SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA
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ONLINE COURSE

DEPARTMENT OF MANAGEMENT STUDIES

MATERIALS MANAGEMENT

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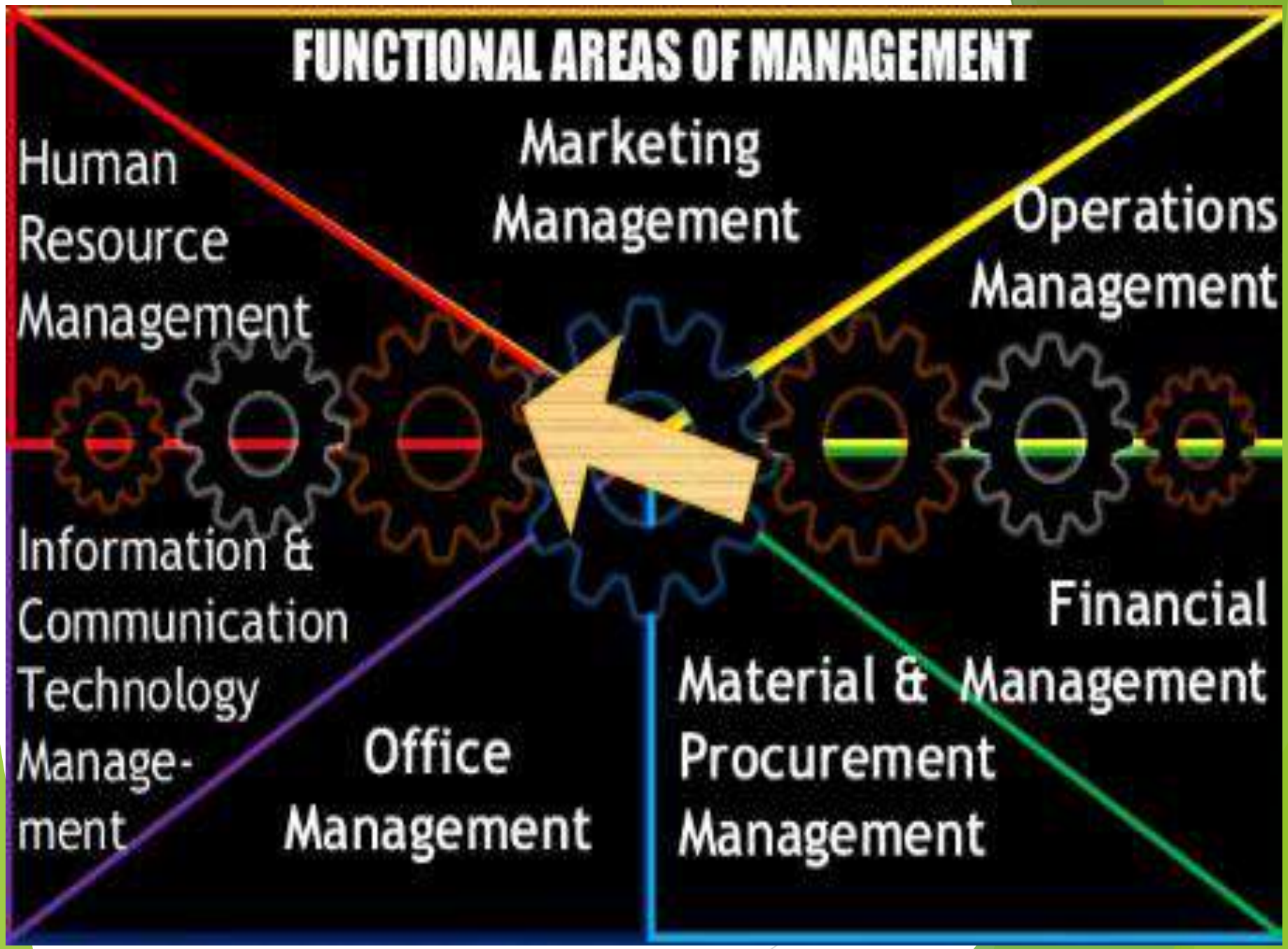
UNIT-I

Materials Management


FUNCTIONAL AREAS OF MANAGEMENT
Human Resource Management
Marketing Management
Operations Management
Information & Communication Technology Manage-ment
Office Management
Material & Procurement Management
Financial Management

Introduction to Materials Management

- Every organization depends on materials and services from other organizations to varying extents. These materials and services are obtained through exchange of money. Various materials are used as inputs such as raw materials, consumables and spares. These are required to be purchased and made available to the shops/users as and when needed to ensure uninterrupted production.

Introduction to Materials Management

- Efficient management of input materials is of paramount importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization.

Introduction to Materials Management

- Putting in the simplest terms materials management is about moving the materials within an organization.
- Materials can basically be defined as those objects or things that are to be moved in order to produce goods. Material is one of the 5M's that a manager has at his command, the other being Men, Machine, Methods and Money.
- Materials could be in the form of raw materials, paperwork, messages or information etc.
- So materials can be both tangible and intangible.

Introduction to Materials Management

- E.g: The newspaper boy delivering the newspaper to your doorstep everyday or the milkman delivering the milk packets to you. These are tangible materials.
- There is also some material moved when you watch a movie on your television or when you receive a phone call. These are the intangible materials that are moved.

Introduction to Materials Management

- So, materials management is an important function of every business.
- The better is the materials management in a company, the better is the health of that company

Classification of Materials

Materials can be put in three categories:

- First category is purchased materials like the raw materials, components, spare parts and items that are used and do not appear in the end product.
- The second category is of in-process materials or the materials in the semi-finished stages and
- Lastly the finished goods that are ready for customers. One has to manage these materials.

MATERIALS MANAGEMENT: DEFINITION

It is concerned with planning, organizing and controlling the flow of materials from their initial purchase through internal operations to the service point through distribution.

OR

Material management is a scientific technique, concerned with Planning, Organizing & Control of flow of materials, from their initial purchase to destination.

AIM OF MATERIALS MANAGEMENT

To get

- The Right quality
- Right quantity of supplies
- At the Right time
- At the Right place
- For the Right cost

PURPOSE OF MATERIALS MANAGEMENT

- To gain economy in purchasing.
- To satisfy the demand during period of replenishment.
- To carry reserve stock to avoid stock out.
- To stabilize fluctuations in consumption.
- To provide reasonable level of client services.

Aim of Materials management

The aim of this management is to obtain the materials at the minimum possible price while maintaining quality also and to maintain the inventories in such a way that minimum cost is incurred while maintaining adequate materials for the production process.

FUNCTIONS OF MATERIALS MANAGEMENT

The general electric company U.S.A. has enlisted the following functions of Materials Management:

- Materials Planning programming
- Purchasing
- Inventory control
- Receiving and Warehousing
- Store Keeping

FUNCTIONS OF MATERIALS MANAGEMENT

- Value Analysis and standardization
- Pre-design value Analysis
- Production Control
- Transportation
- Materials Handling and
- Disposal of Scrap and Surplus

The major responsibilities of Materials Management are:

- Coordination of diverse activities
- Keeping liaison between designing, Engineering, Manufacturing, and production
- Cost reduction
- Marketing

SCOPE OF MM

- Material planning
- Cataloguing or coding the materials
- Standardisation
- Scheduling
- Procurement
- Inspection
- Quality control
- Packaging
- Storage
- Inventory control
- Distribution
- Disposal

OBJECTIVES

Primary Objectives

- Provision of materials (Procurement, Storage, Issue)
- Minimization of inventories (Control, Accounting, Assuring high capital turn over ratio)

Secondary Objectives

- Locating new sources of supply
- Simplification
- Quality Control
- Value Analysis
- Coordination
- Development of Skill and Knowledge

Problems in Materials Management

- Problems relating to Material Planning
- Problems relating to Design and Specifications
- Problems relating to Obsolescence
- Problems relating to Procurement

Integrated MM-Approach

- For example, under a separate set-up, the purchase department may treat discount as a very important factor and buy large quantities to avail the discount without taking into account its impact on the warehousing and carrying costs. In other words, we need to balance the conflicting objectives from a total organization viewpoint so as to achieve optimum results for the organization as a whole.

Integrated MM-Approach

- An expansion, for example, will require planning for the increased requirements, developing new sources, revision in inventory levels, apart from increased load in receipt of materials, inspection and storing.

Meaning and Need Of Integrated MM

- In an integrated set-up, the materials manager who is responsible for such interrelated functions, is in a position to exercise control and coordinate! with an overview that ensures proper balance of the conflicting objectives of the individual functions.

Meaning and Need Of Integrated MM

- Integration also helps in the rapid transfer of data. through effective and informal communication channels. This is crucial as the materials management function usually involves handling a vast amount of data.

Meaning and Need Of Integrated MM

- Therefore, integrating the various functions ensures that message channels are shortened and the various functions identify themselves to a common materials management department which in turn, results in greater coordination and better control.

INTEGRATED MATERIALS MANAGEMENT

- An integrated set up efficient management of input materials.
- Material planning & indenting, purchase systems & procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply.

INTEGRATED MATERIALS MANAGEMENT

(contd…)

- Better accountability
- Better coordination, better performance, better adaptability to EDP
- Training and development of staff

Relationship Of MM With Other Functional Areas Of Management

- The Materials Management can be directly connected to the functional areas of customer satisfaction through Total Quality Management (TQM); Human Resources Management (HRM); environmental issues in material management; cost and finance issues and IT related issues. All the above-mentioned issues contribute to the material management function directly in more than one ways and the success of each of these elements contribute to the success and the failure of the material management process

Relationship Of MM With Other Functional Areas Of Management

- Materials and profitability
- Material Management and Production department
- Material Management and Finance department
- Materials Management and Personnel Department
- Relationship between Material and Marketing department

Concept Of Organization & Structure.

- An organizational structure is a system that outlines how certain activities are directed in order to achieve the goals of an organization. These activities can include rules, roles, and responsibilities.

Concept Of Organization & Structure

- The organizational structure also determines how information flows between levels within the company. For example, in a centralized structure, decisions flow from the top down, while in a decentralized structure, decision-making power is distributed among various levels of the organization.
- Having an organizational structure in place allows companies to remain efficient and focused.

MM In The Overall Company Organization

- Providing greater direct control over material costs
- Developing Personal awareness of the total system approach instead of a narrow and restrictive functional approach.
- Opening channels of communication and stimulating the sharing of ideas among the various material functions.
- Supporting the career paths of talented personnel by providing then the means to develop well-rounded expertise. The material concept supports the movement of personnel across functional boundaries.

MM In The Overall Company Organization

- Developing greater operating efficiencies as material functions work together to create material systems, coordinate procedures, and streamline the movement of material and data among themselves.
- Encouraging an overall synergistic effect as functions cooperate towards common goals.

ORGANIZING FOR MATERIALS MANAGEMENT

- Someone in every organization must make materials management decisions and since materials objectives are inter-related, it is desirable to give one-person authority overall activities concerned with materials management.

ORGANIZING FOR MATERIALS MANAGEMENT

- There are some organizations where materials authority is dispersed in a number of departments in the organization, which means duplication of efforts and is considered a wasteful exercise.

