Inventory Control

Introduction – Inventory

- The term inventory means the value or amount of materials or resource on hand. It includes raw material, work-in-process, finished goods & stores & spares.
- Inventory Control is the process by which inventory is measured and regulated according to predetermined norms such as economic lot size for order or production, safety stock, minimum level, maximum level, order level etc.
- Inventory control pertains primarily to the administration of established policies, systems & procedures in order to reduce the inventory cost.

Objectives of Inventory Control

- To meet unforeseen future demand due to variation in forecast figures and actual figures.
- To average out demand fluctuations due to seasonal or cyclic variations.
- To meet the customer requirement timely, effectively, efficiently, smoothly and satisfactorily.
- To smoothen the production process.
- To facilitate intermittent production of several products on the same facility.
- To gain economy of production or purchase in lots.

Objectives of Inventory Control

- To reduce loss due to changes in prices of inventory items.
- To meet the time lag for transportation of goods.
- To meet the technological constraints of production/process.
- To balance various costs of inventory such as order cost or set up cost and inventory carrying cost.
- To balance the stock out cost/opportunity cost due to loss of sales against the costs of inventory.
- To minimize losses due to deterioration, obsolescence, damage, pilferage etc.
- To stabilize employment and improve lab our

Scopes of Inventory Control

- 1. Determination of economic order quantity
- 2. Formulation of policy
- 3. Determination of lead time
- 4. Effectiveness towards running of store
- 5. Organisation structure
- 6. Determination of safety stock
- 7. Minimum material handling and storage cost.

1. Determination of economic order quantity:

Economic order quantity or economic lot size refers to that number ordered in a single purchase or number of units should be manufactured in a single run, so that the total costs — ordering or set up costs and inventory carrying costs are at the minimum. So, the determination of E.O.Q. is also within the scope of inventory control.

2. Formulation of policy:

The policies of investment procurement, storage, handling, accounting, storages and stock outs, deterioration, obsolescence etc. are to be formulated under the scientific system of inventory control. What, when and how much of purchasing and fixation of minimum and maximum levels is also to be determined for a given period of time.

3. Determination of lead time:

By lead time is meant the time that lapses between the raising of an indent by the stores and the receipt of materials by them. Lead time is of fundamental importance in determining inventory levels.

4. Effectiveness towards running of store:

The deter-mination of policies of the location, layout and materials and storage handling equipments certainly help in the effective working of stores organisation.

5. Organisation structure:

After determining of inventory policy, the next step is to decide the location, layout and types of storehouse. It facilitates the movement of materials and thus minimise the storage and handling cost of stores.

6. Determination of safety stock:

Safety stock is defined as the difference between the amount stocked to sati.sfy demand during a certain time interval and the mean expected demand for that period. It is for the purpose of providing protection against depletion. If demand remained constant and lead tin-; is invariable, there would be no fear of shortages and no need for safely stocks.

The exact quantity of safety stock of an item depends upon its lead time, usage value, and variability of lead time demand, carrying charges and the importance of its stock out cost. Again, determination of buffer stock reserve stock is included in the management of inventory.

7. Minimum material handling and storage cost:

Stores organisation activities are arranged in such a manner that the east of bringing in the store house and issuing from the store house if the various stores, will minimise the storage and materials handling cost of stores.

Types of Inventory

- The four types of inventory most commonly used are Raw Materials, Work-In-Progress (WIP), Finished Goods, and Maintenance, Repair, and Overhaul (MRO). When you know the type of inventory you have, you can make better financial decisions for your supply chain. That includes choosing the best inventory management software to keep track of all that inventory.

1. Raw Materials

Materials that are needed to turn your inventory into a finished product are raw materials. For example, leather to make belts for your company would fall under this category. Or if you sell artificial flowers for your interior design business, the cotton used would be considered raw materials.

2. Work-In-Progress

Inventory that is being worked on is Work-In-Progress (WIP), just like the name sounds. From a cost perspective, WIP includes raw materials, labor, and overhead costs. Think of the inventory under this category as being a part of the bigger end-product picture. If you sell medical equipment, the packaging would be considered WIP. That's because the medicine cannot be sold to the consumer until it is stored in proper packaging. It's literally a work-in-progress.

