24

WAREHOUSE HANDLING EQUIPMENT

Material handling (MH) involves "short-distance movement that usually takes place within the confines of a warehouse and between a building and a transportation agency". It can be used to create "time and place utility" through the handling, storage, and control of material, as distinct from manufacturing (i.e., fabrication and assembly operations), which creates "form utility" by changing the shape, form and makeup of material.

Material handling refers to the storage, control, protection and movement of products and material throughout warehousing, consumption, manufacturing, disposal and distribution. Many kinds of equipment and systems exist from manual to fully automated options to help conduct material handling. Using material handling equipment is crucial for making sure a supply chain runs well.

LEARNING OUTCOMES

After studying this lesson the learner:

- defines the principles and importance of MHE;
- identifies the categories of warehouse MHE;
- explains the use and select the right type of MHE;
- finds the advantages of MHE.

24.1 PRINCIPLES OF MATERIAL HANDLING

Although there are no definite "rules" that can be followed when designing an effective MHS, the following "Ten Principles of Material Handling," as compiled by the College-

Notes

Industry Council on Material Handling Education (CIC-MHE) in cooperation with the Material Handling Institute (MHI), represent the distillation of many years of accumulated experience and knowledge of many practitioners and students of material handling:

A. **Planning Principle:** All MH should be the result of a deliberate plan where the needs, performance objectives, and functional specification of the proposed methods are completely defined at the outset.

B. **Standardisation Principle:** MH methods, equipment, controls and software should be standardised within the limits of achieving overall performance objectives and without sacrificing needed flexibility, modularity, and throughput.

C. **Work Principle:** MH work (defined as material flow multiplied by the distance moved) should be minimised without sacrificing productivity or the level of service required of the operation.

D. **Ergonomic Principle:** Human capabilities and limitations must be recognized and respected in the design of MH tasks and equipment to ensure safe and effective operations.

E. **Unit Load Principle:** Unit loads shall be appropriately sized and configured in a way that achieves the material flow and inventory objectives at each stage in the supply chain.

F. **Space Utilisation Principle:** Effective and efficient use must be made of all available (cubic) space.

G. **System Principle:** Material movement and storage activities should be fully integrated to form a coordinated, operational system which spans receiving, inspection, storage, production, assembly, packaging, unitizing, order selection, shipping, and transportation, and the handling of returns.

H. **Automation Principle:** MH operations should be mechanised and/or automated where feasible to improve operational efficiency, increase responsiveness, improve consistency and predictability, decrease operating costs, and to eliminate repetitive or potentially unsafe manual labour.

I. **Environmental Principle:** Environmental impact and energy consumption should be considered as criteria when designing or selecting alternative equipment and MHS.

J. **Life Cycle Cost Principle:** A thorough economic analysis should account for the entire life cycle of all MHE and resulting systems.

24.1.1 Importance of MHE

Material handling equipment can greatly benefit companies in diverse industries. Many companies enjoy how material handling systems and equipment improve their workplace's efficiency and safety. Additionally, material handling equipment can reduce waste, lower costs and optimise a facility's space. Here are some of the most significant benefits of using material handling equipment:

- **Greater efficiency:** One of the biggest advantages of material handling equipment is its ability to process items efficiently. Outfitting the facility with relevant material handling equipment can reduce production stoppages by improving the circulation of materials around a facility. Many different types of material handling equipment can help to get the materials to key locations faster and maintain a more consistent flow, increasing efficiency as a result.

- **Reduced waste:** When a company relies on manual labour or improper equipment to handle its materials, its materials are much more likely to get damaged during transportation and storage, leading to higher material and product waste. Outfitting the facilities with material handling equipment can reduce waste significantly. For example, stacking frames can keep crushable items safe while stacked over one another, and forklifts can securely transport pallets to various locations.

- **Lower costs:** Another major benefit of material handling equipment is its ability to help a company lower its costs. When using equipment designed to make systems more efficient and speed up processes, it can increase profitability due to decreased work stoppages and errors. Additionally, material handling equipment reduces waste; meaning'll reduce costs related to replacing damaged materials and products.

