

Unit-1

Material Cost

Materials:

In cost accounting, material is defined as the part of inventory. Basically, material and raw material are used for same purpose. This is main part of total cost of production. It can reduce or increase according to the fluctuation in production. So, this is very flexible and controllable source of production. For making furniture, wood is the material. 60% to 70% proportion in the total cost of production will be material cost. So, it is very necessary for producing any new product. Its cost will reflect the profit of company directly. This input can be stored and transported from one place to another.

Meaning:

Material means any commodity or substance which is processed in a factory in order to be converted into finished product.

Classification of material:

- Raw material- The basic material supplied in crude form to be used for production
- Components- Finished part made out of raw material which are assembled to make finished products
- Tools- appliances used in manufacturing operations
- Spare parts- used for maintenance of plant, machinery etc
- Consumable stores- items used for smooth running of machines like lubricants, oil, cotton wastes, rags etc.

Material Cost:

The cost of material used at the basic input in a process of production of any good is known as the material cost. Material cost is bifurcated as direct material cost and indirect material cost.

Importance of material cost:

- **Conciliation For Proper Quality with Price of Material:** If company buys high quality material, its price will be high. If company buys low quality material, its price will less. Company has to compromise quality with price of material. Quality will not less than minimum standard. At that level, company has to pay price of material.

- **Purchase at Competitive Price:** If company is selling the products in competitive market, its price must be same with other competitors. It will be only possible, if company will buy products at competitive price. For buying competitive price, company has to check past records of purchased material and compare prices with other competitors
- **Continue Supply of Material:** It is main objective and feature of material that for continue operating of machinery, it is very necessary that we should have to continue supply of raw material for production. Without, this our fixed cost will be increased. That is not good. So, it is needed that store keeper must record when he issues the goods to production department. He also alerts to purchase department for new buying of material.
- **Equilibrium in the Stock of Material:** Over-stocking and understocking both are harmful for concern. Equilibrium in stock of material means optimum stocking of materials. It can be only possible, if company records and control the stock and use different techniques for measuring level of stock.
- **To Reduce the Wastage and Losses:** To reduce normal and abnormal wastage and losses of material in production should be also the aim of material record and control.

Types of materials:

Materials may be classified into two categories direct and indirect materials.

1.Direct Material:

Those materials, which are easily and unambiguously acknowledged in relation to a specific product, process or job are called direct materials. Following examples in this regard would make the concept of direct material clearer. i)

Primary Packaging Materials

- a) Bag for cement.
- b) Plastic packing for milk, ghee and oil.
- c) Can for tinned food and drink.
- d) Bottles for water, wine and whisky.
- e) Card board box for drinks like Frooti, real juice.
- f) Tin packing for ghee and oil.

ii) Basic Raw Materials -

- a) Bricks and cement in building construction.
- b) Gold and silver in jewellery.
- c) Paper in books.
- d) Milk and cream in ice cream.
- e) Cloth in garments.
- f) Timber in furniture.

2. Indirect Material:

Those materials, which are not easy to be acknowledged in relation to a specific product, process or job are called indirect materials. Following examples would make the concept of indirect material clearer :

- a) Materials having in significant monetary value e.g. nails used in furniture, thread used in stitching garments etc.
- b) Materials which are used by Service Department e.g. power house, boiler house etc.
- c) Items which are useful in the maintenance of various types of Machines e.g. lubricant oil/grease, cotton waste and other consumables etc.

Material Control:

Material control, is the system that ensure, the provision of the required quantity of material of the required quality at the required time with the minimum amount of capital tied up.

Procurement:

Procurement refers to the activities required to obtain goods and services from suppliers. It is needed to ensure that purchases are made at reasonable prices and from reputable suppliers. The most effective procurement process focuses on obtaining those goods and services that are in short supply, or which present opportunities for significant cost reductions.

Procedure for procurement of materials:

The standard procurement steps are:

1. **Purchase Requisition:** Purchases of materials are initiated through purchase requisitions. It is a formal request by the head of the

department or other authorities to the purchase manager to purchase the specified materials.

Such requisitions are received from certain authorised persons as follows:

XYZ Co. Ltd.
PURCHASE REQUISITION

Department..... No.....
To be delivered at..... Date.....
.....
Please Purchase the items listed below :

<i>Items No.</i>	<i>Quality</i>	<i>Description and Code No.</i>	<i>Purpose</i>

For the use of purchase department only
Purchase Order No..... Requisition by.....
Delivery date..... Approved by.....

2. **Selection of Suppliers:** When the purchasing department receives a duly authorised purchase requisition, a source of supply has to be selected. The purchase department generally maintains a list of suppliers for each type of material and selects a particular supplier after inviting tenders.

The important rule is to buy the best quality materials at the lowest possible price after giving due consideration to delivery dates and other terms of purchases. Purchase should be made from dependable sources of supply and ethical standards in dealing with suppliers should be maintained.

3. **Purchase order and Follow up:** When the supplier has been selected, the most common procedure is the preparation of a purchase order. The purchase order is the form used by purchasing department authorising the suppliers to supply the specified materials at a price and terms stated therein.

A purchase order should be carefully prepared as it forms a basis of legal contract between the parties concerned. For this reason, authority to sign purchase orders should also be restricted to selected responsible officials.

Large companies generally prepare five copies of the purchase order. The original is sent to the supplier. Second copy is retained by the purchase department for its own file and reference. Third copy is sent to the receiving department as advance intimation to expect the materials.

Fourth copy is sent to the cost accounting department for entry in the ordered column of the stores ledger account. Last copy is sent to the department requisitioning the material as an intimation of the order and expected date of receipt of materials.

XYZ Co. Ltd.
PURCHASE REQUISITION

Department..... No.....
To be delivered at..... Date.....
.....

Please Purchase the items listed below :

<i>Items No.</i>	<i>Quality</i>	<i>Description and Code No.</i>	<i>Purpose</i>

For the use of purchase department only
Purchase Order No..... Requisition by.....
Delivery date..... Approved by.....

4. **Receipt of materials:** All incoming material should be received by the receiving department. This department performs the functions of unpacking the goods received and verify their quantities and conditions. The quantity is checked against the purchase order copy and the supplier's advice note which is normally received along with the goods.

Goods received note serves the following purposes:

1. It informs the store keeper or other requisitionist of the receipt of materials.
2. It notifies the accounting department that the materials have been received and that a voucher can be prepared.

3. When it includes columns of cost, it can serve as a source of entry in the stores ledger. Original copy of this goods received note is sent to the purchase department to be marked completed.

Second copy is sent to the store keeper. Third copy is sent to the accounting department for entry in the stores ledger and last copy is retained by the receiving department for its own file.

FORMAT OF GOODS RECEIVED NOTE

ABC Ltd.

Supplier.....

No.....

Date.....

Advice Note No.....

Purchase Order No.....

<i>Quantity</i>	<i>Description</i>	<i>No. of Packages</i>	<i>Gross Weight</i>

Inspection Report

<i>Quantity Passed</i>	<i>Quantity Rejected</i>	<i>Reason for Rejection</i>	<i>Received by</i>
Inspected by.....	Date.....		

5. **Inspection and Testing of Materials:** Goods received should be inspected for quantity to ensure that they comply with specifications stated on the purchase order. Where technical or laboratory inspection is necessary, the goods are passed to laboratory which will provide a report on the quality of goods.

An inspection report is prepared to show the results of the inspection. This report is either prepared separately or incorporated in the goods received note. In either case, the report is forwarded to the purchasing department.

6. **Return of Rejected Materials:** Where materials received are damaged or are not in accordance with the specifications, these are usually returned to the supplier along with a debit note, informing him that his account has been debited with the value of materials concerned. When such a claim is accepted by the supplier, he signifies his acceptance by the issue of a credit note. The rejected materials may be returned to the supplier immediately or they may be held pending his instructions.

The debit note may be prepared by the purchase department on the basis of the inspection report. Original copy is sent to the supplier one copy is sent to accounts department for adjustment entry and one copy is retained for purchase department file.

FORMAT OF DEBIT NOTE
ABC CO. Ltd.

To (supplier)	No.		
.....	Date		
We are debiting your account with the value of undermentioned materials for the reasons stated. Meanwhile, we wait for your instructions.			
<i>Quantity</i>	<i>Description</i>	<i>Rate</i>	<i>Amount</i>
Reasons.....		Date received	
.....			
Purchase Order No.....		Goods received Note No.....	
Supplier's Invoice No.....			
		Signature	

7. **Passing Invoices for Payment:** When the invoices are received by the purchasing department, the process of assembling the business paper concerned with each purchase and preparation of vouchers begins. Invoices are numbered serially and entered in the invoice register.

