

# **II M.Com**

## **PRODUCTION AND MATERIALS MANAGEMENT**

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**Unit III to V**

**Presented By**

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## **PRODUCTION AND MATERIALS MANAGEMENT**

### **UNIT III**

#### **PRODUCTION PLANNING AND CONTROL**

##### **Product Planning - Meaning**

The direction and coordination of the firm's material and physical facilities towards the attainment of pre-specified production goals in the most efficient available way.

##### **Importance of Planning for Production Process**

1. To increasingly complex, requiring systematic 'thinking through'.
2. To the element of time in varying degrees.
3. To probable change must always be taken into account.
4. To most economical combination of resources.

##### **Analysis of the Planning Process**

1. Research and exploration
2. Choice of resources, facilities, methods and procedures.
3. Codification (mark) of plans

##### **Production Control**

The British Standards Institute defines the term production control to include the following

- i. The production plan or planning
- ii. Scheduling
- iii. Machine or labour utilization
- iv. Stock control
- v. Manufacturing control
- vi. Progress

##### **Objectives of Production Control**

1. To issuing the necessary orders
2. To ensure availability
3. To ensure carrying out of the orders

##### **Functions involved in Production Control**

1. Control activities
2. Control of material movement
3. Availability of tools in controlled
4. Quantity produced is controlled

5. Control of replacement
6. Labour efficiency and control

### **Advantages of Production Control**

1. Better service to customers
2. Less overtime work
3. Need of smaller inventories of work-in-process and of finished goods
4. More effective purchasing
5. More effective use of equipment
6. Less loss of time
7. Savings in the cost
8. Less work-stoppages.

### **PRODUCTION PLANNING AND CONTROL**

According to Gordon B. Carson, “Production planning control consists of the organization and the planning of the manufacturing process routing, scheduling, dispatching and inspection, coordination and the control of materials, methods, machines, tooling and operating time. The ultimate objectives is the organization of the supply and movement of materials and labour, machine utilization and related activities in order to bring about the desired manufacturing results in the terms of quality, time and price”.

### **Main elements of Production Planning and Control**

1. Routing
2. Loading
3. Scheduling
4. Dispatching
5. Follow-up

### **Objectives of Production Planning and Control**

1. Quality of the output
2. Plant utilization
3. Process efficiency
4. Delivery of goods
5. Maintenance of inventories
6. Flexibility
7. Effectiveness of work
8. Absenteeism
9. Team spirit

10. Ideas for new methods
11. Reduced supervision
12. Reduced waiting time

### **Functions of Production Planning and Control**

1. Materials
2. Methods
3. Machines and equipment
4. Manpower
5. Process planning
6. Estimating
7. Loading and Scheduling
8. Dispatching
9. Follow-up
10. Inspection
11. Evaluation

### **Stages of Production Planning and Control**

1. Pre-planning (Macro Level)
  - a. Product design
  - b. Process design
  - c. Flow design (layout)
  - d. Work station design
2. Planning (Micro Level)
  - a. Planning Resources 9 M's
  - b. Process planning (Routing)
  - c. Scheduling
  - d. Estimating
3. Control
  - a. Dispatching
  - b. Inspecting
  - c. Follow-up
  - d. Evaluation

### **Organization for Production Planning and Control**

1. To highly repetitive type of production
2. To the sequence of operations is prefixed
3. To an independent production planning and control department

### **Production Planning and Control – An Integrated Functions**

1. Sales Department
  - a. While giving quotations
  - b. Preparing order acceptance
  - c. To provide sales, status and progress of various orders
  - d. To provide sale report
  - e. Not accept a rush order
  - f. Buyer's feed back on quality
  - g. New schedules, amendments, cancellations and design changes
2. Design Department
  - a. To consideration of capacity of machines
  - b. Design change intimated earliest
  - c. The design tolerance
3. Inspection and Quality Control Department
  - a. To provide immediate feed back
  - b. To set-up fresh machine tool
  - c. Inspection of jobs prior to key operations, and transfer to another dept.
  - d. To overlapping operations must be cleared
  - e. Errors observed
  - f. To improve quality control
4. Purchase and Stores Department
  - a. To purchase raw material well in advance
  - b. To identify progress time and anticipated delay.
  - c. To based on market demand postponed RM purchase
  - d. To production planning and control information on lead time of different items.
  - e. To act immediately on receipt of revised schedules and changes in specifications.
5. Tool Room – making tools and gauges (weight) available in the right quantities.
6. Maintenance Department - Attending on the machines in essential top priority.
7. Personnel Department
  - a. Keep leave, resignations, hiring etc.

