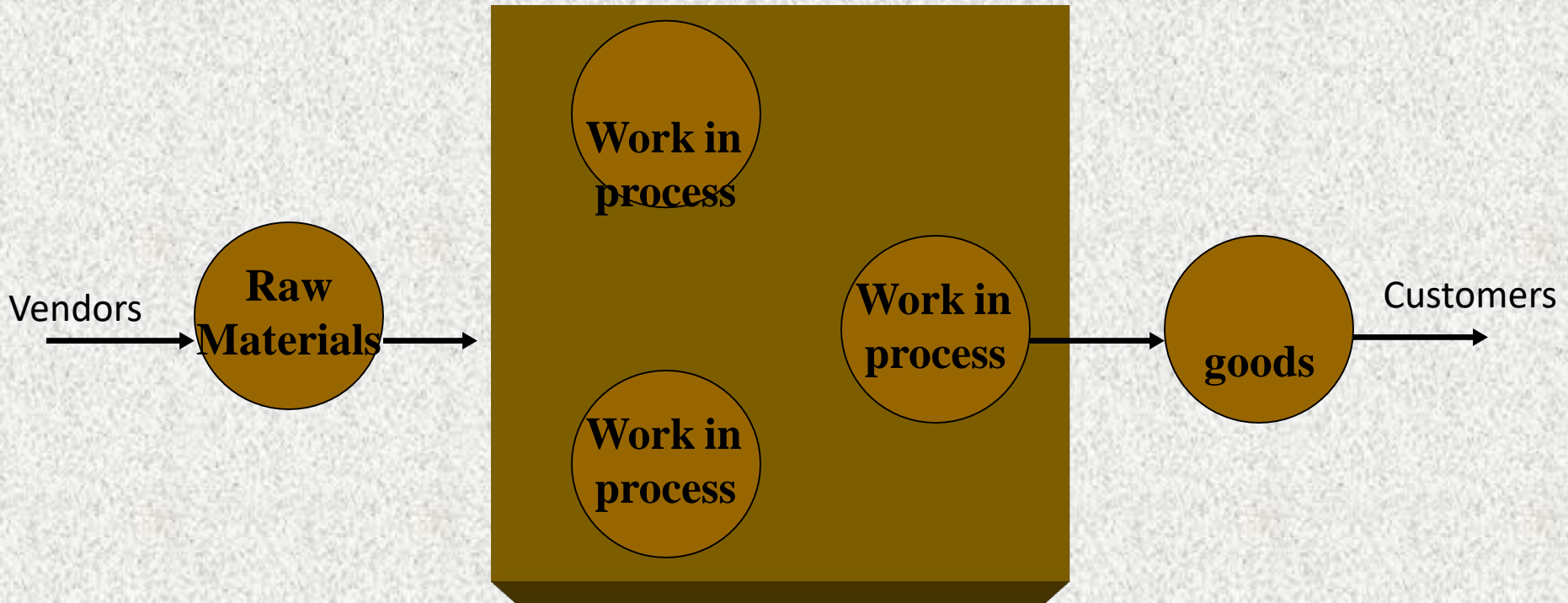


Inventory Definition

- A stock of items held to meet future demand
- Inventory is a list for goods and materials, or those goods and materials themselves, held available in stock by a business.
- Constitute significant part of current assets
- On an average approximately 60% of current assets in Public Limited Companies in India
- A considerable amount of fund is required
- Effective and efficient management is imperative to avoid unnecessary investment
- Improper inventory management affects long term profitability and may fail ultimately



Nature of Inventories

- **Raw Materials** – Basic inputs that are converted into finished product through the manufacturing process
- **Work-in-progress** – Semi-manufactured products need some more works before they become finished goods for sale
- **Finished Goods** – Completely manufactured products ready for sale
- **Supplies** – Office and plant cleaning materials not directly enter production but are necessary for production process and do not involve ~~significant investment.~~

Reasons to hold Inventories

- ❑ Meet Variation In Customer Demand
- ❑ Meet unexpected demand
- Smooth seasonal or cyclical demand