Documentation involved in materials accounting:

- **Stores ledger:** Stores department will maintain a record called 'stores ledger' in which a separate folio is kept for each individual item of stock. It records not only the quantity details of stock movements but also record the rates and values of stock movements.
With the information available in the store's ledger, it is easier to ascertain the value of any stock item at any point of time. The minimum, maximum and reorder levels of stock are also mentioned for taking action to replenish the stock position.
- **Bin card:** A 'bin card' indicates the level of each particulars item of stock at any point of time. It is attached to the concerned bin, rack or place where the raw material is stored. It records all the receipts of a particular item of materials and its issues. It gives all the basic information relating to physical movements. It is record of receipts, issues and balance of the quantity of an item of stock handled by a store.

- **Material return note:** If Materials received from the stores are not of suitable quality or if there is surplus material remaining with the department, they are returned to stores with a note called ‘ material return note’ evidencing return of material from department to stores.
- **Material Transfer Note:** If materials are transferred from one department or job to another within the organization, then material transfer note should be raised. It is a record of the transfer of materials between stores, cost centres or cost units showing all data for making necessary accounting entries.
- **Stores requisition Note:** It is also called as ‘materials requisition note’. When production or other departments requires material from the stores it raises a requisition, which is an order on the stores for the material required for execution of the work order. This note is signed by the department in-charge of the concerned department. It is documents which authorize the issue of a specified quantity of materials.
- **Goods Received Note(GRN):** Once the inspection is completed, GRN is prepared by the stores department, and copies of GRN is sent to the purchasing department, costing department, accounts department and production department, which initiated purchase requisition.
- **Material Inspection Note:** when materials are delivered, a supplier’s carrier will usually provide a document called ‘ delivery note’ or ‘delivery advice’ to confirm the details of materials delivered. When materials are unloaded, the warehouse staff check the material unloaded with the delivery note. Then the warehouse staff prepares a materials receipt note, a copy of which is given to the supplier’s carrier as a proof of delivery. After receiving the materials the Inspection Department thoroughly inspects whether the quality of material is in accordance with the purchase order and the quality of material received and it prepares a note called ‘material inspection note’, copies of which are sent the supplier and stores department.
- **Purchase order:** If the purchase requisition received by the purchasing department is an order then it will call tenders or quotations from suppliers of materials. It will send enquiries to prospective suppliers giving details of requirement and requesting details of available materials, prices, terms and delivery etc. Quotation will then be compared and will place order with those suppliers who will provide necessary goods at competitive prices.
- **Bill of materials:** Bill of materials is a comprehensive list of materials, with specifications, material codes and quantity of each material required for a particular job, process or production unit. It will also include the

details of substitute materials. It is prepared by the engineering or planning department for submission of quotation and after the receipt of work order. It is a method of documenting materials required for execution of the specified job work.

- **Purchase requisition:** Purchase requisition is an instruction to a buying office to purchase goods or services . It states their quantity and description and elicits a purchase order.

The manager in-charge of purchase department should obtain requisition from the stores in-charge, departmental head or similar person requiring goods before placing orders on suppliers. If the present stock run down to the reorder level, then the stores department send a purchase requisition to purchase department, authorizing the department to order further stock.

Unit 2

2.1 Methods of Pricing Material Issues –

The important methods followed in pricing of issue of materials are:

1. Actual Cost Method:

Where materials are purchased specially for a specific job, actual cost of materials is charged to that job. Such materials will normally be stored separately and issued only to that particular job.

2. First-In First-Out (FIFO) Method:

A method of pricing the issue of material using, the purchase price of the oldest unit in the stock. Under this method materials are issued out of stock in the order in which they were first received into stock. It is assumed that the first material to come into stores will be the first material to be used.

Advantages:

- (a) It is easy to understand and simple to price the issues.
- (b) It is a good store keeping practice which ensures that raw material leave the stores in a chronological order based on their age.
- (c) It is a straight forward method which involves less clerical cost than other methods of pricing.
- (d) This method of inventory valuation is acceptable under standard accounting practice.
- (e) It is a consistent and realistic practice in valuation of inventory and finished stock.
- (f) The inventory is valued at the most recent market prices and it is near to the valuation based on replacement cost.

Disadvantages:

- a) There is no certainty that materials which have been in stock longest will be used, if they are mixed up with other materials purchased at a later date at different price.
- (b) If the price of the materials purchased fluctuates considerably, it involves more clerical work and there is possibility of errors.
- (c) In a situation of rising prices, production cost is understated.
- (d) In inflationary market, there is a tendency to under-price material issues. In deflationary market, there is a tendency to overprice such issues.
- (e) Usually more than one price has to be adopted for a single issue of materials.

- (f) The method makes cost comparison difficult of different jobs when they are charged with varying prices for the same materials.

This method is more suitable where the size of the raw materials is large and bulky and its price is high and can be easily identified in the stores separately. This method is useful when the frequency of material receipts is less and the market price of the material are stable and steady.

3. Last-In First-Out (LIFO) Method:

Under this method most recent purchase will be the first to be issued. The issues are priced out at the most recent batch received and continue to be charged until a new batch received is arrived into stock. It is a method of pricing the issue of material using the purchase price of the latest unit in the stock.

Advantages:

- (a) Stocks issued at more recent price represent the current market value based on the replacement cost.
- (b) It is simple to understand and easy to apply.
- (c) Product cost will tend to be more realistic since material cost is charged at more recent price.
- (d) In times of rising prices, the pricing of issues will be at a more recent current market price.
- (e) It minimizes unrealized inventory gains and tends to show the conservative profit figure by valuation of inventory at value before price rise and provides a hedge against inflation.

Disadvantages:

- (a) Valuation of inventory under this method is not acceptable in preparation of financial accounts.
- (b) It is an assumption of a cash flow pattern and is not intended to represent the true physical flow of materials from the stores.
- (c) More than one price may have to be adopted for an issue.
- (d) It renders cost comparison between jobs difficult.
- (e) It involves more clerical work and sometimes valuation may go wrong.
- (f) In times of inflation, valuation of inventory under this method will not represent the current market prices.

4. Highest-in First-Out (HIFO) Method:

Under this method, the materials with highest prices are issued first, irrespective of the date upon which they were purchased. The basic assumption is that in fluctuating and inflationary market, the cost of material is quickly absorbed into product cost to hedge against risk of inflation. This method is used when the material is in short supply and in execution of cost-plus contracts. This method is not popular and not acceptable under standard accounting practices.

5. Simple Average Cost Method:

Under this method all the materials received are merged into existing stock of materials, their identity being lost. The simple average price is calculated without any regard to the quantities involved. The simple average cost is arrived at by adding the different prices paid during the period for the batches purchased by dividing the number of batches. For example, three batches of materials received at Rs. 10, Rs. 12 and Rs. 14 per unit respectively.

The simple average price is calculated as follows:

$$\text{Rs. } 10 + \text{Rs. } 12 + \text{Rs. } 14 / 3 \text{ batches} = \text{Rs. } 36 / 3 \text{ batches} = \text{Rs } 12 \text{ per unit}$$

Simple Average Method:

This method is not popular because it takes into consideration the prices of different batches but not the quantities purchased in different batches. This method is used when prices do not fluctuate very much and the stock values are small in value.

6. Weighted Average Cost Method:

It is a perpetual weighted average system where the issue price is recalculated every time after each receipt taking into consideration both the total quantities and total cost while calculating weighted average price. For example, three batches of material received in quantities of 1,000 units @ Rs. 15, 1,300 units @ Rs. 16 and 800 units @ Rs. 14.

The weighted average price is calculated as follows:

$$(1,000 \text{ units} \times \text{Rs. } 15) + (1,300 \text{ units} \times \text{Rs. } 16) + (800 \text{ units} \times \text{Rs. } 14) / 1,000 \text{ units} + 1,300 \text{ units} + 800 \text{ units}$$

$$= \text{Rs. } 15,000 + \text{Rs. } 20,800 + \text{Rs. } 11,200 / 3,100 \text{ units} = \text{Rs.}$$

$$47,000 / 3,100 \text{ units} = \text{Rs. } 15.16 \text{ per unit}$$

This method tends to smooth out the fluctuations in price and reduces the number of calculations to be made, as each issue is charged at the same price until a fresh batch of material is received.

This method is easier as compared to FIFO and LIFO, as there is no necessity to identify each batch separately. But this method increases the clerical work in calculation of new average price every time a new batch is received. The issue price calculated rarely represents the actual purchase price.