3. Finished Goods

Maybe the most straight-forward of all inventory types is finished goods inventory. That inventory you have listed for sale on your website? Those are finished goods. Any product that is ready to be sold to your customers falls under this category.

4. Overhaul / MRO

Also known as Maintenance, Repair, and Operating Supplies, MRO inventory is all about the small details. It is inventory that is required to assemble and sell the finished product but is not built into the product itself. For example, gloves to handle the packaging of a product would be considered MRO. Basic office supplies such as pens, highlighters, and paper would also be in this category.

Depending on the specifics of your business, this inventory might be in storage, at a supplier, or in transit out for delivery.

Elements of Inventory Management

- As a business grows to a larger and complex organization, it is common for it to experience problems with inventory management.
- As a business's operations increase, it is required to continually process and keep track of a growing number of orders. This can be quite challenging, and if not handled properly, it can cause the business financial and even legal issues.
- However, along with having the right inventory management system, you also need a solid strategy to go along with it.
- So, your strategy should often incorporate the utilization of software because it addresses many key elements of a good management strategy such as automation and minimal error.
- Above all, it is not only about the software. It also includes best practices for supply chain management, responsive customer service and so on.
- Therefore, in today's highly competitive global economy, a modern inventory management software and strategy is critical to the success of any retail or eCommerce business.
- Below are four key elements of a solid inventory management strategy.

Greater Supply Chain Visibility

- Generally, greater supply chain visibility is the result of a good inventory management strategy and significantly facilitated by software.

- A business needs to coordinate with suppliers on the necessary quantity of goods to be delivered at specific times. In addition, business owners need to carefully choose suppliers based on order fulfillment times, product quality and other criteria.

- Inventory management software helps you make more informed decisions that will save your business money through greater supply chain visibility.

- It enables you to properly assess the best suppliers to order from, based on shipping speed, market demand and other factors.

Accurate Financial Records

- Accurate financial records and subsequently more accurate financial statements are key to a solid inventory management strategy.

- Therefore, it is especially important if your business spans multiple channels, has a large supply chain and a diverse customer base. The more comprehensive and accurate your financial statements are, the more impact your planning, forecasting and decision making will have.

- This is another area where inventory and order management software plays a key role in uniting every channel and your accounting platform.

Inventory Optimization

- Any good inventory management strategy has inventory optimisation at its core.
- This has to do with determining the exact amount of inventory your business needs and ensuring the systems are in place to maintain it.
- Why is this important? If the inventory is low, it can result in shortages. In its turn, it can lead to loss of customers and drain in the business's profits.
- Also, if certain products are overstocked, it can raise expenses such as warehouse rent, heating, lighting, security etc. Both will have a negative effect on the business's bottom line.

Improved Efficiency and Productivity

- Greater productivity is the goal of any business, and there's no question that inventory management software like DEAR immediately facilitates this.

- Implementing inventory software and training staff to use it ensures they will utilize their time more wisely. In its turn, it would eliminate most manual processes.

- What is more, software also enhances the efficiency by making it easier to detect incidents such as theft, warehouse accidents etc. This can be accomplished through the real-time viewing of inventory data.

- The fewer mistakes your business has through software, the more it will fall in line with inventory management best practices.

Costs associated with inventory

- Inventory cost includes the costs to order and hold inventory, as well as to administer the related paperwork. This cost is examined by management as part of its evaluation of how much inventory to keep on hand.

- Inventory Management is one of the most crucial aspects of a small business. Just like cash flow, it can make or break your business.

- Business owners have always been looking for ways to optimize inventory levels without hurting their profits.
- It is essential to evaluate your business on a regular basis to ensure that you are on track to succeed. That is why, in this article, we will be focusing on inventory costs and how to manage it.
- How has your small business's inventory management turned out so far?
- Have you had the right products available when you needed them?
- Did you lose out on business when items were out of stock?
- Did you lose money due to excess inventory stock?
- Before we go into the above, let us understand the different kinds of inventory management and inventory costs.

