

MATERIAL HANDLING

Introduction of Material Handling.

- Material handling involves the movements of materials manually or Mechanically in batched groups or one item at a time within the plant the movement maybe horizontal, vertical or the combination of both.
- Starting from the time, the raw material enters the factory gate and goes out of the factory gate in the form of finished product, it is handled at all stages in between the stores and in the shop floor.
- It has been estimated that average material handling cost is roughly 20 to 35% of total production cost

Introduction of Material Handling.

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- It has also been estimated that a component may be handled even 50 times or more, before it changes to finished product. So the production cost can be lowered considerably by making a saving in the material handling cost.
- In workshop 20 to 40% of the plant accidents are the results of bad methods of material handling.
- So we can say that, material handling means providing the right amount of the materials in right condition, at the right place in right time , in the right position & in the right Sequence by using the right method.

MATERIAL HANDLING

- There are two main functions and principles of Material Handling:-
- To choose production machinery and assist in plant layout
- To choose most appropriate MHE which is safe and at the minimum possible overall cost.

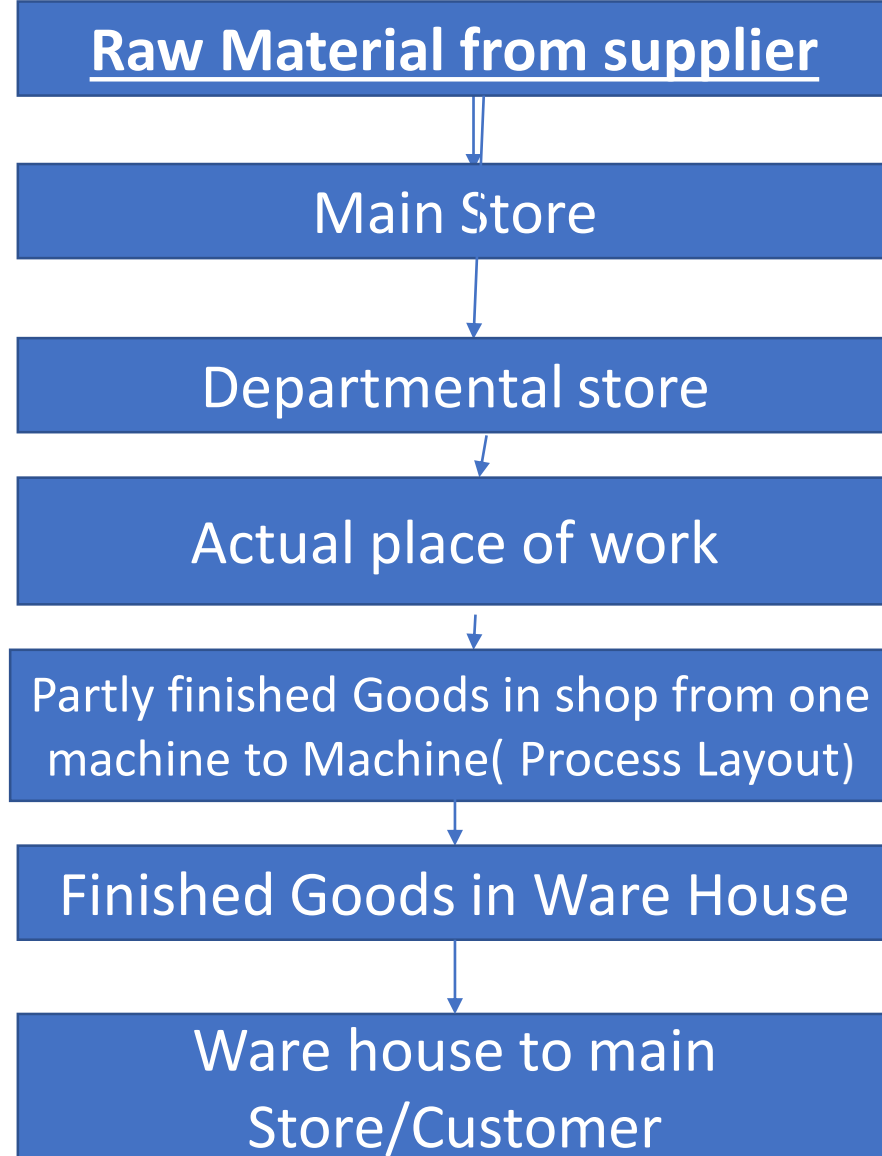
THE EFFECTIVENESS OF EFFICIENT MATERIAL HANDLING SYSTEM:

- Minimize the movement in a production operation.
- Reduction in manufacturing cycle time movement of materials can speeded up or the distance moved by material adopting shortest route.
- Using the principle of containerization to move optimum numbers of pieces at the same time.
- Using mechanical aids in place of manual labour.