7. Standard Cost Method:

Under this method, material issues are priced at a predetermined standard issue price. Any variance between the actual purchase price and standard issue price is written off to the Profit and Loss

Account. Standard cost is a predetermined cost set by the management prior to the actual material costs being known and the standard issue price is used for all issues to production and for valuation of closing stock.

If initially the standard price is set carefully then it reduces all the clerical work and errors tremendously and the stock recording procedure is simplified. The realistic production cost comparisons can be made easier by eliminating fluctuations in cost due to material price variance. In a situation of fluctuating prices, this method is not suitable.

8. Replacement Cost Method:

This method is also called as 'market price method'. The replacement cost is a cost at which material identical to that can be replaced by purchasing at the date of pricing material issues; as distinct from the actual cost price at the date of purchase. The replacement price is the price of replacing the material at the time of issue of materials or on the date of valuation of closing stock.

This method is not acceptable for standard accounting practice, since it reflects a cost which has not really been paid. If stocks are held at replacement cost, for balance sheet purposes when they have been bought at a lower price, an element of profit which has not yet been realized will be built into the Profit and Loss Account.

This method is advocated by charging the market price of material to the job or process, make it easier to determine the profitability of the job or process. This method is suitable particularly in the inflationary tendency of market prices of materials. Where there is no precise market for particular materials, it would be difficult in ascertainment's of replacement prices for the material issues.

9. Next in First Out (NIFO) Method:

This method is a variant of replacement cost method. Under this method the price quoted on the latest purchase order or contract is used for all issues until a new order is placed.

2.2 Reasons for Stock Discrepancies:

The possible reasons for discrepancy between physical stock and stock shown in records may be due to the following:

- (a) Shortage of material due to spoilage, evaporation, wastage in material handling, breakdown in handling and storing. Increase in weight due to absorption of water etc.
- (b) Items of material placed in wrong location.
- (c) Pilferage and theft from stores by insiders and outsiders.

- (d) Issue and receipt of stock without proper recording and maintenance of stores recording and accounting.
- (e) Stock returns not recorded properly.
- (f) Stock issues to production departments without proper recording in stock card and stores ledger.
- (g) Arithmetical errors in calculating the balances in bin card.
- (h) Clerical errors in stores ledger.
- (i) Supplier supplies a different quantity of material than is mentioned in the delivery challan.
- (j) Discrepancy due to improper weighing of material.

2.3 Steps to Avoid Stock Discrepancies:

Steps to be taken to avoid discrepancies in physical stock and stock as shown in records are as follows:

- (a) Entry into the stores should be restricted only to authorized persons.
- (b) Material requisition should be signed only by the authorized persons.
- (c) Proper maintenance of stores records like bin card/stock card, stores ledger etc.
- (d) Regular check by independent staff to detect and correct mistakes.
- (e) Issue of material only against proper requisition slip.
- (f) Recording of all movements of stock.
- (g) Physical verification and counting at the time of receipt and issue of material.
- (h) Use of FIFO method for stock issues for avoidance of deterioration and obsolescence.

2.4 Accounting Procedure for Material Shortages:

Action to be taken and to record the information:

- (i) The units shown in the stock card and stores ledger is to be compared and further check it with the physical verification of units.
- (ii) If any excess or shortfall of units is found, investigate the reasons.
- (iii) After identification of reasons for excess or shortfall of units, the following accounting entries are to be passed:

Particulars		Debit (Rs.)	Credit (Rs.)
(i) Accounting Entries for Shortage of Material:			
(a) If normal shortage is found			
Factory overhead A/c	Dr.	xxx	
To Stores ledger control A/c			xxx
(b) If abnormal shortage is found			
Costing profit and loss A/c	Dr.	xxx	
To Stores ledger control A/c			xxx
(c) If the shortage is due to omission in entry or short recording			
Work-in-progress A/c	Dr.	xxx	
To Stores ledger control A/c			xxx
(ii) Accounting Entries when Excess Stock Found:			
(1) If the excess stock is due to normal causes			
Stores ledger control A/c	Dr.	xxx	
To Factory overhead A/c			xxx
(2) If the excess of stock is due to abnormal reasons			
Stores ledger control A/c	Dr.	xxx	
To Costing profit and loss A/c			xxx
(3) If excess shown due to wrong entry			
Stores ledger control A/c	Dr.	xxx	
To Work-in-progress A/c			xxx

Unit- 3 Inventory Management

Definition and Meaning of Inventory, Requirements of Stock Control, Impact of Inflation on Inventory Holding

1. Introduction:

Inventories occupy the most strategic position in the structure of working capital of most business enterprises. It constitutes the largest component of current asset in most business enterprises. In the sphere of working capital, the efficient control of inventory has passed the most serious problem in many industries where most of the current assets of companies are blocked in inventories. For example, cement mills.

Inventory management refers to the process of ordering, storing, using, and selling a company's inventory. This includes raw materials, components, and finished products, as well as the warehousing and processing of these items. There are different methods of inventory management, each with its pros and cons, depending on a company's needs. Inventory management is the entire process of managing inventories from raw materials to finished products. Inventory management tries to efficiently streamline inventories to avoid both gluts and shortages.

2. Definition:

1. Inventory:

Inventory is the accounting of items, component parts and raw materials that a company either uses in production or sells. The four major components are raw materials and its components, work in progress, finished goods and maintenance, repair and operating supplies. The term **inventory** generally refers to the complete list of items, goods, materials, or assets that a business or organization has in stock, either for sale, use, or distribution. It can also refer to a detailed catalogue or record of resources available.

1. Philip Kotler (Marketing and Management Expert)

"Inventory consists of the goods or materials a business holds for the ultimate goal of resale or production."

2. C.K. Prahalad and M.S. Krishnan (Management Scholars)

In their book *The New Age of Innovation*, they discuss inventory as part of the supply chain and describe it as:

"The buffer or stock of materials that ensures smooth production and sales activities in the presence of supply and demand variations."

3. **Jay Heizer and Barry Render (Operations Management Authors)**

In *Operations Management: Sustainability and Supply Chain Management*, inventory is defined as:

"The stock of any item or resource used in an organization, including raw materials, work-in-progress, and finished goods."

4. **Henry Ford (Industrialist)**

Although not in academic texts, Henry Ford famously commented on inventory in his philosophy:

"Inventory is money sitting around in a different form."

Would you like more elaboration or a specific focus on inventory management practices?

2. **Inventory Management:**

Inventory management is the process of overseeing a company's inventory, including how products are ordered, stored, produced, and sold. Inventory Management refers to the process of ordering, storing, using, and tracking a company's inventory. This includes managing raw materials, components, and finished products, as well as overseeing warehousing and processing items.

1. **Jay Heizer and Barry Render**

In *Operations Management: Sustainability and Supply Chain Management*:

"Inventory management is the process of ensuring that an organization has the right quantity of inventory at the right time to meet customer demands while minimizing costs."

2. **Chopra and Meindl**

In *Supply Chain Management: Strategy, Planning, and Operation*:

"Inventory management is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be."

3. Philip Kotler

In *Marketing Management*:

"Inventory management refers to all the activities undertaken to ensure that adequate stocks of materials are available to meet customer demand without overstocking or understocking."

4. Richard B. Chase and Robert Jacobs

In *Operations and Supply Chain Management*:

"Inventory management involves planning and controlling inventory to balance the cost of carrying goods with the benefits of meeting customer needs effectively."

If you'd like, I can provide deeper insights into any specific framework or tools related to inventory management!

3. Meaning:

1. Inventory:

Inventory refers to the stock of goods, materials, and resources held by a business to support production, sales, and operations. It includes raw materials, work-in-progress, and finished goods ready for sale. Effective inventory management ensures that companies have the right quantity of stock to meet customer demand while minimizing storage costs and waste. Proper inventory levels are crucial for smooth business operations, supply chain efficiency, and customer satisfaction. Authors like Philip Kotler and Jay Heizer emphasize its role in balancing supply and demand while avoiding overstocking or shortages, which can affect profitability and operational performance.

In modern businesses, inventory plays a vital role in supply chain management, directly impacting profitability and operational efficiency. Advanced techniques like Just-in-Time (JIT) and Economic Order Quantity (EOQ) are widely used to optimize inventory.

2. Inventory management:

Inventory management is the systematic approach to acquiring, storing, tracking, and controlling an organization's inventory to meet demand efficiently and cost-effectively. It plays a crucial role in balancing stock levels to prevent overstocking, which ties up capital, and understocking, which can disrupt production or sales.