- b. Notifications received from EB, Period of load shedding, power cuts. Etc.
- 8. Manufacturing shops
  - a. Preparing detailed work assignment
  - b. Consulting OT, changes in job priority, job splitting, shifting etc.
  - c. To sanctioning of leave to workmen and substitute arrangements.
  - d. To damage of mach. and repair etc
  - e. Making suggestions of replacement of machines.
  - f. Motivating the workmen
  - g. Verifying daily production reports.

### **Measurement of Effectiveness of Production Planning and Control**

1. Delivery
2. Inventories
3. Production Management

### **Production Methods and Production Planning and Control**

1. Job Production – Functions of Production Planning and Control
  - a. Materials are purchased
  - b. Standard tools are stocked
  - c. Process planning activity
  - d. Schedule is prepared to mark
2. Batch Production - Functions of Production Planning and Control
  - a. Materials control and tools control
  - b. Detailed route sheets
  - c. Loading and scheduling
  - d. Progressing function
3. Continuous Production - Functions of Production Planning and Control
  - a. Materials functions is critical
  - b. No tool control
  - c. No process planning activity
  - d. Scheduling is restricted to final quantity required
  - e. Progressing the final production quantity.

## Problems of Production Planning and Control

### A. Decisions at Macro Level

- a. Process design
- b. Work station design and equipment selection
- c. Flow of work
- d. Replacement policies

### B. Decisions at Micro Level

- a. Materials and tools control
- b. Production control
- c. Quality control and cost control
- d. Labour control

## Comparison between Production Planning and Production Control

Sl. No.	Production Planning	Production Control
1.	It is pre-production activity	It is set in motion when production activity begins
2.	It involves the collection, maintenance and analysis of data	It is concerned with communication, reports like output, productivity, rejection rate etc.
3.	To anticipate the problems and remedies	To taking corrective steps
4.	It is centralized activity like materials control, tool control, process planning and control	It is widespread activity. Like dispatching, inspection.
5.	It see necessary resources are available	To track of the activities and ensures

## **UNIT IV**

### **INVENTORY CONTROL – Meaning**

Inventory is a Stock of physical goods held at a specific location and at a specific time. Each distinct item in the inventory at a location is termed stock keeping unit (sku), and each skill has number of units in stock. Each location is a stock point.

### **Cost Associated with Inventory Decisions**

1. Material Cost – It is the purchasing cost.
2. Ordering (Procurement) Costs: These cost are associated with the purchasing ordering of materials.
  - a. Rent for the space used
  - b. Salaries payable
  - c. Paper work
  - d. Cost of inviting quotations / tenders
  - e. Cost of processing quotations
  - f. Cost of placing the purchase order
  - g. Postage, telegram, telex, fax, e-mail, etc.,
  - h. Travelling expenses
  - i. Depreciation of furniture etc.
  - j. Entertainment and refreshment expenses
  - k. Legal and court fee.
3. Inventory carrying costs
  - a. Financing cost
  - b. Insurance charges
  - c. Property taxes
  - d. Storage expenses
  - e. Handling expenses
  - f. Cost of spoilage cost
  - g. Cost of obsolescence
4. Stock-out costs



## **Inventory Control Techniques**

1. Economic Order Quantity
2. Determination of Stock Levels (Min-max Plan)
3. Inventory Control Ratios and Indexes
4. Ageing Schedule of Inventory
5. Input-out Ratio Analysis
6. Perpetual and Periodic Stock taking systems
7. Order Cycling System
8. Two Bin System
9. Selective Inventory Control
10. Materials Requirement Planning
11. Just-in-Time
12. Value Analysis

### **I. Economic Order Quantity**

#### **Basic Assumptions of EOQ Model**

1. Annual carrying costs per unit and costs per order can be accurately estimated and are the only relevant costs.
2. Annual demand can be estimated and is linearly consumed by customers.
3. Average inventory level is the order quantity 'Q' divided by 2
4. With demand linear and certain, there need not be any stock-out costs.
5. There are no quantity discounts on large orders
6. Lead time is known, fixed and independent of demand
7. Inventory has one stock point.

