

MAA OMWATI INSTITUTE OF MANAGEMENT AND TECHNOLOGY HASSANPUR

ASSIGNMENT/IMPORTANT QUESTIONS

CLASS –MBA 4TH SEM

SUBJECT –WAREHOUSE MANAGEMENT AND INVENTORY CONTROL (operation)

SYLLABUS

UNIT I

Warehouse management: meaning and significance; warehouse organization: requisitions and replenishment of materials, receipt and inspection of materials, issue of materials, stocktaking, discrepancies and their resolution, control of tools, surplus, and scrap materials, storage and handling practices of

UNIT II

Computerization of warehouse activities, performance evaluation of stores activities, iso standards and warehouse activities, warehouse location, layout, and facilities planning, warehouse security, safety, and maintenance

UNIT III

Inventory Management: inventory concepts, pressures for low inventory, pressures for high inventory, types of inventory - seasonal, decoupling, cyclic, pipeline, safety stock; inventory costs; inventory control systems: issues in the P and Q systems of inventory control; The Basic Economic Order Quantity Model, Production Quantity Model, Quantity Discounts, Reorder Point, Safety Stocks, Service Level, Order quantity for periodic inventory system, Order quantity with variable demand

UNIT IV

Just-In-Time: Principles of just-in-time, Core logic of JIT, Main features for stocks, Achieving just-in-time operations, and other effects of JIT, Benefits and disadvantages of JIT, Comparison with other methods of inventory management. KANBAN as a control tool. Vendor managed inventory; Make or Buy Decisions: Factors influencing Make Or Buy Decisions-cost, quality, capacity core v/s noncore, management strategy. Evaluation of performance of Materials function: cost, delivery, quality, inventory turnover ratio methodology of evaluation, Use of ratios and analysis like FSN: Fast slow, Nonmoving, HML-High Medium, Low, and XYZ. Materials Management in JIT Environment

SHORT QUESTIONS

1. Define warehouse management.
2. What is the significance of warehouse management?
3. What is meant by requisition of materials?
4. What does material replenishment involve?
5. What is the purpose of material receipt and inspection?
6. Mention two methods of issuing materials from stores.
7. What is stocktaking?
8. How are discrepancies in inventory typically resolved?
9. Why is tool control important in a warehouse?
10. What is surplus material?

11. Name two benefits of warehouse computerization.
12. What is meant by performance evaluation in stores activities?
13. Define ISO standards in the context of warehouse operations.
14. List two criteria for warehouse location selection.
15. Mention two principles of good warehouse layout.
16. What are two essential facilities in warehouse planning?
17. What is the importance of warehouse safety?
18. How can warehouse maintenance be ensured?
19. What is the role of warehouse security?
20. What are two advantages of automated warehouses?

21. Define inventory.
22. Name two pressures for low inventory.
23. Name two pressures for high inventory.
24. What is seasonal inventory?
25. Define decoupling inventory.
26. What is pipeline inventory?
27. What is cyclic inventory?
28. Define safety stock.
29. What is the EOQ model?
30. What is the purpose of a reorder point?

31. What is Just-In-Time (JIT)?
32. State one core principle of JIT.
33. Mention one main feature of JIT regarding stock.
34. What is KANBAN?
35. What is Vendor Managed Inventory (VMI)?
36. List any two benefits of JIT.
37. Mention one drawback of JIT.
38. What is a make-or-buy decision?
39. Define inventory turnover ratio.
40. What does FSN classification stand for?

LONG ANSWER QUESTIONS

UNIT I

1. Define warehouse management and explain its significance in materials handling.
2. Describe the process of requisition and replenishment of materials.
3. Explain the procedure for receipt and inspection of materials in detail.
4. Discuss various methods for issuing materials from a warehouse.
5. Explain stocktaking and methods used for conducting it.
6. What are the causes of inventory discrepancies and how are they resolved?
7. Discuss the control measures for tools, surplus, and scrap materials.
8. Explain the best storage and handling practices used in warehouses.
9. Describe the organizational structure of a warehouse.

UNIT II

10. Discuss the benefits and process of computerizing warehouse activities.
11. How is the performance of stores activities evaluated?
12. Explain the role of ISO standards in warehouse management.
13. What are the key factors affecting warehouse location decisions?
14. Describe the principles of warehouse layout planning.
15. What are the critical facilities to be considered in warehouse planning?
16. Explain the safety practices that must be followed in warehouses.
17. Discuss the importance and methods of warehouse maintenance.
18. Describe various techniques to ensure warehouse security.
19. Compare manual and automated warehouse systems.

UNIT III

20. Define inventory and explain its types with examples.
21. Discuss pressures for holding high and low inventory.
22. Explain the concept and role of safety stock.
23. Describe the Basic EOQ Model with an example.
24. Explain the Production Quantity Model and its application.
25. Discuss quantity discounts and their influence on order decisions.
26. What is the reorder point? Explain how it is calculated.
27. Explain the order quantity method for periodic inventory systems.
28. How is order quantity determined under variable demand?
29. Compare the P-system and Q-system of inventory control.
30. Describe the different types of inventory costs.

UNIT IV

31. Define Just-In-Time and explain its core logic and operational benefits.
32. What are the main features of JIT concerning inventory?

33. Explain how JIT operations are achieved in practice.
34. Discuss the advantages and disadvantages of JIT.
35. Compare JIT with traditional inventory management systems.
36. Explain the use of KANBAN as a control tool in JIT systems.
37. Define Vendor Managed Inventory and its benefits for supply chain management.
38. What are the key factors influencing make-or-buy decisions?
39. Describe methods used to evaluate the performance of the materials function.
40. Explain the use of FSN, HML, and XYZ analysis in inventory classification.

Answer of short questions

- 1. Define warehouse management.**

Warehouse management refers to the process of efficiently managing the storage, handling, and movement of goods within a warehouse.
- 2. What is the significance of warehouse management?**

It ensures optimal space utilization, reduces costs, improves inventory accuracy, and enhances customer satisfaction.
- 3. What is meant by requisition of materials?**

It is a formal request to issue materials from the store for production or other purposes.
- 4. What does material replenishment involve?**

It involves refilling inventory to maintain adequate stock levels to meet demand.
- 5. What is the purpose of material receipt and inspection?**

To verify the quality and quantity of received materials before acceptance into inventory.
- 6. Mention two methods of issuing materials from stores.**
 - FIFO (First-In, First-Out)
 - LIFO (Last-In, First-Out)
- 7. What is stocktaking?**

It is the physical counting and verification of inventory on hand.
- 8. How are discrepancies in inventory typically resolved?**

By reconciling records, investigating causes, and making necessary adjustments.
- 9. Why is tool control important in a warehouse?**

To prevent loss, ensure availability, and maintain efficiency and safety.
- 10. What is surplus material?**

It refers to materials in excess of current requirements that may not be immediately needed.
- 11. Name two benefits of warehouse computerization.**
 - Improved inventory accuracy
 - Faster order processing
- 12. What is meant by performance evaluation in stores activities?**

It involves assessing the efficiency and effectiveness of store operations.
- 13. Define ISO standards in the context of warehouse operations.**

They are internationally recognized guidelines for quality management and operational consistency.
- 14. List two criteria for warehouse location selection.**
 - Proximity to suppliers/customers
 - Transportation accessibility
- 15. Mention two principles of good warehouse layout.**
 - Efficient material flow
 - Optimal space utilization
- 16. What are two essential facilities in warehouse planning?**
 - Loading/unloading docks
 - Storage systems (e.g., racks or shelving)
- 17. What is the importance of warehouse safety?**

It prevents accidents, protects workers and goods, and ensures regulatory compliance.

18. How can warehouse maintenance be ensured?

Through regular inspections, cleaning schedules, and prompt repairs.

19. What is the role of warehouse security?

To prevent theft, unauthorized access, and safeguard inventory.

20. What are two advantages of automated warehouses?

- Reduced labor costs
- Increased operational efficiency

21. Define inventory.

Inventory refers to the stock of goods and materials held for production or sale.

22. Name two pressures for low inventory.

- Lower holding costs
- Reduced risk of obsolescence

23. Name two pressures for high inventory.

- Meeting unpredictable demand
- Bulk purchasing discounts

24. What is seasonal inventory?

Inventory built up in anticipation of seasonal demand.

25. Define decoupling inventory.

Stock kept between processes to avoid interdependence and delays.

26. What is pipeline inventory?

Goods that are in transit between locations.

27. What is cyclic inventory?

The portion of inventory that is regularly used and replenished.

28. Define safety stock.

Extra inventory held to guard against uncertainties in demand or supply.

29. What is the EOQ model?

Economic Order Quantity (EOQ) determines the ideal order size to minimize total inventory costs.

30. What is the purpose of a reorder point?

To trigger a new order when inventory falls to a specified level.

31. What is Just-In-Time (JIT)?

A system that reduces inventory by receiving goods only when needed for production or sales.

32. State one core principle of JIT.

Elimination of waste in the production process.

33. Mention one main feature of JIT regarding stock.

Minimal or zero inventory levels.

34. What is KANBAN?

A visual scheduling system for managing inventory and workflow based on demand.