The process involves managing raw materials, work-in-progress items, and finished goods to ensure smooth operations. Effective inventory management ensures that businesses have the

right products in the right quantity, at the right time, and in the right place. Key techniques include Just-in-Time (JIT), Economic Order Quantity (EOQ), and ABC analysis.

Authors like Jay Heizer and Barry Render describe inventory management as essential for aligning supply chain activities with customer demands while minimizing costs. Similarly, Chopra and Meindl emphasize its importance in determining replenishment policies and optimizing stock levels.

Technological tools such as inventory management software and Enterprise Resource Planning (ERP) systems enhance accuracy by automating processes like stock tracking, forecasting, and reordering. By implementing efficient inventory management, organizations can improve operational efficiency, reduce costs, and maintain customer satisfaction, thereby gaining a competitive advantage in the market.

4. Requirements of Stock Control

Stock control, also known as inventory control, refers to the processes used to manage and oversee stock levels, ensuring the right quantity of stock is available at the right time to meet customer or operational demands while minimizing costs.

The key requirements for effective stock control are:

- 1. Accurate Record-Keeping**

Maintaining precise records of stock levels, movements, and usage patterns is essential for effective control and decision-making.

- 2. Demand Forecasting**

Predicting future demand based on historical data and market trends ensures the right stock levels are maintained.

- 3. Stock Classification**

Organizing inventory using methods like ABC analysis helps prioritize control efforts on high-value or fast-moving items.

- 4. Reordering Policies**

Establishing reorder points and economic order quantities (EOQ) ensures timely replenishment without overstocking.

- 5. Monitoring and Auditing**

Regular stock audits and tracking systems help identify discrepancies, minimize shrinkage, and ensure accountability.

6. Technology and Automation

Using inventory management software, barcodes, and RFID systems increases efficiency and reduces human error.

7. Cost Control

Balancing holding costs, ordering costs, and stockout costs is critical for financial optimization.

8. Flexibility

Adapting stock control methods to changing market conditions and customer demands ensures agility and competitiveness.

5. Benefits of Proper Stock Control

Effective stock control offers numerous advantages to businesses by ensuring optimal inventory levels and streamlining operations. Here are the key benefits:

1. Cost Savings

Reduces holding costs (storage, insurance, and depreciation) by avoiding overstocking and minimizes stockout costs by preventing shortages.

2. Improved Cash Flow

Frees up capital by maintaining optimal stock levels, enabling funds to be allocated to other business areas.

3. Enhanced Customer Satisfaction

Ensures that products are always available, leading to timely order fulfillment and improved customer loyalty.

4. Minimized Waste and Obsolescence

Prevents spoilage or obsolescence of inventory, especially for perishable or seasonally dependent items.

5. Streamlined Operations

Supports smooth production processes by providing the right materials at the right time, avoiding delays.

6. Accurate Demand Forecasting

Helps track sales trends, enabling better forecasting and more informed decision-making.

7. Reduced Theft and Pilferage

Ensures accountability and prevents losses through regular audits and monitoring.

8. **Improved Supplier Relationships**

Ensures efficient ordering processes, leading to better communication and reliability with suppliers.

Proper stock control is essential for improving profitability, operational efficiency, and long-term business sustainability. Would you like to explore stock control techniques?

6. Impact of Inflation on Inventory Holding

Inflation, the rise in prices over time, significantly affects inventory holding, influencing both costs and decision-making in inventory management. Here are its key impacts:

1. **Increased Inventory Costs**

Inflation raises the costs of acquiring, storing, and insuring inventory. Storage costs like rent, utilities, and wages also increase, making holding inventory more expensive.

2. **Rising Purchase Prices**

As the cost of raw materials and goods rises, businesses may choose to buy and hold larger quantities of inventory to avoid future price increases. This can lead to higher holding costs.

3. **Reduced Purchasing Power**

Inflation erodes the purchasing power of money, making it costlier to replenish stock over time. Businesses may struggle to maintain optimal stock levels.

4. **Inventory Valuation Impact**

Accounting methods like FIFO (First-In, First-Out) and LIFO (Last-In, First-Out) are affected by inflation. Under FIFO, older, lower-cost inventory is sold first, leading to lower costs of goods sold and higher profits (but higher taxes). LIFO may reflect higher costs, reducing profits but saving taxes.

5. **Demand Uncertainty**

Inflation may alter customer purchasing behavior, with reduced demand for non-essential goods, causing businesses to hold excess inventory.

6. **Stockpiling Behavior**

Anticipation of further inflation may lead businesses to overstock, tying up capital and increasing the risk of obsolescence.

7. **Cash Flow Pressure**

Higher inventory costs can strain cash flow, especially for businesses with limited working capital.

To mitigate these challenges, businesses can adopt strategies like just-in-time inventory, renegotiating supplier contracts, or investing in forecasting tools to manage inflationary pressures effectively.

7. Ways to Overcome or Mitigate the Effects of Inflation on Inventory Holding

Inflation poses challenges to inventory management, but businesses can adopt several strategies to minimize its impact and maintain operational efficiency:

1. Adopt Just-in-Time (JIT) Inventory Management

Reduce the need for large inventory holdings by purchasing materials only when needed for production. This minimizes holding costs and ties up less capital.

2. Implement Inventory Optimization Tools

Use technology such as inventory management software to accurately forecast demand and manage stock levels. Advanced tools can analyze trends and optimize reordering to avoid overstocking or understocking.

3. Negotiate Long-Term Supplier Contracts

Lock in favorable pricing by entering long-term agreements with suppliers. This helps shield businesses from sudden price increases due to inflation.

4. Use Hedging Strategies

Hedge against inflation by investing in financial instruments like commodity futures or inflation-protected securities that offset rising costs.

5. Diversify Suppliers

Source materials from multiple suppliers, including those in regions with lower inflation rates, to reduce dependency on price-volatile markets.

6. Adopt the LIFO (Last-In, First-Out) Accounting Method

In an inflationary environment, LIFO can reflect higher inventory costs in financial statements, reducing taxable income and conserving cash flow.

7. Increase Inventory Turnover

Focus on selling inventory faster to reduce the holding period. High turnover minimizes exposure to cost escalations caused by inflation.

8. Invest in Bulk Purchasing

When inflation is predictable, consider purchasing larger quantities of raw materials at current prices to avoid future price hikes, while carefully managing storage capabilities.

9. Enhance Cash Flow Management

Maintain strong cash reserves to absorb rising inventory costs and mitigate liquidity issues during inflationary periods.

10. Focus on Product Mix and Pricing

Adjust product pricing to reflect inflationary increases and focus on high-margin products to offset rising costs.

11. Monitor and Analyse Market Trends

Stay updated on inflation forecasts, market changes, and supply chain dynamics to make informed decisions about inventory procurement and management.

By combining these strategies, businesses can reduce the financial strain of inflation on inventory holding and maintain competitive operations.

Unit- 4 Inventory Control Techniques

[Inventory Control Techniques- Economic Order Quantity, Pull System in Inventory Control, Fixation of Inventory Levels, VED Analysis, FNSD Analysis, ABC Analysis, Just in Time Inventory Management]

Inventory is one of the most critical assets for any organization. It includes raw materials, work-in-progress (WIP), and finished goods required for production or sales. Proper inventory management is essential to maintain the balance between supply and demand while minimizing holding costs and ensuring operational efficiency.

Inventory Control refers to the processes and strategies used to manage an organization's stock efficiently, ensuring the availability of the right quantity of materials at the right time while avoiding overstocking or stockouts. It is a vital component of supply chain management, as it directly impacts production, customer satisfaction, and profitability.

Meaning of Inventory Control Techniques

Inventory Control Techniques are systematic approaches and tools used to monitor, manage, and optimize inventory levels. These techniques help businesses determine when to reorder, how much to order, and how to classify and prioritize inventory items based on various factors such as cost, demand, and criticality.

The primary objectives of inventory control techniques are:

1. **Minimizing Costs:** Reducing holding, ordering, and wastage costs.
2. **Ensuring Availability:** Keeping sufficient stock to meet customer or production needs.
3. **Improving Efficiency:** Streamlining processes to avoid delays and maximize productivity.
4. **Reducing Waste:** Minimizing obsolete, expired, or surplus inventory.

Importance of Inventory Control Techniques

1. **Cost Efficiency:** Helps optimize ordering and storage costs by maintaining ideal stock levels.
2. **Improved Cash Flow:** Reduces excess inventory, freeing up capital for other operational needs.
3. **Customer Satisfaction:** Ensures timely delivery of products or services by avoiding stockouts.
4. **Risk Mitigation:** Minimizes the risk of obsolescence, spoilage, or damage to inventory.
5. **Operational Productivity:** Ensures smooth production or sales processes without disruptions.