#### **Weaknesses of EOQ Formulae**

1. Erratic(irregular) usages
2. Faulty basic information
3. Costly calculations
4. EOQ ordering must be tempered with judgement

#### **Precautions is using EOQ**

1. Costs are not the same
2. The inventory cost depends on weight, volume and nature.
3. The special cases like impending price rise, closure of suppliers' units, change in import policy etc.
4. There are instances when EOQ should not be applied.

### **Objections to EOQ Models**

1. Inventory and ordering cost cannot be accurate.
2. The EOQ calculated is often an inconvenient number
3. The use of EOQ usually leads to random orders.
4. EOQ applied without due regard to the possibility of falling demand can lead to a high value of obsolescent inventory.
5. EOQ may not be applicable when the requirements are irregular.

### **Limitations of EOQ**

1. Ordering in package sizes
2. Economical freight rate
3. Simplification of routine
4. Perishables or articles having low shelf life
5. Seasonal articles
6. Consolidate discounts
7. Imports

## **II. Determination of Stock Levels (Min-max Plan)**

The demand and supply method of stock control technique determines different stock levels viz., Max. level, Min. level, reorder level, average level, danger level etc.

### **1. Maximum Stock Level**

This level represents the quantity of inventory above which stock should not be allowed to be kept.

#### **Disadvantages**

- a. Working capital is blocked
- b. More storage space
- c. There is a risk of deterioration in quality
- d. The possibility of loss on account

#### **The following factors that help in deciding the limits of inventory to be stored:**

- a. Amount of capital available and required
- b. Storage facility
- c. Rate of consumption
- d. Possibility of change in fashion
- e. Restriction imposed by Government

- f. EOQ
- g. Lead time – Interval between the perception and the fulfillment of a need.

**2. Reorder level :** The store keeper should initiate the purchase requisition for fresh supplies of the materials.

**3. Minimum Stock Level:** The quantity below which stock should not be allowed to fall.

**The level is fixed after considering the following:**

- i. Rate of consumption
- ii. Lead time
- iii. Degree of safety desired depending upon the risk

**Apart from the above factors, the following three significant conditions should also be examined**

- i. Fluctuations in demand with constant lead times
- ii. Fluctuations in lead time, demand being constant
- iii. Fluctuations in both.

**Stock out may give rise to following factors:**

- a. Customer loss
- b. Loss of production
- c. Idling of machines or men
- d. Emergency purchases at high prices
- e. Extra-transportation charges for speedier modes of transportation.

**4. Danger Level:** It refers to a point at which issuing of a material is stopped unless under specific instructions.

**The purchase department should take one or all of the following actions:**

- a. Find an alternative route of supply.
- b. Request the sales department in turn.
- c. Inform the production personnel about the situation
- d. Apply extra pressure on the supplier to keep to his original delivery dates.

**5. Working Stock:** It is the quantity available for regular use but it does not include the min. stock.

**6. Nil (Zero) Stock Level:** This level indicates that there is virtually no stock of the product with the organization.

## **Inventory Reorder and Replenishment System (P System and Q System)**

**Basically, there are two types of replenishment systems:**

- i. Fixed Quantity System (Q-system)
- ii. Fixed Period System (P-System)

### **i. Fixed Quantity System (Q-system) - Characteristics**

- a. Re-order quantity is fixed and normally it equals EOQ
- b. Depending upon the demand, the time interval of ordering varies.
- c. replenishment action is initiated when stock level falls to ROL
- d. Safety stock is maintained to account for increase in demand during lead time.

### **Advantages of Fixed order quantity system**

1. Simple and cheaper to operate.
2. Stock control will be accurate as the replenishment action is initiated soon after the stock reaches reorder level.
3. Suitable for low value items
4. Appropriate for variety of inventory maintained within the organization.

### **Limitations of Fixed order quantity system**

- i. Many items reach reorder level at the same time.
- ii. The records of stock levels and usage rate data are to be maintained.

### **ii. Fixed Period System (P-System) – Characteristics**

- a. Order interval is fixed for individual item or group of items.
- b. Stock is reviewed at periodic intervals and quantity.