5 Types of Inventory Costs

- Ordering, holding, carrying, shortage and spoilage costs make up some of the main categories of inventory-related costs. These groupings broadly separate the many different inventory costs that exist, and below we will identify and describe some examples of the different types of cost in each category.

- The other requires a certain amount of calculation to understand the impact it has on your Gross Profit. Let's look at types of costs :

1. Ordering Costs

- Ordering costs include payroll taxes, benefits and the wages of the procurement department, labor costs etc. These costs are typically included in an overhead cost pool and allocated to the number of units produced in each period.

- Transportation costs
- Cost of finding suppliers and expediting orders
- Receiving costs
- Clerical costs of preparing purchase orders
- Cost of electronic data interchange

2. Inventory Holding Costs

- This is simply the amount of rent a business pays for the storage area where they hold the inventory. This can be either the direct rent the company pays for all the warehouses put together or a percentage of the total rent of the office area utilized for storing inventory.

- Inventory services costs
- Inventory risk costs
- Opportunity cost – money invested in inventory
- Storage space costs
- Inventory financing costs

3. Shortage Costs

- Shortage costs, also known as stock-out costs, occurs when businesses become out of stock for various reasons. Some of the reasons might be as below :

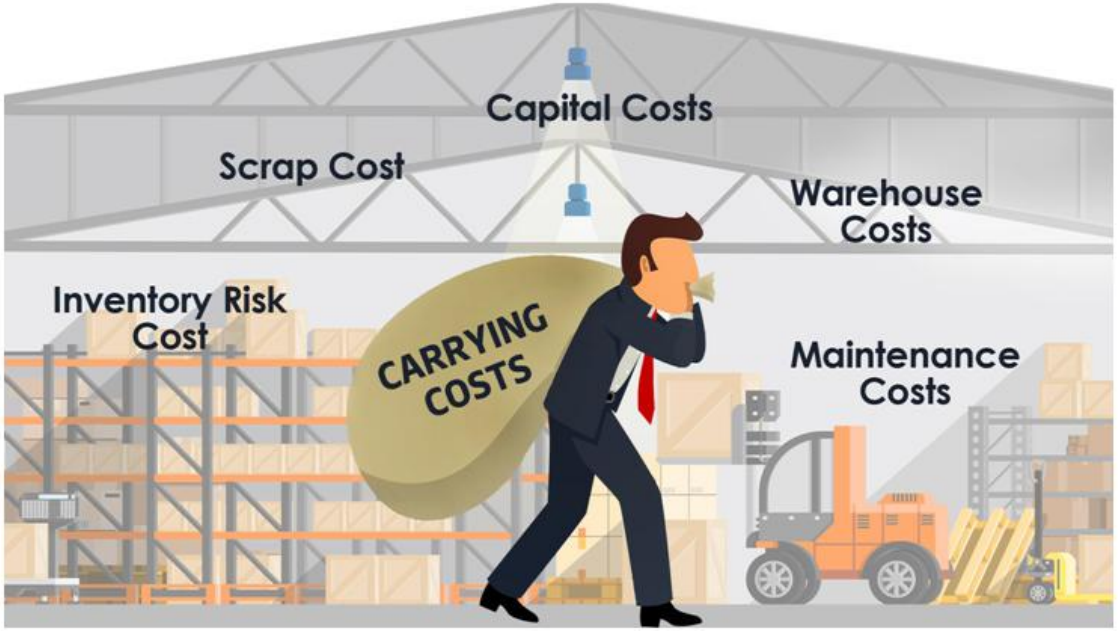
- Emergency shipments costs
- Disrupted production costs
- Customer loyalty and reputation

4. Spoilage Costs

Perishable inventory stock can rot or spoil if not sold in time, so controlling inventory to prevent spoilage is essential. Products that expire are a concern for many industries. Industries such as the food and beverage, pharmaceutical, healthcare and cosmetic industries, are affected by the expiration and use-by dates of their products.