Inventory Control Techniques

1. Economic Order Quantity (EOQ)

- EOQ is a formula used to determine the optimal order quantity that minimizes total inventory costs.
- It balances ordering costs (costs of placing orders) and holding costs (costs of storing inventory).
- Formula: $EOQ = \sqrt{2DS/H}$
- where:
 - D = Demand (units per year),
 - S = Ordering cost per order,
 - H = Holding cost per unit per year.

2. Pull System in Inventory Control

- Inventory is replenished based on actual demand rather than forecasts.
- Common in Just-in-Time (JIT) systems.
- Ensures materials are only produced or ordered when needed, reducing overstock and waste.
- Examples include Kanban systems, where visual cues signal when more inventory is required.

3. Fixation of Inventory Levels

- Establishing inventory levels to ensure sufficient stock while avoiding overstocking.
- Includes:
 - **Maximum Level:** Highest quantity to keep in stock.
 - **Minimum Level:** Safety stock to avoid stockouts.
 - **Reorder Level:** Stock level at which a new order is placed.
 - **Average Stock Level:** The average inventory held over time.

4. VED Analysis (Vital, Essential, Desirable)

- Categorizes inventory based on criticality for operations:
 - **Vital (V):** Most critical items; stockout can halt operations.
 - **Essential (E):** Important items; stockouts can disrupt operations.
 - **Desirable (D):** Least critical items; stockout has minimal impact.
- Helps prioritize resources and control critical inventory items.

5. FNSD Analysis (Fast-moving, Non-moving, Slow-moving, Dead Stock)

- Groups inventory based on movement and usage rates:

- **Fast-moving (F):** Frequently used or sold items.
 - **Non-moving (N):** Items with no recent usage.
 - **Slow-moving (S):** Items with low usage rates.
 - **Dead Stock (D):** Obsolete or unsellable items.
 - Aids in identifying inventory turnover and reducing waste.
6. **ABC Analysis (Always Better Control)**
- Categorizes inventory based on value:
 - **A Items:** High-value items, low quantity (tight control required).
 - **B Items:** Moderate value and quantity.
 - **C Items:** Low-value items, high quantity (less control needed).
 - Helps prioritize inventory management efforts.
7. **Just in Time (JIT) Inventory Management**
- Aims to minimize inventory by producing or ordering only when needed.
 - Reduces carrying costs, waste, and overproduction.
 - Requires strong supplier relationships and efficient logistics.
 - Risks include supply chain disruptions leading to stockouts.

Economic Order Quantity (EOQ)

Definition

Economic Order Quantity (EOQ) is an inventory management technique that determines the optimal order quantity for a company to minimize its total inventory costs. These costs include:

1. **Ordering Costs:** Costs incurred every time an order is placed, such as administrative costs, shipping fees, etc.
2. **Holding Costs:** Costs associated with storing and maintaining inventory, such as storage fees, insurance, depreciation, etc.

EOQ ensures the balance between these two costs, aiming to order the right amount of stock that minimizes the overall cost.

EOQ Formula

The EOQ formula is:

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

Where:

- **D** = Annual demand (units required per year)

- **S** = Ordering cost per order (fixed cost incurred every time an order is placed)
- **H** = Holding cost per unit per year (cost of storing one unit for a year)

Key Assumptions of EOQ

1. Demand is constant throughout the year.
2. Lead time (time between placing an order and receiving it) is fixed.
3. The cost per unit of inventory is constant.
4. No stockouts or shortages occur.
5. Ordering and holding costs are constant and known.

Steps to Calculate EOQ

1. Identify the annual demand (DD).
2. Determine the ordering cost per order (SS).
3. Calculate the holding cost per unit per year (HH).
4. Substitute the values into the EOQ formula to find the optimal order quantity.

Example 1: Simple EOQ Calculation

A company manufactures pens and sells 10,000 pens annually. The cost to place an order is \$50, and the holding cost per unit per year is \$2. What is the EOQ?

Given:

- $D = 10,000$ units
- $S = 50$ dollars per order
- $H = 2$ dollars per unit per year

Solution:

$$EOQ = \frac{\sqrt{2DS}}{H} = \frac{\sqrt{2 \times 10000 \times 50}}{2} = \sqrt{500000} = 707 \text{ units}$$

Interpretation:

The company should order 707 pens in each order to minimize total inventory costs.

Example 2: EOQ with Total Costs

Suppose the same company decides to order 707 pens as calculated in Example 1. Let's compute the **total annual inventory cost**:

1. **Ordering Costs:**

- Number of orders = $\frac{\text{Annual demand}}{EOQ} = \frac{10,000}{707} = 14.14$
- Total ordering cost = Number of Orders × Ordering Cost per Order
 $= 14.14 \times 50$
 $= 707 \text{ dollars (approximately)}$

2. Holding Costs:

- Average inventory = $\frac{EOQ}{2} = \frac{707}{2} = 353.5 \text{ units}$
- Total holding cost = Average Inventory × Holding Cost per Unit
 $= 353.5 \times 2 = 707 \text{ dollars}$

3. Total Cost:

- Total cost = Ordering Cost + Holding Cost = $707 + 707 = 1,414 \text{ dollars annually.}$

Advantages of EOQ

1. **Cost Efficiency:** Minimizes total inventory costs.
2. **Optimal Stock Levels:** Avoids overstocking and stockouts.
3. **Simplifies Reordering:** Provides a clear reorder quantity.

Limitations of EOQ

1. **Constant Demand Assumption:** Real-life demand fluctuates, making EOQ less accurate.
2. **Ignores Quantity Discounts:** EOQ does not account for bulk discounts.
3. **Static Parameters:** Assumes fixed holding and ordering costs, which might vary in reality.

Practical Application Example

Scenario:

A bookstore sells 12,000 books annually. Each order costs \$40 to process, and the holding cost per book is \$1.

1. Calculate EOQ:

$$EOQ = \frac{\sqrt{2 \times 12000 \times 40}}{1} = \sqrt{960000} = 979 \text{ books}$$

2. Calculate Number of Orders:

Number of Orders = Annual Demand / EOQ = $12,000 / 979 = 12.25 \text{ orders annually}$

3. Total Costs:

- Ordering Cost = $12.25 \times 40 = 490$ dollars
- Holding Cost = $979/2 \times 1 = 489.5$ dollars
- Total Cost = $490 + 489.5 = 979.5$ dollars.

This demonstrates how EOQ helps reduce unnecessary costs while maintaining optimal inventory levels.

Pull System in Inventory Control

Definition

A **pull system** in inventory control is a demand-driven approach where production, procurement, or inventory replenishment is initiated only when there is actual demand or consumption of goods. Unlike a push system (where inventory is built based on forecasts), a pull system ensures that goods are "pulled" through the supply chain in response to real-time requirements.

The pull system aims to minimize overproduction, reduce waste, and improve efficiency by maintaining only the inventory necessary to meet current demand.

Key Characteristics of a Pull System

1. **Demand-Driven:** Items are produced or restocked only when needed.
2. **Minimized Inventory Levels:** Reduces carrying costs by avoiding excess stock.
3. **Responsive Supply Chain:** Ensures flexibility to adapt to real-time demand changes.
4. **Eliminates Waste:** Reduces unnecessary overproduction, storage, and obsolescence of goods.

Common Methods in Pull Systems

1. **Kanban System:**
 - A visual system where signals (e.g., cards, containers, or digital notifications) are used to indicate when inventory or materials need replenishment.
 - For example, in a manufacturing process, a workstation sends a signal (Kanban card) to the previous workstation when more materials are required.
2. **Just-in-Time (JIT) Inventory Management:**
 - Ensures that inventory is replenished exactly when needed.
 - Materials or products arrive "just in time" for use, avoiding overstock and waste.
3. **Reorder Point System:**

- Inventory is reordered only when it reaches a predetermined level, ensuring timely replenishment without overstocking.

Steps in a Pull System

1. **Identify Demand Signals:** Monitor consumption or sales patterns to trigger replenishment.
2. **Streamline Supply Chain:** Ensure suppliers can respond quickly to demand signals.
3. **Establish Visual Controls:** Use tools like Kanban cards, bins, or digital alerts to signal inventory needs.
4. **Minimize Lead Time:** Reduce the time between ordering and receiving inventory.

Example of a Pull System

Scenario:

A coffee shop uses a pull system for managing its inventory of coffee beans.