## **Economic Batch Quantity (EBQ)**

Economic Batch Quantity (EBQ), also known as Optimum Batch Quantity (OBQ) is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run.

OR

Economic Batch Quantity (EBQ), also known as the optimum production quantity (EPQ), is the order size of a production batch that minimizes the total cost.

### **Assumptions of Economic Batch Quantity (EBQ)**

1. Annual carrying costs
2. Set-up costs
3. Annual demand

4. There is no safety stock
5. No stock out occur
6. There are no quantity discounts
7. The rate of production exceeds the rate of usage by customers.
8. All production not used to satisfy demand is placed in inventory.

#### **Setting-up Time for Economic Batch Quantity (EBQ)**

1. Preparation and finishing
2. Mounting and removal of tools and fitting
3. Measuring, calibrating and adjustment
4. Trial runs and adjustment to ensure the machine is set-up correctly.

#### **To reduce set-up time the following steps are required:**

1. Select the machine set-up to be reduced
2. Appoint a team consisting of three to four set-up personnel
3. Video-tape details of the set-up.
4. Analyze the set-up procedure.
5. Examine external activities.
6. Reduce the internal set-up time
7. Reduce the total time

#### **Economic Batch Quantity (EBQ)**

### **III. Inventory Control Ratios and Indexes**

Inventory Turnover Ratio = Cost of goods consumed or sold during the period/ Average inventory held during the period

#### **Types of Inventories**

1. Slow moving inventories: It have a low turnover ratio.
2. Dormant inventories: Inventories which have no demand are classified as dormant inventories.

### **IV. Ageing Schedule of Inventory**

#### **V. Input-out Ratio Analysis**

Input output ratio is the ratio of new materials going in to production and raw standard materials control of the actual output.

$$= \text{Std. Cost of quantity} / \text{Std. Cost of standard quantity}$$

### **VI. Perpetual and Periodic Stock taking systems**

### **VII. Order Cycling System**

### **VIII. Two Bin System**

- IX. Selective Inventory Control**
- X. Materials Requirement Planning**
- XI. Just-in-Time**
- XII. Value Analysis**

## **UNIT-VSTORE KEEPING**

Store-keeping is a service function which deals with the physical of goods under the custodianship of a person called store keeper or store controller.

### **Types of Stores**

#### **1. Receiving Store**

Performs activities necessary to exercise control on quality and quantity of purchased materials before they are accepted and taken into stock.

#### **Receiving store may be sub divided into:**

- a) Inward stores
- b) Quarantine store - to temporarily stock materials
- c) Rejection store

#### **2. Main store**

- a) Crib stores - to be issued to the workmen in the beginning of the shift and to be collected at the end of the shift.
- b) Finished part store
- c) Plant store
- d) Sub-store

#### **3. Warehouse (finished product store)**

#### **4. Special store**

- a) Bonded store - to stock materials that are hypothecated to bank
- b) Statutory store - materials such as kerosene, diesel
- c) Temperature controlled store - fish, milk

**5. Scrap yard:** It performs activities of receipt, segregation and storage of different types of scrap.

### **Functions**

1. Delivery at the most appropriate time.
2. Exercising control on quantity of materials received.
3. Storing and protecting of materials against conditions, climate.
4. Issuing materials against properly authorized material requisition slips.
5. Maintaining records of all receipts, issues and balance of materials.
6. Maintenance of adequate stocks.
7. Arranging for inspection of materials received.
8. Carrying out stock verification
9. Keeping inventory investment within desired limits.

**Functions of a Store-keeper**

1. Identification of all materials stored.
2. Receipt of incoming goods
3. Inspection of all receipt
4. Storage and preservation
5. Material handling
6. Packing
7. Maintenance of stock records
8. Issue and dispatch
9. Store accounting
10. Inventory control
11. Stock-taking
12. Salvaging

**Principles of Good Store Location and Layout**

1. Economy in cost of transportation
2. Approachability by rail/road transport
3. Efficient service
4. Reduced fire risks
5. Safety and Security
6. Minimisation of risk of spoilage and deterioration (decline)
7. Flexibility for future expansion
8. Overall integration of factors
9. Wide gate way for smooth movement
10. Water proof stores
11. Load distributed evenly
12. Easy to handling equipment