- **Better use of warehouse space:** can use various types of material handling equipment, particularly storage and handling equipment, to save space in warehouse. For example, you can install mezzanines to receive a second level of storage in the warehouse and tall racks to increase vertical storage capabilities. Additionally, side loaders allow placing aisles more closely together. Due to the better use of warehouse space, it can significantly increase warehouse capacity.

- **Increased employee safety:** A major benefit of using material handling equipment is that it reduces the need for staff to do strenuous manual labour. Since regularly lifting and hauling heavy materials by hand leads to chronic injuries, machinery designed to do these tasks for them can increase employee safety. Secure storage devices and machinery also prevent materials from falling and hurting staff.

INTEXT QUESTIONS 24.1

1. What is meant by material handling?
2. Give the role of MH
3. _____ creates "time and place utility"

   a. Material Handling

   b. Transport

   c. Supply chain

   d. manufacturing

24.2 CLASSIFICATIONS OF MATERIAL HANDLING EQUIPMENT

The classifications of material handling equipment are as follows:

A. Storage Equipment

B. Material Handling Equipment (Movement Equipment)

C. Safety Equipment

Fig.24.1: **Warehouse**

24.2.1 Storage equipment used in warehouses

- Storage in Racks - Normal Racks, High Racks, Deep Racks etc.
- Bin storage - Plastics bins
- Storage in Sacks & Silos-like Wheat, Rice, Chemicals, Fertilisers etc.

Storage equipment is also one way of ensuring the operational area of the warehouse remains clean, organised and clutter-free. The most productive warehouses are those which have efficient lats. Using a simple mechanism of shelving and sectioning, storage equipment makes it possible for various materials to be rearranged, while avoiding major accidents or potential delays.

Following are the various storage solutions available.

Table 24.1: **Storage equipment used in warehouses**

Name	Description
Selective Pallet Racking	Selective Pallet Racking is the simplest & economical racking system which allows 100% accessibility to each pallet. This racking is suitable for large variety of 'SKU's irrespective of quantity
Heavy-duty Racks	Heavy duty shelving is a simple storage solution which facilitates storage of non palletized items. Ideal for a large variety of medium to big sized items that can be handled manually.
Long span Shelving Racks	Long span Shelving is ideally suited for items: which are light/medium in weight and voluminous in nature. This type of racking is used for Auto, Retail, Engineering Sectors.
Bin Racking	Usually used in Spares parts to store smaller items.
Slotted Angle Racks	This shelving is a versatile system best suited for storage of small components, bins, carton shaving light loads up to (300 kgs) level.

Mezzanine Flooring	Column based Mezzanine floor system is a light| weight steel flooring system provided at a suitable height above the ground. The system can be configured to suit the last of the room, taking into account pillar positions, door positions etc.
Heavy Duty Mobile Racks	Comprises electrically driven trolleys which move sideways closing up the space, normally used for aisles. The mobile trolleys run on wide surface flange and high grade steel rails to distribute the imposed loads across the floor evenly.
Cantilever Racking System	Generally used where the need is to hang the products like tyres.
Drive throughRacking System	

Warehouse storage is usually of the bulk or rack variety, where bulk storage pallets are typically just stored on a floor and where rack storage pallets are stacked on racks to make use of higher ceiling space. Typical rack warehouse storage equipment as similar to above figure includes pallet racks and wire decking, heavy-duty shelving, cantilever racks, reel racks, and, sometimes, high-density storage systems such as drive-in racking, push back racking, and pallet flow racking. Inventory systems such as FIFO (first in, first out) have some bearing on which of these high-density systems are suitable. Aisle space is referred to as narrow aisle (NA) or very narrow aisle (VNA) and can place a limit on lift manoeuvrability. A typical counterbalanced lift truck needs at least 11 ft. of aisle width to turn around. Three-wheel pallet jacks are often employed in warehouses due to their improved ability to navigate through tight corridors.