1. **Demand Signal:**
 - Each time 2 kg of coffee beans are used, a visual signal (e.g., an empty container or digital alert) is sent to reorder stock.
2. **Reorder Process:**
 - The supplier delivers coffee beans just in time to replenish the stock before the remaining inventory is exhausted.
3. **Advantages for the Coffee Shop:**
 - Avoids overstocking beans that could go stale.
 - Reduces storage costs and waste.
 - Ensures freshness and high-quality products for customers.

Advantages of a Pull System

1. **Reduced Inventory Costs:** Lower carrying costs due to minimized stock levels.
2. **Improved Efficiency:** Avoids bottlenecks caused by overproduction or storage issues.
3. **Flexibility:** Can adapt quickly to changes in customer demand.
4. **Waste Reduction:** Eliminates overproduction and unnecessary storage.
5. **Better Cash Flow:** Money isn't tied up in excess inventory.

Disadvantages of a Pull System

1. **Dependency on Suppliers:** Relies heavily on suppliers to respond quickly to replenishment needs.
2. **Risk of Stockouts:** Any delay in supply chain operations could lead to stockouts.
3. **Requires Real-Time Monitoring:** Accurate demand tracking is essential for success.
4. **Not Suitable for All Industries:** High-demand variability or long lead times can disrupt pull systems.

Real-World Example of a Pull System

Toyota Production System (TPS):

- Toyota implemented the **Kanban system**, a type of pull system, to manage its production process.
- In their assembly line, each workstation pulls parts from the previous one only when needed. This ensures production is synchronized with real-time demand, minimizing waste and reducing inventory costs.

Comparison Between Push and Pull Systems

Aspect	Push System	Pull System
Production Trigger	Based on forecasts	Based on actual demand
Inventory Levels	High (safety stock maintained)	Low (minimal safety stock)
Flexibility	Less flexible to demand changes	Highly flexible to demand changes
Risk	Overstock and obsolescence	Stockouts due to supply delays
Focus	Efficiency through economies of scale	Efficiency by reducing waste

Conclusion

A pull system is a lean inventory control approach that aligns production and stock levels with actual demand. While it reduces waste and inventory costs, its success depends on robust demand tracking and a responsive supply chain. Implementing a pull system, such as Kanban or JIT, can significantly enhance operational efficiency in industries where demand is stable and predictable.

Various Inventory Levels in Inventory Management

To effectively manage inventory, businesses establish specific inventory levels to ensure there is neither a shortage nor an excess of stock. These levels help maintain smooth operations, reduce costs, and improve efficiency.

1. Maximum Inventory Level

- **Definition:** The highest quantity of stock a company should maintain to avoid overstocking.
- **Purpose:** Prevents excessive inventory, which can lead to increased holding costs, obsolescence, or wastage.

Formula:

Maximum Level = Reorder Level + Reorder Quantity – (Minimum Usage × Minimum Lead Time)

Example:

A company's reorder level is 1,000 units, reorder quantity is 500 units, minimum usage is 50 units per day, and the minimum lead time is 5 days.

Maximum Level = $1,000 + 500 - (50 \times 5) = 1,250$ units.

This means the company should not keep more than 1,250 units in stock.

2. Minimum Inventory Level

- **Definition:** The lowest quantity of stock that must be maintained to avoid a stockout situation.
- **Purpose:** Ensures continuous operations even during unexpected delays or increased demand.

Formula:

Minimum Level = Reorder Level – (Average Usage × Average Lead Time)

Example:

A company's reorder level is 1,000 units, average usage is 40 units per day, and average lead time is 10 days.

Minimum Level = $1,000 - (40 \times 10) = 600$ units.

This means the company should not let its inventory fall below 600 units.

3. Reorder Level (ROL)

- **Definition:** The inventory level at which a new purchase order is placed to replenish stock.
- **Purpose:** Ensures stock is reordered in time to avoid shortages.

Formula:

Reorder Level = Maximum Usage × Maximum Lead Time

Example:

Maximum usage is 70 units per day, and the maximum lead time is 15 days.

Reorder Level = $70 \times 15 = 1,050$ units.

This means a new order should be placed when the inventory falls to 1,050 units.

4. Average Inventory Level

- **Definition:** The average amount of inventory held over a period of time.
- **Purpose:** Helps monitor and optimize inventory levels.

Formula:

$$\text{Average Inventory Level} = \frac{\text{Maximum Level} + \text{Minimum Level}}{2}$$

Example:

If the minimum level is 600 units and the maximum level is 1,250 units:

Average Inventory Level = $600 + 1,250 / 2 = 925$ units.

This means the company typically maintains 925 units of inventory.

5. Danger Level

- **Definition:** A critical inventory level below which immediate action is required to avoid stockouts.
- **Purpose:** Acts as a warning to replenish stock urgently.

Formula:

$$\text{Danger Level} = \text{Average Usage} \times \text{Emergency Lead Time}$$

Example:

If average usage is 40 units per day and emergency lead time is 5 days:

Danger Level = $40 \times 5 = 200$ units.

This means if inventory falls below 200 units, the company should expedite replenishment to avoid disruption.

6. Safety Stock Level

- **Definition:** Additional inventory kept as a buffer to handle unexpected demand surges or supply delays.
- **Purpose:** Prevents stockouts and ensures uninterrupted operations.

Formula:

$$\text{Safety Stock} = (\text{Maximum Usage} - \text{Average Usage}) \times \text{Lead Time}$$

Example:

Maximum usage is 70 units per day, average usage is 40 units per day, and lead time is 10 days:

Safety Stock = $(70 - 40) \times 10 = 300$ units.

This means the company should maintain 300 units as a safety buffer.

Summary of Inventory Levels

Inventory Level	Purpose	Key Formula
Maximum Level	Prevent overstocking and excessive holding costs.	$\text{Reorder Level} + \text{Reorder Quantity} - (\text{Minimum Usage} \times \text{Minimum Lead Time})$
Minimum Level	Avoid stockouts and disruptions in operations.	$\text{Reorder Level} - (\text{Average Usage} \times \text{Average Lead Time})$
Reorder Level	Trigger inventory replenishment.	$\text{Maximum Usage} \times \text{Maximum Lead Time}$
Average Inventory	Measure average inventory held over time.	$\frac{\text{Minimum Level} + \text{Maximum Level}}{2}$
Danger Level	Warn when inventory falls critically low.	$\text{Average Usage} \times \text{Emergency Lead Time}$
Safety Stock	Act as a buffer against unexpected demand or supply delays.	$(\text{Maximum Usage} - \text{Average Usage}) \times \text{Lead Time}$

Practical Example

Scenario: A retail store sells 1,000 units of a product monthly. The maximum usage is 50 units per day, average usage is 40 units per day, and the minimum usage is 30 units per day. Lead time ranges from 5 to 15 days.

- **Reorder Level:**

$$\text{ROL} = 50 \times 15 = 750 \text{ units.}$$

(Place an order when inventory falls to 750 units.)

- **Minimum Level:**

$$\text{Minimum Level} = 750 - (40 \times 10) = 350 \text{ units.}$$

- **Maximum Level:**

$$\text{Maximum Level} = 750 + 500 - (30 \times 5) = 1,100 \text{ units.}$$

- **Safety Stock:**

Safety Stock = $(50 - 40) \times 10 = 100$ units.

This approach ensures the store has enough inventory to meet customer demand without overstocking or running out of stock.

VED Analysis in Inventory Management

Definition

VED Analysis (Vital, Essential, and Desirable Analysis) is a method used to classify inventory items based on their criticality to the business or operations. It is primarily applied in industries like healthcare, manufacturing, and maintenance to ensure that critical items are always available, while less critical items are managed more flexibly.

Classification in VED Analysis

1. Vital (V):

- Items critical to operations, production, or services.
- A stockout of these items can halt operations, cause significant losses, or endanger lives (in healthcare).
- Examples: Life-saving drugs in hospitals, key components in production machinery.

2. Essential (E):

- Items important for operations but not as critical as vital items.
- A shortage of these items may lead to operational inefficiencies or increased costs, but operations can continue temporarily.
- Examples: Regular drugs in hospitals, spare parts for machines that can run temporarily without them.

3. Desirable (D):

- Items that are good to have but do not immediately affect operations if unavailable.
- These are often luxury or convenience items.
- Examples: Non-essential hospital supplies like decorative items or backup stationery.

Steps in VED Analysis

1. Identify Inventory Items:

List all inventory items used in the organization.