35. What is Vendor Managed Inventory (VMI)?

A system where the supplier manages the inventory levels of their products at the buyer's location.

36. List any two benefits of JIT.

- Lower inventory holding costs
- Improved production efficiency

37. **Mention one drawback of JIT.**

High risk of stock outs due to supply chain disruptions.

38. **What is a make-or-buy decision?**

A choice between producing a product internally or purchasing it from an external supplier.

39. **Define inventory turnover ratio.**

It measures how often inventory is sold and replaced during a period.

40. **What does FSN classification stand for?**

Fast-moving, Slow-moving, and Non-moving inventory classification.

Answer of long questions

ChatGPT said:

Here are long descriptive answers to your 9 questions related to **Warehouse and Inventory Management**:

1. Define warehouse management and explain its significance in materials handling.

Warehouse management refers to the systematic control of the storage and movement of materials within a warehouse and the associated processes, including receiving, storing, retrieving, and dispatching goods. It also involves labor management, layout optimization, inventory control, and the use of technology to ensure efficient operations.

Significance in Materials Handling:

- **Efficiency in Operations:** Proper warehouse management ensures the smooth flow of goods, minimizing delays and bottlenecks in material movement.
 - **Cost Reduction:** Optimized space usage and reduced labor costs contribute to overall cost efficiency.
 - **Inventory Accuracy:** It provides real-time visibility into inventory levels, reducing errors and stock outs.
 - **Customer Satisfaction:** Timely dispatch and delivery of products improve service levels and customer satisfaction.
 - **Safety and Compliance:** Ensures proper handling of materials, adherence to safety standards, and compliance with legal regulations.
 - **Minimized Material Handling:** By positioning goods optimally and reducing unnecessary movements, warehouse management helps streamline operations.
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2. Describe the process of requisition and replenishment of materials.

Requisition of Materials:

- It begins when a department or production unit identifies a need for certain materials.
- A **Material Requisition Note (MRN)** or request form is prepared detailing the type, quantity, and purpose.
- The request is reviewed and authorized by the concerned authority.
- Once approved, the warehouse staff issues the materials and updates inventory records accordingly.

Material Replenishment:

- Involves monitoring inventory levels and restocking items to maintain optimal stock.
 - Triggered by reaching a **reorder point** or through periodic review.
 - May use automated systems or software that generate purchase orders.
 - Replenishment can be internal (from another warehouse) or external (from vendors).
 - The goal is to avoid stock outs and ensure uninterrupted operations.
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3. Explain the procedure for receipt and inspection of materials in detail.

Receiving Procedure:

1. **Arrival of Goods:** Materials are delivered to the warehouse by suppliers or transport agencies.
 2. **Verification of Documents:** Delivery challans, purchase orders, and invoices are checked for accuracy.
 3. **Unloading and Identification:** Goods are unloaded, and each package is identified with tags or labels.
 4. **Physical Inspection:** Carried out to check for damage, shortages, or excess materials.
 5. **Quality Inspection:**
 - Sample testing may be done to ensure compliance with specifications.
 - Rejection or acceptance is based on inspection results.
 6. **Recording and Documentation:** Details are entered into the Goods Receipt Note (GRN).
 7. **Storage:** Accepted goods are stored at designated locations in the warehouse.
 8. **Communication:** Any discrepancies are reported to the purchase department for resolution.
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4. Discuss various methods for issuing materials from a warehouse.

Methods of Issuing Materials:

1. **First-In, First-Out (FIFO):**

- Oldest inventory is issued first.
 - Useful for perishable items or those with expiry dates.
 - 2. **Last-In, First-Out (LIFO):**
 - Newest inventory is issued first.
 - Sometimes used in non-perishable industries where cost control is a concern.
 - 3. **Specific Identification Method:**
 - Items are issued based on their specific identity or batch number.
 - Suitable for expensive or customized items.
 - 4. **Two-Bin System:**
 - Inventory is divided into two bins. When one is empty, a reorder is triggered while using the second.
 - 5. **Automated Dispensing Systems:**
 - In high-tech warehouses, materials are issued using automated systems and barcoding for accuracy and speed.
 - 6. **Material Requisition Slips:**
 - Employees or departments fill out a form for the required materials which is verified and signed before issuing.
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5. Explain stocktaking and methods used for conducting it.

Stocktaking is the physical counting of inventory items to verify the quantity and condition of stock compared to recorded levels.

Methods of Stocktaking:

1. **Annual/Periodic Stocktaking:**
 - Conducted at the end of a financial year.
 - Operations may be paused for accurate counting.
2. **Perpetual Stocktaking:**
 - Continuous counting throughout the year.
 - Used in automated systems with real-time updates.
3. **Cycle Counting:**
 - Regularly counts specific items on a rotating basis.
 - Focuses on high-value or fast-moving items.
4. **Spot Checking:**
 - Random checking of selected items.
 - Used to identify errors or issues.

Purpose:

- Ensure accuracy of inventory records.
- Detect pilferage, damage, or misplacement.
- Support auditing and compliance.

6. What are the causes of inventory discrepancies and how are they resolved?

Causes:

- **Human Errors:** Mistakes in counting, data entry, or labeling.
- **Theft or Pilferage:** Unauthorized removal of stock.
- **Damage or Spoilage:** Loss of stock due to mishandling or expiry.
- **System Errors:** Software glitches or unrecorded transactions.
- **Misplaced Inventory:** Items stored in incorrect locations.

Resolution Methods:

- **Regular Audits:** Frequent stocktaking to catch issues early.
- **Training:** Staff training on accurate record-keeping and handling.
- **Security Measures:** CCTV, access control, and RFID tracking.
- **Reconciliation:** Adjusting records based on verified stock.
- **Root Cause Analysis:** Investigating repeated issues and correcting processes.

7. Discuss the control measures for tools, surplus, and scrap materials.

Tool Control:

- **Tool Registers:** Record issuance and return of tools.
- **Tagging:** Each tool is tagged for easy identification.
- **Secure Storage:** Tools kept in lockers or tool rooms with restricted access.
- **Maintenance Logs:** Regular servicing and checks ensure tool readiness.

Surplus Material Control:

- **Segregation:** Stored separately and clearly labeled.
- **Periodic Review:** Assessed for reuse, return, or disposal.
- **Inventory Records:** Tracked in a surplus register or software.

Scrap Material Control:

- **Classification:** Scrap is categorized (metal, plastic, etc.).
 - **Storage:** Kept in designated scrap yards or bins.
 - **Documentation:** Disposal and sales recorded for accountability.
 - **Recycling/Disposal:** Environmentally compliant procedures followed.
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8. Explain the best storage and handling practices used in warehouses.

Storage Practices:

- **Categorized Storage:** Similar items stored together for easy retrieval.
- **Labeling:** Clear and visible labeling of racks and items.
- **Space Optimization:** Use of vertical space with pallet racks or mezzanines.
- **Environmental Control:** Temperature and humidity control for sensitive items.
- **FIFO/LIFO Implementation:** Proper movement of stock using inventory methods.

Handling Practices:

- **Material Handling Equipment:** Use of forklifts, conveyors, pallet jacks to minimize manual labor.
 - **Safety Procedures:** Training, signage, and use of PPE (Personal Protective Equipment).
 - **Minimized Movement:** Designing layout to reduce unnecessary handling.
 - **Barcode/RFID Use:** Fast and accurate tracking of items during movement.
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9. Describe the organizational structure of a warehouse (very long descriptive explanation).

A warehouse's **organizational structure** is designed to facilitate efficient operations, accountability, and effective coordination among various functions. It typically follows a hierarchical system that defines roles, responsibilities, and workflow.

1. Warehouse Manager:

- **Position:** Head of the warehouse.
- **Responsibilities:** Overall control of warehouse operations, planning, budgeting, safety compliance, staff management, and coordination with procurement and logistics.
- **Skills Required:** Leadership, decision-making, inventory control knowledge, ERP familiarity.

2. Inventory Controller:

- **Role:** Oversees inventory accuracy, conducts cycle counts, analyzes inventory variances, and updates systems.
- **Reports To:** Warehouse Manager.
- **Tools Used:** Inventory management software, Excel, ERP systems.

3. Receiving Supervisor:

- **Role:** Manages receipt of goods, inspection, and documentation.

- **Responsibilities:** Unloading coordination, GRN (Goods Receipt Note) creation, and liaising with quality control.

4. Quality Inspector:

- **Role:** Inspects incoming materials for defects or quality compliance.
- **Interacts With:** Receiving, procurement, and production departments.

5. Cutaway Staff:

- **Duties:** Move goods to designated storage locations.
- **Requirements:** Knowledge of layout, handling equipment operation, and item classification.

6. Picking and Packing Team:

- **Pickers:** Select items from storage based on pick lists.
- **Packers:** Package the items securely for shipment.
- **Importance:** Accuracy is crucial for customer satisfaction and minimizing returns.

7. Dispatch Coordinator:

- **Tasks:** Plans and executes outbound shipments, prepares documentation, coordinates with transport.

8. Storekeepers:

- **Roles:** Daily handling of stock, issuing materials, maintaining bin cards, and labeling items.

9. Safety Officer:

- **Objective:** Ensures all warehouse operations comply with health and safety regulations.
- **Activities:** Safety audits, employee training, accident reporting.

