

AUTOMATED MATERIAL HANDLING



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Introduction

- Material handling is defined as "the movement, storage, protection and control of materials throughout the manufacturing and distribution process including their consumption and disposal".
- **The purpose of material handling in a factory is to move raw materials, work piece-in process, finished parts, tools, and supplies from one location to another to facilitate the overall operations of manufacturing.**
- The handling of materials must be performed safely, efficiently, at low cost, in a timely manner, accurately (the right materials in the right quantities to the right locations), and without damage to the materials.

OBJECTIVES OF MATERIAL HANDLING

- To lower unit materials handling cost.
- To reduce manufacturing cycle time.
- To provide better control of the flow of materials.
- To provide better working conditions.
- To provide better quality by avoiding damages to products.
- To increase storage capacity through better utilization of storage areas.
- To provide higher productivity at lower manufacturing costs.

Types of Material Handling

Manual handling

Manual handling refers to the use of a worker's hands to move individual containers by lifting, lowering, filling, emptying, or carrying them.

Automated handling

Whenever technically and economically feasible, equipment can be used to reduce and sometimes replace the need to manually handle material.

AUTOMATION IN MATERIAL HANDLING

Automation

- **The term automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, and other applications with minimal or reduced human intervention or efforts.**
- **The biggest benefit of automation is that it saves labor; however, it is also used to save energy and materials and to improve quality, accuracy and precision.**
- **In material handling process most work is done through by Automated Guided Vehicles, Rail Guided Vehicles, Robots, Automated storage and retrieval system.**

Use Of Automation

- To increase labor productivity.
- To reduce labor cost.
- To mitigate the effects of labor shortages.
- To reduce or remove routine manual and clerical tasks.
- To improve worker safety.
- To improve product quality.
- To reduce manufacturing lead time.
- To accomplish what cannot be done manually.

INTRODUCTION To Automated Guided Vehicles

Automated Guided Vehicles

- It is a material handling system that uses independently operated, self-propelled vehicles guided along defined pathways. The vehicles are powered by on-board batteries that allow many hours of operation (8-16 hr. is typical) between recharging.
- The Automated Guided Vehicle belongs to a class of highly flexible, intelligent, and versatile material-handling systems used to transfer materials from various loading locations to various unloading locations throughout the facility.

Applications of AGV

Some of the applications areas of Automated Guided Vehicles include:

- Driverless train operations
- Assembly line operation
- Flexible manufacturing system
- Raw material handling
- Pallet handling
- Finished product handling
- Trailer loading

Components Of AGV

There are four main components of an automated guided vehicle system. They are summarized as follows:

- The Vehicle: It is used to move the material within the system without a human operator.
- The Guide Path: It guides the vehicle to move along the path.
- The Control Unit: It monitors and directs system operations, including feedback on moves, inventory, and vehicles.
- The Computer Interface: It is connected with other computers and systems such as mainframe host computer.

AGV Types

Driver less trains

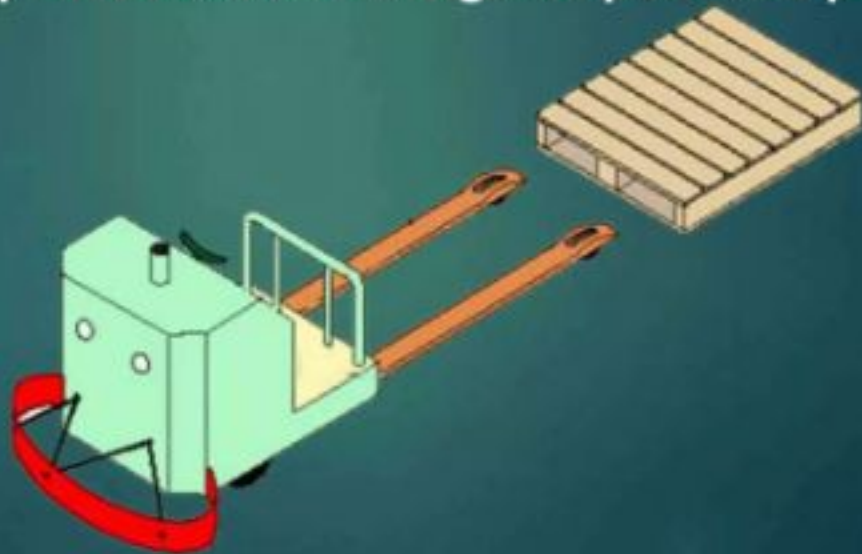
- ❑ Consists of towing vehicle, which is the AGV that pulls.
- ❑ One or more trailers forming a train.
- ❑ Heavy payloads.
- ❑ Large distances like in a warehouse.
- ❑ With or without intermediate pick-up and drop-off points along its path.