THE EFFECTIVENESS OF EFFICIENT MATERIAL HANDLING SYSTEM

- Provide for improved working conditions and greater safety in the movement of materials.
- Better flow of goods.
- Loss rejection of materials by handling material efficiently
- Safe handed, efficient, flexible and proper sized MHE should be selected.
- Utilize gravity for material movement whenever possible.
- Better utilisation of storage capacity.
- Design container packages etc. to reduce damage to the material in transit.
- Higher productivity at lower cost.

Flow chart of Material handling



Guiding principles for an efficient material handling system

- **Principle of Planning-**

- ✓ Pre planning of all material handling activation must be done for its efficient operation and employment.

- **Principle of System Analysis:**

- ✓ All the activities like receiving of raw material, and finished goods, storage, production, inspection, Packaging & Transportation should be considered as necessary operations of a system and effort should be made as many of these activities as practical.

- **Principle of Material Flow-**

- ✓ For minimum flow or movement of material for all the necessary operations best plant layout should be planned.

- **Principle of simplification-**

- ✓ Handling should be simplified by reducing, combining or eliminating necessary movements of work or equipments.

Principle of space utilization :

- According to this principle, the space of the plant should be best utilized for minimum movement of material handling.

Principle of unit size

- The quantity, size or weight of unit load or flow rate should be increased to the possible limit.

Principle of Mechanization-

- ✓ Handling operations should be mechanized.

Principle of Automation-

- ✓ Automation should be introduced in production & handling function.

Following factors may be considered while selecting MHE:-

Materials to be moved:

- Size of material, shape, weight, nature (solid, liquid , gas etc) should be considered.

Plant building and Layout:

- Width of assets, uneven floor level, width of doors, height of ceiling, strength of floor walls column etc.

Types of production machines:

- Different machines have different output for unit time. The MHE should be able to handle the maximum output.

Types of material flow pattern:

- Vertical flow pattern will require elevators, conveyors, pipes etc whereas horizontal flow pattern will needs trucks, overhead bridge cranes, conveyors etc.

TYPE OF PRODUCTION:

- It affects the selection of MHE on large extent.
- Conveyors are more suitable for mass production , power trucks for batch production.

Cost of MHE:

- Handling cost.
- Life of the equipment.
- Amount of care and maintenance required for MHE.

Different types of Material Handling Equipments:-

- **Manual:-**

- a) Two Wheel Trolley
- b) Three wheel Trolley
- c) Four wheel trolley

- **Powered:-**

- a) Fork lift
- b) Crane-
 - i) EOT Crane
 - ii) Jib Crane
 - iii) Hoist
 - iv) Gantry
 - v) Truck
 - vi) Conveyor

Two wheels Trolley:-

- This type of trolley is used to carry material within the shop & the handling object is not large.
- Only one person can carry materials by pulling or pushing this trolley.

Three Wheels Trolley:-

- This type of trolley having three wheels, one in front & two wheels are in rear.
- The diameter of wheels in the rear are larger than front.
- Ball type bearing is fitted in its wheel.

Four Wheels Trolley:-

- This type of trolley having Four wheels & manually operated.
- The dia. of all wheel are same.
- Bearing is fitted in its wheel
- It is generally use to carry bulky & heavy materials within the shop or other shop which is nearer to parent shop.

Fork lift

- The forks are attached to a column on the track.
- Fork can be lifted to the desired height along with the material (boxes) in them & the material can be stacked at the proper place, even very close to the roof.
- It is used for short distances(40 to 70m) travel and for indoor applications normally.