5. Inventory Carrying Costs

- This is the lesser-known aspect of inventory cost. This cost requires a certain amount of calculation to understand the extent of its impact on your P&L statement. Inventory carrying costs refers to the amount of interest a business loses out on the unsold stock value lying in the warehouses.




Companies That Offshore May Require Larger Domestic Inventories – and Incur Larger Carrying Costs
Multiple Factors Impact Inventory Carrying Costs:
Obsolescence
Insurance
Scrap, Sorting, Rework
Taxes
Admin. Mgmt. Costs
Cost of Capital
Warehouse Space
Inventory Carrying Costs
More
Source: Economics and Statistics Administration, Office of the Chief Economist

- Business owners often miss out on understanding the impact of the above factors while calculating the impact inventory has on their business. The inventory holding costs does show up as part of rental expense in the Profit & Loss statement.

- While the inventory carrying cost is seldom considered while calculating the gross profit, we usually take into account only the principle cost of the goods held in the warehouses.

Example of Inventory Carrying Cost

- To understand the inventory carrying costs better, let's take an example of an importer of goods. When he imports goods into his country, they are first received at a dock.
- Multiple customs department clearances are required before they can be transported to the company warehouse. Now let's say, due to some deficiency in the documentation, the goods get held up in the customs clearance department.
- As everyone is aware, until the goods get cleared, there are charges that the customs department levies to hold these goods, and these charges rise exponentially. The costs further depend on the value of goods being held and the volume/area they use up to store them at the dock.
- We can compare this by considering these additional charges that a business owner has to bear on the goods similar to the interest charges the business owner bears, which is a normal scenario that is invisible.
- The dock is the warehouse, while the customs department's charges can be compared to the interest income the business loses out on the principle value of the goods.
- While these custom department penalties are still visible, the only difference is the interest a business loses out on the stock is never taken into account.

Understanding Stock Categorization

- It is necessary to categorize all the stock items into the below four brackets

- High Value – Fast Moving
- High Value – Slow Moving
- Low Value – Fast Moving
- Low Value – Slow Moving
- Let us analyze the treatment to be given to each of the 4 categories mentioned.

1. High Value – Fast Moving

- You must analyze the sales trends for these items and understand the average quantity sold per day.
- Based on this parameter, we should have stock in the warehouse equivalent to its lead time.
- For example, if the lead time for a High-Value product is 7 days, and per day sales are 100 quantities of this product, then there must be 700 qty of this item in the warehouse at all times.
- This will ensure the inventory never runs out of this stock item.

2. High Value – Slow Moving

- Since the value of such items is high while they do not sell much, the inventory team can consider ordering them only when required by the customer.
- It is also necessary to also analyze the ordering pattern for this kind of product by the customers.
- E.g., if a particularly high-value product is usually ordered in April by a set of customers. In that case, we should keep stock of such a product only for April to fulfill its demand.
- Another good strategy that can be followed for such stock items is the drop ship methodology. Drop ship methodology implies that instead of storing stocks within the warehouses, you directly ask your vendor to dispatch it at the customer's location.
- This ensures you never have to bear the inventory holding or carrying charges for such stock items.

3. Low Value – Fast Moving

- Since these stocks' value is low, keeping them in stock will not hurt the costs much. But a good strategy would be to estimate their lead time, per day sales, and keep at least as much stock as is required till the lead time.

- This approach is similar to the one followed for Step 1. However, we can afford to have a little extra quantity that can act as a cushion for the sales team to up-sell or cross-sell.

4. Low Value – Slow Moving

- This is the category that hurts the business the least, but depending on the nature of your business, this may be the most crucial category, as they can consist of spare parts required by machinery or items which are probably not available with any trader.
- Many small business owners often ignore this category and do not stock these items. A good strategy would be to estimate the yearly requirement of these stocks after analyzing the sales pattern for the last 4–5 years. Based on the analysis, maintain an average monthly stock level for these stock items.
- These are essential as it may help set a differentiating image of your business in competition to other businesses.
- Business owners may classify their stocks into the above categories and understand their approach for their inventory. However, businesses must consider another aspect in addition to the above pointers, which is the volume of stock item.
- If the volume of any stock item lying in any of the above four categories is high, it would directly impact the inventory holding charges.