Pricing related

- ❑ Temporary price discounts Hedge against price increases
- Take advantage of quantity discounts

Process & Supply

- ❑ Internal – upsets in parts of or our own processes
- ❑ External – delays in incoming goods

Objective of Inventory Management

- To maintain a optimum size of inventory for efficient and smooth production and sales operations
- To maintain a minimum investment in inventories to maximize the profitability
- Effort should be made to place an order at the **right time** with **right source** to acquire the **right quantity** at the **right price** and **right quality**

An effective inventory management should

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

An optimum inventory level involves three types of costs

Ordering costs:-

- Quotation or tendering
- Requisitioning
- Order placing
- Transportation
- Receiving, inspecting and storing
- Quality control
- Clerical and staff

Carrying costs:-

- Warehousing or storage
- Handling
- Clerical and staff
- Insurance
- Interest
- Deterioration, shrinkage, evaporation and obsolescence
- Taxes
- Cost of capital

Stock-out cost

Loss of sale

Failure to meet delivery commitments

1. ABC analysis

2. VED analysis

3. SDE analysis

4. FSN analysis

5. HML analysis

ABC analysis

- Process of classifying items using values as measure.
- Process of exercising selective control over inventories.

Objectives of the analysis

1. Frame policy guidelines regarding control of items.
2. This policy enables material managers to exercise selective control when he is confronted with large number of items.
3. Expensive items are branded as A items(10%) the in between as B(20%) and least expensive as C(70%)

The method.

1. All the item that are used in the industry are identified.
2. Items are listed as per the value.
3. The number of high valued items , medium valued and low valued items are counted.
4. Their percentage is found out.

The concept

It is practically not feasible to exercise tight control over all items in a large or in medium sized organization. Hence we resort to classify the items according to their importance.

VED analysis

- Based on the critical values and shortage cost of the item. Thus helps focus on vital items.
- Based on criticality the item can be classified into 3 categories viz; Vital, Essential and Desirable.
- Vital items are critically needed in a manufacturing unit. The items with lower criticality included in E and lowest in D.
- The status of each item will be discussed with justification by the material manager in consultation with other departments of the manufacturing unit.

SDE analysis

Classification based on lead time/ availability

- S(Scarce) those item which are imported or which need a lead time more than 6 months.
- D(Difficult): The items which require less than 6 months but more than a fort night.
- E(easily available): Items which are available easily in less than a fort night.
- Helps bring down lead time and out of stock cost.

FSN analysis

Classification based on frequency of issue or use.

- F = Fast moving items that are frequently issued in a manufacturing unit.
- S = Slow moving items in a manufacturing unit.
- N = Non moving item

This classification helps in establishing most suitable layout by locating all fast moving items near the dispensing window to reduce the handling efforts.

HML analysis

Classification based on unit value.

H = high cost

M= medium cost

L= Low cost

This type of analysis helps in exercising control at the use point . Proper authorization should be there for replacing a high value item

Definition of EOQ

It is the particular quantity at which the sum of cost of both the ordering and inventory carrying cost is minimum.

$$\text{Total cost} = \text{carrying cost} + \text{procurement cost}$$

Consumption rate

It is the rate at which the raw materials are consumed.

If we plot a graph between time and level of inventory the slope of the graph gives the consumption rate

Constant consumption rate.

If the raw material is consumed at same rate over the same period of time.

Actual / irregular consumption rate

There will be variation in the production which leads to different consumption rates at different time intervals. Also influenced by factors like power failure.

Replenishment

The process of refilling the material as and when it is consumed so that the inventory level is maintained within a range .

Types:-

1. Instantaneous replenishment
2. Replenishment at constant rate
3. Replenishment at irregular rate.

1. **Instantaneous replenishment:** refilling is done at one time, at one instant for the one full lot size.
2. **Replenishment at constant rate:** If we replenish the used inventory at a constant rate . Usually practiced in industries especially the ones which manufacture its own raw material.
3. **Replacement at irregular interval:** The inventory is not refilled at regular interval of time.