Different types of Cranes used for Material handling-

- **Different types of cranes are –**

- i) EOT (Electric Overhead Travelling Crane)

- ii) JIB Crane

- iii) Hoist Crane

- iv) Gantry Crane

EOT Crane

- EOT stands for Electric Overhead Travelling Crane.
- This is used for handling and moving with a maximum specified weight of the components called capacity of the crane within a specified area.
- Generally the crane is operated by Electric power.
- This crane moves on the Gantry Rails fixed on the top of the gantry Girders.
- This crane having three common motions-
 - HOISTING
 - CROSS TRAVEL
 - LONG TRAVEL



EOT CRANE

EOT (Electric Overhead Travelling)Crane:-

- An EOT crane having the following parts:-
 - a) Bridge Girder
 - b) End Carriages
 - c) Platforms
 - d) Long Travelling Mechanism
 - e) Crab
 - f) Cabin & Electric equipments

Bridge Girder:-

- A Bridge girder consists of a welded, riveted or machine bolted structure which is composed of a single girder or double Girders
- This is the main supporting members for all dead & live load.

End Carriages:-

- End Carriage contain Long Travel driving Wheels as well as idle wheels and support the girders at the end.

Platforms:-

- These provide support for the LT machinery as well as idle wheels and sometimes for the electrical panels.
- This also provide walking space along the span of the Crane.

Long Travelling Mechanism:-

- To move the Crane along the bay length. It consists of
 - a) One Motor at the center t span or 02 motors provided at ends of span.
 - b) Electromagnetic or thruster Brake which brake to long travel motion.
 - c) Gear box which provides exact speed ratio as required between motor and Lt wheel.
 - d) Lt shaft which transmits the torque from gear box output to wheel.
 - e) Wheel moves on the gantry rail along the bay length.

Crab:-

• It consists The TWO Machineries:-

1) Hoist- It is the mechanism of the crane by which it lift the load in up & down movement of a job.

It is having the following parts-

- ✓ Motor
- ✓ Electromagnetic/Thruster Brake
- ✓ Gear box
- ✓ Drum
- ✓ Wire Rope
- ✓ Snatch block/Bottom Block
- ✓ Shaft & coupling

2) Cross Travel Machinery:-

- It consists the following parts-
 - ✓ Main Motor & Auxiliary Motor
 - ✓ Brake Gear box
 - ✓ Shaft & coupling
 - ✓ Wheel

Cabin & Electric equipments:-

- ✓ A cabin if provided is suspended from one end of the girder.
- ✓ Master controllers and the main electric panels are mounted in driver's cabin.

Electromagnetic or thruster Brake:-

- The braking torque of the brake is produced by the action of a strong compression spring.
- Normally when there is no power is available due to its strong spring action it apply the brake not to move the pulley.
- When the current is switched ON the brake is released by the solenoid/Thruster against the pressure of the operating spring
- The normal position of the of the brake is therefore 'ON'.
- The length of the brake operating spring is set during assembly to give the required torque & no substitute alteration is required.
- The heavy duty Cast iron brake shoes having Fabric lining secured with brass and aluminium rivets, they have large pulling surfaces & self-aligning.



JIB CRANE

JIB Crane:-

- A Jib crane having a Column which is rigidly connected with 04 nos. grouting Bolts.
- A horizontal I-section is connected with this vertical column at 90 degree by Thrust Bearing.
- In a jib crane hoist unit is mounted on this I-section & generally all these are supported by the Column.
- A Jib Crane is preferred where lifting of the job is required in a few locations only or where EOT crane can't be erected, for example outside near the wall of the building.



HOIST CRANE

Hoist:-

- It is mounted on a single Rail.
- It is generally used for chemical cleaning of material

Gantry Crane:-

- A Gantry acts as an auxiliary to bridge crane.
- It is on wheel and can be moved at the place of use.

A gantry crane is a type of overhead crane with a single or double girder configuration supported by freestanding legs that move on wheels or along a track or rail system.

Larger gantry systems may run on a rail or track embedded in the ground, typically in a straight line in a dedicated work area.



Gantry Crane

Conveyor:-

- It is employed to transport materials over a fixed path which may be horizontal or inclined (up & Down) to different locations in a factory.



Conveyor