## **Responsibility of Store-keeper**

### **1. Receipt of Goods**

- Receive the incoming goods
- Assist unloading operations
- Count, verify
- Check for damage / shortage
- Fill Goods Inward Register
- Complete vendors consignment note (Challan)
- Inspect or arrange for inspections
- Prepare Goods Rejection memo
- Send goods to stores

### **2. Stores Office**

- Ensure all storage facilities
- Ensure good housekeeping
- Report accidents
- Check bin cards etc
- Report to management of utilization factor and idle time
- Ensure first-in-first out
- Note low/high/non-moving/slow-moving stocks
- Check physical condition of all stocks
- Check suitability of packaging
- Clear waste packing materials
- Check electrical / mechanical equipment, lighting, fire fighting equipment and other appliances
- Make entries in Bin / Stock cards
- Ensure receipts and issues are correctly documented
- Ensure that rules and regulations relating to physical custody and preservation
- Correct accounting of stores.

### **Benefits of Scientific Store-keeping**

1. Scientific stock control reduces loss
2. Efficient stores issues reduce down time in production and increase profits.
3. Periodic review detects
4. Follow up with purchase helps to avoid stockouts
5. Proper record keeping provides exact picture of inventory in stores to top mgt.

## **Store Location**

Store location refer to choosing, fixing, or selecting a site for the stores building in the organization.

### **Centralized Stores**

The structure of stores is a major factor in the organization.

#### **Advantages of a Centralized Stores**

- i. A wide range of goods is provided for all users
- ii. Inventory can be minimum
- iii. Better control is possible
- iv. As centralized stores are normally big in size
- v. Bigger Storehouses ensure better and more modern handling methods.
- vi. Delivery at a single point
- v. Receipt and inspection of goods can be more efficiently organized.
- vi. Opportunities of standardization are improved.
- vii. Stock turnover is increased
- viii. Unnecessary duplication of records.

#### **Disadvantages of a Centralized Stores**

- i. Extra handling of materials is involved
- ii. More staff required
- iii. If the system is not well organized.
- iv. More internal documentation may become necessary
- v. In case of fire, the risk is greater.

#### **Principles of Good Store Location and Layout**

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2. Approachability by rail / road transport
3. Efficient service
4. Reduced fire risks
5. Safety and security
6. Minimisation of risk of spoilage
7. Flexibility for future expansion
8. Overall integration of factors
9. The gagways should be wide enough to ensure smooth movement
10. Obstructions of all forms such as poles etc.
11. In the vertical stacking, the load should be distributed evenly.

12. A Location system should be so devised

13. The stores area should be equipped with handling equipment such as cranes, lifts, weighing scales etc.

### Approach to Stores Location

#### 1. Fixed Location

The allocation of the space is made on any of the following basis

- i. On the basis of supplier
- ii. On the basis of similarity of items
- iii. On the basis of the joint issue of items
- iv. On the basis of the size and frequency of issue

#### 2. Random Location

#### 3. Zonal Location

**Some general Principles of Locating materials within store are given below:**

Sl. No.	Characteristics of the material	Preferred location in the stores
1	Fast moving item	As close to the issue counter as possible
2	Heavy items, difficult to transport	Near the point of use, or near broad gangways, or near the gate.
3	Oils, greases, paints or messy items.	In a separate store
4	Inflammable and dangerous items	In an isolated fire-proof place
5	Rubber and rubber parts	In an air-conditioned store.
6	Costly items like bearings etc.	In locked cupboards and away from entrance to store.

### Safety and Security of Stores

#### 1. Accidents

##### The main causes of accidents

- ❖ Materials falling from racks
- ❖ Removal of obstacles
- ❖ Injury arising from lifting heavy loads
- ❖ Collision (falling from racks) with bins.
- ❖ Falling off while climbing to reach the upper shelves
- ❖ Injury to hands arising from lifting
- ❖ Slipping on oil, greases or even water spoilage
- ❖ Injury caused by nails left on empty cases
- ❖ Injury from corrosive acids – warning labels
- ❖ Dropping goods

## 2. Security

- ❖ Employee protection and safety
- ❖ Prevent employee theft
- ❖ Emergency response
- ❖ Ambassador

### Safety of Material Handling Equipment

#### Some General safety rules

- ❖ When a driver leaves his vehicle, the hand brakes applied.
- ❖ Vehicles should not be reversed until the operators has ensured
- ❖ The vehicle must be switched off when refueling or lubricating
- ❖ Load when being shifted, must be securely fastened.
- ❖ When a truck is being loaded by a crane, all occupants must dismount from the truck and stand clear.