ORGANIZING FOR MATERIALS MANAGEMENT

- A materials manager is needed, since Inventory management is a key process and requires tough decisions and as such must understand the inventory process.
- Purchasing managers of manufacturing companies also work frequently as materials managers, particularly if there are no major materials management problems.

ORGANIZING FOR MATERIALS MANAGEMENT

- In majority of organizations, the purchasing manager makes an excellent and effective materials manager provided he has the skills and authority.
- There are number of problems being faced in such a situation.

ORGANIZING FOR MATERIALS MANAGEMENT

- One quite common arrangement is to group together all materials management activities under a materials manager who in turn report to manufacturing manager.

ORGANISING MATERIALS MANAGEMENT

- The materials manager requires a staff to help him achieve his objectives.
- The feasibility of a materials management organization are division of work by:
  - Organization by function
  - Organization by Location
  - Organization by Product/Project

ORGANISING MATERIALS MANAGEMENT (CONTD..)

The important aspects which must be considered are:

- The project schedule will require timely procurement of materials.
- Storage at site where conventional stores management aspects are not relevant .
- Flexibility of the set-up to spot interchangeable materials and equipment between projects to avoid delay and idling of equipment.
- Ability to obtain or forecast costs which will assist in costing the entire.

Inter-Departmental Relationships

Materials Management with:

- Production Department
- Marketing Department
- Finance Department

Span Of Control And Delegation

- Principles of sound organization should be followed in establishing span of control and delegation of powers.
- Executives at the top of an organization will have fewer persons reporting to them than a materials engineer who at his level may have many persons reporting to him.
- Powers, especially those of expenditures, should be clearly defined so that smooth working is possible.

Approaches to organizing materials management

- Conventional approach
- Modern approach
- Mixed approach

****Both at Top level and Middle level.****

CONVENTIONAL APPROACH

ORGANIZATION CHART

…..The Source of All Power & Authority

MODERN APPROACH

UNIT-II

MATERIAL MANAGEMENT

INTRODUCTION

- Organizations deal with a large number of materials with varying degree of characteristics in terms of size, shape, price, physical and chemical properties, sources of supply, modes of handling, user departments (destinations) accounting procedures, etc.
- In addition, there are several departments of the organization which require only the information about the materials, e.g., design, engineering, production scheduling etc.

INTRODUCTION

- In order to meet these complex requirements the items need to be classified properly. The classification system is a major decision for the organisation in the sense that once introduced it might be difficult to alter in future.

Classification of materials

- When there are numerous items handled by an organization, their planning and coordination becomes extremely difficult, if not impossible, if each one of them is handled separately. Classification of materials involves grouping of items according to some criteria.

Purpose of classification

- To devise procedures of planning and control for materials in a class.
- To devise purchase procedures, inspection methods, and storing and issuing procedures, common to all materials in a class.
- To devise accounting and evaluation procedures common to all materials in a class.

CLASSIFICATION OF MATERIALS

- **Classification** refers to the systematic division, grouping or categorization of materials or store items with reference to some common characteristic.
- Classification of materials can be made on different bases namely nature, manufacturing process, value, purpose etc.

CLASSIFICATION OF MATERIALS

ON THE BASIS OF NATURE OF MATERIALS

- Raw Materials
- Machinery and Equipment
- Consumable Items
- Chemicals
- Inflammable Items
- Fuel Stock
- Furniture
- Scrap Materials
- Packaging Materials
- General Items

CLASSIFICATION OF MATERIALS

ON THE BASIS OF USABILITY OF MATERIALS

- Serviceable, Unserviceable and Obsolete Items
- Finished and Semi-finished Items
- Dead Stock Items
- Unused Items

CODIFICATION

Codification is a process of representing each item by a group of numbers and alphabets indicating the group, the subgroup, the type and the dimensions of the item.

SYSTEMS OF CODIFICATION

- Alphabetic system,
- Simple numeric or sequence system,
- Combination system,
- Block system,
- Decimal system,
- Numerical system,
- Mnemonic system and
- Six letter – nine letter codes.

PROCESS OF CODIFICATION

- Many organizations in the public and private sectors, railways and DGS & D, have their own system of codification, varying from eight to thirteen digits.
- The first two digits normally represent the major groups, such as raw materials, spare parts, sub-contracted items, tools, oil, stationery, medicines etc. The next two digits indicate the sub-groups.
- Dimensional characteristics of length, width, head diameter usually constitute the further three digits and the last digit is reserved for minor variations.

PROCESS OF CODIFICATION

- The codification could be thought of on the basis of source of purchasing where items obtained from one source of purchasing are grouped together and given codes. The codification could also be built on are grouped together and given codes.

Codification Systems

- There are several systems possible for codification of materials depending on the choice of coding symbols-alphabets, numbers, or a combination of alphabets and numbers (alphanumeric).
- Two popular and fundamental systems-Brisch and Kodak.

KODAK SYSTEM

- The Kodak system of codification of items has been developed by Eastman Kodak Company of New York which consists of 10 digits of numerical code.
- The logic of major grouping is based on sources of supply. All materials are divided into 100 basic classifications, contributed only by procurement considerations.

Digits

1-2 Major group(raw materials, spare parts, subcontracted items, hardware items, Packing material, tools, oil, Stationery, etc.)

3-4 Sub Group(ferrous, non-ferrous, etc.)

5-7 Dimensional Characteristics (length, width, head diameter etc.)

8 Minor variations

9 location of storage

10-11 User departments of the organization

12 Products or product lines requiring the item

13 Any other information(related to inventory accounting purchasing etc.)

BRISCH SYSTEM

- The Brisch system of codification of items named after a prominent consulting engineer in the UK consists of seven digits and is applied in three phases.
- The items are grouped into suitable preliminary categories, such as assemblies, components, off the shelf items.
- After these preliminary categories, items are grouped within the respective class in order to bring similar items together. The Brisch system, though it consists only of seven digits, is quite comprehensive as the basis is on logical major groupings.

Colour Coding Systems

- Sometime colour codes are used to identify the items. Common instances are, red, blue and green in an electric cable, red and green in electric switches, and so on. Some organisation use the codes locally such as to identify the steam, water and other pipes while there exist some national or international colour coding system. The limited number of colours available narrows the scope. Nevertheless, this is quite an effective system providing easy identification.

OBJECTIVES OF CODIFICATION

- Accurate and Logical Codification
- Preventives of Duplication
- Standardization and Reduction in Varieties
- Efficient Purchasing
- Efficient Recording and Accounting
- Easy Locating, Indexing and Inspection
- Easy Computerisation

ADVANTAGES OF CODIFICATION

- To avoid long and unwieldy description.
- To have accurate and logical identification.
- To prevent duplication.
- To standardize items.
- To reduce varieties.
- To have an efficient purchasing department.

ADVANTAGES OF CODIFICATION (Contd.)

- To obtain efficiency in recording and accounting.
- To simplify and facilitate mechanical recording.
- To simplify and facilitate pricing.
- To have proper system of location and indexing.
- To assure correct and efficient inspection; and
- To implement production as planned.

STANDARDIZATION

- Quite often, a good number of products or parts may differ very marginally or insignificantly from each other in dimensional or some similar characteristics. The functional requirements will be equally well served if all such parts are made to the same common specifications. This is called standardization. The process of standardization logically leads to reduction in the number of part, variety that an organisation handles.

STANDARDIZATION AND VARIETY REDUCTION

- A standard is defined as a model or general agreement of a rule established by authority, consensus, or custom, created and used by various levels of interest.
- Standardization enables the materials manager to achieve overall economy and ensures inter-changeability of parts.

PROCESS OF STANDARDISATION

- Prepare the list of all items used to make the final product.
- Classify the items according to their performance
- Group the items with similar functional characteristics, study the dimensional features.
- Analyze the effect on performance of items.
- Check from the national or international standards if there is already a dimension existing equal to the most representative dimension found after analysis in the previous step.

BENEFITS OF STANDARDIZATION

- Standardization helps to reduce inventory items.
- It helps in evolving better means of communication about an item in the company.
- It forms a base for further inventory analysis.
- the specification of items can be more clearly spelt out, making quality control firm.
- In a developing economy like ours, where the need is to promote exports, insistence on standards helps in creating confidence in the international market.

STANDARDIZATION

According to the International Standards Organization located in Geneva, standardization is defined as the process of formulating and applying rules for an orderly approach to a specific activity, for the benefit and with the cooperation of all concerned and in particular for the promotion of the overall economy taking due account of functional performance conditions and safety requirements. The process of formulating, issuing and implementing standards is called standardization.

EXAMPLES OF STANDARDS

- Product Standards
- Engineering Standards
- Material Standards
- Design Standards
- Quality Standards
- Process Standards
- Equipment Standards
- Safety Standards
- Administrative Standards, etc.

STANDARD

A standard provides requirements, specifications, guidelines or characteristics. It can be used consistently to ensure that materials, products, processes and services are fit for their purpose and use. Standardization assures all the processes are standardized.

BENEFITS OF STANDARDIZATION

- Enables Mass Production
- Better Utilization of Resources
- Improves Supplier Coordination
- Enables Easy Assembly
- Improves Quality
- Lowers Inventories and Safety Stock
- Transfer of Technology

LIMITATIONS OF STANDARDIZATION

- Resistance to Change
- Mechanical View
- Rigidity

SIMPLIFICATION

It is closely related concept like standardization which refers to the reduction in the number of different sizes and shapes of items produced and stocked. It means reducing the number of standard items a firm uses in its product design and carries in its inventory.

Variety REDUCTION

The process of standardization logically leads to simplification and variety reduction. Variety reduction defined as a form of standardization consisting of the reduction of the number of types of products or materials or parts within a definite range to a lesser number which is adequate to meet prevailing needs at a given time.

UNIT-III

INVENTORY MANAGEMENT

INVENTORY

- **MEANING**
  - held for SALE
  - Consumed in the PRODUCTION of goods/services
- **Forms** of Inventory for Manufacturing Comp.

  Raw materials, Work in process, Finished goods and stores & spares

INVENTORY-Definition

- Inventory may be defined as usable but idle resource'. If resource is some physical and tangible object such as materials, then it is generally termed as stock. Thus stock or inventory are synonymous terms though inventory has wider implications.

Inventory-contd..

- Broadly speaking, the problem of inventory management is one of maintaining, for a given financial investment, an adequate supply of something to meet an expected demand pattern. This could be raw materials work in progress finished products or the spares and other indirect materials. Inventory can be one of the indicators of the management effectiveness on the materials management front. Inventory turnover ratio (annual demand/average inventory) is an index of business performance.

Inventory-contd..

- A soundly managed organization will have higher inventory turnover ratio and vice-versa. Inventory management deals with the determination of optimal policies and procedures for procurement of commodities. Since it is quite difficult to imagine a real work situation in which the required material will be made available at the point of use instantaneously, hence maintaining, inventories becomes almost necessary.
- Thus inventories could be visualized as `necessary evil'.

INVENTORY MANAGEMENT- OBJECTIVES

- To minimize investments in inventory.
- To meet the demand for products by efficiently organizing the production & sales operations.