24.2.2 Material Handling Solutions

Handling technology has evolved so much that it has changed the entire traditional concept of the warehouse. Material handling is an important part of material management at a warehouse. Physically moving material requires equipment of various kinds, depending upon type and amount of material to be moved. Moving material around a warehouse involves lifts and trucks of many kinds, such as pallet jacks, lift trucks, hand trucks, scissor lifts, stackers, etc. Special designs such as narrow-aisle forklifts are available for

high-density storage schemes. Wire-or rail-guided reach trucks are sometimes employed in narrow-aisle warehouses to maximise the use of storage space. Such automation, known as automated storage and retrieval, can reduce personnel requirements – at a cost. Often, such systems use horizontal or vertical carousels for the storage of stock. Special attachments are available for forklifts for handling unpalletized loads such as paper rolls or storage drums.

Conveyor systems of various kinds are also employed in some warehouses for the movement of picked goods. Both gravity and live roller conveyors are common as are skatewheel conveyors. Temporary, flexible conveyors are sometimes used as well. Warehouse management such as keeping tabs on materials and goods moving to, from, and through a warehouse is often aided by the use of mobile workstations and handheld devices. With such equipment available to them, warehouse workers are able to move throughout the warehouse and have necessary data such as pick lists immediately at hand. Barcoding and RFID tags are used to further streamline the process. Warehouse management software is used to track the flow of goods through a facility, including receiving, putaway, picking, shipping, and inventorying. Regardless of the picking method or the nature of the picking (piece, case, pallet), a rule of thumb says that the items moved most frequently should be stored closest to the pick point to minimise transit times, which make up a large portion of most picking cycles. Following are some of key material handling equipment used inside the warehouse:

Table 24.2: **Material Handling Solutions**

Name	Description
Pallet Jacks	Move heavy loads upto 6,000lbs. Handle includes a three-position (raise, lower, neutral) lever for fingertip control and one-hand operation.
Integrated Dock Leveller	Innovative designs for both integrated and edge of dock levellers are available.
TruckRestraints	Truck restraints help to maximize loading dock safety and productivity. Eliminates trailer creep and won't allow driver to pull away while still loading.
DockSeals and Shelter	Dock seals and shelters are designed to reduce energy loss, theft, product damage and insect infiltration

Strip Doors and Air Curtains	Reduce the loss of heated and cooled air while preventing the flow of dust and contaminants from parking or loading areas with these energy efficient doors.
LargeCeiling Fans	High volume low speed ceiling fans are capable of generating significant energy savings for large spaces. One fan can cover up to 20,000 sq.ft. of space
Caranes and Hoists	Free-standing bridge cranes reduce operator fatique when operating hoists, balancers, or manipulators continuously over multiple shifts
Dollies	Move heavy equipment, boxes, and other bulky items with steel or wood dollies (Related products- roller dollies, lever truck, pallet dollies, triangle dollies, wood dollies, and casters)
Trucks	Choose from wooden, steel, aluminium, or plastic work trucks (Related products. Platform truck, stocking truck, wagons, self propelled, security truck, and wire truck.
Utility Carts	Make transportation of tools and material easy. Hundreds of uses in the shop or office (Related products - Utility carts, shop truck, ergonomic carts, and ladder carts)

24.2.3 Safety equipment

Safety is another key aspect of warehousing. The people, material and equipment should be saved from any accident. Following are some of the safety equipment used inside the warehouse.

Table 24.3: **Safety equipment**

Name	Description
Emergency Wash Station	Emergency station shower is activated via at triangular pull handle, while the eyewash activates with a steel push handle

Antifatique Mats	Exceptionally buoyant mats feature raised deck-plate surface providing exceptional slip resistance. Cushions legs and spine increasing employee productivity, morale and physical well-being, Grease- and chemical - resistant
Barrier Raills	Easy to install barricades protect valuable equipment and workers from hazards in the workplace. 11-ga. steel components absorb impact of a 13.000-lb, load at 4 mph
Bollards	Heavy duty bollards provide a physical barrier between fork trucks and valuable equipment. This short post, generally 3-5 feet in height, is used to create either a visual or protective perimeter
Column Protectors	Universal rack protectors guard posts from damaging impact that can be caused by heavy machinery.
Wire Partitions	Wire enclosures work well as tool rooms, security cage, or hazardous material.
Traffic Visibility Mirrors	Wide angle convex mirrors designed to increase surveillance, provide security, and promote safety.
Handrails	Safety guardrails make overhead walkways and mezzaines safe with easy to install guardrails
Miscellaneous Equipments	A wide range of products for warehouse. distribution center, or manufacturing plant. (Related products Floor signs, waste containers, Chairs, Shop stools, and tables).