10. Maintenance Staff:

- **Function:** Responsible for the upkeep of equipment, lighting, racks, and safety systems.

11. IT Support:

- **Support Role:** Manages warehouse management systems (WMS), barcode scanners, and RFID devices.

This **multi-layered structure** ensures specialization, efficiency, accountability, and smooth coordination, which are crucial for effective warehouse management in modern supply chains.

10. Discuss the benefits and process of computerizing warehouse activities.

Benefits of Computerization:

1. **Increased Accuracy:** Reduces human errors in inventory tracking and order processing.
2. **Real-time Data:** Provides up-to-date information on inventory levels, stock movements, and order status.
3. **Improved Efficiency:** Automates routine tasks like picking, stocktaking, and reporting.
4. **Better Space Utilization:** Helps in optimizing storage locations through warehouse mapping tools.
5. **Enhanced Customer Service:** Faster order fulfillment and improved tracking increase customer satisfaction.
6. **Cost Reduction:** Reduces labor costs, minimizes stockouts, and avoids overstocking.
7. **Improved Forecasting:** Data analytics and historical trends assist in better demand forecasting.

Process of Computerization:

1. **Needs Assessment:** Identify areas that need automation (e.g., inventory control, picking, shipping).
2. **Software Selection:** Choose appropriate Warehouse Management System (WMS) software based on operations scale.
3. **Hardware Setup:** Install barcode scanners, RFID readers, computers, and networking infrastructure.
4. **Data Migration:** Transfer existing records into the digital system with proper validation.
5. **Training:** Train staff to use the system effectively.
6. **Testing & Integration:** Conduct system testing and integrate with other ERP modules like procurement or finance.
7. **Go-Live & Monitoring:** Launch the system and monitor for performance and issues.

11. How is the performance of stores activities evaluated?

Performance is evaluated using **quantitative and qualitative metrics**, including:

- **Inventory Turnover Ratio:** Measures how quickly inventory is used or sold.
- **Order Accuracy Rate:** Percentage of correct items delivered to the requester or customer.
- **Cycle Time:** Time taken from order requisition to material delivery.
- **Stockout Frequency:** Number of times items are unavailable when required.
- **Carrying Cost:** Total cost of holding inventory.
- **Storage Space Utilization:** Measures how efficiently space is used.
- **Number of Discrepancies:** Differences between physical stock and recorded data.
- **Customer Satisfaction:** Internal or external feedback on responsiveness and reliability.

Evaluation methods include internal audits, customer feedback, system reports, and benchmarking against best practices.

12. Explain the role of ISO standards in warehouse management.

ISO (International Organization for Standardization) provides globally recognized standards to ensure quality, safety, and efficiency.

Key Roles in Warehouse Management:

- **ISO 9001 (Quality Management):** Ensures consistent procedures, documentation, and continual improvement in warehouse operations.
- **ISO 14001 (Environmental Management):** Guides the sustainable handling of materials, including hazardous substances.
- **ISO 45001 (Occupational Health and Safety):** Ensures employee safety through hazard identification and risk management.
- **ISO 28000 (Supply Chain Security):** Enhances security procedures in the supply chain including warehousing.

Benefits:

- Promotes standardization and accountability.
 - Enhances customer confidence.
 - Improves compliance with legal and regulatory requirements.
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13. What are the key factors affecting warehouse location decisions?

1. **Proximity to Markets and Customers:** Reduces delivery time and transportation costs.
 2. **Accessibility to Transportation:** Nearness to highways, ports, railways, and airports improves logistics efficiency.
 3. **Cost of Land and Utilities:** Lower costs can lead to significant savings.
 4. **Labor Availability and Cost:** Skilled workforce should be accessible at reasonable wages.
 5. **Availability of Infrastructure:** Power, water, internet, and communication facilities.
 6. **Regulatory Environment:** Local taxes, zoning laws, and business policies.
 7. **Safety and Security:** Risk factors such as crime rate, natural disasters, and pollution.
 8. **Proximity to Suppliers:** Enables quick replenishment and reduces lead time.
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14. Describe the principles of warehouse layout planning.

1. **Efficient Flow:** Ensure smooth inward (receiving) and outward (dispatch) movement with minimal cross-traffic.
 2. **Maximum Space Utilization:** Optimize vertical and horizontal space.
 3. **Accessibility:** Every item should be easy to locate and retrieve.
 4. **Flexibility:** Layout should be adaptable to future changes in volume or product types.
 5. **Safety:** Clear walkways, proper signage, and emergency exits must be incorporated.
 6. **Segregation of Areas:** Separate zones for receiving, storage, picking, packing, and dispatch.
 7. **Ergonomics:** Minimize manual handling and ensure ease of movement for staff and equipment.
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15. What are the critical facilities to be considered in warehouse planning?

1. **Receiving Docks:** For unloading and inspection of incoming materials.
 2. **Storage Systems:** Pallet racking, shelving units, bins, etc., suited to product type.
 3. **Handling Equipment:** Forklifts, trolleys, cranes, conveyor belts.
 4. **Picking & Packing Stations:** Designed for order accuracy and efficiency.
 5. **Dispatch Area:** Well-organized space for staging and loading of outbound goods.
 6. **Administrative Area:** Offices for warehouse managers and staff.
 7. **Security Systems:** CCTV, fire alarms, access control systems.
 8. **Safety Features:** Fire exits, extinguishers, first-aid kits, and emergency lighting.
 9. **IT Infrastructure:** Computers, barcode scanners, and WMS connectivity.
 10. **Rest and Sanitation Facilities:** For the comfort and hygiene of workers.
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16. Explain the safety practices that must be followed in warehouses.

1. **Use of Personal Protective Equipment (PPE):** Helmets, gloves, safety shoes, and vests.
 2. **Proper Training:** Staff must be trained in equipment use, emergency procedures, and safety regulations.
 3. **Clear Signage:** Warning signs for hazardous areas, exits, and equipment zones.
 4. **Equipment Maintenance:** Regular servicing of forklifts, conveyors, etc.
 5. **Cleanliness:** A clean environment prevents accidents like slips and falls.
 6. **Fire Safety:** Fire alarms, extinguishers, and clear evacuation routes.
 7. **Emergency Preparedness:** Drills and protocols for fires, chemical spills, or other emergencies.
 8. **Restricted Access:** Unauthorized personnel should not enter storage or machinery zones.
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17. Discuss the importance and methods of warehouse maintenance.

Importance:

- Ensures smooth operations and avoids downtime.
- Enhances equipment life.
- Prevents accidents and ensures safety.
- Maintains compliance with legal and industry standards.

Methods:

- 1. Preventive Maintenance:**
 - Scheduled servicing of equipment and facilities to avoid breakdowns.
 - Includes lubrication, part replacement, and inspections.
- 2. Corrective Maintenance:**
 - Repairs performed after equipment failure or faults are detected.
- 3. Predictive Maintenance:**
 - Uses data and sensors to anticipate failures before they occur.
- 4. Cleaning and Housekeeping:**
 - Daily and periodic cleaning schedules to maintain hygiene and organization.
- 5. Maintenance Logs:**
 - Documentation of all maintenance work helps track equipment health.

18. Describe various techniques to ensure warehouse security.

- 1. Surveillance Systems:**
 - CCTV cameras monitor activities 24/7.
- 2. Access Control:**
 - ID cards, biometric scanners, and password systems restrict entry.
- 3. Security Personnel:**
 - Guards monitor entry/exit points and patrol premises.
- 4. Inventory Control Systems:**
 - Barcoding and RFID prevent unauthorized movement of goods.
- 5. Fire and Safety Systems:**
 - Smoke detectors, extinguishers, and alarms safeguard against fire hazards.
- 6. Fencing and Lighting:**
 - Physical barriers and proper lighting deter theft and vandalism.
- 7. Visitor Management:**
 - Logging and monitoring of visitors and delivery personnel.
- 8. Alarm Systems:**
 - Triggered by unauthorized entry or emergency conditions.

19. Compare manual and automated warehouse systems.

Feature	Manual Warehouse System	Automated Warehouse System
Labor Dependency	High	Low

Feature	Manual Warehouse System	Automated Warehouse System
Speed & Efficiency	Slow, labor-intensive	Fast, accurate
Cost	Low initial, high operating	High initial, low operating
Inventory Accuracy	Prone to errors	Highly accurate
Flexibility	Easier to adapt	May require system changes
Space Utilization	May be inefficient	Optimized with vertical storage
Scalability	Limited	Easily scalable with software
Technology Use	Minimal (paper-based)	Advanced (WMS, RFID, robotics)
Risk of Damage	Higher due to human error	Lower with controlled systems
Data & Reporting	Manual logs and reports	Real-time tracking and analytics

20. Define inventory and explain its types with examples.

Inventory refers to the stock of goods and materials a business holds for the purpose of resale, production, or maintenance. It is a crucial part of supply chain management and helps meet customer demand efficiently.