INVENTORY CLASSIFICATION

- Raw materials
- Components and parts
- Maintenance, repair and operating inventories (MRO
- Work-in-process goods
- Finished goods

  Resale goods
  - Capital goods
  - Construction materials
  - Hard goods/soft goods
  - Fuel and lubricants
  - Stationery goods
  - Primary packing material

Inventory Related Cost

- cost of carrying inventories (holding cost)
- cost of incurring shortages (stock out cost)
- cost of replenishing inventories (ordering cost)

These three types of costs are the most commonly incorporated in inventory analysis, though there may be other costs parameters relevant in such an analysis such as inflation, price discounts etc.

Cost of carrying inventory

- This is expressed in Rs./item held in stock/unit time. This is the opportunity cost of blocking material in the non-productive form as inventories.
- Some of the cost elements that comprise carrying cost are-cost of blocking, capital (interest rate); cost of insurances; storage cost; cost due to obsolescence, pilferage, deterioration etc. It is generally expressed as a fraction of value of the goods stocked per year. For example, if the fraction of carrying charge is 20% per year and a material worth Rs. 1,000 is kept in inventory for one year, the unit carrying cost will be Rs. 200/item/year.

Cost of incurring shortages

- It is the opportunity cost of not having an item in stock when one is demanded. It may be due to lost sales or backlogging. In the backlogging (or back ordering) case the order is not lost but is backlogged, to be cleared as soon as the item is available on stock. In lost sales case the order is lost. In both cases there are tangible and intangible costs of not meeting the demand on time. It may include lost demand; penalty cost; emergency replenishment; loss of good-will etc. This is generally expressed as Rs./item short/unit time.

Cost of replenishing inventory:

- This is the amount of money and efforts expended in procurement or acquisition of stock. It is generally called ordering cost. This cost is usually assumed to be independent of the quantity ordered, because the fixed cost component is generally more significant than the variable component. Thus it is expressed as Rs. /order.

RISK OF HOLDING INVENTORY

- Price decline
- Product Deterioration
- Product Obsolescence

TOOLS & TECHNIQUES OF INVENTORY MANAGEMENT/ CONTROL

- ABC Analysis
- Economic Ordering Quantity (EOQ)
- Order Point Problem
- Two Bin Technique
- VED Classification
- HML Classification
- SDE Classification
- FSN Classification
- Order Cycling System
- Just In Time (JIT)

ABC-CLASSIFICATION

This method usually categorizes inventory into three classes with each class having a different management control associated.

- A - Outstandingly important
- B - of average importance
- C - Relatively unimportant as a basis for a control scheme

ABC ANALYSIS

CATEGORY	NO. OF ITEMS(%)	ITEM VALUE(%)	MANAGEMENT CONTROL
A	15	70 (HIGHEST)	MAXIMUM
B	30	20(MODERATE)	MODERATE
C	55	10(LEAST)	MINIMUM
TOTAL	**100**	**100**	

A items (High Cons. Val)

- Very strict cons. Control
- No or very less safety stock
- Phased delivery (Weekly)
- Weekly control report
- Maximum follow up
- As many sources as possible
- Accurate forecasts
- Central purchasing/storage
- Max. efforts to control LT
- To be handled by Sr. officers

B items (Moderate cons. Val.)

- Moderate control
- Low safety stock
- Once in three months
- Monthly control report
- Periodic follow up
- Two or more reliable
- Estimates on past data
- Combination on past data
- Combination purchasing
- Moderate
- Middle level

C items (Low cons. Val)

- Loose control
- High safety stock
- Once in 6 months
- Quarterly report
- Exceptional
- Two reliable
- Rough estimate
- Decentralized
- Min. clerical efforts
- Can be delegated

ABC curve

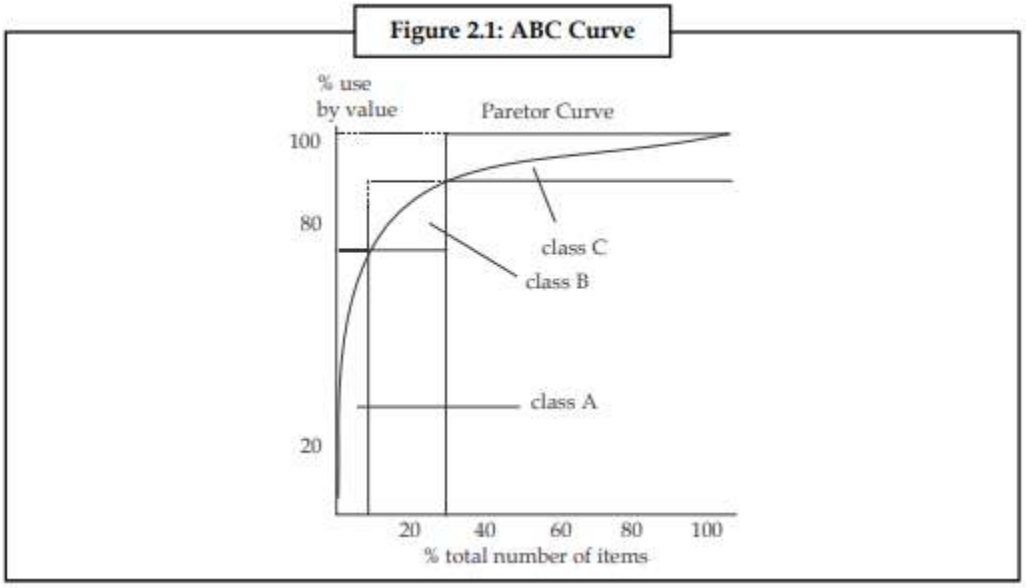


Figure 2.1: ABC Curve
% use
by value
Paretor Curve
100
80
20
class C
class B
class A
20
40
60
80
100
% total number of items

Problem

Vasanth & Co. Company inventories 20 items. The company decided to setup an ABC inventory system The company records provide the information, which is as follows:

Problem Contd.

Item Code	Annual usage in units	Cost per unit (Rs)
G	2,500	150
H	15,000	90
I	12,000	100
J	8,000	50
K	1,00,000	50
L	25,000	300
M	80,000	500
N	2,000	300
O	3,000	70
P	6,500	60
Q	10,000	75
R	6,000	20
S	20,000	50
T	40,000	90
U	1,20,000	350
V	20,000	200
W	1,500	350
X	4,000	100
Y	4,500	200
Z	7,000	40

Solution

Table 2.2: Ranking of items as per Consumption value.

Item code	Annual usage in units	Cost per unit (Rs.)	Consumption Value	Ranking
G	2,500	150	3,75,000	17
H	15,000	90	13,50,000	7
I	12,000	100	12,00,000	8
J	8,000	50	4,00,000	14
K	1,00,000	50	50,00,000	4
L	25,000	300	75,00,000	3
M	80,000	500	400,00,000	2
N	2,000	300	6,00,000	12
O	3,000	70	2,10,000	19
P	6,500	60	3,90,000	16
Q	10,000	75	7,50,000	11
R	6,000	20	1,20,000	20
S	20,000	50	10,00,000	9
T	40,000	90	36,00,000	6
U	1,20,000	350	420,00,000	1
V	20,000	200	40,00,000	5
W	1,500	350	5,25,000	13
X	4,000	100	4,00,000	15
Y	4,500	200	9,00,000	10
Z	7,000	40	2,80,000	18

Solution

Table 2.3: Classification items in ABC

Ordered Ranking	Item Code	Consumption Value	Cumulative consumption value	Percentage of Cumulative consumption value	Class
1	C	420,00,000	420,00,000	37.90	A
2	M	400,00,000	820,00,000	74.14	
3	L	75,00,000	895,00,000	80.92	B
4	K	50,00,000	945,00,000	85.44	
5	V	40,00,000	985,00,000	89.05	
6	T	36,00,000	1021,00,000	92.31	
7	H	13,50,000	1034,50,000	93.53	C
8	I	12,00,000	1046,50,000	94.62	
9	S	10,00,000	1056,50,000	95.52	
10	Y	9,00,000	1065,50,000	96.33	
11	Q	7,50,000	1073,00,000	97.01	
12	N	6,00,000	1079,00,000	97.55	
13	W	5,25,000	1084,25,000	98.03	
14	J	4,00,000	1088,25,000	98.39	
15	X	4,00,000	1092,25,000	98.75	
16	P	3,90,000	1096,15,000	99.10	
17	G	3,75,000	1099,90,000	99.44	
18	Z	2,80,000	1102,70,000	99.70	
19	O	2,10,000	1104,80,000	99.89	
20	R	1,20,000	1106,00,000	100	

Working note:

- 110600000.....100%
- 110600000/100=1106000.....1%
- 1106000*80=88480000.....80%
- 1106000*15=16590000....15%
- 88480000+16590000=1050700000.....80%+15%=95%

Economic Ordering Quantity (EOQ)

Level of Inventory at which **Total Cost*** of Inventory is **MINIMUM**

*(Ordering and Carrying Cost)