- They would require a bigger warehouse to store them. If such items fall in the first or the third category, you will need to follow multiple strategies to keep your inventory costs in check.
- A good approach for high volume items would be one of the below.
- Drop Shipping : Try and follow the drop shipping methodology where possible. This will ensure you need not make arrangements within your warehouse. The entire lot that you need to sell can be managed within the warehouse of your suppliers.
- Semi Knocked Down : if the stock items can be assembled quickly at the client's place, the right approach would be to store them in a semi knocked down form. Such high volume stock items, when stored in semi knocked downstage, require lesser storage.

Factors Affecting Inventory Control

- Type of product
- Type of manufacture
- Volume of production

Benefits of Inventory Control

- Ensures an adequate supply of materials
- Minimizes inventory costs
- Facilitates purchasing economies
- Eliminates duplication in ordering
- Better utilization of available stocks
- Provides a check against the loss of materials
- Facilitates cost accounting activities
- Enables management in cost comparison
- Locates & disposes inactive & obsolete store items
- Consistent & reliable basis for financial statements

Inventory

Nature of Inventory

- Dependent demand– Demand for one product is linked with demand for another product, such as components, subassemblies etc.
- Independent demand– Demand for a product/ service occurs independently of demand for any other for any other product or service, such as finished product, service parts, lubricants, cutting oil, greases, preservatives etc.

Nature of Inventory

- The dependency is vertical if the demand for one product is derived from the demand for another product. E.g. demand for engine block is derived from demand for cars.
- The dependency is horizontal if the demand for one item is not directly related, but related in another manner. E.g. demand for C.I. ingots horizontally depend on automobile product of company.
- Only independent demand items need forecasting because that of dependent items can be derived from de derived from demand for independent items.

Accounting for Inventory

- Inventory value account for varying proportions of raw materials, work in process parts, components or finished products.

- In continuous production/ mass production inventory for raw materials and finished product is high and that of WIP parts is less.

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- In batch production/ Job shop production inventory for raw material & finished products is less and WIP inventory is high.

DISTRIBUTION OF INVENTORY ACCOUNT

	Raw Materials	WIP Inventory	Finished goods at factory	Finished goods at distribution
Capital goods	60%	20%	20%	00%
Garment industry	30%	55%	5%	10%
Consumer product	5%	10%	30%	55%

Inventory Costs

Types of Inventory Costs

- Ordering (purchasing) costs
- Inventory carrying (holding) costs
- Out of stock/shortage costs
- Other costs

Ordering Costs

- It is the cost of ordering the item and securing its supply.
- Includes–
  - Expenses from raising the indent
  - Purchase requisition by user department till the execution of order
  - Receipt and inspection of material

Inventory Carrying Costs

- Costs incurred for holding the volume of inventory and measured as a percentage of unit cost of an item.
- It includes–
  - Capital cost
  - Obsolescence cost
  - Deterioration cost
  - Taxes on inventory
  - Insurance cost
  - Storage & handling cost

CARRYING COSTS

Aljian states carrying costs as–

- Capital costs
- Storage space costs
- Inventory service costs
- Handling–equipment costs
- Inventory risk costs

Out–of–Stock Costs

- It is the loss which occurs or which may occur due to non availability of material.
- It includes–
  - Break down/delay in production
  - Back ordering
  - Lost sales
  - Loss of service to customers, loss of goodwill, loss due to lagging behind the competitors, etc.