Worker safety is a primary concern in a busy warehouse. Racks are often buttressed at their ends to protect them from forklift collisions. Racks are usually fenced or enclosed along one side to avoid boxes from being pushed through and falling during handling. Many lifts are equipped with overhead guards to protect operators against injury from falling stock. Pickers wear appropriate harnesses to protect them from falls.

24.2.4 Other MHE

Industrial Trucks and Forklifts

Industrial trucks and forklifts cover a broad category of equipment. The one thing they

have in common is that all of the pieces of equipment help with transportation. Industrial trucks and forklifts are available in a range of sizes. These industrial trucks come in two main types: stacking and non-stacking trucks.

- A non-stacking truck is only for transportation.
- A stacking truck can load products and stack them.

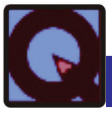
Usually, industrial trucks have attachments like insert able flat surfaces or forks to make the transportation process easier. These attachments to fit under pallets for quick and easy picking. Industrial trucks lift materials through manual or powered means. Powered industrial trucks usually have a cab, making it easy for the operator to pick up heavy material. Some power-assisted industrial cabs have to be pushed into position but can still lift materials via controls. Additionally, some more advanced industrial trucks can be automated, using optical sensors and predefined pathways to move along the warehouse floor. Some of the primary types of industrial trucks include:

- **Hand trucks:** Sometimes referred to as a dolly, hand platform trucks are some of the most basic forms of industrial trucks. They usually feature a handle for leverage and a small platform to set heavy objects on that would be difficult to carry. The operator tips the equipment onto the handle and rolls the equipment to wherever the item needs to go.
- **Platform and pallet trucks:** Platform trucks are a type of hand truck that have wider platforms and sit low to the ground. Pallet trucks, or forklifts, are designed to lift pallets. They'll slip under a pallet, and then an operator will steer the pallet wherever it needs to go. These types of trucks come in both manual and electrical forms.
- **Sideloaders:** Sideloaders are built to fit in narrow aisles. They pick up items from different directions, making them ideal when a warehouse is using more of their space by placing aisles close together.
- **Walking stackers:** A walking stacker lifts and moves materials like a forklift. Though they don't come with a cab for an operator, they can come in electric versions to assist with transportation.
- **Pallet jacks:** One of the common types of warehouse equipment, pallet jacks are a very basic form of a forklift. They're used to move materials around a warehouse and are often manually pushed, though there are powered options as well.
- **Order pickers:** An order picker lifts operators high off of the ground and allow them to get too hard-to-reach materials on high shelves.

Bulk Material Handling

Bulk material handling equipment refers to the equipment that stores, controls and transports materials in bulk. Usually, the materials will be in a loose form. This type of equipment typically handles beverages, metal items, minerals, food and liquid. An example of a bulk material handling system is the use of a conveyor belt to move materials from one area of the production floor to another. 'll see hoppers and drums funnel loose items into areas where the items can be packaged or manipulated in some way. Common examples of this type of material equipment include:

- **Stackers:** These pieces of bulk material handling move items from one point to another. Stackers are automated and will place various items and products onto stockpiles.
- **Conveyor belts:** One of the key parts of a conveyor system is a conveyor belt. They usually utilize pulleys or drums to rotate the belt and move material on it across a facility.
- **Reclaimers:** A reclaimer is a large machine used to pick out materials from stockpile.
- **Bucket and grain elevators:** Bucket elevators are sometimes called grain legs. They help to transport bulk materials vertically. Grain elevators move materials along a production pathway, as well as store it.
- **Hoppers:** Hoppers are shaped like funnels and are used to dump or pour materials into containers. They can close off their opening and hold onto the material until it needs to be released.
- **Silos:** Common on farms, but useful in a variety of facilities, a silo is a tower that holds materials. Common materials stored in silos include grain, woodchips, coal, sawdust and food.