EOQ MODEL

$$Q = \sqrt{\frac{2UP}{S}}$$

Q = Economic Order Quantity

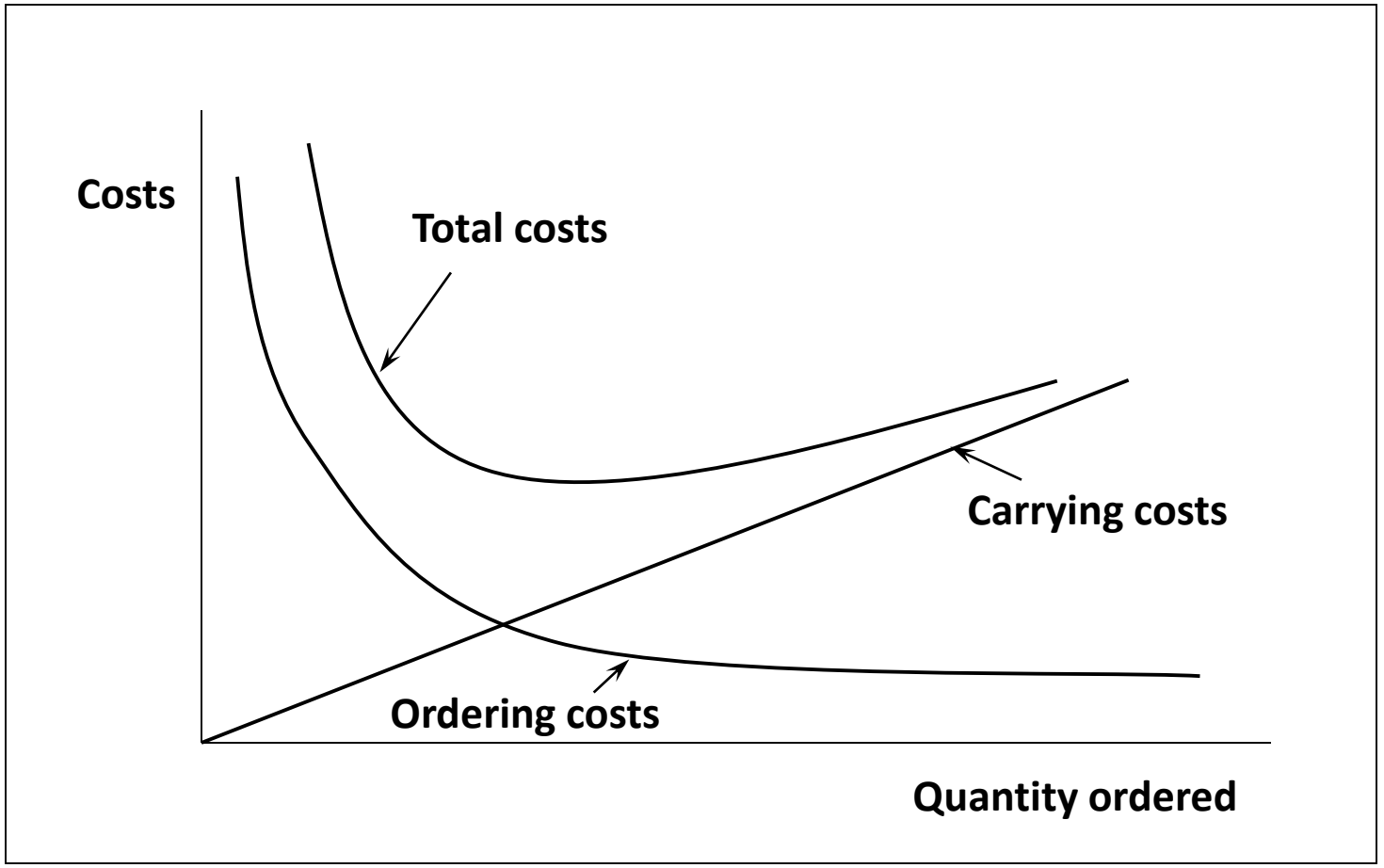
U = Annual usage/demand

P = Cost of Placing an order

S = Storage cost per unit per order

where Storage cost is given in % , it is always calculated by multiplying the % with the purchase price of raw material per unit, i.e., Storage cost = % X Purchase price of raw material

BEHAVIOUR OF INVENTORY RELATED COSTS



EOQ- Example

A firm's annual inventory is 1,600 units. The cost of placing an order is Rs 50, purchase price of raw material/unit is Rs.10 and the carrying costs is expected to be 10% per unit p.a. Calculate EOQ?

U=1600, P= Rs. 50, S= .10 x Rs.10=Rs.1

$$EOQ = \sqrt{\frac{2 \times 1600 \times 50}{1}}$$

= 400 units

Working note:

- EOQ=?
- Annual demand=1600 units
- Ordering cost=50
- EOQ=√2*ANNUAL DEMAND*ORDERING COST/STORAGE COST.
- Storage cost=Denominator
- =10%of rs10=10/100*10=1rs

Example

A manufacturer uses 4,000 units of a component every year and he buys them entirely from outside supplier. The order placing and receiving cost is Rs.100 per order and annual carrying cost is Rs. 10%. Unit cost of raw material is Rs 200/-. Calculate Economic Order Quantity.

EOQ = √ (2 A O)/C

= √ (2 x 4,000 x 100)/ 10% of 200

= √ (8, 00,000/20)

= √40,000

= 200 units

Annual Requirement: 4,000

Ordering cost per order: 100

Carrying Cost: 10%

Price per unit: 200

Drawback of EOQ model

- In the EOQ model, various parameters are used such as demand, inventory carrying charges, ordering cost. These parameters are estimated and though they are assumed to be known, in real life what we have is an estimated value which may be different than real value for various reasons.

NOTE

- **Number of Orders** = Annual Requirement/Size of the order
- **Ordering Cost** = Number of Orders x Ordering Cost per order
- **Carrying Cost** = Carrying Cost% x Size of the Order x Price per Unit /2
- (Eg:Carrying cost=10% **=>10/100.**
- **Total Cost** = Ordering Cost + Carrying Cost

The various levels of Inventory

- Maximum Level
- Minimum Level
- Re-order Level
- Danger Level

ORDER POINT PROBLEM

- The **re-order point** is that level of inventory when a fresh order should be placed with suppliers. It is that inventory level which is equal to the consumption during the lead time or procurement time.
- **Re-order level** = (Daily usage × Lead time) + Safety stock.
- **Minimum level** = Re-order level – (Normal usage × Average delivery time).
- **Maximum level** = Reorder level – (Minimum usage × Maximum delivery time) + Re-order quantity.
- **Average stock level** = Minimum level + (Re-order quantity)/2.
- **Danger level** = (Average consumption per day × Lead time in days for emergency purchases).

TWO BIN TECHNIQUE

- Control of Category ‘C’ inventories
- Two Bins/Groups

- **First Bin**- just enough to last from the date a new order is placed until it is received for inventory.
- **Second Bin-** enough to meet current demand over the period of replenishment.

VED CLASSIFICATION

- Specifically used for Classification of **SPARE PARTS**

➢ **V**- part is VITAL(high stock level)

➢ **E**- part is *ESSENTIAL* (moderate stock level)

➢ **D**- part is DESIRABLE (minimum stock level)

VED Analysis

- This analysis attempts to classify items into three categories depending upon the consequences of material stock out when demanded.
- The cost of shortage may vary depending upon the seriousness of such a situation. Accordingly the items are classified into V(Vital), E(Essential) and D(Desirable) categories.
- Vital items are the most critical having extremely high opportunity cost of shortage and must be available in stock when demanded.
- Essential items are quite critical with substantial cost associated with shortage and should be available in stock by and large.
- Desirable group of items do not have very serious consequences if not available when demanded but can be stocked items.

HML CLASSIFICATION

Material classified on the basis of **UNIT VALUE**

- **H**- HIGH VALUE
- **M**- MEDIUM VALUE
- **L** – LOW VALUE

FSN CLASSIFICATION

- Inventory is classified based on the MOVEMENT OF INVENTORIES from stores.
- Inventory technique used to **AVOID OBSOLESCENCE**

- **F**- Fast moving
- **S**- Slow moving
- **N**- Non moving

ORDERING CYCLING SYSTEM

- Periodic reviews are made of each item of inventory & orders are placed
- to restore stock
- to a prescribed stock level

JUST-IN-TIME (JIT) INVENTORY CONTROL

- The JIT control system implies that the firm should maintain a minimal level of inventory and rely on suppliers to provide parts and components ‘just-in-time’ to meet its assembly requirements.

- JIT also known as Zero Inventory Production Systems**(ZIPS)**, Zero Inventories**(ZIN)**, Materials as Needed**(MAN)**, or Neck of Time**(N0T)**

JIT Vs. JIC

- This may be contrasted with the traditional inventory management system which calls for maintaining a healthy level of safety stock to provide a reasonable protection against uncertainties of consumption and supply – the traditional system may be referred to as a **"just-in-case"** system.
- The **most commonly used tools** of inventory management in India are: **ABC analysis, FSN analysis and inventory turnover analysis.**

Most commonly used tools

- The **most commonly used tools** of inventory management in India are: **ABC analysis, FSN analysis and inventory turnover analysis.**

Inventory Turnover Ratio

- Inventory also include raw materials that go into the production of finished goods. For example, the fabric used to make clothing would be inventory for a clothing manufacturer.
- Inventory turnover is the number of times a company sells and replaces its stock of goods in a period. As such, inventory turnover provides reflects how well a company manages costs associated with its sales efforts.

Calculating Inventory Turnover

- inventory turnover details how much inventory is sold over a period.
- Inventory turnover ratio(finished goods)= Annual sales / Average inventory.
- Inventory turnover ratio(Raw materials)= Annual consumption/ Average inventory

Inventory Turnover-Benefits

- **The higher the inventory turnover, the better,** since high inventory turnover typically means a company is selling goods quickly, and there is considerable demand for their products.
- **Low inventory turnover,** on the other hand, would likely indicate weaker sales and declining demand for a company's products.
- **Inventory turnover indicates how well a company is managing its stock**.

UNIT-IV

STORES MANAGEMENT

MATERIALS HANDLING

According to American Materials Handling Society, the materials handling is the art and science involving the moving, packaging and storing of substances in any form. It is related with movement of raw material/parts/semi-finished or finished goods in the plant.

MATERIALS HANDLING

Other activities involved in materials handling are storing, protecting, and controlling of materials besides movement of materials. It can be manual or with the help of equipment. It can be used to create time and place utility. Material handling function is different from manufacturing, which creates form utility by changing the shape, colour, form, weight and makeup of material.

MATERIALS HANDLING

Material Handling is the art and science of moving, conveying, elevating, positioning, transporting, packaging, storing, protecting and controlling of raw materials/parts/goods. It is to provide right amount of right material, in right condition, at right place, in right position, in right sequence, at right cost and with right method.

MATERIALS HANDLING

Material handling implements the flow paths planned during facility layout between each department and for connecting departmental islands, enabling parts and material transportation between various stages of processing. It is responsible for ensuring the right product, location, condition, quantity and timing of materials delivery.

MATERIALS HANDLING

It is an integral part of the total manufacturing system process. Basically, material handling reduces to three primary activities: loading and unloading, movement to and from storage, and order filling.

MATERIALS HANDLING

Material handling is the preparation, placing, and positioning of raw materials/parts/semi-finished or finished goods from one place to another in the plant. It facilitates their movement or storage. It covers all the basic operations involved in the movement and positioning of bulk or individual, packaged or unpackaged, heavy or light, semisolid or solid state, finished or semi-finished materials by means of machinery, and within limits of a place of business. Materials handling is the moving of materials or products by any means, including storage, and all movements except processing operations and inspection.

OBJECTIVES OF MATERIAL HANDLING

- The material handling is helpful to lower unit materials handling cost.
- It provides better control of the flow of materials in the organization.
- It reduces the manufacturing cycle time.
- It reduces delays and damage of raw materials/parts/semi-finished or finished goods.
- It increases storage capacity.

OBJECTIVES OF MATERIAL HANDLING

- It promotes safety and improves working conditions in the organization.
- It is helpful to maintain or improve product quality.
- It provides contribution for better quality by avoiding damages to products.
- It provides higher productivity at lower manufacturing costs.

MATERIAL HANDLING COSTS

- **Equipment cost**

  It comprises the purchasing of the equipment, auxiliary components, and installations required for handling the materials.

- **Operating cost**

  It consists of maintenance, electricity, fuel, and labor cost. It covers both wages and injury compensation.

MATERIAL HANDLING COSTS

- **Unit purchase cost**

It is associated with purchasing the pallets (portable platform for storing or moving goods that are stacked on it) and containers. It involves the cost due to packaging of materials for movement and storing.

TYPES OF MATERIAL HANDLING

There are three types of material handling

- Manual Handling
- Mechanical Material Handling and
- Automated Material Handling.

Factors affecting Material Handling equipment

- Properties Of The Material
- Layout And Characteristics Of The Building
- Production Flow
- Cost Considerations
- Nature Of Operations
- Engineering Factors
- Equipment Reliability

MATERIAL HANDLING

Broadly material handling equipment can be classified into two categories:

(*a*) Fixed path equipments, and

(*b*) Variable path equipments.

