

# Inventory Control & Management

# Important issues with Inventory

- Inventory is an important aspect of Distribution Management
- Inventory is capital is capital, it contributes to the engagement of working capital
- There are costs in carrying inventory
- Cost of obsolescence
- Stock out
- Wrong product

# Important issues with Inventory

- **Danger s of stock out**
  - If a customer order is received and the stores does not have stocks when we call it an instance of stock out.
- **Wrong inventory**
- **Aggregate inventory**

# Important issues with Inventory

- Geographical Specialization in inventory
  - Opening depots at several places ins geographically spreading the inventory rather than concentrating the same at a central place, and servicing the markets from such central location

# Important issues with Inventory

- Decoupling
  - Technique of obtaining operating efficiencies through stock piling, work in progress at certain stages of conversion to finished goods, in the manufacturing unit, as against converting them into finished goods, so that when required the work in process can be converted to finished goods in short notice.

# Important issues with Inventory

- Balancing Supply and demand
  - Managing the time gap between consumption and manufacturing, in respect of items that have seasonal upsurges in demand, but manufacturing of which may have to be carried out spread through the year
  - E.g. Umbrella, winter wear, air coolers

# Important issues with Inventory

- Buffering Uncertainties
  - Safety stock
  - One must know what should be the level of cover
  - Safety stock has an effect of multiplying across depots, and increases costs of the operation.
  - Average inventory

# Coverage Profile

- The performance cycle
  - Average standard time taken for a requirement message to materialize into physical stock received at the location that initiated the requirement memo.
  - Also known as lead time



# Coverage Profile

- Frequency
  - No. of times the location is serviced
  - If a depot is serviced once a month vis-à-vis a depot that is serviced 15 times in a month, we may like to keep at least one month's requirement in the former depot, whereas in the latter case 2 days' + stock may suffice

# ABC Classification

- 10:20:70 rule is applied
- A class items which contributes maximum volume of sales
- B class items which contributes to medium sales in volume or value terms
- C class items which contribute to the least amount of sales in volume or value terms

# VED Classification

- Items are classified as to how vital, essential, and or desirable they are in the total scheme of things.
- In case of electricity appliances example
  - Essential items are wire , switch etc
  - Desirable items are decorative fittings, lamp shades etc.

# ABC & VED Analysis

**A Class**

**B Class**

**C Class**


**Vital   Essential   Desirable**

# SAP Analysis

- Which is classifying the inventory on the basis of Scarce, Available, and Plenty
- This may be built into the forecast provisions in as much limitations in supply or obsolescence of the item in near future will be the guiding policy for procurement

# FSN Analysis

- Classifying into Fast, Slow or Normal rate of off take or consumption
- Consumption pattern where the rate is slowed down or accelerated due to some exceptional reasons may not give representative figure

# Intending for inventory

- While the general procedure is to forecast demand for a period and accordingly place and indent for materials, there is a school of thought, which practices indents being on the basis of replenishment of inventory, triggered by stock depletion