Types of Inventory:

1. **Raw Materials:** Basic inputs used in the production process.
Example: Steel for manufacturing automobiles.
2. **Work-in-Progress (WIP):** Items that are partially completed.
Example: Assembled engines waiting for final inspection.
3. **Finished Goods:** Completed products ready for sale.
Example: Televisions ready for shipment to retailers.
4. **Maintenance, Repair, and Operations (MRO):** Items used to support production but not part of the final product.
Example: Lubricants, gloves, cleaning supplies.
5. **Transit or Pipeline Inventory:** Inventory in transit between locations.
Example: Goods shipped from the factory to the warehouse.
6. **Cycle Inventory:** Portion of inventory used to satisfy regular sales or production.
Example: Weekly restocking based on normal consumption.
7. **Safety Stock:** Extra inventory kept to avoid stockouts.
Example: Extra parts kept in case of supplier delay.
8. **Seasonal Inventory:** Stock built up in anticipation of peak demand.
Example: Winter jackets stored before the season starts.

21. Discuss pressures for holding high and low inventory.

Pressures for Low Inventory:

1. **Reduced Holding Costs:** Lower costs for storage, insurance, and obsolescence.

2. **Lean Manufacturing:** Supports JIT and reduces waste.
3. **Improved Cash Flow:** Less money tied up in inventory.
4. **Minimized Risk:** Reduces risk of damage, spoilage, or obsolescence.

Pressures for High Inventory:

1. **Customer Service Levels:** Ensures product availability and faster delivery.
 2. **Volume Discounts:** Bulk buying may reduce unit cost.
 3. **Buffer Against Uncertainty:** Protects against delays, demand fluctuations.
 4. **Smooth Production:** Ensures uninterrupted production flow.
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22. Explain the concept and role of safety stock.

Safety Stock is the additional quantity of inventory kept to protect against uncertainties in demand and supply.

Role of Safety Stock:

- Acts as a buffer against unexpected spikes in demand.
- Covers supply chain disruptions like delays or shortages.
- Prevents stockouts that could halt production or affect customer service.
- Increases reliability of inventory management systems.

Example: A retailer keeps extra mobile phones during a product launch in case demand exceeds forecasts.

23. Describe the Basic EOQ Model with an example.

Economic Order Quantity (EOQ) is the order quantity that minimizes the total inventory cost, which includes ordering cost and holding cost.

EOQ Formula:

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

Where:

- D = Annual demand
- S = Ordering cost per order
- H = Holding cost per unit per year

Example:

- Annual demand (D) = 10,000 units
- Ordering cost (S) = ₹500
- Holding cost (H) = ₹2/unit/year

$$EOQ = \sqrt{\frac{2 \times 10000 \times 500}{2}} = \sqrt{5,000,000} = 2236 \text{ units}$$

This means ordering 2,236 units each time will minimize total costs.

24. Explain the Production Quantity Model and its application.

The **Production Quantity Model** is a variation of EOQ where inventory is replenished gradually as items are produced, rather than all at once.

Formula:

$$EPQ = \sqrt{\frac{2DS}{H} \cdot \frac{P}{P-d}}$$

Where:

- D = Annual demand
- S = Setup cost
- H = Holding cost
- P = Production rate
- d = Demand rate

Application: Used when items are produced internally instead of purchased and the production rate is higher than the demand rate.

Example: A car manufacturer producing engines in batches rather than buying them.

25. Discuss quantity discounts and their influence on order decisions.

Quantity Discounts are price reductions offered to buyers who purchase in large quantities.

Types:

- **All-units discount:** Discount applies to all units once threshold is reached.
- **Incremental discount:** Discount applies only to units above the threshold.

Influence on Order Decisions:

- Buyers may order more than EOQ to take advantage of discounts.

- Must balance the **total cost** (purchase cost + holding + ordering) instead of just ordering cost and holding cost.
 - Encourages bulk buying but increases holding costs and risk of obsolescence.
-

26. What is the reorder point? Explain how it is calculated.

Reorder Point (ROP) is the inventory level at which a new order should be placed to avoid stockouts during lead time.

Formula:

$$ROP = d \times L$$

Where:

- d = Demand rate per period
- L = Lead time

If safety stock is used:

$$ROP = (d \times L) + \text{Safety Stock}$$

Example:

- Daily demand = 20 units
- Lead time = 5 days
- Safety stock = 30 units

$$ROP = (20 \times 5) + 30 = 130 \text{ units}$$

27. Explain the order quantity method for periodic inventory systems.

In a **Periodic Inventory System**, inventory levels are reviewed at fixed intervals, and orders are placed to replenish stock up to a predetermined maximum level.

Order Quantity = Target Level – Inventory on Hand

- Target Level = Expected demand during next period + Safety stock.
- It's used when continuous monitoring isn't feasible.

Example:

- Review every Monday.
- Target stock = 500 units
- Current inventory = 200 units
- Order Quantity = 500 – 200 = 300 units

28. How is order quantity determined under variable demand?

When **demand is variable**, statistical methods and safety stock are used:

Steps:

1. **Forecast Demand:** Based on historical data.
2. **Determine Standard Deviation:** To account for variability.
3. **Calculate Safety Stock:** Based on desired service level.
4. **Use Adjusted EOQ or Reorder Point:** With higher safety stock.

Formula for Safety Stock (under normal distribution):

$$SS = Z \cdot \sigma_d \cdot \sqrt{L}$$

Where:

- Z = Z-score for service level
- σ_d = Standard deviation of demand
- L = Lead time

Variable demand requires dynamic adjustments to order size and timing to avoid shortages or overstocking.

29. Compare the P-system and Q-system of inventory control.

Feature	P-System (Periodic Review)	Q-System (Continuous Review)
Review Time	Fixed intervals (e.g., weekly)	Continuous monitoring
Order Quantity	Varies; bring stock to target level	Fixed quantity (EOQ)
Trigger	Time-based	Inventory-level based
Safety Stock	Usually higher	Lower due to constant monitoring
Cost	Lower monitoring cost	Higher monitoring cost
Example	Grocery store restocking weekly	Spare parts inventory in factories

30. Describe the different types of inventory costs.

1. **Ordering Cost:** Cost of placing and receiving an order.
Includes: Purchase order processing, transportation, and inspection.
2. **Holding (Carrying) Cost:** Cost of storing unsold inventory.
Includes: Warehousing, insurance, depreciation, and opportunity cost.
3. **Shortage (Stock out) Cost:** Cost incurred when inventory is unavailable.
Includes: Lost sales, production delays, customer dissatisfaction.
4. **Purchase Cost:** Cost of acquiring inventory.
Includes: Unit price, taxes, and shipping.
5. **Setup Cost (for production):** Cost of preparing machines or processes for manufacturing a batch.
Relevant in: EOQ and Production Quantity Models.

31. Define Just-In-Time and explain its core logic and operational benefits.

Just-In-Time (JIT) is an inventory management strategy where materials and products are produced or acquired only as needed for use, reducing inventory levels to a minimum.

Core Logic:

- Eliminate waste (time, materials, motion).
- Produce only what is needed, when it is needed, and in the exact amount needed.
- Achieve continuous improvement and efficiency across operations.

Operational Benefits:

- **Reduced Inventory Costs:** Minimizes holding and storage costs.
 - **Improved Cash Flow:** Less capital tied up in inventory.
 - **Better Quality Control:** Smaller batches allow quicker feedback and correction.
 - **Increased Efficiency:** Streamlined production reduces idle time and overproduction.
 - **Higher Responsiveness:** Faster reaction to customer demand changes.
-

32. What are the main features of JIT concerning inventory?

- **Minimal Inventory:** Only small quantities are kept; materials arrive "just in time" for use.
 - **Frequent Deliveries:** Suppliers deliver smaller lots more frequently.
 - **Pull System:** Production is driven by customer demand, not forecasts.
 - **Quick Setup and Flexibility:** Machines and processes are designed for quick changeovers.
 - **High Supplier Integration:** Strong coordination with suppliers for timely deliveries.
-

33. Explain how JIT operations are achieved in practice.

Implementation Practices:

1. **Supplier Partnerships:** Long-term, reliable partnerships ensure timely delivery.
 2. **KANBAN Systems:** Visual signals are used to trigger production and movement.
 3. **Cellular Manufacturing:** Machines arranged in sequence for product flow with minimal movement.
 4. **Total Quality Management (TQM):** Focus on zero defects to avoid waste.
 5. **Workforce Training:** Multi-skilled workers handle various tasks to maintain flow.
 6. **Standardized Processes:** Promotes efficiency and quick identification of issues.
 7. **Continuous Improvement (Kaizen):** Small, ongoing changes to improve performance.
-

34. Discuss the advantages and disadvantages of JIT.

Advantages:

- Lower inventory and storage costs.
- Improved product quality and reduced waste.
- Greater efficiency in production.
- Enhanced supplier relationships.
- Quick adaptation to changes in demand.

Disadvantages:

- High dependency on suppliers.
 - Vulnerable to supply chain disruptions.
 - Requires accurate demand forecasting.
 - Initial implementation is complex and resource-intensive.
 - Limited flexibility for large, sudden orders.
-

35. Compare JIT with traditional inventory management systems.

Aspect	JIT	Traditional System
Inventory Level	Very low	High (buffer stocks)
Production	Pull-based	Push-based
Order Quantity	Small, frequent	Large, infrequent
Storage Costs	Low	High
Supplier Role	Integral to system	Less critical
Flexibility	High for small changes	Low responsiveness

Aspect	JIT	Traditional System
Risk	High (stockouts, delays)	Low (stock buffers)

36. Explain the use of KANBAN as a control tool in JIT systems.

KANBAN is a visual inventory and production control system used in JIT to signal the need for movement or production of materials.