INTEXT QUESTIONS 24.2

1. How MHE are classified?
2. Give examples for bulk handling equipment?
3. _____ is referred as dolly

   a. Hand trucks b. Hoppers

   c. Stackers d. Pallet truck

24.3 USE OF MATERIAL HANDLING EQUIPMENT'S IN A WAREHOUSE

Forklifts, reach trucks, order pickers and pallet trucks are the typical parts of the material handling equipment (MHE) fleet. Anything that relates to the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing distribution, consumption and disposal is part of this category of equipment. Used to increase output, control costs, and maximize productivity, warehouse management has a number of ways to determine how efficient is the use of the material-handling equipment in any kind of operation.

Uses of Material handling equipment are as follows:

- Reduce manufacturing cycle time
- Reduce delays, and damage
- Promote safety and improve working conditions
- Maintain or improve product quality
- Promote productivity
    - Material should flow in a straight line
    - Material should move as short a distance as possible
    - Use gravity
    - Move more material at one time
    - Automate material handling
- Promote increased use of facilities
    - Promote the use of building cube
    - Purchase versatile equipment
    - Develop a preventive maintenance program
- Control inventory

24.3.1 Selecting the Right Materials Handling Equipment

With all of the benefits of using bulk material handling equipment, any one might be interested in investing in such equipment. So, learn more about the main considerations want to take when determining the right equipment:

A. **Material type:** Start by defining what kind of material'll be handling. The weight,

size and shape of the material, as well as if it's gas, solid or liquid, can all affect what kind of material handling equipment 'll need. If a piece of equipment can't handle materials efficiently or safely, remove it from the list.

B. **Facility of space:** The amount of space facility will affect the equipment choice. Different types of warehouse equipment are more suited for smaller or larger spaces. Before choosing the equipment, ensure it can reach materials, fit between aisles and safely navigate the space.

C. **Production flow:** When company has a consistent production flow between two fixed positions, it can likely use a full conveyor system. However, if production flow faces a lot of change,'ll likely want to prioritize machinery that can easily change directions and navigate new routes around the facility.

D. **Operation types:** Besides the production flow, may want to take into account the types of operations regularly perform. For example, rental equipment can be better for temporary operations, while buying a piece of equipment can be better for permanent operations. Additionally, it's important to understand if material flow pattern is horizontal or vertical.

E **Expense:** As to pick any equipment, need to consider whether it is affordable or not. Also want to consider the maintenance and operating costs of various pieces of equipment to ensure're getting the most value for money.

F. **Structural factors:** Before selecting any equipment, ensure its compatible with facility's structural factors. For example, the material handling equipment should work with the facility's structural strength, door and ceiling dimensions and floor conditions.

G **Reliability:** Any company knows the value of reliable equipment, as it keeps their production flow running smoothly and avoids expenses related to maintenance. Ensure the most reliable equipment possible and comprehensive after-sale support.

INTEXT QUESTIONS 24.3

1. Give the prime use of MHE
2. Which major criteria you will find in selecting the MHE
3. Before choosing equipment, ensure it can reach the materials, fit between _____ and safely navigate the space

   a. Aisles b. Route

   c. Spaces d. All these

24.4 ADVANTAGES OF MHE

MHE is crucial for the success of a company as it looks to handle material efficiently. Improper storage and handling can cause product loss, damaged material and inefficiency in the supply chain. To avoid these issues, investment in material handling equipment designed should be made for the needs of every company and the materials they handle. Below are some of the ways a good material handling system can provide distinct advantages to a company:

A. Reduce Material and Product Waste:

A common issue warehouses and facilities face is the lack of proper storage systems and the presence of equipment that mishandles materials. These issues can lead to products becoming damaged or wasted during the storage or transportation process. This material waste can lead to higher costs for the company handling the material and dissatisfied clients who expect their products to be well cared for.