2. **Classify Based on Criticality:**
Evaluate the importance of each item to operations or services and classify them as **Vital**, **Essential**, or **Desirable**.
3. **Set Inventory Priorities:**
Assign higher inventory levels or strict monitoring for **Vital** items, moderate levels for **Essential** items, and more relaxed control for **Desirable** items.
4. **Implement Policies:**
Develop procurement and stock management strategies for each category.

Example of VED Analysis

Scenario:

A hospital needs to manage its inventory of medical supplies, including medicines, surgical tools, and non-medical items.

Item	Category	Reason
Life-saving drugs (e.g., insulin, antibiotics)	Vital	Necessary for critical care; shortage can lead to fatalities.
Regular drugs (e.g., painkillers, cough syrups)	Essential	Important for patient care but not immediately life-threatening.
Gloves, bandages	Essential	Needed for everyday procedures but shortages can be managed temporarily.
Office stationery	Desirable	Useful but does not impact patient care or hospital operations directly.
Wheelchairs (spares)	Desirable	Good to have in reserve but not critical for daily operations.

Advantages of VED Analysis

1. **Critical Focus:** Ensures vital items are always in stock to avoid operational disruptions.
2. **Cost Optimization:** Reduces holding costs by managing desirable items more flexibly.
3. **Resource Allocation:** Helps prioritize resources for critical inventory.
4. **Risk Mitigation:** Minimizes risks associated with stockouts of critical items.

Limitations of VED Analysis

1. **Subjective Classification:** The criticality of items might vary between organizations or departments.

2. **Complexity in Implementation:** Requires thorough evaluation and periodic review.
3. **Does Not Consider Cost:** VED focuses only on criticality, not the cost or consumption patterns of items.

Comparison with ABC Analysis

Aspect	VED Analysis	ABC Analysis
Focus	Criticality of items	Cost and consumption value of items
Purpose	Avoid disruption due to stockouts	Optimize inventory costs and stock levels
Application	Primarily in healthcare and production	Universal across industries
Classification Criteria	Vital, Essential, Desirable	High, Medium, Low (cost/consumption)

Use Case Example

Manufacturing Industry:

A car manufacturer uses VED analysis to manage spare parts for assembly lines:

- **Vital:** Engine components and transmission parts that are essential for production.
- **Essential:** Tires and seats that can be substituted temporarily.
- **Desirable:** Cosmetic parts like emblems or paint, which can be delayed without affecting operations.

Conclusion

VED analysis is a valuable tool for managing inventory in critical industries. By prioritizing items based on their importance to operations, it helps reduce risks, optimize costs, and ensure smooth functioning. However, it is most effective when combined with other inventory management techniques, such as ABC analysis, to balance criticality and cost considerations.

FNSD Analysis in Inventory Management

Definition

FNSD Analysis is a method used to classify inventory based on the movement or consumption rate of items. The acronym stands for **Fast-moving, Normal-moving, Slow-moving, and Dead stock**. This classification helps businesses identify how quickly inventory

is being consumed or sold, enabling them to optimize stock levels and reduce inventory holding costs.

Classification in FNSD Analysis

1. Fast-moving (F):

- Items that are consumed or sold at a high rate.
- These items require frequent replenishment and are usually kept in large quantities.
- Examples: Everyday consumables like bread in a grocery store or bolts in a hardware shop.

2. Normal-moving (N):

- Items with a moderate rate of consumption or sale.
- These require less frequent replenishment and are usually restocked periodically.
- Examples: Monthly-use items like cleaning supplies or spare parts used occasionally.

3. Slow-moving (S):

- Items that have a low turnover rate.
- These are ordered infrequently and might stay in inventory for a longer time.
- Examples: Specialized tools or niche products that are not in regular demand.

4. Dead Stock (D):

- Items with little to no movement for an extended period.
- These are typically obsolete, unsellable, or irrelevant to current operations.
- Examples: Outdated electronic devices, expired medicines, or discontinued product lines.

Purpose of FNSD Analysis

- 1. Stock Optimization:** Ensures the right balance between frequently used and slow-moving items.
- 2. Cost Reduction:** Reduces holding costs by identifying slow-moving and dead stock for liquidation or write-offs.
- 3. Replenishment Planning:** Guides procurement schedules for fast- and normal-moving items.
- 4. Improved Cash Flow:** Helps avoid cash being tied up in excess or obsolete inventory.

Steps in FNSD Analysis

1. **Identify Inventory Items:**
Create a list of all inventory items and their consumption or sales data over a defined period (e.g., month or year).
2. **Determine Consumption Rate:**
Calculate the rate at which each item is consumed or sold.
3. **Classify Items:**
Divide items into Fast-moving, Normal-moving, Slow-moving, or Dead stock based on their turnover rate.
4. **Action Plan:**
 - Prioritize replenishment for fast-moving items.
 - Monitor and manage normal-moving items.
 - Review slow-moving items for potential reduction.
 - Dispose of or repurpose dead stock.

Example of FNSD Analysis

Scenario:

A retail store sells a variety of products and wants to classify its inventory using FNSD analysis. The following are the sales data for a month:

Item	Sales/Consumption (Units)	Category	Reason
Milk	3,000	Fast-moving	Daily demand and high turnover.
Laundry Detergent	500	Normal-moving	Moderate demand; restocked monthly.
Air Purifier	50	Slow-moving	Low demand; purchased occasionally by customers.
Obsolete Toys	0	Dead Stock	Outdated product line with no sales in months.

Action Plan for the Example

1. **Fast-moving Items (Milk):**
 - Maintain high stock levels to prevent shortages.
 - Place frequent orders with suppliers.
2. **Normal-moving Items (Laundry Detergent):**
 - Maintain moderate stock levels based on regular demand patterns.

- Replenish stock on a periodic basis (e.g., monthly).
3. **Slow-moving Items (Air Purifier):**
 - Reduce stock levels to avoid overstocking.
 - Evaluate demand trends and consider offering discounts or promotions.
 4. **Dead Stock (Obsolete Toys):**
 - Write off or liquidate inventory through clearance sales.
 - Avoid restocking unless there's a clear demand.

Advantages of FNSD Analysis

1. **Enhanced Inventory Control:** Focuses on fast- and normal-moving items to meet customer demand.
2. **Cost Optimization:** Reduces carrying costs by identifying slow-moving and dead stock.
3. **Improved Decision-Making:** Helps plan procurement and stock levels more effectively.
4. **Reduced Obsolescence Risk:** Identifies dead stock early to prevent further accumulation.

Limitations of FNSD Analysis

1. **Subjectivity in Classification:** The classification criteria might vary between businesses or industries.
2. **Focus on Turnover Only:** It doesn't consider the criticality or cost of items, which might be important for decision-making.
3. **Requires Regular Updates:** Consumption patterns can change over time, so the analysis must be updated periodically.

Comparison Between FNSD and ABC Analysis

Aspect	FNSD Analysis	ABC Analysis
Focus	Turnover rate of inventory	Monetary value and consumption of items
Purpose	Optimize stock levels based on movement	Optimize cost by focusing on high-value items
Classification Criteria	Fast, Normal, Slow, Dead	A (High value), B (Medium value), C (Low value)

Conclusion

FNSD analysis is a practical tool for managing inventory based on consumption patterns. It helps businesses focus on fast-moving items to meet demand, manage normal-moving items efficiently, and address slow-moving or dead stock to optimize costs. When combined with other methods like ABC or VED analysis, it provides a comprehensive approach to inventory management.

ABC Analysis in Inventory Management

Definition

ABC Analysis (Always Better Control Analysis) is an inventory management technique used to classify inventory items based on their monetary value and importance. This helps businesses prioritize and allocate resources effectively to manage high-value items while optimizing inventory costs.

Principles of ABC Analysis

ABC Analysis is based on the **Pareto Principle (80/20 Rule)**, which states that 80% of the total value of inventory is often derived from only 20% of the items. The classification is as follows:

1. A Category (High-Value Items):

- These items contribute to the majority of the inventory value (typically 70-80%).
- They constitute a small percentage of the total inventory (about 10-20%).
- Require tight control, frequent monitoring, and accurate demand forecasting.
- Examples: High-value machinery parts, expensive electronics.

2. B Category (Medium-Value Items):

- Items with moderate inventory value (typically 15-25%).
- They constitute around 20-30% of the total inventory.
- Require periodic review and moderate control.
- Examples: Mid-range tools, standard spare parts.

3. C Category (Low-Value Items):

- Items with the least inventory value (typically 5-10%).
- They make up the majority of the total inventory (about 50-60%).
- Require the least attention, with simple control mechanisms.
- Examples: Screws, nuts, bolts, and other small consumables.