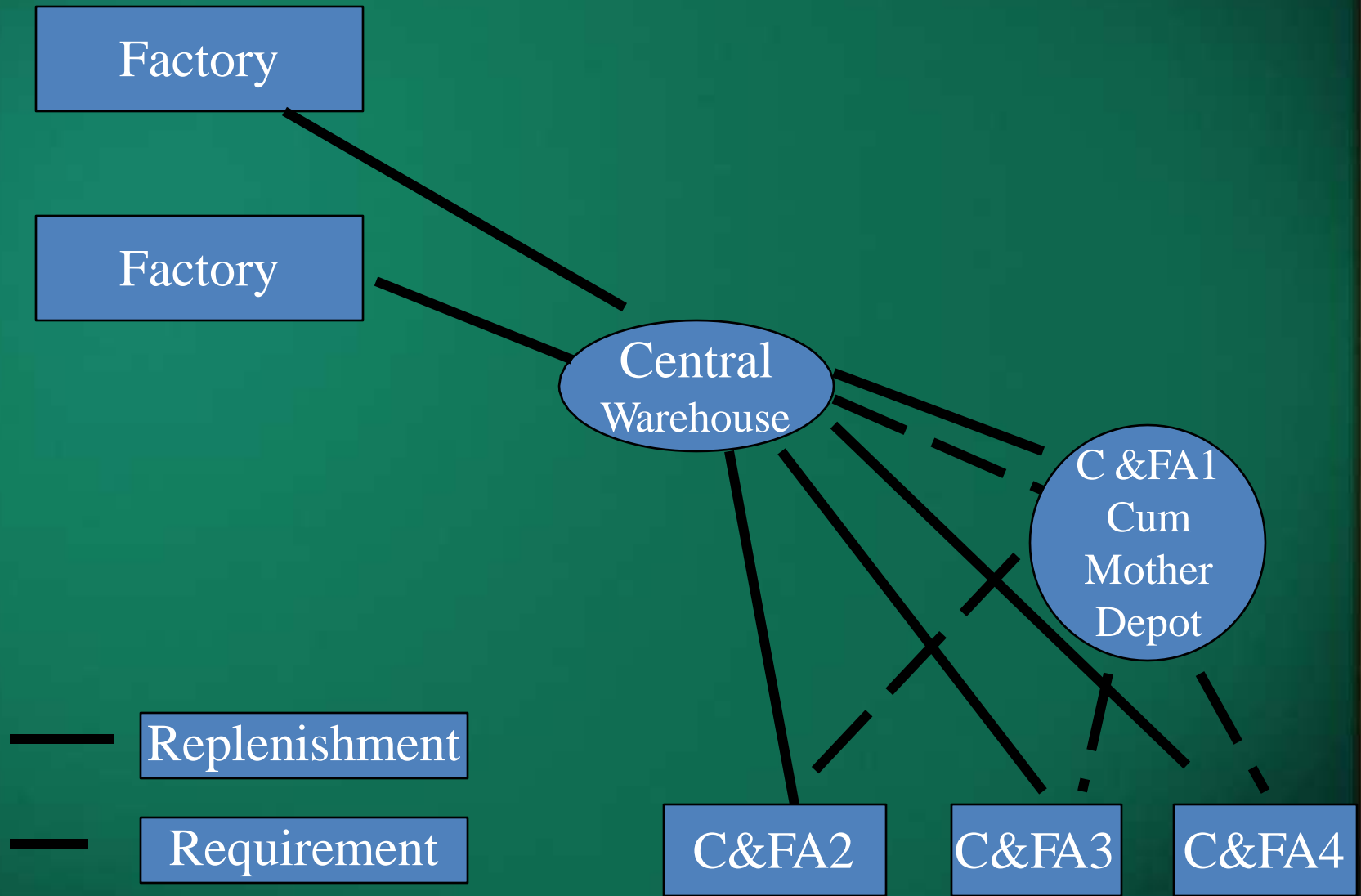
# Intending for inventory

- Central planning module based on the information initiated the procedure of replenishment
- For SKUs that are of a regular movement nature, replenishment based indenting may be comparatively easier



# Intending for inventory

- case of items that are not so regular in off takes , in such cases the distribution function may resort to treating one depot to operate as a mother depot covering a cluster of other depots around there where in such items may be stored on a forecast basis, and supplies may be made from there to the smaller depots assigned to them on a replenishment basis



# Forecast

$$F_t = (B_t \times S_t \times C_t \times T) + I$$

Where,

$F_t$  = forecast quantity for period  $t$

$B_t$  = base level demand for period  $t$

$S_t$  = seasonality factor period  $t$

$T$  = trend component

$C_t$  = promotional factor for period  $t$

$I$  = irregular or random quantity

# Forecast

- Base Demand
  - Is the quantity that is left after the influence of all or most of the other components have been removed
- Seasonal component
  - Is recurring, upward or downward movements in the demand pattern due to seasonal influence

# Forecast

- Trend
  - Components are long range upward or down ward movements in the demands influenced by certain factors in the environment e.g. Urban Housing
- Cyclic Components
  - Are swing due to business factors such as recessions , booms etc.