Other Costs

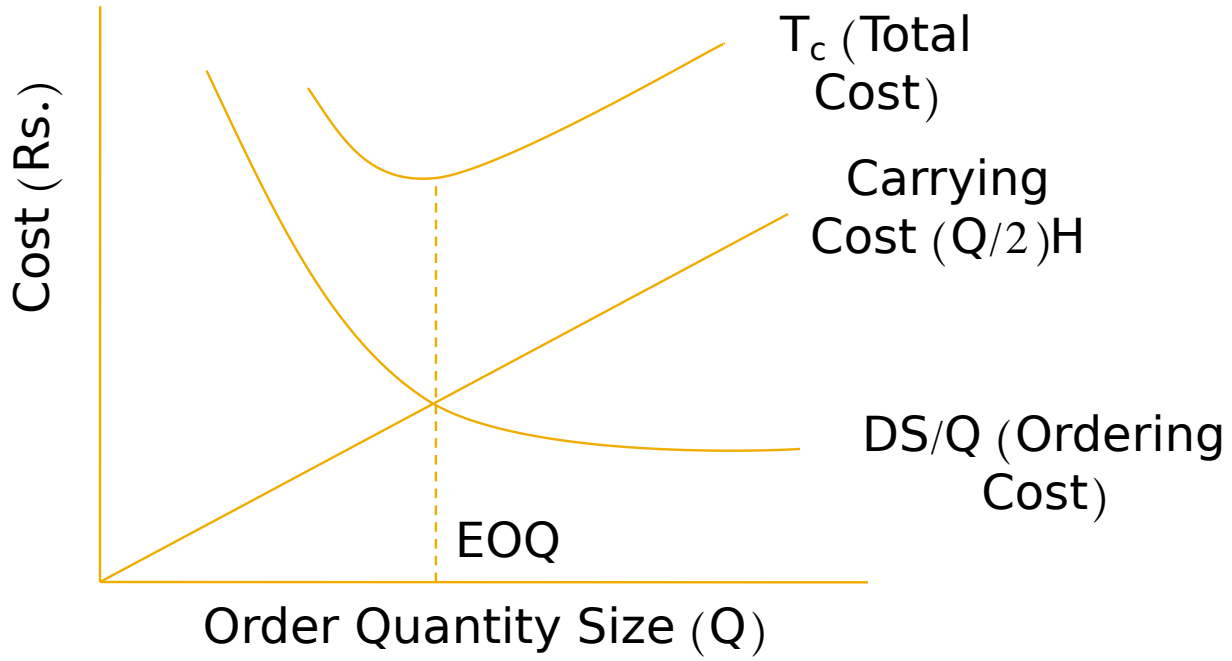
- Capacity Costs
  - Over–time payments
  - Lay–offs & idle time
- Set–up Costs
  - Machine set–up
  - Start–up scrap generated from getting a production run started
- Over–stocking Costs

Inventory Models

Economic Order Quantity (EOQ)

- EOQ or Fixed Order Quantity system is the technique of ordering materials whenever stock reaches the reorder point.
- Economic order quality deals when the cost of procurement and handling of inventory are at optimum level and total cost is minimum.
- In this technique, the order quantity is larger than a single period’s ne requirement so that ordering costs & holding costs balance out.

Economic Order Quantity (EOQ)



Assumptions of EOQ

- Demand for the product is constant
- Lead time is constant
- Price per unit is constant
- Inventory carrying cost is based on average inventory
- Ordering costs are constant per order
- All demands for the product will be satisfied (no back orders)

Weaknesses of EOQ formula

- Erratic usages
- Faulty basic information
- Costly calculations
- No formula is substitute for commonsense
- EOQ ordering must be tempered with judgment

Basic Fixed Order Quantity Model (EOQ)

Total Annual Cost = Annual Purchase Cost + Annual Holding Cost + Annual Ordering Cost

$$TC = DC + \frac{Q}{2}H + \frac{D}{Q}S$$

$$EOQ = \sqrt{\frac{2DS}{H}}$$

TC = Total annual cost
D = Demand
C = Cost per unit
Q = Order quantity
S = Cost of placing order/setup cost
H = Annual holding and storage cost per unit of inventory

Order Points & Service levels

Important Terms

- Minimum Level – It is the minimum stock to be maintained for smooth production.
- Maximum Level – It is the level of stock, beyond which a firm should not maintain the stock.
- Reorder Level – The stock level at which an order should be placed.
- Safety Stock – Stock for usage at normal rate during the extension of lead time.
- Reserve Stock – Excess usage requirement during normal lead time.
- Buffer Stock – Normal lead time consumption.