(*a*) *Fixed path equipments* which move in a fixed path.

- (Conveyors, monorail devices, chutes and pulley drive equipments belong to this category.)

(*b*) *Variable path equipments* have no restrictions in the direction of movement although their size is a factor to be given due consideration .

- (Trucks, forklifts mobile cranes and industrial tractors belong to this category.)

CLASSIFICATION OF MATERIAL HANDING EQUIPMENTS

- Conveyors
- Industrial Trucks
- Cranes And Hoists
- Containers
- Robots

Material Handling Equipment

- The common type of material handling equipment used in stores are :

  i) Trolleys ii) Fork-lift truck iii) Hoists

  iv) Monorail v) Belt conveyor vi) Roller conveyor vii) Crane

- The selection of the material handling equipment depends upon the size , shape and weight of the items, the location of the item in the stores , etc.

MATERIAL HANDLING EQUIPMENTS

Conveyers

- Equipment used to move materials over a fixed path between specific points.

Types Of Conveyers

Mainly there are about 20 types of conveyers

- Belt conveyers
- Chute conveyers
- Wheel conveyers
- Roller conveyers
- Chain conveyers
- Slat conveyers
- Flat belt conveyers
- Magnetic belt conveyers
- Vertical conveyers

Conveyers are used

- When material is to be moved frequently between specific points
- To move materials over a fixed path
- When there is a sufficient flow volume to justify the fixed conveyor investment

Cranes

- Equipment used to move materials over variable paths within a restricted area.

Types of Cranes

- Jib Cranes
- Bridge Cranes
- Gantry Craned
- Stacker cranes




Industrial Trucks

- Equipment used to move materials over variable paths, with no restrictions on the area covered by the movement.

Types of industrial trucks

- Hand Truck
- Pallet Jack
- Walkie Stacker

Types of industrial trucks-(Contd)

- Counterbalanced lift truck
- Narrow-Aisle reach truck

Fork Lifts

- Most Common Equipment is material handling.

Unit Load Formation Equipment

- Unit load formation equipment used to restrict materials so that they maintain their integrity when handled a single load during transport and for storage.

Pallets

- 48 x 40 in. pallet is most popular in US.
- 1200 x 800 mm "Euro-Pallet" is the standard pallet in Europe is a flat transport structure that supports good in a stable fashion while being lifted by a forklift.

Pallet Boxes

- Reusable container used to utilize and protect loose items for fork/platform truck handling.

Storage Equipment

Drive-Through Rack

Drive-In Rack

Flow-Through Rack

Push-Back Rack

STORES

- Stores play an important role in operations , maintenance, and in house production activities.
- It ensures timely availability of essential items in the most efficient , economical and expeditious manner.

STORES

- Includes material planning , programming , material purchasing , inventory control , receiving and ware housing , transporting , material handling and disposal of scrap.

OBJECTIVE AND FUNCTIONS

- Standardization of stock items by unified coding for easy identification.
- Purchase of material based upon requisition placed by the indenters.
- Classification of item based upon their value/usage/source.
- Proper storage
- Proper record keeping and periodical review of balances.

STORES DEPARTMENT

Types of movement of the material from the stores department:

- Receipt of material
- Issue of material
- Return of material from Production Department to Stores Department.
- Transfer of material

Storage System

A) **Physical Systems:**

The design of proper shortage system is very important for easy location, proper identification, and speedy issue to the consuming department. The commonly followed systems for physically controlling stores materials are: closed stores system, open stores system and random access stores system. A single firm can follow a combination of these systems depending upon the nature of production operation and the use of materials.

Physical Systems

a) Closed Stores System: In such a system all materials are physically stored in a closed or controlled area, usually kept in physical control by locking. Only stores personnel are permitted to enter the stores area. Entry and exit of the material from the area is permissible only with the accompaniment of authorizing document. Maximum physical security and tight accounting control of inventory material are ensured by such a storage system.

Physical Systems

b) Open Stores System: In this system no separate store room exists. The material is stored as close to the point of use as is physically possible. Such a system finds applicability in the highly repetitive, mass production type of systems exhibiting a continuous and predictable demand, e.g. automobile assembly plant. The storage facilities are arranged at each work station as per requirement and availability of space. The storage facilities are open and worker has direct access to it; no authorisation document is needed.

Physical Systems

c) Random Access Stores System: This is a typical kind of closed stores system in which no material has a fixed location, All materials are stored at random locations throughout the store room. However, similar types and sizes of storage equipment are grouped together. When an item enters the stores, it is stocked at the first available storage location for that particular group, and when it leaves the storage, location becomes empty for any other item of the same group.

VALUATION OF ISSUES

This is a more complex process than the valuation of the receipts. It is because of this reason that the material may be issued out of the various lots which might have been purchased at various prices. As such, a problem may arise as to which of the receipt prices should be used to value the material requisition notes.

METHODS FOR VALUATION

- First In First Out (FIFO)
- Last In First Out (LIFO)
- Highest In First Out (HIFO)
- Simple Average Rate (SAR)
- Weighted Average Rate (WAR)
- Market rate

Store Location

The location of stores is a strategic decision which if once taken cannot be easily undone. It would be extremely costly to change the storage location at a later stage. It should be carefully decided and planned so as to ensure maximum efficiency. The optimal location of stores minimizes the total transportation, handling and other costs related to stores operation and at the same time provides the needed protection for stores items.

Layout and Design of Stores

The efficient layout and design of stores is very important from the point of view of its functioning which is linked to the overall functioning of the plant. A good layout must bring the point of origin, store room and point of use in adjacent and proper reference of best material flow.

Objectives for the planning and design of stores

- To achieve maximum ease of operation with ready accessibility of major materials.
- To achieve minimum waste of space and flexibility of arrangement.
- Minimization of material handling requirements.
- Minimization of material deterioration and pilferage.

LOCATION AND LAYOUT

- The normal practice is to locate the stores near the consuming departments.
- In stores layout, the governing criteria are easy movement of materials, good housekeeping, and sufficient space for men and material handling equipment, optimum utilization of storage space, judicious use of storage equipment, such as shelves, racks, pallets and proper preservation from rain, light and other such elements.

LOCATION AND LAYOUT

- Other important factors governing the location are:
- the number of end users and their location,
- the volume and the variety of goods to be handled,
- the location of the central receiving section and
- accessibility of modes of transportation.

SAFETY

- This factor is perhaps the most important aspect. In stores a large volume of goods are handled every day.
- Accidents considerably reduce the moral and effectiveness of the system.

SAFETY

The following measures are necessary if accidents are to be checked:

- Safety consciousness should be instilled in the minds of stores personnel through training programmes, visual aids and literature.
- Safety appliances, such as goggles, hand gloves, full face integral helmets, use of leather clothing & boots etc., must be provided and their use must be encouraged.
- Good housekeeping is essential. Stocking must be in appropriate locations so that handling is minimum.

SAFETY

- All stores equipment must be kept in good order.
- Healthy competition can be stimulated by installing „safety awards“ and cash prizes. This also motivates others to practice safety.
- Provision of fire fighting facilities is necessary especially where inflammable materials are stored handled.
- Other factors which merit attention include provision of toilets, routine maintenance equipment, safe electrical wrings, etc.

Factors to be Considered While Locating the Store – Room

- The location of stores should be carefully considered in terms of ensuring maximum efficiency.
- The store-location should minimize the cost involved in carrying of inventories and other stores operation.
- Stores location depends upon the nature and value of materials and frequency of consumption of material.

Factors to be Considered While Locating the Store – Room

- Stores should be easily accessible to all use departments and there by material handling should be reduced to minimum.
- Medicines & materials inventories should be located near the main operation theater.
- In big organizations having number of service units and each one is located far from the central office; decentralized storage system should be followed.

STORES RECORDS

The store-keeper has to maintain two stores records namely

- Bin card
- Stores ledger

BIN CARD

- Bin card is a stores record in which the items received and issued are clearly specified by the store-keeper.
- Whenever the materials are received, the store-keeper has to prepare a stores received note indicating the type of materials and quantity and based on that he has to fill-up the receives column in the bin card after placing the materials in their respective Bins.

BIN CARD

- When any issue ofmaterials is made, he has to check for the authorization of the requisition before issuing the materials.
- On making the issues he has to enter into the issues column that quantity of materials issued.
- The column reserved indicates the number of items and their type kept as reserve for important jobs.

STORE LEDGER

- It is same as Bin card, the difference is only with regard to the addition of amount column in this stores ledger used in day to day management of stores.
- Whenever the materials are received from the supplier, after checking the consignment, the number of items received must be shown in the received column, under quantity.
- After the invoice sent by the supplier is verified, the rate and amount column are also filled-up.

STORE LEDGER

- When any issue is made, the store-keeper on checking the authorization of materials requisition has to make entries in the Bin card and stores ledger.
- The main advantage of stores ledger is that is adds as a counter-check for the entries shown in the Bin Card.

BIN CARD VS. STORES LEDGER

- Bin card is maintained by stores department while stores ledger is maintained by costing department.
- Bin card is not an accounting record but only a quantity record and as such is not concerned with the financial implications of stores transactions.
- Maintenance of stores ledger provides a second check on maintenance of bin cards.

STORES ISSUES

Indentation Procedure:

- Stores in stock represent money. Any indiscriminate issue system can result in misappropriation, waste, improper use etc. It is, therefore, desirable to have a proper indentation procedure so that issues are made under proper authority to users. Store-keepers should have complete details of the names, designation and specimen signatures of all authorized officials to approve the indents

STORES ISSUES

- Various types of documents are in use when stocks are issued against a valid requisition. Some of the names commonly used are (i) Stores Indent (ii) Stores Requisition (iii) Stores Order (iv) Stores Schedule (v) Issue Voucher / Note (vi) Demand Note etc. Indents or Requisition Vouchers

STORES ISSUES

- Issue Rate:

For finding out the cost of finished items it is essential that the cost of all component materials should be considered. For this an Issue Rate is assigned to each article as it is brought on stock. The rate is fixed, on the principle that the cost to be charged to works on which the materials are to be used. It includes the following costs wherever and whichever is applicable. (i) Ordering Cost (ii) Invoice Cost (iii) Freights (iv) Transport (v) Insurance (vi) Packaging (vii) Inspection (viii) Storage Charges

STORES RECEIPT

- Bin Cards
- Goods Received Sheet

STORE EQUIPMENT

- Store Equipment means all convenience store fixtures, machinery, furniture, equipment, including, but not limited to, walk-in coolers, store fixtures, counters, shelving, refrigeration equipment, cash registers, safes, fountain dispensing equipment, coffee equipment, ice machines, tables and any other fixtures or equipment necessary for running a convenience store that may be at each of the Stores(excluding Petroleum Equipment.)

ORGANIZATION OF STORES

- In a large organization the management is faced with the problem of adopting the type of organization of store**:**
- **Types of Stores:**

  (a) Central Store.

  (b) Central Store with sub-stores.

  (c) Independent stores situated in various departments.
- Central store indicates centralized buying and handling of stores.