Key Features:

- Uses cards, bins, or electronic signals to indicate need.
- Maintains a pull system — next step in production pulls materials from the previous.
- Reduces overproduction and excess inventory.
- Each KANBAN card contains details like part number, quantity, and source.

Example: An empty bin with a KANBAN card is sent to the previous workstation as a signal to produce more items.

37. Define Vendor Managed Inventory and its benefits for supply chain management.

Vendor Managed Inventory (VMI) is a system where the supplier manages the inventory levels of the customer, based on shared data.

Benefits:

- **Reduced Inventory Holding:** Customers maintain lower inventory.
 - **Improved Replenishment:** Suppliers ensure timely stock availability.
 - **Stronger Collaboration:** Builds trust and coordination between buyer and supplier.
 - **Better Forecasting:** Suppliers can forecast demand more accurately.
 - **Reduced Stock outs:** Fewer chances of running out of stock.
-

38. What are the key factors influencing make-or-buy decisions?

1. **Cost Consideration:** Comparing in-house production cost vs. supplier cost.
2. **Capacity Availability:** Whether the company has the resources and technology.
3. **Quality Requirements:** Supplier ability to meet quality standards.
4. **Strategic Focus:** Core vs. non-core activities — focus on strengths.
5. **Lead Time:** Internal production may take more/less time than buying.
6. **Confidentiality:** Sensitive processes or IP may favor in-house production.

7. **Flexibility:** Ability to adapt to changes in demand or design.
-

39. Describe methods used to evaluate the performance of the materials function.

1. **Inventory Turnover Ratio:** Measures how often inventory is used/sold.

$$\text{Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

Turnover Ratio = Average Inventory Cost of Goods Sold

2. **Order Accuracy:** Percentage of orders delivered without errors.
 3. **Stock out Rate:** Frequency of inventory unavailability.
 4. **Carrying Cost:** Total cost of storing inventory.
 5. **Material Cost Variance:** Difference between expected and actual costs.
 6. **Supplier Lead Time:** Time taken by vendors to deliver after ordering.
 7. **Obsolescence Rate:** Portion of inventory becoming outdated or unusable.
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40. Explain the use of FSN, HML, and XYZ analysis in inventory classification.

These are inventory classification techniques used to manage stock effectively:

1. FSN (Fast, Slow, Non-moving):

- **Fast-moving:** Consumed frequently.
- **Slow-moving:** Low usage rate.
- **Non-moving:** Not used for a long time.
- *Helps in identifying stock clearance or movement patterns.*

2. HML (High, Medium, Low cost):

- **High cost items:** Require strict control.
- **Medium cost:** Moderate control.
- **Low cost:** Less focus.
- *Useful in budgeting and cost control.*

3. XYZ Analysis (Based on inventory value variability):

- **X items:** Regular demand, accurate forecasts.
- **Y items:** Moderate variability.
- **Z items:** Irregular demand.
- *Used for forecast planning and safety stock decisions.*

A short explanation of syllabus

Unit I

Warehouse Management: Meaning and Significance

Meaning:

Warehouse Management refers to the supervision and control of all warehouse operations including the storage, movement, and tracking of materials within a warehouse. It involves the planning, organizing, staffing, directing, and controlling of resources and processes for the efficient handling of goods and materials.

Significance:

- **Efficient Space Utilization:** Optimizes warehouse layout and storage capacity.
- **Inventory Control:** Ensures proper stock levels are maintained.
- **Reduces Wastage:** Helps prevent damage, obsolescence, and theft.
- **Improves Customer Service:** Enables timely delivery and order fulfillment.
- **Cost Efficiency:** Minimizes storage, labor, and carrying costs.
- **Supports Supply Chain:** Acts as a buffer and facilitator in the flow of goods from manufacturer to end-user.

Warehouse Organization: Key Functional Areas

Requisitions and Replenishment of Materials

In any organization, especially in manufacturing, construction, retail, and warehouse operations, **materials management** plays a crucial role. Two important processes in this system are **Requisitions** and **Replenishment**.

1 Material Requisition

A **Material Requisition** is a formal request to procure or issue materials from the warehouse to a department or project. It ensures the **right quantity and quality of materials** are available when needed.

□ **Purpose:**

- To notify the warehouse or purchasing department of material needs.
- To ensure materials are supplied to the right place at the right time.
- To maintain clear records for inventory control and cost tracking.

□ **Steps in Material Requisition Process:**

1. **Initiation:**
 - A department identifies the need for a material (e.g., production, maintenance).
 2. **Filling the Requisition Form:**
 - Details include material name, quantity, specification, and purpose.
 3. **Authorization:**
 - The requisition is approved by a supervisor or manager.
 4. **Issue or Procurement:**
 - If available, the warehouse issues the materials. If not, it triggers a purchase order.
-

□ **2 □ Material Replenishment**

Replenishment is the process of restocking materials or inventory to maintain optimal stock levels and prevent stockouts or overstocking.

□ **Purpose:**

- To ensure continuous availability of materials.
- To maintain smooth production and operations.
- To avoid emergency purchases and supply chain disruptions.

□ **Replenishment Methods:**

1. **Reorder Level System**
 - When stock reaches a predefined minimum level, replenishment is triggered.
 2. **Economic Order Quantity (EOQ)**
 - Uses a mathematical model to determine the most cost-effective order size that minimizes holding and ordering costs.
 3. **Just-In-Time (JIT)**
 - Materials are replenished just before they are needed to reduce inventory holding.
 4. **Automatic Replenishment Systems**
 - Use of software and sensors (Inventory Management Systems) to track stock levels in real-time and automate orders.
-

□ Relationship Between Requisition and Replenishment

Requisition	Replenishment
A demand-driven request for materials.	A supply-driven response to stock levels.
Initiated by users or departments.	Triggered by inventory control systems.
Focuses on issuing materials.	Focuses on restocking materials.
Ensures availability for a specific task.	Ensures availability for ongoing operations.

□ Conclusion:

- **Requisition** ensures that material needs are communicated clearly and fulfilled in time.
- **Replenishment** ensures that the stock is maintained at healthy levels to support continuous operations.
- Together, they form the backbone of efficient **inventory management** in any organization.

□ Receipt and Inspection of Materials

In any organization, the process of receiving and inspecting materials is crucial to ensure that the right products, in the correct quantity and quality, are delivered before they are accepted into inventory or used in production.

Receipt of Materials

Material Receipt is the process of formally accepting delivery of goods from suppliers at the receiving dock or warehouse.

□ Steps in Material Receipt:

1. **Receiving Delivery:**
 - When goods arrive at the warehouse or delivery point, the delivery note or packing list is checked against the purchase order (PO).
2. **Document Verification:**
 - Verify the supplier's delivery note, invoice, and purchase order to ensure:
 - Correct supplier.
 - Correct material description.
 - Correct quantity.
 - Correct delivery date.
3. **Unloading and Temporary Storage:**

- Goods are unloaded safely and placed in a designated inspection area for checking.

Inspection of Materials

Material Inspection ensures that the materials received meet the company's quality standards, specifications, and contract conditions.

Types of Inspection:

1. **Visual Inspection:**
 - Physical appearance, packaging damage, labeling, and condition.
2. **Quantity Verification:**
 - Counting the number of units or weighing bulk materials to confirm the correct amount has been delivered.
3. **Quality Inspection:**
 - Checking material specifications like dimensions, tolerances, chemical composition, mechanical strength, and compliance with standards.
4. **Testing:**
 - For specialized materials, samples may be sent to a lab or tested on-site for technical compliance.

Acceptance or Rejection

- If materials pass inspection → **Goods Receipt Note (GRN)** is generated and the material is moved to storage.
- If materials fail inspection → A **Rejection Note** or **Return to Supplier** notice is raised, and the supplier is informed.

Importance of Receipt and Inspection

- Prevents defective or incorrect materials from entering the production system.
- Helps ensure supplier reliability and quality compliance.
- Reduces the risk of rework, wastage, or production downtime.
- Protects against financial loss due to supplier errors.

Documents Involved:

- Purchase Order (PO)
- Delivery Note
- Goods Receipt Note (GRN)
- Inspection Report
- Rejection Note (if applicable)

□ Conclusion

The **receipt and inspection process** is a critical checkpoint in material management, ensuring that only materials that meet quality and quantity standards are accepted and stored. It helps maintain smooth operations, protects the company from defects, and builds trust in supplier relationships.

Issue of Materials

The **Issue of Materials** is the process of supplying materials from the store or warehouse to the user departments like production, maintenance, or projects — based on a formal request. This is a key part of inventory management that ensures smooth operations and accurate stock control.

□ Purpose of Material Issue

- To supply required materials for production, maintenance, or office use.
- To maintain proper records of inventory movement.
- To control material costs and avoid wastage.
- To ensure accountability for issued materials.

□ Types of Material Issues

1 □ □ Routine Issue:

- For daily production or maintenance, based on pre-approved schedules or material requisitions.