Proper warehouse storage equipment will ensure items in the warehouse are stored safely. For instance, stacking frames can help a company keep crushable materials stacked on top of each other without harming the items. Improved warehouse transportation equipment also helps to move materials more efficiently and safely, reducing the chances that materials get dropped or harmed. Additionally, a material handling system can help companies keep a more accurate track of their inventory. For instance, proper shelving and organizational features help companies know exactly where to find products and keep track of them when they need to be moved. Computerized systems can automatically track inventory and ensure always have the correct number of products.

B. Lower Material Handling Costs

One of the biggest concerns of those who use material handling equipment in their business is to lower their cost. Much of a company's production process is built around material movement, procurement and storage. These aspects of the process can cost a significant amount of money, especially if the material handling system is inefficient. If a material handling system can't handle the flow of materials efficiently, stoppages can occur, leading to new costs and lower profitability.

Proper material handling equipment and systems will keep the production process running smoothly. Fully automated systems can ensure there's no guesswork in handling product and reduce the chance of user error. Even proper manual equipment can help a company better handle material, ensuring it gets to point A to point B efficiently. The higher initial costs of more sophisticated equipment are well worth it, as they help a company handle more material with greater speed and efficiency. In the long-term, 'll lower costs associated with errors, damaged equipment and work stoppages.

C. Greater Warehouse Capacity

Optimizing a warehouse's capacity to hold more goods is one of the most important things one can do to increase profitability. With appropriate storage and handling equipment, can use more of the warehouse's space for increased storage capacity.

Sideloaders allow to place aisles closer together, as they can easily fit in between them and pick out equipment from either side. Another example of warehouse equipment opening up floor space is the use of racks, stacking frames and mezzanines. With this storage and handling equipment, can stack pallets and materials higher safely. By increasing the warehouse's capacity, it can hold more goods without increasing storage costs. Efficient storage means efficient production. As a result, can raise overall production ability and potentially raise profitability.

D. Better Work Conditions and Worker Safety:

Manually lifting materials and transporting them can be very time-consuming and strenuous for workers. Workers can get burnt out doing this kind of manual labor and run a higher risk of injuries. With equipment, make their work much easier, freeing them up for more tasks and creating a more enjoyable workplace. Also reduce the chance that mistakes happen, which makes it so managers have much fewer headaches to manage during the workweek.

Additionally, when automating much of the material handling process and giving staff powerful equipment to handle heavy loads, make the workforce much safer for employees. Lifting heavy materials can cause many chronic injuries, especially if workers aren't properly trained. Improperly stored material could also fall on workers, hurting them a great deal. MHE in warehouses helps workers conduct these strenuous tasks, lowering their chance of injury.

E. Better Material Flow

Often, materials enter a facility i n a raw form and exit in the form of completed products or goods. If the facility handles multiple steps of a production process, the material needs to flow smoothly. Not having the proper warehouse equipment can lead to stoppages in production. For instance, an improper material handling system could cause product damage or delay material from reaching the appropriate stage.

With an improved system and pieces of equipment, improve material's circulation around the facility. The material will get to the needed stations and locations faster, ensuring flow stays consistent. A positive side effect of the improved material flow is that it causes materials to stay in the facility for shorter periods of time and gets to consumers faster.

F. Improved Distribution

Ability to deliver final goods to wholesalers and retailers is crucial to these clients' satisfaction. Not having MHE and other warehouse equipment can cause products to get to clients much slower. Poor storage and packaging equipment and systems can lead to damaged products. Damaged products and slower distribution are a recipe for dissatisfied clients.

With the best material handling equipment in the corner, I can make sure products are stored safely and distributed properly. A conveyor system, for example, can move products through different stages of the production process and get them in position for distribution.

G. Conclusion

Building Warehouse and managing it is a large investment. Like any other investment this investment too will demand a return on investment (ROI). The warehousing space is a cost and needs to be utilized in the best possible manner. All possible ways need to be adopted to maximize its utilization. MHE reduces human efforts and allows safe and quick storage and retrieval of material. Different kinds of rack are available to utilize the height or the space and store material vertically. Similarly, forklifts and reach stackers can be used to unload the materials and move within the warehouse. The safety equipment ensures the safety of the people operating in the warehouse. Right set of MHE are critical for the success of the warehouse. Technologies like AGV have completely overturned the concept of man going to material. It is material which is now coming to man. Blockchain, IOT, AI, Big data all newer technologies are not impacting other fields of business but Supply Chain too in a large manner.