CENTRALIZED STORE

- When an organization receives raw materials in one warehouse but supplied the raw materials several production centres or departments and divisions is called centralized store. When the management of the company is very strict regarding the materials control, they follow central management.

ADVANTAGES OF CENTRALIZED STORE

- Better supervision could be possible due to its single location
- Materials are tightly controlled due to specific area
- Better layout can be made
- High technical skills maintained by store supervisor
- As stock are kept as low as possible , it has needed a lesser storage area
- Better facilities for stores audit
- Easier stock taking is possible
- Lower cost of insurance is required

DISADVANTAGES OF CENTRALIZED STORE

- Due to frequent transport to production centre, departments and divisions , a higher transport cost is incurred
- Possibility of bottle neck in the flow of materials to production
- It has a greater risk of obsolescence
- Due to centralized store, production may be hampered due to delay material supply.

DECENTRALIZED STORE

- Decentralized Store is the store where materials are received and issued from the same place. A large group of company maintain decentralized store nearer to its production centre so that they can avoid production disruption and minimizes the carrying cost of inventory. Every production department purchase and handle raw materials separately. Decentralized store is suitable where there is huge materials movements and production.

ADVANTAGES OF DECENTRALIZED STORE

- Easy materials controlling and storing functions
- Materials handling can be quicker than centralized system
- Minimizes the chances of materials losses due to fire, carrying etc.
- Internal Transportation costs is not needed
- Materials handling costs can be saved
- Requirements of individual departments can be easily fulfilled

DISADVANTAGES OF DECENTRALIZED STORE

- Supervision costs of materials are relatively higher.
- More space is required for individual departments.
- Investment amount is comparatively higher.
- Very chance of misappropriation of stock due to appropriate authority.
- As separate store, additional staff is needed. Hence staffing costs will be higher.

UNIT V

SURPLUS, OBSOLETE AND SCRAP MATERIALS

WASTE MANAGEMENT

- Industrial wastes and scraps include spoiled raw materials, defective parts, rejected components, production wastes, etc. that holds a commercial value, and therefore, they should be discarded at periodic intervals and the amount should be accurately recorded into the books of accounts. Therefore, waste management plays a key role in proper management of operations.
- Waste materials can be classified into three categories: obsolete, surplus & scrap items.

SURPLUS, OBSOLETE AND SCRAP MATERIALS

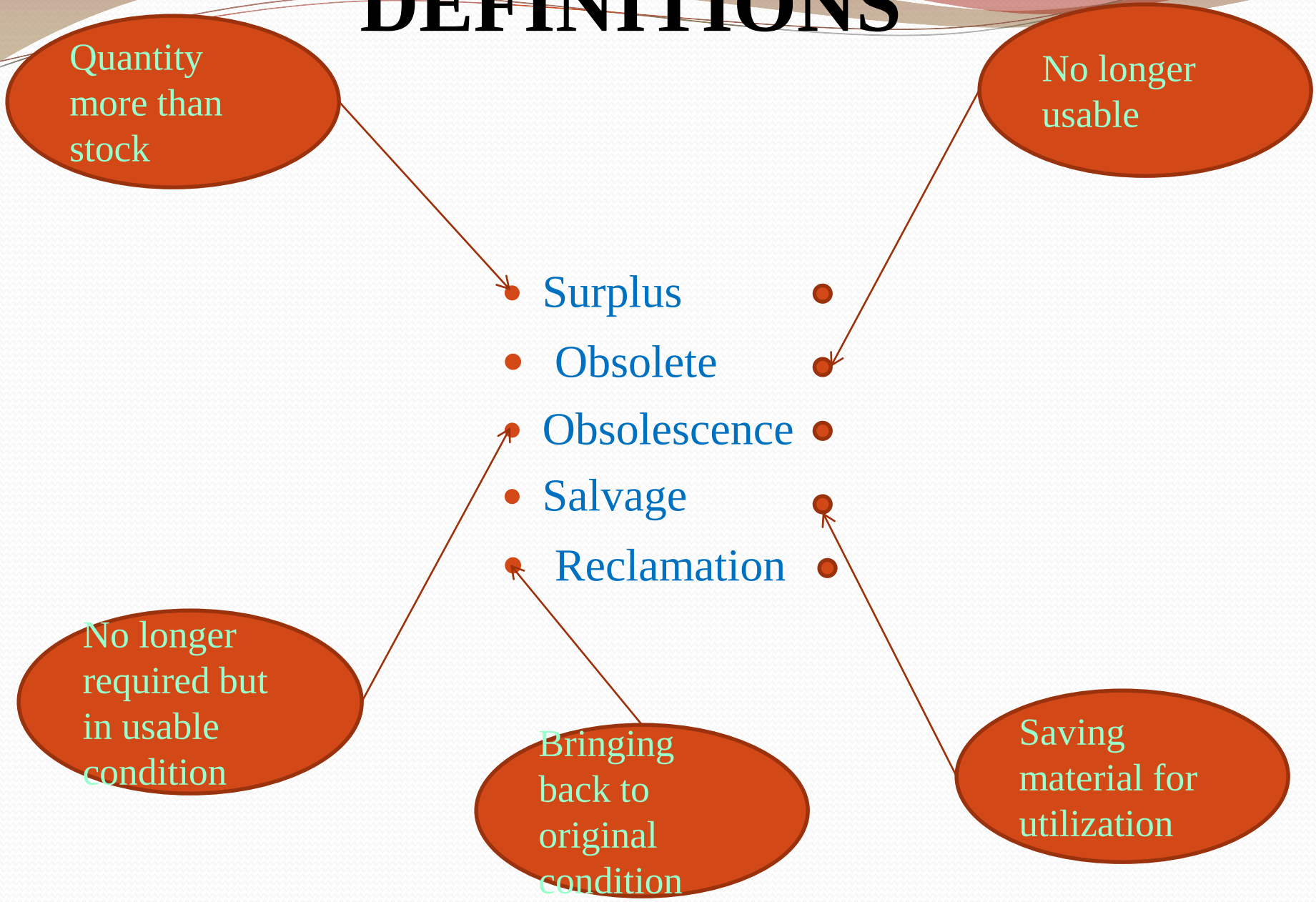
The obsolete, surplus & scrap items can be put under the following categories.

1. Obsolete materials & equipments
2. Unserviceable equipment & machines
3. Deteriorate stock
4. Surplus stock
5. Scrap material

SCRAP AND SCRAP MANAGEMENT

- **Scrap** - Waste that either has no economic value or only the value of its basic material content recoverable through recycling.
- **Scrap management** - Manufacturers do not intend or plan to make scrap, but depending on the industry and the product, scrap is produced. But depending on the type of scrap, it may be re-cycled back into the production process or sold as a revenue generating product or simply non-recyclable and the enterprise has to pay for an outside contractor to dispose of the product.

DEFINITIONS



OBSOLETE ,SURPLUS AND SCRAP

- **Obsolete:** These materials / equipment hold an economic value and are not damaged, but are not useful to the company for a longer duration for its operations on account of reasons, such as changes in process, product line, materials, etc.
- **Surplus:** These materials / equipment do not have immediate use, but have been amassed due to faulty planning and purchasing. But they do have a usage value in the future.
- **Scrap:** This refers to the process wastage, such as borings, turnings, flashes and borings, which have an end use and hold commercial values. So, they need to be discarded periodically

Responsibility of Scrap Disposal

Primary Responsibility

Purchase Department

Secondary Responsibility

Operations Department

Maintenance Department

Stores Department

Causes for generation

- Changes in product design – obsoletion
- Rationalization – initiative for variety reduction leads to surplus or obsolete items
- Cannibalization – parts of one idle machine are fitted on another machine needed urgently during maintenance, results into obsoletion of parts and at times even scrap
- Faulty planning and forecasting – leads to excess procurement, surplus generation.

Causes for generation

- Faulty purchase practices – sub-optimization in buying to utilize available discounts and transportation economy, surplus and obsolete stocks are generated.
- Other causes – parts kept aside for insurance claims, bad storage system, bad material handling, bad manufacturing and badly maintained machines are other causes for spoilage and scrap.

Procedure for disposal

- Reuse/Feedback
- Return to supplier
- Sale to another company
- Sale to dealer
- Sale to employees
- Donations to Educational / Research institutions

1. Reuse/Feedback

- Circulation within the company to its various units at various locations and to different departments to get necessary feedback of the requirement of surplus or obsolete stock of one unit to another unit.

2. Return to the Supplier

- If there is no requirement from within the company units/departments, then materials should be returned to its original supplier at original cost after deducting a small amount as a restocking charge.
- Good suppliers do take back such unused materials in order to develop better business relationship. Nowadays, the industrial buyers insist on incorporating buy-back clause during finalisation of purchase contract.

3. Direct Sale to Another Company

- Surplus and obsolete materials of one company may serve a useful purpose in another company having the same product line and an identical production system. In such cases, attempts should be made to sell surplus and obsolete materials to those firms. Sometimes scrap of some company becomes the raw materials of another.
- These categories of scrap cover steel scrap, machine shop turnings, plate scrap, punching scrap, copper bearings scrap, brass scrap, old scrap zinc, tin scrap, scrap lead, nickel chrome, stainless steel, old packing materials, used paper, and so on.

4.Sale to a dealer

- Sale to a dealer or broker may be done by auction, with notification on ‘as is where is’ basis. It may be open auction or tender. Yearly rate contract system can also be followed where the dealers are to collect the scrap from the particular area of production shop. The contract procedure and legal formalities adopted in buying are applicable in sales of surplus, obsolete materials, scrap and waste.

5. Sale to Employees

- Some organizations follow the practice of selling the surplus, obsolete and non-moving items to their employees at a very low price. This sometimes satisfies the employees who make some gain by re-selling the materials or by using the same in their houses.

6. Donation to Educational/Research Institutions

- Various schools, colleges, polytechnics, engineering and technology institutes, universities, research centers, medical colleges and scientific laboratories require various tools and equipment for research. This is why many organisations follow the practice of disposing off unwanted materials to the academic institutions as a good gesture and also to enjoy some tax benefit.

Methods used for disposal of scrap

- Auction and Tender methods are frequently used for disposal of scrap. Parties in both the cases are normally required to inspect the scrap in the scrap yard and deposit earnest money. Very often the company insists on a basic price depending upon the category of scrap. The disposal section works, in this aspect, in close coordination with the finance department. In many cases the disposal section may try to enter into a long-term contact with end-users such as steel plants.

UNIT-VI

PURCHASING

PURCHASING

- **Purchasing:**

Purchasing describes the process of buying. It covers the knowledge of the requirements, identifying and selecting a supplier and negotiating price

- **Procurement:**

It is a broader term. It includes purchasing products required for production, stores, traffic, receiving, inspection and salvage.

PURCHASING MANAGEMENT

- Purchasing management is concerned with the planning and controlling of the acquisition of suppliers' goods and resources, to fulfill the administrative and strategic objectives of the organization.

PURCHASING MANAGEMENT

- In practice, purchasing managers have to deal with both customers internal as well as external. He/she has to respond creatively to internal customers' need on the one hand and to maintain a mutually profitable relationship with suppliers on the other.