# Forecast

- Irregular components
  - Random unpredictable fluctuations which just happen, like a sudden shortage of competitor's product creating an upsurge in firm's products' demand

# Forecasting Techniques

- Qualitative techniques
  - Survey
  - Panels
  - Market research
  - Consensus
  - Delphi method
  - Panel of experts
  - Historical analogy

# Time Series Techniques

- Are statistical methods using historical sales data which contain relatively clear relationships and trends
- Time series based forecasting methods are
  - Moving average
  - Exponential smoothing
  - Extended smoothing
  - Adaptive smoothing



# Moving Average Forecasts

- Use average of the most recent periods
- They may be three monthly, four monthly, even 12 monthly
- Every time a new period of actual data gets available, it replaced the oldest time period's data

# Exponential Smoothing

- Bases the estimate of the future sales on the weighted average of the previous demand and forecast levels
- The adjustment index is called the alpha factor
- $F_t = D_{t-1} + (1 - \text{Alpha})F_{t-1}$

# Exponential Smoothing

- Extended smoothing
  - Is to extend the basic model by including trend and seasonality considerations
  - Three components and constants to represent the base, trend, and seasonal components
- Adaptive Smoothing
  - Provides a regular review of the alpha factor validity

# Other techniques

- Regression Analysis
  - Using econometric tools, regression analysis based forecasting simply means estimating the sale of an SKU on the basis of some independent factor.
  - E.g. Sales estimate of cold drinks is the dependent variable on basis of right in temperature which is the independent variable

# Economic Order Quantity

- Replenishment order quantity that minimizes the combined costs of inventory maintenance and ordering

- $$EOQ = \sqrt{2D \times C_o}$$
$$= \sqrt{U \times C_c}$$

Where, D = annual sales volume or annual demand

$C_o$  = cost per order

U = Cost per unit of the product

$C_c$  = Inventory carrying cost expressed as a percentage of the cost per unit

# Economic Order Quantity

- Higher the demand during the period, higher will be the EOQ
- Higher the ordering costs, it makes economic sense to have a higher EOQ
- If carrying costs are high, it makes economic sense to have a lower EOQ
- Products having a high per unit cost will also be economical to order in lesser quantities

# Re-ordering Procedure

1. Fixed quantities at different intervals
  - The quantity will be the EOQ already worked out
  - The re-order level is set at a quantity
2. Fixed interval separate quantity
  - Re-order periods have been set and on those days orders are placed

# Inventory stocking systems may be influenced by

- Limitations of space
- Value risks
- To spread vulnerability
- For obtaining economies of scale
- Each item is given an unique code number
- Consumption figures are noted
- Variations in patterns are also noted



# Material Requirement Planning-MRP

- Helps material manager in controlling inventory in the area of inbound material movement
- Elaborate material requirement planning for the master production schedules, to create schedules for suppliers of raw materials, packing materials, and intermediaries, along with inventories of parts, quantities, and delivery dates.

# Distribution Requirement Planning-DRP

- This is the tool for controlling inventory in the distribution system of the organization
- DRP enables allotment of inventory of finished goods from factory through the Central Ware House to various distribution centers based on
  - Demand
  - Intends
  - Safety stocks
  - Frequency of supplies
  - Lead times

# An effective DRP leads

- Improved customer services
- Decrease in inventory levels
- Resultant decreased warehouse space requirement
- Better transport coordination
- MRP & DRP are integral parts of any Enterprise Resource Planning system

# Just In Time-JIT

- Based on the premise that inventory should not be brought into the system until it is required for use in the production
- Characterized by maintaining zero inventories of raw materials and assemblies
- JIT to succeed must ensure very close coordination between the buyers and the suppliers on a real time basis.