2 □ □ Emergency Issue:

- Unplanned requests due to sudden breakdowns, shortages, or urgent needs.

3 □ □ Returnable Issue:

- Tools or equipment that are issued temporarily and expected to be returned.

□ Material Issue Procedure

1. Material Requisition Received

- A department fills out a **Material Requisition Note (MRN)** specifying the material type, quantity, and purpose.

2. Verification and Approval

- The storekeeper verifies stock availability and the requisition is approved by authorized personnel.

3. **Issue of Materials**
 - Materials are picked from the stock and physically handed over to the requester.
4. **Documentation**
 - An **Issue Voucher** or **Material Issue Note (MIN)** is prepared and signed by both the storekeeper and recipient.
5. **Stock Updating**
 - Inventory records are updated to reflect the reduced stock levels.

Documents Used in Material Issue

- **Material Requisition Note (MRN)**
- **Material Issue Note (MIN)**
- **Bin Cards / Stock Registers**
- **Goods Issue Slip**

Importance of Proper Material Issue

- Ensures uninterrupted production and operations.
- Helps maintain accurate stock records.
- Prevents misuse, theft, or unauthorized use of materials.
- Provides traceability and accountability for all materials issued.
- Supports cost control and budgeting.

Conclusion

The **Issue of Materials** is a systematic process that ensures the right materials reach the right place at the right time, supporting operational efficiency while maintaining accurate stock records. It's essential for both **inventory control** and **cost management**.

Stocktaking

Stocktaking is the process of **physically counting and verifying the quantity and condition of inventory** in a warehouse, store, or stockroom. It is an essential part of inventory management to ensure that the recorded stock matches the actual stock.

Purpose of Stocktaking

- To verify the accuracy of stock records.
- To detect theft, loss, damage, or misplacement.
- To evaluate stock for accounting and auditing purposes.
- To ensure that there are enough materials for production or sales.
- To identify obsolete, expired, or slow-moving items.

Types of Stocktaking

1 **Periodic Stocktaking**

- Done at fixed intervals (monthly, quarterly, or yearly).
- Usually performed at the end of a financial year for final accounts.

2 **Continuous Stocktaking**

- An ongoing process where different sections of stock are counted on a rotating basis throughout the year.
- Less disruptive than periodic stocktaking.

3 **Perpetual Stocktaking**

- Uses **real-time tracking** via software, barcode scanners, or RFID systems.
- Stock records are updated automatically whenever materials are received or issued.

Stocktaking Procedure

1. **Preparation**

- Freeze stock movement (stop receiving or issuing) during stocktaking.
- Gather stocktaking sheets, pens, and scanners.

2. **Physical Counting**

- Each item is counted, weighed, or measured manually or electronically.
- Teams often work in pairs for accuracy.

3. **Verification**

- Counts are compared to the stock records.
- Discrepancies are investigated and corrected.

4. **Reporting**

- A **Stocktaking Report** is prepared highlighting shortages, surpluses, and damaged items.
- Adjustments are made to the inventory records.

Importance of Stocktaking

- Prevents stock discrepancies.
- Improves inventory control.
- Supports financial reporting and audit compliance.
- Reduces losses due to theft, damage, or error.
- Ensures accurate planning for procurement and production.

Conclusion

Stocktaking is a vital process that helps organizations maintain accurate stock records, minimize losses, and improve decision-making. Whether done manually or digitally, it ensures accountability and operational efficiency.

❓ Discrepancies and Their Resolution

In inventory and materials management, a **discrepancy** refers to a difference between the **physical stock** and the **recorded stock**. Detecting and resolving these discrepancies is essential to maintain accurate inventory records, financial statements, and smooth operations.

❑ What are Discrepancies?

A **discrepancy** occurs when the counted quantity during stocktaking or verification does not match the quantity recorded in the stock records or system.

❑ Common Types of Discrepancies:

1❑ ❑ Shortage:

- Physical stock is **less** than recorded stock.

2❑ ❑ Surplus:

- Physical stock is **more** than recorded stock.

3❑ ❑ Damaged or Obsolete Stock:

- Stock found during inspection is unusable or expired.

4❑ ❑ Wrong Material or Misplacement:

- Stock recorded for one item but another item is found, or the item is in the wrong location.
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❑ Causes of Discrepancies

- Manual counting errors during receipt, issue, or stocktaking.
- Theft or pilferage.

- Supplier shortages or excess in deliveries.
 - Damaged goods not recorded properly.
 - Errors in data entry or system updates.
 - Misplacement or mislabeling of stock.
 - Unauthorized issue or usage.
-

Resolution of Discrepancies

1 **Rechecking / Recounting:**

- If a discrepancy is found, the first step is to recount the item to rule out human error.

2 **Investigation:**

- Trace records of receipts, issues, transfers, and adjustments to find the source of the difference.

3 **Physical Verification:**

- Inspect storage areas for misplaced or overlooked items.

4 **Adjustment Entry:**

- Once confirmed, stock records are adjusted to match the physical count through authorized adjustment entries.

5 **Root Cause Analysis:**

- Identify why the discrepancy occurred and take corrective actions (e.g., retraining staff, improving security, better labeling).

6 **Reporting and Documentation:**

- Prepare a discrepancy report detailing:
 - Type of discrepancy.
 - Possible cause.
 - Actions taken for resolution.

7 **Corrective and Preventive Measures:**

- Strengthen stock control procedures.
- Increase staff training.
- Use automated inventory management systems.
- Introduce periodic audits.

☐ Importance of Timely Resolution

- ✓☐ Maintains accurate inventory records.
- ✓☐ Supports reliable financial reporting.
- ✓☐ Prevents disruption in production or sales.
- ✓☐ Reduces wastage, losses, and fraud.
- ✓☐ Improves supplier and customer trust.

☐ Conclusion

Discrepancies are common but manageable in material management. Quick detection, systematic investigation, proper adjustment, and preventive actions are the keys to resolving discrepancies and ensuring efficient, accurate, and reliable inventory control.

Control of Tools, Surplus, and Scrap Materials

Efficient **control of tools, surplus materials, and scrap** is crucial for optimizing costs, minimizing losses, and ensuring smooth operational processes in any organization, particularly in manufacturing, construction, or warehouse settings.

☐ 1 ☐ Control of Tools

Tools are essential items in any organization, particularly in production or maintenance. They can be costly, and improper control can lead to loss, theft, or misuse.

☐ Key Aspects of Tool Control:

1. **Tool Inventory Management:**
 - Maintain a detailed **inventory record** for each tool.
 - Include specifications, purchase date, usage, and condition.
2. **Tool Issue System:**
 - Tools should be issued based on **requests or work orders**.
 - **Tool Issue Forms** or **Sign-Out Sheets** must be filled out, recording the name, department, and duration of the tool loan.
3. **Tool Return and Inspection:**

- Tools should be returned after use and undergo an inspection for damage or wear.
 - A **Tool Return Register** should be maintained to track returns.
 - 4. **Preventive Maintenance and Repairs:**
 - Regular checks should be done to ensure tools are in good working condition.
 - **Scheduled maintenance** or **repairs** should be planned to avoid downtime.
 - 5. **Security Measures:**
 - Tools should be stored in secure, organized areas to prevent theft.
 - Use **tool tracking systems**, such as RFID tags or barcode scanners, for high-value tools.
-

□ 2 □ Control of Surplus Materials

Surplus materials are the excess stock that is not immediately needed in the production or operation process. Proper control of surplus materials helps prevent overstocking and reduces storage costs.

□ Key Aspects of Surplus Material Control:

1. **Inventory Audits:**
 - Conduct **regular stocktaking** to identify excess stock.
 - Use **minimum and maximum stock levels** to determine when surplus materials need to be used or reordered.
 2. **Storage and Organization:**
 - Surplus materials should be stored separately from active materials to prevent confusion.
 - Label surplus materials clearly to indicate they are excess or temporary stock.
 3. **Reallocation or Redistribution:**
 - Surplus materials should be reallocated to departments or projects that require them.
 - Surplus materials can be used for future production to prevent waste.
 4. **Controlled Purchasing:**
 - **Purchase orders** should be aligned with the actual needs of production or operations.
 - Use **Just-In-Time (JIT)** procurement to avoid accumulating surplus materials.
 5. **Surplus Disposal:**
 - If surplus materials cannot be used, consider **sale, recycling, or disposal** according to company policies.
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□ 3 □ Control of Scrap Materials

Scrap materials are waste materials, damaged goods, or by-products that no longer have value in the production process. Managing scrap materials is essential to ensure they are disposed of or recycled responsibly.

□ **Key Aspects of Scrap Material Control:**

1. **Separation of Scrap:**

- Scrap should be clearly separated from usable materials to avoid contamination.
- Establish designated areas for scrap collection to prevent mixing with valuable stock.

2. **Documentation and Reporting:**

- Keep detailed records of the types, quantities, and reasons for scrap.
- **Scrap reports** should be generated to track material losses and assess the impact on cost.

3. **Scrap Disposal or Recycling:**

- Scrap can be sold to recycling companies for reuse, depending on the material type.
- Alternatively, scrap materials should be disposed of following **environmental regulations**.