FUNCTIONS OF PURCHASE DEPARTMENT

- support company operations with an uninterrupted flow of materials and services
- buy competitively and wisely
- help keep a minimum inventory
- develop reliable alternate sources of supply
- develop good vendor relationship and a good continuing supplier relationship
- achieve maximum integration with the other departments of the firm
- train and develop highly competent personnel who are motivated to make the firm as well as their department succeed.
- develop policies and procedures which permit accomplishment of the preceding objectives at the lowest reasonable operating cost

CHARACTERISTICS OF A PURCHASING MANGER

- Interpersonal skills
- Analytical Decision Making
- Loyal to the Organization
- Computer Literacy
- Technical skills
- Ability to Make Decision
- Innovative
- Bargaining Power

5 R’S FUNCTIONS OF ORGANIZATION

- Right quality .
- At right price.
- From the right source.
- In right quantity.
- At the right time.

IMPORTANT ACTIVITIES OF A PURCHASE DEPARTMENT

- Buying activity
- Expediting.
- Special projects (Non routine)
- Routine

PURCHASE REQUISITION

- Purchase Requisition is an indication given to the purchases department to purchase certain material. It is issued either by the storekeeper (in respect of material required for regular production purposes) or by production department (in respect of special materials required).

PARTICULARS IN PURCHASE REQUISITION

- Material to be purchased
- When it is required
- How much to be purchased

TYPES OF PURCHASE REQUISITIONS

- Standard requisition
- Travelling requisition
- Bills of materials

MANAGEMENT OF VENDORS IS ATTEMPTED THROUGH THE FOLLOWING WAYS

- Vendor Registration
- Vendor Development
- Vendor Rating
- Vendor Exploration

Vendor registration

For this purpose, the vendors interested to supply the specific category/subcategory of items are asked to submit the application along with all the documents required to establish their financial & technical capability. The application forms so received are scrutinized and the vendor capacity assessment is carried out through inspection department/ technical experts to establish the technical capability of the vendors. These vendors are listed as ‘registered’ after following up certain processes.

Vendor development

- Many process industries like to search the alternative and less costly material as substitution of the currently used costlier materials. The less the procurement cost the more is the profit. Also, there may be situations where the existing suppliers may not be willing to supply the items on various grounds thus, necessitating, looking into different alternatives. An efficient materials manager would devote enough time to develop substitutes & sources of supply with a view to reduce cost of input materials and also to have reliable alternative source for foreign sources.

Vendor development

- Normally, in large manufacturing organizations, a Vendor Development Cell (VDC) remains engaged all through for the purpose. When the need to develop a vendor for an item is felt the requisition for such items is made by concerned department indicating the trial quantity and the potential vendors. Trial orders are placed on potential vendors and also necessary help is rendered to them to come up to the desired level.

Vendor rating

- The vendors also like to be given priority to be the purchaser if it constantly improves its selling performance which from a purchaser point of view is mainly its offered price, quality and punctuality in delivery. For purchaser, there shall always be a need to continuously monitor and update its registered vendor base so that the organization continues to have the most competent & competitive vendors in its list of vendors. For this purpose the efforts are made to monitor supply performance of the vendors and rate them objectively.

Vendor rating

- The major factors usually considered for such vendor rating are competitiveness of vendor (price), quality of supply and delivery adherence. Vendor rating may also be used for removing a vendor from registered vendor list and also in the selection of vendors while issuing Limited Tender Enquiry

Vendor exploration

To have competitive & competent sources of supply, efforts are made to explore suitable vendors from various sources like, internet websites, international bulletins, vendors list of other similar manufacturing organisations etc. This is known as vendor exploration and in the competitive environment it is taken as a serious activity.

Techniques of Vendor Rating

(a) Categorical **Plan**

(b) Weighted Point **Plan**

(c) Cost Ratio Method

Categorical Plan

- The categorical plan is a sample of all vendor rating schemes. It relies heavily on the judgment and experience of the decision maker. The purchaser maintains a list of his suppliers and their products. The vendor performance is reviewed periodically by an evaluation committee comprising of all representatives.

Weighted Point Plan

- Quality, delivery or service and price are the three most important attributes of a good supplier. Depending upon the importance, a purchaser attaches to a particular attribute he fixes a weightage for it. The total weightages are being 100. The weightages, for example, of the attributes are as follows:
- Quality — 60%
- Delivery — 25%
- Price — 15%

Cost Ratio Method

- This method relates to identifiable purchasing and receiving costs to the value of shipment received from respective suppliers. The higher the ratio of costs to shipments, the lower the rating applied to the supplier. Quality, delivery, service and price are the usual categories to which costs are allocated, after subdividing each factor into various elements.

Cost Ratio Method :contd..

- The respective cost ratios are suitably combined with the vendors' quoted price, to determine the net cost. Here, the vendor performance is reviewed periodically by an evaluation committee comprising of representatives from all departments involved with purchasing.

MATERIAL REQUIREMENTS PLANNING

- Material requirements planning is a time phased priority-planning technique that calculates material requirements and schedules supply to meet demand across all products and parts in one or more plants.
- MRP is an inventory control process carried out with the aid of the computer to determine time-phased requirement of components that are used for manufacturing products on the assembly line principles.

JIT

Just in Time (JIT) production is a manufacturing philosophy which eliminates waste associated with time, labour, and storage space. Basics of the concept are that the company produces only what is needed, when it is needed and in the quantity that is needed.

BENEFITS OF JIT

- Reduced set up times in store
- Improved flows of goods in/through/out warehouse
- Employees who possess multi-skills are utilized more efficiently
- Better consistency of scheduling and consistency of employee work hours
- Supplies continue around the clock keeping workers productive and businesses focused on turnover.

PURCHASING ACTIVITIES

- There are two major forms of purchasing activities that take place in an organization:

- Tactical purchasing
- Strategic sourcing

TACTICAL PURCHASING

- The organizations require some materials for the smooth flow of production. The day to day management of materials flow is called tactical purchasing.
- These activities generally ensure that products and services are delivered to the right internal people at the right time but are often not carried out using a long term horizon.

STRATEGIC SOURCING

- The purchasing which affects the long-term profitability is called strategic purchasing.
- In the strategic sourcing process there may includes members from other than purchasing department like from engineering, quality, design, manufacturing, marketing and accounting department for managing, developing and integrating with supplier capabilities to achieve competitive advantages like cost reduction, technology development, quality improvement and cycle time reduction.

PURCHASING CYCLE

The main steps in the cycle are as under:

- Recognition of need
- Description of need
- Determination of prices
- Preparation of purchase order
- Placing the order with a selected supplier
- Receiving the ordered materials
- Checking and approving for payment to supplier

TYPES OF PURCHASING

- Forward buying
- Tender buying
- Systems contract
- Speculative buying
- Rate contracts
- Reciprocity in buying
- Zero stock buying
- Blanket orders

Forward Buying

- Forward buying, as the name suggests, is the system under which buying is done with longer term in perspective. It is not meant for meeting the present consumption requirement. It is rather a commitment on part of both the buyer and the seller, normally for a period of one year. Depending upon the availability of the item, the financial policies, the economic order quantity, the quantitative discounts and the staggered delivery, the future commitment is decided

Forward Buying

- A few organisations do hedge, particularly in the commodity market by selling or buying contracts. Forward buying helps a firm in booking capacity of a supplier and thus often results into a safeguard against a competitor acquiring his capacity. It is usually done for raw materials but is not limited to it. Such an arrangement is a win-win situation for both, the buyer and the supplier

Tender Buying

- Tender buying has always been considered the only way of buying materials/services in the government and quasi government procurements. Selecting a supply source (supplier) out of many sources available is called tender buying. Many applicants are invited to participate in the tendering process and then one or more than one tender is selected for order placement. Such tenders are also called the accepted tender's (A/Ts).

Tender Buying

- The main focus through tender buying is on competition of price and quality. Usually, the best quality (T1 or Q1) is selected after assessment of the technical offers and then the lowest offered price (L1) tender is selected for order placement.

Process of tender buying

- A purchase function starts with the raising of a requisition (indent/material procurement requisition) for an item which is required for a stated purpose.
- This requisition is then converted into an enquiry form which is issued to the probable vendors who are asked to respond within a given date and time (called tender opening date) as mentioned in the enquiry issued to them.
- The interested vendors respond to the tender enquiry by giving their tenders.
- Tenders thus, received are opened on the tender opening date at the fixed time.

Process of tender buying-contd

- The tenders are then subjected to evaluation with respect to a tenderer's capability, financial as well as technical, and other criteria as laid down in the tender enquiry.
- This step also witnesses series of discussions, clarifications and negotiation with the tenderers.
- Some tenders can be rejected at this stage as they might not meet the requirement of the purchaser.
- Finally, the tenders that are found suitable are subjected to price comparison and usually the tenderer offering the lowest price (L1) is selected for placement of order.

Process of tender buying-contd

- The process explained above shows a great deal of variations depending upon a company's procurement policy.
- In some places, the best quality offering tenders are accepted for subsequent price comparison whereas in some other place all the tenderer's who meet the minimum requirement are considered accepted for price comparison and order placement.
- Similarly, in some places the order is placed only on L1 (lowest offered price) whereas in some other places it may not be rigidly followed so.

Types of tenders

- **Global tender:**

  A global tender is floated with a view to elicit offers/response from any vendor situated anywhere in the world.

- The need for a global tender arises when the purchaser either does not know about the vendors for a particular item in question or when he thinks that a wider choice of vendor is possible through it, irrespective of his nation's boundaries.

Open tender

- An open tender too like a global tender tends to invite tender from any interested vendor.
- The basic difference assumed between an open tender and a global tender enquiry is essentially the range of its applicability. While a global tender gets the worldwide publicity, an open tender is limited only within a country. Otherwise limited within the country itself, besides the internet mode, the enquiry is also printed in the national dailies, internal, the concept remains the same as it also seeks to elicit better or wider response.

Limited tender

- When the issue of tender enquiry is limited only to a selected few vendors, it is called limited tender enquiry (LTE).
- LTE is issued when the capabilities of the vendors is well known to the purchaser.
- It is considered better than global and open tender modes as there is always an element of uncertainty in those two modes with respect to the capabilities of the vendors.
- For issuing LTE, a purchaser maintains a list of approved /registered vendors whose capabilities are checked periodically.

Single tender enquiry

- An STE is issued only when either the item is proprietary in nature, that is only one supplier produces that item or where there may be more vendors but due to certain exigencies it is not possible to devote time on evaluating the vendors offers/one supplier can fulfil the needs.
- The mode to tender depends on many factors as well a company's procurement policy. For example, for a small value purchase, if the policy does not prohibit, single tender enquiry or limited tender enquiry is considered ideal.

Single tender enquiry

- These are also ideal for high value and frequently bought items. On the other hand, for high value and non- frequently bought items/systems, open/global tenders are suited.
- In many government organisations, whose procurements are also called public procurements for the reason that they spend public money for the public cause, all the tenders are to be invited only through open/global tenders.