Lead time

Lead time is the time gap between starting or initiating the process of ordering and receiving the ordered quantity in stores.

This is estimated by the past experience.

Lead time includes the following:-

1. Time taken to prepare purchase requisition and placing the order.
2. Time taken to deliver purchase order to vendor.
3. Time taken for the vendor to manufacture.
4. Time taken for transportation from vendors place to the stores.

Reorder point

This is the point which indicate that it is high time we place the order failing which the stokes may get exhausted.

Reorder point = lead time – predicted point of exhaustion.

Eg. If we order once in every 10 days and the lead time is 3 days then $ROP = 10 - 3 = 7$ days.

Lead time analysis.

Lead time depends on :-

1. The urgency or importance of the components in the manufacturing process.
2. Reliability of the vendors.

Reserve stock(O-RS)/ Safety stock/Buffer stock

- To guard against disturbances of production process either due to uncertainties in consumption rates or lead time some extra stock is maintained.
- It serve the purpose of minimizing the chances of running out of stock.
- It should not be very less or excess.

Safety stock come to play when there is :-

1. An excess rejection or wastage in production process than normal.
2. Rejection at the time of receipt due to
 - Poor production quality by vendor.
 - Damage to raw material.

Factor of uncertainty

Uncertainty is the main reason for having safety stock.
It may be due to:-

1. Uncertainty of demand
2. Uncertainty of delivery.
3. Uncertainty of quantity.

•**Uncertainty of demand:** there will be a difference between the expected demand and the actual demand which is known as the forecast error. It is mainly dependent on the buyers side.

•**Uncertainty of delivery:** depends on how long the lead time is going to be. If something goes wrong with the suppliers production the lead time may prolong.

•**Uncertainty of quantity:** this depends on how many scrap or imperfect items the ordered quantity is going to contain.

Determination of safety stock

The level of safety stock to be maintained depends on various factors like:-

- Cost of item in question
- Uncertainties in demand
- Negative fall out of stock of this item
- Spoilage due to long storage , etc

Optimum safety stock = maximum lead time in amount - normal lead time in amount.

Max. lead time = the worst possible scenario occurred. Found out in consultation with the purchase department or past records.

Normal lead time = most expected lead time or the average lead time.

e.g.. If the maximum lead time is 13 days and the average lead time is 11.5 days then $13 - 11.5 = 1.5$, a stock that last for 1.5 days is the optimum safety stock.

Disposal of obsolete and surplus material.

Obsolete material: Those materials or equipments which are not damaged and which have economic work but are no longer useful for the company's operation due to change in production line.

The term can be associated with equipments, materials, stocks, techniques, etc.

It is very difficult to predict when the technology will change leading to obsolescence. The company should have sharp eye on the competition so that it can have more

Inventory management under uncertainty

1. Option price model
2. Risk adjusted discount cash flow (DFC) Model
3. Dynamic inventory model

Option price model

- Option is a contract that gives the holder a right to acquire or sell certain things at a predetermined price without any obligation.
- Calculated by integrating the market information and inventory control.

Risk adjusted discount cash flow (DFC) Model

- Inventory control problem is converted to capital budget problem
- 1000 television per month. The cost of holding inventory is spread overtime.

Beneficial for projects like oil drilling where the benefit is acquired only after a long time but once oil is struck the additional expense is covered.

- $\text{Inflows} = \text{no: of units} \times \text{probability} \times \text{present value}$

Dynamic inventory model

1. Uncertain variables are identified
2. Probability associated with them is taken
3. Simulation techniques are applied

Emerging trends in inventory management

- Entering into long term contract at a fixed price to reduce uncertainties
- Just-in-time
- Kanbans – Japanese technique (Only produce when demand comes)
- Internet based ordering system
- Supply chain management
- Vendor development
- Investment in plant and machinery

Inventory control responsibility

- Purchasing naturally has vest interest in inventories, even to the extend that in some companies the purchasing and stores functions

In effect the responsibility cannot be kept on one head since inventory management is a integrated effort

- Inventories are economic importance to finance department
- The fact that materials must be moved from one place to another is of importance to materials department