4. **Scrap Minimization Strategies:**

- Analyze the causes of scrap generation and implement measures to reduce waste, such as:
 - Improving production techniques.
 - Training workers on proper handling and usage of materials.
 - Using quality control measures to prevent defects.

5. **Cost Accounting:**

- Keep track of scrap costs and its impact on production costs.
- **Scrap recovery systems** can be introduced to reclaim usable parts from scrap materials.

□ **Importance of Controlling Tools, Surplus, and Scrap**

- **Cost Reduction:** Preventing unnecessary purchases of surplus materials and reducing scrap minimizes waste and lowers operational costs.
 - **Efficiency Improvement:** Ensures tools and materials are readily available when needed, avoiding production delays.
 - **Inventory Accuracy:** Proper control ensures accurate inventory records, which are crucial for financial reporting and forecasting.
 - **Environmental Impact:** Proper disposal and recycling of scrap materials reduce waste and help meet sustainability goals.
 - **Security and Accountability:** Tracking and controlling tools prevent theft or misuse, ensuring they are used effectively.
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□ Conclusion

Effective **control of tools, surplus materials, and scrap** is essential for maintaining cost-efficiency, operational effectiveness, and environmental sustainability. Regular tracking, proper storage, and timely disposal or redistribution of materials ensure a smooth operation and reduce unnecessary costs.

Storage and Handling Practices

Proper **storage and handling practices** are crucial for maintaining the quality, safety, and accessibility of materials in warehouses or stockrooms. These practices prevent damage, minimize waste, ensure safety, and promote operational efficiency.

Importance of Storage and Handling Practices

- □ **Preserves Material Quality:** Proper storage prevents damage from environmental factors like humidity, light, or temperature changes.
- □ **Prevents Loss or Theft:** Good handling and storage ensure that goods are secure and accounted for.
- □ **Improves Efficiency:** Organized storage systems make it easier to locate and retrieve items, improving overall productivity.
- □ **Compliance with Safety Standards:** Proper handling ensures that health and safety regulations are met, reducing the risk of accidents.

Storage Practices

□ Key Elements of Good Storage:

1. **Proper Organization and Labeling:**
 - Materials should be stored in an organized manner, with clear **labels** indicating the item name, SKU, quantity, and any special handling instructions.
 - **Storage locations** should be clearly marked, such as using **bin cards** or **shelf tags**.
2. **Temperature and Environmental Control:**
 - Some materials (like chemicals, food, or electronics) require specific temperature and humidity conditions for storage.
 - Use **climate-controlled rooms** or **refrigerators** for sensitive materials, such as perishable goods or temperature-sensitive items.
3. **Shelving and Racking Systems:**
 - Use appropriate **shelving, racking, or pallet systems** based on the type and volume of materials. This allows for easy stacking, space maximization, and quick access.
 - **Vertical storage** can help save space while ensuring safe storage of materials.
4. **Inventory Management:**

- Implement an **inventory management system** (manual or digital) to track stock levels, locations, and movements in real-time.
 - Use methods like **FIFO (First In, First Out)** or **LIFO (Last In, First Out)** for inventory control, depending on the material type.
5. **Palletization:**
- Store bulk materials on **pallets** for easy movement, stacking, and handling.
 - **Pallet racking systems** should be sturdy and capable of holding heavy loads.
6. **Material Segregation:**
- Separate materials based on type, size, or handling requirements to prevent mix-ups and damage.
 - Store hazardous materials in designated areas, ensuring they are compliant with safety regulations.
7. **Adequate Lighting and Ventilation:**
- Proper lighting is essential for easy identification of materials.
 - Ensure the warehouse or storage area has good **ventilation** to prevent mold growth and improve air quality.
-

Handling Practices

□ Key Elements of Good Handling:

1. **Safe Lifting and Handling:**
 - **Proper lifting techniques** (e.g., lifting with the legs, not the back) should be followed to avoid injury.
 - Use **material handling equipment** like forklifts, pallet jacks, and conveyors for heavy or bulky items.
2. **Handling Equipment:**
 - Equip the warehouse with suitable **handling tools** such as forklifts, cranes, and dollies.
 - Ensure all equipment is **regularly maintained** and operated by trained personnel.
3. **Employee Training:**
 - Employees should be trained in the correct handling procedures, including the use of equipment and personal protective equipment (PPE), if necessary.
 - **Safety protocols** should be emphasized, particularly for hazardous or fragile materials.
4. **Minimizing Material Damage:**
 - Avoid dropping, dragging, or throwing materials. Handle items carefully to avoid **scratching, denting, or breaking**.
 - **Cushioning materials**, such as bubble wrap or foam, should be used for fragile items.
5. **Efficient Material Flow:**
 - Ensure that materials are moved **quickly and safely** from receiving to storage, and then to production or dispatch.

- Use **clear pathways** and **well-defined areas** for picking, storing, and loading materials.
 - 6. **Packing and Unpacking:**
 - When packing materials for shipment, ensure that items are **securely packaged** to avoid damage during transit.
 - Unpacking should be done carefully to prevent any injuries or damage to the goods.
-

Safety Considerations

1. **Personal Protective Equipment (PPE):**
 - Employees should wear appropriate PPE, such as gloves, helmets, safety shoes, and goggles, depending on the materials being handled.
 2. **Ergonomics:**
 - Use **ergonomically designed equipment** and **workstations** to reduce physical strain on workers and promote better posture.
 3. **Fire Safety:**
 - Store flammable materials in fire-resistant cabinets or segregated areas.
 - Install **fire extinguishers** and maintain proper fire exits in the storage areas.
 4. **Spill Prevention and Cleanup:**
 - Store hazardous materials in **spill-proof containers**.
 - Have **spill kits** available and train staff in emergency spill response procedures.
-

Conclusion

Implementing **proper storage and handling practices** ensures that materials are stored safely, handled efficiently, and easily accessible when needed. These practices minimize loss, damage, and safety risks, while optimizing workflow and maintaining inventory accuracy.

UNIT II

. Computerization of Warehouse Activities

Definition:

Computerization involves the use of software systems and automated tools to manage warehouse operations efficiently.

Key Components:

- **Warehouse Management System (WMS):** Central software to monitor inventory, track shipments, and manage space.
- **Barcoding and RFID:** For quick scanning, tracking, and updating inventory in real-time.
- **Automated Inventory Updates:** Ensures accuracy and reduces manual work.
- **Data Analytics:** Provides insights into stock movement, performance, and forecasting.

Benefits:

- Faster order processing and retrieval
 - Enhanced inventory accuracy
 - Improved space utilization and layout planning
 - Real-time inventory visibility
 - Reduced paperwork and human error
-

2. Performance Evaluation of Stores Activities

Purpose:

To measure efficiency, effectiveness, and economy in material handling and storage functions.

Key Performance Indicators (KPIs):

- **Inventory Turnover Ratio:** Measures how often inventory is sold and replaced.
- **Stock Accuracy:** Matches physical stock with records.
- **Order Cycle Time:** Time taken from order placement to delivery.
- **Carrying Cost of Inventory:** Storage, insurance, and depreciation costs.
- **Stock out Rate:** Frequency of item unavailability.

Methods:

- Internal audits and reviews
 - Performance reports and dashboards
 - Benchmarking with industry standards
-

3. ISO Standards and Warehouse Activities

Relevant ISO Standards:

- **ISO 9001:** Quality Management Systems — Ensures process efficiency and customer satisfaction.
- **ISO 14001:** Environmental Management — Reduces warehouse environmental impact.
- **ISO 45001:** Occupational Health and Safety — Ensures a safe workplace.
- **ISO 28000:** Security Management for the Supply Chain — Addresses risks in logistics and warehousing.

Benefits of ISO in Warehousing:

- Standardized operations and documentation
 - Risk mitigation and safety compliance
 - Continuous improvement
 - Enhanced customer and stakeholder confidence
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4. Warehouse Location, Layout, and Facilities Planning

Warehouse Location:

Factors to consider:

- Proximity to suppliers and customers
- Transportation facilities (road, rail, ports)
- Cost of land, labor, and utilities
- Legal and environmental regulations
- Availability of skilled workforce

Warehouse Layout Planning:

Principles:

- **Flow Principle:** Streamlined movement from receiving to dispatch
- **Space Utilization:** Optimal use of cubic space (vertical and horizontal)
- **Accessibility:** Easy access to all SKUs
- **Flexibility:** Capacity to handle change in operations

Warehouse Facilities:

- Loading docks and receiving bays
- Storage racks, shelving systems

- Office and control areas
 - Fire protection and ventilation systems
 - Power backup and climate control
-

5. Warehouse Security, Safety, and Maintenance

Security Measures:

- **Surveillance Systems:** CCTV, motion detectors
- **Access Control:** Restricted entry with ID/swipe cards
- **Inventory Locking Systems:** Safeguards high-value items
- **Alarms and Intrusion Detection:** For break-ins or unauthorized access
- **Insurance and Risk Assessments**

Safety Practices:

- Clear marking of hazardous zones
- Proper material stacking and storage
- Fire extinguishers and emergency exits
- PPE (Personal Protective Equipment) for staff
- Regular safety drills and training

Warehouse Maintenance:

- **Preventive Maintenance:** Routine checks for equipment and infrastructure
- **Corrective Maintenance:** Repairs of damaged racks, lighting, and systems
- **Housekeeping:** Regular cleaning to avoid accidents and contamination
- **Inspection Logs:** Documentation of inspections, servicing, and replacements

UNIT III

INVENTORY MANAGEMENT

1. Inventory Concepts

- **Inventory** is a stock of goods and materials held by an organization to support production, sales, and service.
 - It acts as a buffer between supply and demand.
 - Objectives of inventory management include ensuring availability, minimizing holding costs, and optimizing resource use.
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2. Pressures for Low Inventory

- **Storage Costs:** High storage or warehousing costs.
 - **Perishability/Obsolescence:** Especially relevant in food, fashion, or tech.
 - **Cash Flow Constraints:** Tying up money in inventory restricts investment elsewhere.
 - **Waste Reduction:** Lower inventory means less spoilage or damage.
 - **Just-in-Time (JIT) Philosophy:** Encourages lean operations with minimal stock.
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3. Pressures for High Inventory

- **Customer Service:** Ensures immediate availability of products.
 - **Quantity Discounts:** Economies of scale in purchasing.
 - **Hedge Against Price Fluctuations:** Buying in advance to avoid future price increases.
 - **Protection Against Uncertainty:** Acts as a buffer against delays or demand surges.
 - **Avoiding Stock outs:** Prevents production halts or lost sales.
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TYPES OF INVENTORY

1. Seasonal Inventory

- Stock built up in anticipation of peak demand periods (e.g., winter wear before winter).

2. Decoupling Inventory

- Extra inventory held at different stages of production to allow independent operation of processes.

3. Cyclic Inventory

- Inventory that is used or replenished regularly as part of normal operations.

4. Pipeline Inventory

- Inventory that is in transit between different locations of a supply chain.

5. Safety Stock

- Extra stock held to avoid stock outs due to demand or supply variability.
-

INVENTORY COSTS

1. **Ordering Costs:** Costs associated with placing and receiving orders (administration, transport).
 2. **Holding/Carrying Costs:** Storage, insurance, depreciation, and capital costs.
 3. **Shortage Costs:** Lost sales, backorders, and loss of goodwill.
 4. **Purchase Costs:** Cost of the actual item being bought.
-

INVENTORY CONTROL SYSTEMS

1. P-System (Periodic Review System)

- Inventory is checked and reordered at regular intervals.
- **Issues:**
 - May result in stock outs between reviews.
 - Requires estimation of demand for the entire review period.

2. Q-System (Continuous Review System)

- Inventory is monitored continuously; reorder is triggered when stock hits the reorder point.
 - **Issues:**
 - Requires constant monitoring.
 - More complex and expensive to manage but more responsive.
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INVENTORY MODELS

1. Basic Economic Order Quantity (EOQ) Model

- Formula:

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

Where:

- D = Annual demand
- S = Ordering cost per order
- H = Holding cost per unit per year
- **Goal:** Minimize total ordering and holding costs.

2. Production Quantity Model

- Used when items are manufactured rather than ordered.
- Assumes gradual replenishment.
- EOQ modified to:

$$EPQ = \sqrt{\frac{2DS}{H} \cdot \frac{P}{P-D}}$$

Where P is production rate, D is demand rate.

3. Quantity Discounts

- Discounts offered on bulk purchasing.
 - Total cost includes purchase cost, ordering cost, and holding cost.
 - Evaluate each discount level using total cost comparison.
-

4. Reorder Point

- The inventory level at which a new order is placed.
- Formula (with lead time and demand known):

$$ROP = d \times L$$

Where:

- d = demand per unit time
 - L = lead time
-

5. Safety Stocks

- Extra inventory held to reduce the risk of stockouts.
- Calculated using standard deviation of demand and desired service level (Z-score):

$$\text{Safety Stock} = Z \times \sigma_L$$

Where σ_L = standard deviation during lead time.

6. Service Level

- Probability that stock on hand will meet customer demand.
- Higher service level → higher safety stock required.

7. Order Quantity for Periodic Inventory System

- Formula:

$$\text{Order Quantity} = (\text{Target Inventory Level}) - (\text{Inventory on Hand})$$

Order Quantity = (Target Inventory Level) - (Inventory on Hand)

- Based on forecasted demand during the next review period plus safety stock.

8. Order Quantity with Variable Demand

- Use probabilistic models like:
 - **Normal distribution** for demand forecasting
 - **Simulation techniques** to model uncertainty
- Incorporate **safety stock** to buffer demand variability.

UNIT IV

JUST-IN-TIME (JIT)

1. Principles of JIT

- Produce only what is needed, when it is needed, and in the amount needed.
- Eliminate all forms of waste (time, inventory, defects, etc.).
- Focus on continuous improvement and quality.
- Develop close relationships with suppliers and customers.

2. Core Logic of JIT

- **Pull System:** Production is driven by actual customer demand, not forecasts.

- **Zero Inventory Goal:** Inventory is seen as a liability, not an asset.
 - **Minimize Lead Time:** Fast, reliable production cycles.
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3. Main Features for Stocks in JIT

- **Minimal Buffer Stocks**
 - **Frequent, Small Deliveries**
 - **High Inventory Turnover**
 - **Dependence on Supplier Reliability**
 - **High Emphasis on Quality Control**
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4. Achieving JIT Operations

- **Supplier Integration:** Suppliers deliver small lots directly to production.
 - **Workforce Flexibility:** Multiskilled employees handle multiple tasks.
 - **U-shaped Layouts:** Reduces movement and handling.
 - **Setup Time Reduction:** Quick changeovers between production batches.
 - **Total Quality Management (TQM):** Ensures defect-free production.
-

5. Effects of JIT

- **Reduced Inventory Costs**
 - **Better Cash Flow**
 - **Improved Product Quality**
 - **More Floor Space**
 - **Higher Supplier Dependence**
 - **Stress on Production Flexibility**
-

6. Benefits of JIT

- Low working capital requirement
- Waste elimination
- Improved supplier relationships
- Quick response to market changes
- Enhanced product quality

7. Disadvantages of JIT

- Vulnerability to supply chain disruptions
- High dependency on suppliers
- Unsuitable for volatile demand environments
- Requires strong infrastructure and coordination

8. Comparison with Traditional Inventory Management

Feature	JIT	Traditional (Push) System
Inventory Levels	Minimal	High
Production Strategy	Pull (demand-driven)	Push (forecast-driven)
Lead Time	Short	Longer
Flexibility	High	Moderate
Supplier Relation	Integrated, frequent supply	Less frequent, bulk ordering

KANBAN as a Control Tool in JIT

Definition:

KANBAN is a **visual signal-based system** (usually cards, bins, or electronic signals) used to control the flow of materials and production in a JIT system.

Function:

- Triggers replenishment when items are consumed.
- Limits work-in-process (WIP) inventory.
- Enhances communication and reduces overproduction.

VENDOR MANAGED INVENTORY (VMI)

Definition:

A supply chain initiative where the **vendor is responsible for managing inventory levels** at the customer's location.

Benefits:

- Reduces stock outs and overstocking
- Enhances supplier-customer collaboration

- Decreases ordering costs
- Better demand forecasting

MAKE OR BUY DECISIONS

Definition:

Decision to either **manufacture a product in-house** or **purchase it from an external supplier**.

Factors Influencing Make-or-Buy:

Factor	Description
Cost	Compare in-house production vs outsourcing cost
Quality	Internal vs supplier's quality capabilities
Capacity	Available resources, manpower, and technology
Core vs Non-core	Retain strategic capabilities in-house and outsource non-core functions
Management Strategy	Long-term focus: strategic partnerships, control, innovation, etc.

EVALUATION OF MATERIALS FUNCTION PERFORMANCE

Key Parameters:

- **Cost:** Material procurement and inventory costs
- **Delivery:** On-time deliveries, lead time
- **Quality:** Defect rates, rejections
- **Inventory Turnover Ratio:**

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Inventory Turnover} = \frac{\text{Average Inventory}}{\text{Cost of Goods Sold}}$$

Methodologies:

- KPIs and benchmarking
- Ratio analysis and trend study
- ABC/FSN/HML/XYZ inventory classifications

INVENTORY CLASSIFICATION TOOLS

1. FSN Analysis

- **F (Fast-moving):** Frequently used items
- **S (Slow-moving):** Used occasionally
- **N (Non-moving):** Not used for long periods

2. HML Analysis

- **H (High Cost):** Expensive items
- **M (Medium Cost):** Moderate cost
- **L (Low Cost):** Inexpensive items

3. XYZ Analysis

- Based on inventory value fluctuation or accuracy of forecasts:
 - **X:** Constant demand, easy to forecast
 - **Y:** Moderate fluctuation
 - **Z:** Irregular demand, hard to forecast
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MATERIALS MANAGEMENT IN JIT ENVIRONMENT

Essentials:

- Accurate demand forecasting
- Real-time communication with suppliers
- Vendor development and evaluation
- Efficient internal logistics
- Waste minimization and quality focus

Roles in JIT:

- **Synchronize supply and production**
- **Reduce lead times**
- **Maintain minimal inventory levels**
- **Improve responsiveness to demand**