Systems Contract

- Systems contract is a contract of system of buyer with that of the seller. It is a release system in which items, usually, commonly available off-the-shelf, are identified and pre-priced in anticipation of certain usage. Delivery releases are made against existing orders placed by purchase. This is a procedure intended to help the buyer and the seller to reduce administrative expenses and at the same time to ensure proper controls.

Systems Contract :contd

- The system authorizes the designated persons of the buyer to place orders directly to the supplier with the specific materials during a given contract period. The contract is thus finalized only after it is ensured that an attempt has been made to integrate as many buyer-seller materials management functions as possible.

Systems Contract :contd

- In this system the original indent, duly approved by competent authorities, is shipped back with the items and avoiding the usual documents like purchase orders, materials requisitions, expediting letters and acknowledgements, goods in transit report, etc. The contract is simple, covering only delivery period, price and invoicing procedure.

Systems Contract: contd.

- System contracting is particularly useful for items with low unit price and high consumption profile and thus, relieves the buyers of the routine work.
- Obviously, the systems contracts are an excellent way of simultaneously cutting costs while building efficiencies through simplifications

Speculative Buying

When purchasing is done purely from the point of view of taking advantage of a speculated rise in price of the commodity it is called speculative buying. The intent is not to buy for the internal consumption but to resell the commodity at a later date when the prices have gone up and to make a profit by selling. The items may be those that are needed for internal consumption but the quantity shall be much more than the requirement so as to take advantage of the coming price rise.

Rate Contracts

- Rate contracts are mutual agreements between the buyer and the seller to operate a set of chosen items, during a given period of time, for a fixed price or price variation. Under this system the rates are fixed and at times even the quantity of the selected items. As and when the need arises the buyer issues a purchase order directly on the basis of the rate chart available on the supplier who in turn supplies the items.

Rate Contracts: contd.

- The system of rate contract is prevalent in public sector organisations and government departments. It is common for the suppliers to advertise that they are on rate contract with the DGS&D (Directorate General of Supply & Disposal), for the specific period for the given items. After negotiation, the seller and the buyer agree to the rates of items.

Rate Contracts: contd.

- Application of rate contract helps organisations cut down the internal administrative lead time as individual firms need not go through the central purchasing departments and can place orders directly with the suppliers.

Reciprocal buying

Reciprocal buying refers to an agreement between two or more companies to purchase each other's products, often irrespective of whether such purchases represent the lowest cost or best value to the **buyers**.

Zero stock buying

- **Zero stock buying** refers to **buying** in a manner that the system ensures that the material is delivered by the seller only when it is required and that no prior **inventory** of the item is maintained by the buyer.
- Thus **Zero stock buying** is more of an **inventory** safeguard rather than the normal **buying**.

Blanket orders

- A ***blanket order***, ***blanket*** purchase agreement or call-off ***order*** is a purchase ***order*** which a customer places with its supplier to allow multiple delivery dates over a period of time, often negotiated to take advantage of predetermined pricing. It is normally used when there is a recurring need for expendable goods.

OUTSOURCING

- Outsourcing procurement is often undertaken by very large companies to save money. Procurement requires a great deal of focus on cost saving, profit maximization and compliance. Often good procurement strategies can be the difference between a profitable company and a failed business.

Procurement Outsourcing

- **Procurement Outsourcing** is the transfer of key **procurement** activities related to sourcing and supplier management to a third party to help companies focus & tighten their core competencies.

OUTSOURCING

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OUTSOURCING-contd..

- Some companies such as Amazon, Tesco and Walmart have made their purchasing strategies a competitive advantage. Procurement can be very complex and cost consuming in many large companies so some of them are outsourcing procurement rather than build their own world-class procurement capabilities.

OUTSOURCING-contd..

- A procurement outsourcer can leverage their economies of scale and have the experience and trained staff that cut costs and enhance efficiencies.

OUTSOURCING-contd..

- Smaller companies that have experienced growth spurts and have few internal purchasing resources are also outsourcing procurement to take advantage of external structures and expertise.
- Others that do not have the market leverage to obtain good discounts or the expertise to find good suppliers or purchasing staff are also turning to outsourcing procurement.

key problems from outsourcing

- There are also **several key problems** that may arise from outsourcing:
- **Continuity of service**
- There is a hand over time that needs to be managed so that products continue to be delivered during this time. You should have a detailed transition plan in operation the commencement of any handover.

key problems from outsourcing

- **A reduction in control**
- Obviously by outsourcing you lose control over the day to day purchasing activities so you should ensure that you retain a reliable company and have a measurable and enforceable service level agreement (SLA).

key problems from outsourcing

- **Outsourcing management**
- You need to manage the outsourcing procurement on a continual basis and ensure compliance to your contracts and SLA's.

Outsourcing and subcontracting

- Outsourcing and subcontracting both involve allocating jobs outside of a firm but have important differences.
- Outsourcing is considered a comprehensive cost-cutting strategy by a business that seeks to allocate out entire jobs or departments within a firm to an external firm, permanently.

Outsourcing and subcontracting

- Subcontracting involves hiring an outside firm or individual to complete a specialized task that cannot be done internally and is usually temporary by design.
- Both outsourcing and subcontracting, but primarily outsourcing, have become controversial practices.

What Is the Purchase Order Process?

- Purchase orders indicate the **types, prices and quantity** of the products and services being bought. The purchase order will be sent to the seller and is created by the buyer. It commits the buyer to paying the seller for the goods or services sent or rendered.

Purchase Order Process

- Purchase orders ensure that documentation exists so that the seller will be paid. The purchase order serves to both help buyers with their budgeting and allows them a way to track purchases. In addition, this sort of documentation is essential for audits and end-of-year fiscal analysis. It can be compared against an invoice to ensure that costs were what was expected.

Purchase Order Process

- For instance, consider this purchase order example. A construction company might need to purchase various supplies such as wood, paint or tools. The manager or buying department at the company would create a purchase order for their suppler when the items are requested so that both parties can track what has been requested and what is owed.

Invoice

- Invoices are also an essential part of the purchasing process, but they are different from purchase orders. It is important to be able to distinguish between the two. Invoices are the **documents that request payment** for any goods or services that have been delivered or rendered.

Invoice

- It's important to note that purchase orders are not requests for payment. Invoices, however, are binding requests for money from the buyer. Purchase orders outline the details of a binding contract between the buyer and seller, and once the products or services are provided, the invoice will confirm and finalize the transaction.

Features of a Purchase Order

- There are a few essential elements of a purchase order. These include a unique order number for easy record keeping. The numbers will be increased over time as more purchases are made by various buyers.

Features of a Purchase Order

- Other important aspects of a purchase order include:
- Quantity of goods or services purchased
- A description of the product or good purchased
- Brand names or model numbers
- Price
- Delivery date
- Location

Features of a Purchase Order

- Name and billing address of the buyer
- Name and payment receipt address of the seller
- Payment terms, if any (such as pay on delivery or payment within 30 days)
- Date of issue
- Shipping details
- Any terms and conditions

Features of a Purchase Order

- An integral part of purchase order procedure is checking the above before submitting your purchase order to be sure all elements are contained therein.

Features of an Invoice

- Invoices have many of the same features as purchase orders. However, invoices differ by including a date of issue, the purchase order number, an invoice number, the total amount due, any sales or other taxes (which differ based on state and local laws), any applicable discounts and the payment due date.

Features of an Invoice

- When an invoice is received, it is expected that the buyer will remit payment within the allotted time frame. An invoice may also include information regarding payment plans in case the buyer needs extra time to pay. In addition, invoices usually provide information about what will happen if payment is not remitted during the time outlined. Typically, interest charges may result.

Purchase order and invoice

- The purchase order process and invoicing process are each an integral part of business ownership. It's essential to understand the importance and unique role of each, whether your business sells goods or services.

BENEFITS

- Cost reduction from head count, training, office space and computerization.
- Market leverage allowing for better discounts.
- Transaction cost per purchase are lowered by economies of scale.
- Marketing knowledge of which suppliers are best for each product to be purchased.
- Highly skilled staff that specialize in purchasing.

BENEFITS

- Improved communication between purchasing experts and the company staff.
- Better management information and purchasing analysis is available for people who understand the purchasing environment.
- Globalization means that the same products are often required in different countries.
- Negotiation by an expert in the field is often more effective and profitable.

SUBCONTRACTING

- Subcontracting refers to the practice of bringing in an outside company or individual to perform specific parts of a contract or project.
- In most cases, a company subcontracts another business to perform a task that cannot be handled internally.

TYPES OF SUBCONTRACTING

- Operation subcontracting
- Item subcontracting
- Unplanned subcontracting (operation and item)
- Service subcontracting

REASONS FOR SUBCONTRACTING

- Subcontracting Can Help With Large Projects
- It Is Cost Efficient and Risk Adverse
- Subcontracting Provide Expertise
- Increased Productivity.
- No Long Term Commitment
- Have Specialized Knowledge
- Fewer Legal Obligations

SUBCONTRACT TYPES

- Internal Subcontract
- External Subcontract

Examples of Purchase order /Purchase requisition forms

are:

PURCHASE ORDER

XYZ Offices
25 First Cambridge Street
Cambridge, MA 02141

DATE 25-Oct-19
ORDER NO. 15

VENDOR:

CONTACT NAME Isabelle Karim
CLIENT COMPANY NAME Printing Unlimited, Inc.
ADDRESS 55 Third Street
Philadelphia, PA 10919
PHONE 555-555-5555

SHIP TO:

NAME/DEPT Jolene Sincero; Office Manager
CLIENT COMPANY NAME XYZ Offices
ADDRESS 25 First Cambridge Street
Cambridge, MA 02141
PHONE 444-444-4444

SHIP VIA	SHIPPING METHOD	SHIPPING TERMS	DELIVERY DATE
UPS	UPS GROUND	AP	12-Nov-19

CODE	PRODUCT NAME / DESCRIPTION	QTY	UNIT PRICE	DELIVERY DATE
225	HG Color Printer Cartridge	20	$50.00	12-Nov-19
226	HG Printer Paper	30	$10.00	12-Nov-19
225	HG Color Printer Cartridge	20	$50.00	15-Dec-19
226	HG Printer Paper	30	$10.00	15-Dec-19

REMARKS/NOTES

SUBTOTAL	$2,600.00
DISCOUNT (%)	20 %
SUBTOTAL LESS DISCOUNT	$2,080.00
TAX RATE	6.25 %
TOTAL TAX	$130.00
SHIPPING/HANDLING	$23.00
TOTAL	$2,233.00

QP1220-1 PURCHASE REQUISITION

Requested by:_____ Date:_____

Department:_____ Charge To:_____

Purpose or Use:_____

Vendor Name:_____

Vendor Address:_____

Vendor Address2:_____

Vendor Contact:_____ Phone:_____

Date Needed:_____ Ship Via:_____

Stock Number	Product / Service Description	Qty.	Unit Price	Extended Cost

For Purchasing Department Use Only

Approvals:

Dept. Manager:_____ Date:_____ Approved:_____

Additional:_____ Date:_____ Ordered for:_____

P.O. No.:_____

Vendor EIN or SS on file? ❒ Yes ❒ No Date:_____