Steps in ABC Analysis

1. List All Inventory Items:

Prepare a comprehensive list of all inventory items along with their annual consumption value (unit cost $\times$ annual usage).

2. Calculate Annual Consumption Value:

For each item, calculate the annual consumption value:

$$\text{Annual Consumption Value} = \text{Unit Cost} \times \text{Annual Usage}$$

3. Sort Items by Value:

Arrange the items in descending order based on their annual consumption value.

4. Categorize into A, B, and C Groups:

Assign the top 70-80% of total inventory value to **A**, the next 15-25% to **B**, and the remaining 5-10% to **C**.

Example of ABC Analysis

Scenario:

A company has the following inventory items:

Item	Unit Cost (\$)	Annual Usage (Units)	Annual Consumption Value (\$)
Item 1	500	100	50,000
Item 2	300	120	36,000
Item 3	50	500	25,000
Item 4	20	1,000	20,000
Item 5	10	3,000	30,000
Item 6	2	10,000	20,000

Step 1: Calculate Total Inventory Value

$$\text{Total Value} = 50,000 + 36,000 + 25,000 + 20,000 + 30,000 + 20,000 = 181,000$$

Step 2: Classify Items by Value Contribution

- **A Category** (Top 70-80% of value): Items 1, 2, and 5 contribute to \$116,000 (~64%).
- **B Category** (Next 15-25% of value): Items 3 and 4 contribute to \$45,000 (~25%).
- **C Category** (Remaining 5-10% of value): Item 6 contributes to \$20,000 (~11%).

Final Classification Table:

Item	Category	Reason
Item 1	A	High annual consumption value
Item 2	A	High annual consumption value
Item 5	A	Significant annual consumption value
Item 3	B	Moderate contribution to value
Item 4	B	Moderate contribution to value
Item 6	C	Low contribution to value

Advantages of ABC Analysis

1. **Efficient Resource Allocation:** Focuses efforts on managing high-value items.
2. **Cost Optimization:** Reduces inventory holding costs for low-value items.
3. **Improved Decision-Making:** Provides insights into which items need tighter control.
4. **Enhanced Productivity:** Frees up time and resources for managing critical inventory.

Limitations of ABC Analysis

1. **Ignores Criticality:** Focuses only on monetary value and not operational importance (e.g., VED analysis considers criticality).
2. **Subjectivity in Classification:** Boundaries between categories may vary across industries.
3. **Does Not Address Movement:** Slow-moving high-value items may still end up in category A.

Comparison with FNSD and VED Analysis

Aspect	ABC Analysis	FNSD Analysis	VED Analysis
Focus	Monetary value and consumption patterns	Movement/turnover rate	Criticality to operations
Purpose	Optimize costs and control high-value items	Manage inventory based on consumption rate	Ensure availability of critical items
Classification Criteria	A (High value), B (Medium value), C (Low value)	Fast, Normal, Slow, Dead	Vital, Essential, Desirable

Practical Applications

1. **Retail Stores:** Prioritize stock of high-value products while minimizing inventory of low-value items.
2. **Manufacturing:** Focus on controlling expensive raw materials or components.
3. **Healthcare:** Manage costly medical equipment more stringently than low-cost consumables like bandages.

Conclusion

ABC Analysis is a powerful tool for inventory control that helps businesses focus on high-value items while efficiently managing lower-value inventory. By combining it with other techniques like VED or FNSD analysis, organizations can achieve a comprehensive inventory management strategy tailored to their specific needs.

Just-In-Time (JIT) Inventory Management

Definition

Just-In-Time (JIT) Inventory Management is a system where inventory is procured and produced only when needed, minimizing the holding costs and reducing waste. JIT focuses on aligning inventory orders directly with production schedules to ensure materials are available at the right time and in the right quantity.

JIT was first popularized by **Toyota** in Japan as part of their Toyota Production System (TPS). It is a lean inventory strategy aimed at efficiency and cost reduction.

Principles of JIT Inventory Management

1. **Minimal Inventory Levels:**
 - Inventory is kept as low as possible to avoid excess stock and associated costs.
2. **Demand-Driven Production:**
 - Goods are produced based on customer demand, not forecasted demand.
3. **Streamlined Supply Chain:**
 - Strong collaboration with suppliers ensures timely delivery of raw materials.
4. **Elimination of Waste:**
 - Focus on removing unnecessary steps, overproduction, and surplus inventory.
5. **Continuous Improvement (Kaizen):**
 - Emphasizes ongoing refinement of processes to enhance efficiency and quality.

Key Features of JIT

- **Pull System:** Production is "pulled" based on demand rather than "pushed" based on forecasts.
- **Zero Inventory Goals:** Strives to maintain minimal to no inventory levels.
- **Short Lead Times:** Requires suppliers to deliver raw materials quickly.
- **Quality Assurance:** High-quality inputs are crucial to prevent delays.

Steps in JIT Implementation

1. **Analyse Current Inventory Processes:**
 - Assess existing inventory levels, order schedules, and production timelines.
2. **Develop Supplier Relationships:**
 - Build reliable partnerships with suppliers to ensure timely and quality deliveries.
3. **Adopt Lean Practices:**
 - Optimize workflows, eliminate waste, and streamline production processes.
4. **Implement Demand Forecasting:**
 - Use accurate data to predict customer demand and plan production accordingly.
5. **Train Employees:**
 - Educate staff on JIT principles and the importance of collaboration across departments.
6. **Monitor and Improve:**
 - Regularly review processes and identify areas for continuous improvement.

Example of JIT Inventory Management

Scenario:

A car manufacturer adopts JIT for its production line.

1. **Before JIT:**
 - The company holds a large inventory of raw materials like steel, rubber, and plastic.
 - High storage costs, wastage due to unused materials, and capital tied up in inventory.
2. **After JIT Implementation:**
 - The company orders materials from suppliers only when needed for production.

- Example: If the factory receives an order for 100 cars, the necessary raw materials (tires, glass, engine parts) are delivered **just in time** for production.

Benefits Observed:

- Reduction in inventory holding costs.
- Faster production cycles.
- Reduced waste and improved cash flow.

Advantages of JIT Inventory Management

1. Cost Reduction:

- Minimizes inventory holding and storage costs.
- Reduces capital investment in surplus stock.

2. Improved Efficiency:

- Streamlined operations with minimal delays and redundancies.

3. Waste Elimination:

- Prevents overproduction, obsolescence, and material waste.

4. Better Cash Flow:

- Frees up cash by reducing tied-up capital in inventory.

5. Higher Quality Products:

- Focus on continuous improvement ensures fewer defects and higher quality.

6. Increased Flexibility:

- Quick adjustments to changes in customer demand or market trends.

Disadvantages of JIT Inventory Management

1. Reliance on Suppliers:

- Delayed or faulty deliveries from suppliers can disrupt production.

2. No Buffer Stock:

- In case of sudden demand spikes, there may be a shortage of materials.

3. High Implementation Costs:

- Requires investment in technology, training, and supplier relationships.

4. Demand Forecasting Risk:

- Errors in predicting customer demand can lead to missed opportunities or overproduction.

Industries Using JIT

1. Automobile Manufacturing:

- Companies like **Toyota** and **Ford** use JIT to align material delivery with production schedules.

2. Electronics:

- **Dell Computers** produces PCs only after receiving customer orders, allowing customization.

3. Retail:

- Fast-food chains like **McDonald's** prepare food based on orders, reducing waste.

4. Healthcare:

- Hospitals use JIT for managing medical supplies, ensuring availability without excess inventory.

Example of JIT in Retail: McDonald's

- **Traditional Method:** Pre-cooked burgers were kept in warmers, leading to waste if unsold.
- **JIT Method:** Burgers are now prepared only after an order is placed.
 - **Outcome:** Reduced waste, fresher food, and cost savings.

Comparison of JIT with Traditional Inventory Management

Aspect	JIT Inventory Management	Traditional Inventory Management
Inventory Levels	Minimal	High
Production Approach	Demand-driven (Pull)	Forecast-driven (Push)
Cost Efficiency	High (low holding costs)	Low (high holding costs)
Flexibility	High	Moderate
Waste Management	Minimal	Often leads to surplus or obsolescence

Conclusion

JIT Inventory Management is an effective strategy for reducing costs, eliminating waste, and improving efficiency. However, its success depends heavily on reliable suppliers, accurate demand forecasting, and streamlined operations. While it offers significant benefits in industries like manufacturing and retail, organizations must carefully assess their supply chain and operational capabilities before implementing JIT.