#### i) Cranes

- ❖ Truck cranes must be properly blocked
- ❖ Riding on crane blocks loads should be strictly prohibited.
- ❖ Operators should not leave the crane cabs.
- ❖ Crane booms and booms on other motorized equipment must not be operated closed than 10 feet.

#### ii) Forklift Trucks

- ❖ Periodic checking brakes, steering, horn, lift mechanism, controls guards and tyres.
- ❖ Pushing the lift truck in order to start
- ❖ Trucks must be parked in such a way
- ❖ Driving over objects lying on the floor.
- ❖ The driver's hands should not be wet or greasy.
- ❖ Drivers should travel at a safe speed.
- ❖ Watch for persons who may rush out in front of the truck.
- ❖ When driving without a load, keep forks about six inches above ground.
- ❖ Avoid starting stopping suddenly.
- ❖ Do not overload
- ❖ Never carry a load so high
- ❖ Carrying loose materials on forks should be avoided.
- ❖ Never allow anyone to stand under elevated loads.
- ❖ The load should be picked up under the centre of its weight

- ❖ The load should be tilted against back rest before moving the truck.
- ❖ Make sure to return the till to vertical before lowering or picking up
- ❖ Lower the load slowly.
- ❖ Warn other employees to stand clear when removing materials.

### **Measurement of Stores Efficiency**

1. Store efficiency index = No. of requisitions delivered on time/ Tot. no. of requisitions.
2. Storage loss index  

$$= \frac{\text{Value of inventory lost due to deterioration (decline), obsolescence/ Ave. value of Inventory}}{\text{Inventory}}$$
3. Obsolescence index = Value of non-moving items/Total inventory value
4. Space utilization index = Area used for storage / Total storage are available

### **Security Measures**

1. Closure of stores daily and custody of keys
2. Theft by outsiders
3. Pilferage (fraud) of employees
4. Malpractices of stores staff
5. Precautions against fire protection
6. Pest control measures

### **Organization for Store Management**

1. The place of stores in company's organizational structure
2. Internal organization and working of the stores
  - a. Receiving Section
  - b. Stores Section
  - c. Issue Section
  - d. Accounting Section
  - e. Inventory Valuation
3. Receiving section
  - a. Receiving incoming materials
  - b. Checking and inspecting incoming materials
  - c. Preparing goods inward note
  - d. Notifying indenters of special requisitions regarding the arrival of materials.
  - e. Informing purchasing section regarding excess supply, shortage or defective supply
  - f. Delivering the materials to the appropriate stores.

4. Stores section
5. Store-room Activities
  - a. Procedure
6. Store-room Layout – Should serve the following Objectives
  - a. Reduced investment in shelves, racks or other equipment
  - b. Reduced operating expenses by minimizing the movements of materials
  - c. Increased flexibility
  - d. Increased safety of workers and materials
  - e. Easy accessibility and good housekeeping
  - f. Convenience
  - g. Suitability to the nature and volume of materials
  - h. Maximum utilization of floor space.

### **Factors to be considered for a good store-room Layout**

**While laying out a storeroom, the following factors should be given due attention**

1. Nature of materials
2. The volume of materials
3. Floor and air space
4. Scope for future expansion and flexibility
5. Accessibility
6. Type of storage equipment
7. Protection
8. Proper illumination and ventilation

#### **A. Store Equipment**

- i. Tagging
- ii. Labelling
- iii. Embossing (part no.)
- iv. Etching (drawing or print) and Stamping
- v. Colour Coding
- vi. Batching

#### **B. Materials Identification**

- i. Items issued for consumption
- ii. Items issued on loan

#### **C. Issue Section**

**D. Stores Accounting Section****E. Stock-taking****F. Inventory Valuation****Inter-relationship between Stores and Other Departments**

- i. Stores and Purchase
- ii. Stores and Production
- iii. Stores and Sales
- iv. Stores and Accounts
- v. Stores and Personnel

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