INTEXT QUESTIONS 24.4

1. List the advantages of MHE
2. What is sideloaders
3. An improper material handling system could cause product _____

   A. Damage

   B. Delay

   C. Only a

   D. Both a & b

WHAT HAVE YOU LEARNT

Material handling	• "Short-distance movement that usually takes place within the confines of a warehouse and between a building and a transportation agency" • used to create "time and place utility" through the handling, storage, and control of material (i.e., fabrication and assembly operations) • can reduce waste, lower costs and optimize a facility's space
Work Principle	• MH work (defined as material flow multiplied by the distance moved) should be minimized without sacrificing productivity or the level of service required of the operation.
Better use of warehouse space	• Install mezzanines to receive a second level of storage. • tall racks to increase vertical storage capabilities. • Sideloaders to place aisles more closely together.
Storage equipment	• ensures the operational area of the warehouse remains clean, organized and clutter-free.
Pallet Jacks Industrial trucks	• Move heavy loads upto 6,000lbs • A non-stacking truck is only for transportation. • A stacking truck can load products and stack them.
Bulk material handling equipment	• typically handles beverages, metal items, minerals, food and liquid.
Uses of Warehouse handling equipment	• Reduce manufacturing cycle time • Reduce delays and damage • Promote safety and improve working conditions • Maintain or improve product quality • Promote productivity • Promote increased use of facilities • Control inventory
Role of Safety equipment	• people, material and equipment saved from any injury, damage, accident.

KEY TERMS

Material handling, Greater efficiency, Reduced waste

Lower costs, Better use of warehouse spaceIncreased employee safety

Storage equipment, Handling equipment, Safety equipment

Industrial Trucks and Forklifts, Bulk Material Handling

TERMINAL EXERCISE

1. What is warehouse equipment?
2. What is storage equipment?
3. What is safety equipment?
4. What is bulk material handling?
5. What is the use of a narrow aisle?
6. What is the use of warehouse equipment?
7. Explain the function of storage equipment?
8. What type of safety equipment is available in the warehouse?
9. Differentiate stackers and hoppers?
10. How Industrial Trucks and Forklifts are utilized?
11. Explain the importance and benefits of handling equipment?
12. Describe the various storage and safety equipment?
13. Discuss about the bulk material handling equipment?
14. Describe the selection criteria of material handling equipment?
15. Brief about the advantages of handling equipment?

ANSWERS TO INTEXT QUESTIONS

24.1

1. Material handling refers to the storage, control, protection and movement of products and material throughout warehousing

2. Warehouse handling equipment can reduce waste, lower costs and optimize a facility's space.

3. a. Material Handling

24.2.

1. A. Storage Equipment

   B. Material Handling Equipment (Movement Equipment)

   C. Safety Equipment

2. Conveyor belts and Bucket and grain elevators

3. a. Hand trucks

24.3.

1. Reduce manufacturing cycle time

   Reduce delays, and damage

   Promote safety and improve working conditions

   Maintain or improve product quality

2. Material type

   Facility lat

   Production flow

   Operation types

   Expense

   Structural factors

   Reliability

3. d. All these

24.4

1. Reduce Material and Product Waste, Lower Material Handling Costs, Greater Warehouse Capacity, Better Work Conditions and Worker Safety, Better Material Flow and Improved Distribution

2. Sideloaders allow to place aisles closer together, as they can easily fit in between them and pick out equipment from either side.

3. Damage

DO AND LEARN

The students would have used equipment for various purposes in their houses and in reality, it could be discussed among them to have an idea of how equipment or machinery helps them to make their work easier.

ROLE PLAY

A group of students could visit nearby godowns/regulated markets/marketing yards/ distribution centers of retailers and see how the materials are handled with the use of simple equipments and another group could learn the same operations in milk depos, fruit and vegetable collection centers for their practical exposure and similar kind of exercise they could practice by assuming the role of handling various equipments.