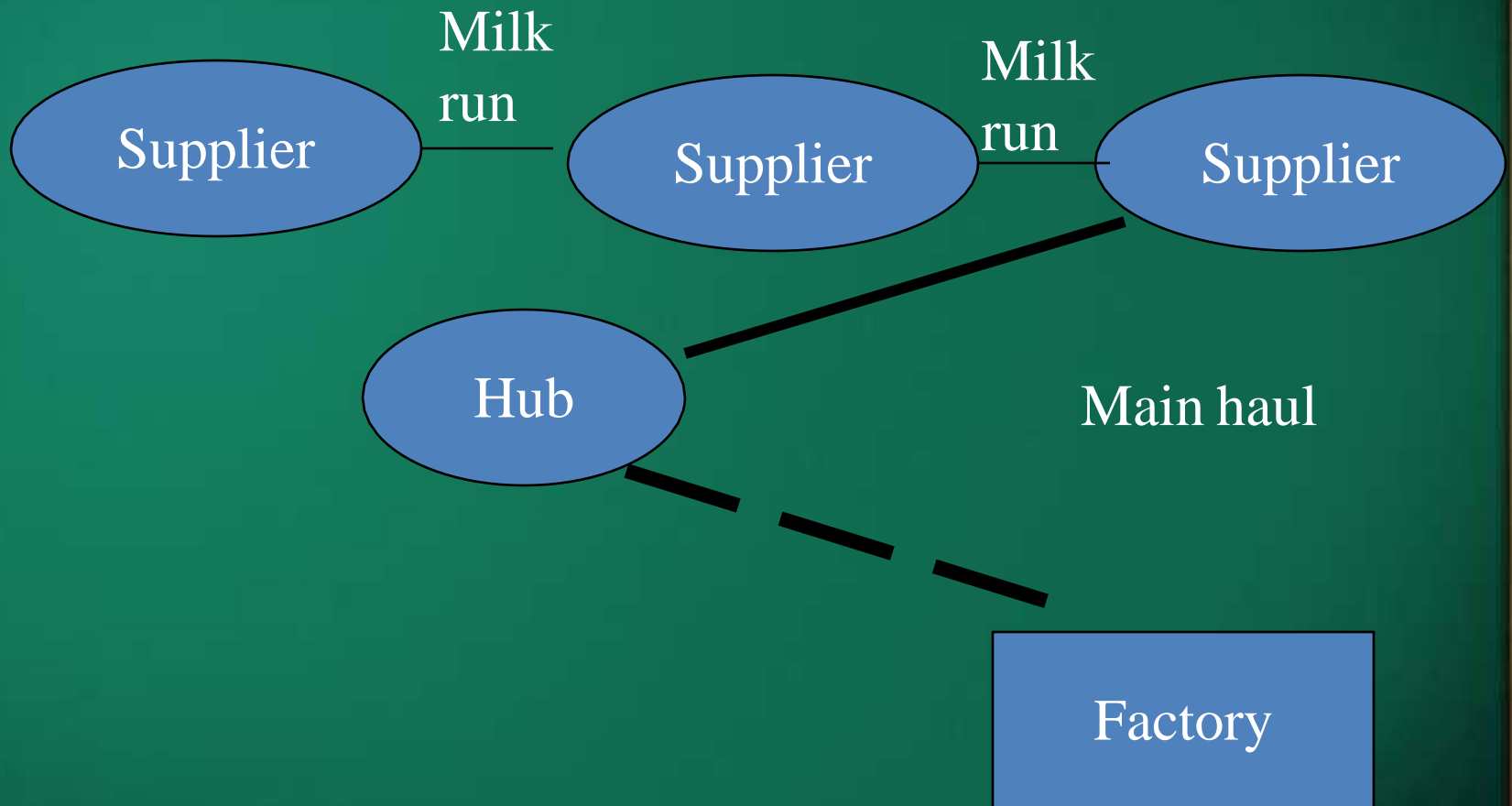
# JIT mean

- Excellent buyer seller partnership
- On line communication and information sharing
- Commitments to zero defects
- Frequent and small lot size shipments

# Milk Runs

- A first level collection of individual through a system of 'milk runs' which in effect means a first level collection of individual items of small required lots from across different suppliers and consolidating them at a hub center, from where a second level main route vehicle carries the aggregated material to the plant

# Milk Runs



# Vendor Management Inventory -VMI

- JIT a Japanese model, did not work very successfully in the USA, so an adaptation was made more popularly known as VMI
- Suppliers take charge of the inventory management of the product and supply
- Achieved by extensive use of electronic data interchange or link ups through software packages or even by locating supplier's representative at the manufacturer's premises



# Kanban

- In Japanese means a signboard or a label, is an information system used to support JIT initiatives.
- It signals supply of materials when used
- Communication tool in inventor management
- Coordinates the inflow of parts into the production line and because it is simultaneously the document for indent, the time in replenishment is greatly minimized

# Summary

- Inventory is an important aspect of Distribution Management
- ABC and VED are important classification of inventory
- SAP and FSN analysis are also useful for inventory management
- Forecasting techniques includes time-series analysis

# Summary

- EOQ formula suggest economic order quantity
- MRP and DRP are important concepts of inventory management
- JIT and KANBAN are Japanese techniques used for inventory management