Classification of Inventory Control

Always Better Control (ABC) Analysis

- This technique divides inventory into three categories A, B & C based on their annual consumption value.
- It is also known as Selective Inventory Control Method (SIM)
- This method is a means of categorizing inventory items according to the potential amount to be controlled.
- ABC analysis has universal application for fields requiring selective control.

Procedure for ABC Analysis

- Make the list of all items of inventory.
- Determine the annual volume of usage & money value of each item.
- Multiply each item's annual volume by its rupee value.
- Compute each item's percentage of the total inventory in terms of annual usage in rupees.
- Select the top 10% of all items which have the highest rupee percentages & classify them as "A" items.
- Select the next 20% of all items with the next highest rupee percentages & designate them "B" items.
- The next 70% of all items with the lowest rupee

Advantages of ABC Analysis

- Helps to exercise selective control
- Gives rewarding results quickly
- Helps to point out obsolete stocks easily.
- In case of “A” items careful attention can be paid at every step such as estimate of requirements, purchase, safety stock, receipts, inspections, issues, etc. & close control is maintained.
- In case of “C” items, recording & follow up, etc. may be dispensed with or combined.
- Helps better planning of inventory control
- Provides sound basis for allocation of funds & human resources.

Disadvantages of ABC Analysis

- Proper standardization & codification of inventory items needed.
- Considers only money value of items & neglects the importance of items for the production process or assembly or functioning.
- Periodic review becomes difficult if only ABC analysis is recalled.
- When other important factors make it obligatory to concentrate on “C” items more, the purpose of ABC analysis is defeated.

VED Classification

VED: Vital, Essential & Desirable classification

- VED classification is based on the criticality of the inventories.
- Vital items – Its shortage may cause havoc & stop the work in organization. They are stocked adequately to ensure smooth operation.
- Essential items - Here, reasonable risk can be taken. If not available, the plant does not stop; but the efficiency of operations is adversely affected due to expediting expenses. They should be sufficiently stocked to ensure regular flow of work.
- Desirable items – Its non availability does not stop the work because they can be easily purchased from the market as & when needed. They may be stocked very low or not stocked.

VED Classification

- It is useful in capital intensive industries, transport industries, etc.
- VED analysis can be better used with ABC analysis in the following pattern:

Category	"V" items	"E" items	"D" items
"A" items	Constant control & regular follow up	Moderate stocks	Nil stocks
"B" items	Moderate stocks	Moderate stocks	Low stocks
"C" items	High stocks	Moderate stocks	Very low stocks

FSN Analysis

FSN: Fast moving, slow moving & non moving

- Classification is based on the pattern of issues from stores & is useful in controlling obsolescence.
- Date of receipt or last date of issue, whichever is later, is taken to determine the no. of months which have lapsed since the last transaction.
- The items are usually grouped in periods of 12 months.
- It helps to avoid investments in non moving or slow items. It is also useful in facilitating timely control.

FSN Analysis

- For analysis, the issues of items in past two or three years are considered.
- If there are no issues of an item during the period, it is “N” item.
- Then up to certain limit, say 10-15 issues in the period, the item is “S” item
- The items exceeding such limit of no. of issues during the period are “F” items.
- The period of consideration & the limiting number of issues vary from organization to organization.

Assignment

Q 1. Explain inventory and Inventory management.

Q 2. What are the objectives of inventory control ?

Q 3. What are the benefits of inventory control ?

Q 4. Explain the types of inventory costs.

Q 5. Explain EOQ in detail. Write the relation for calculating EOQ.

Q 6. What is ABC analysis in inventory control. Write its procedure and advantages.

Q 7. Explain VED classification and FSN analysis,