Pallet trucks

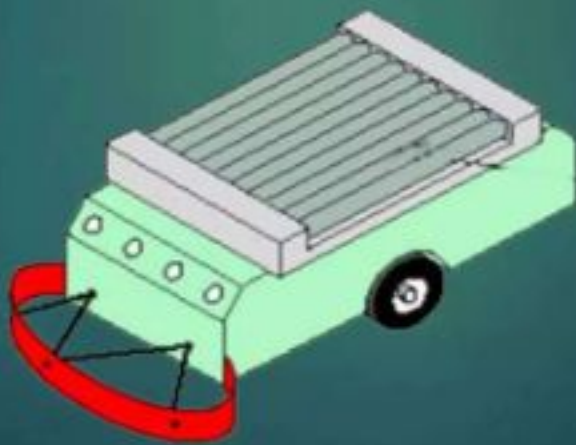
- Used to move palletized loads along predetermined routes
- Vehicle is backed into loaded pallet by worker; pallet is then elevated from floor
- Worker drives pallet truck to AGV guide path and programs destination.





Unit load carrier

- These are used to move **unit loads** from one station to another.
- **Light load** AGVs, up to **250 kg** or less.





Vehicle Guidance Technology

- **The guidance system is the method by which AGVS pathways are defined and vehicles are controlled to follow the pathways.**
- **The primary objective of a guidance system is to keep the vehicle in the pre-designated path.**

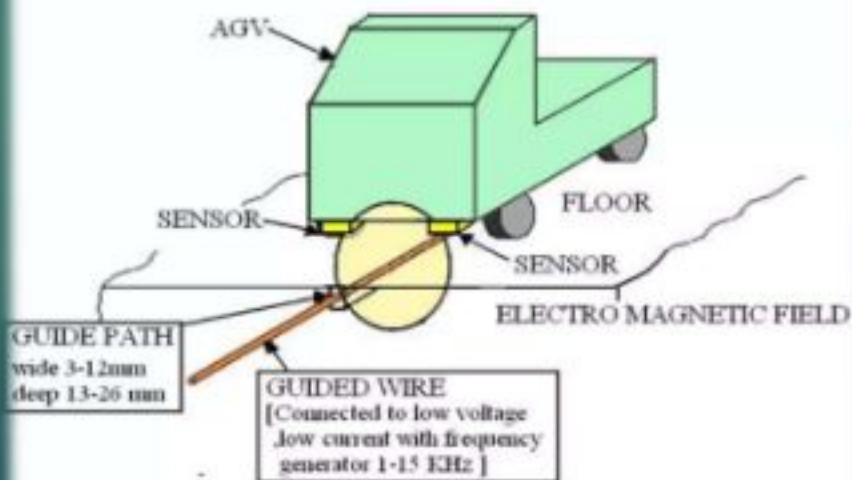
The widely used methods to set the path for AGV are :

- Imbedded guide wires
- Paint strips (Optical navigation system)
- Self guided vehicles (Laser triangulation navigation system)

Imbedded Guide Wires

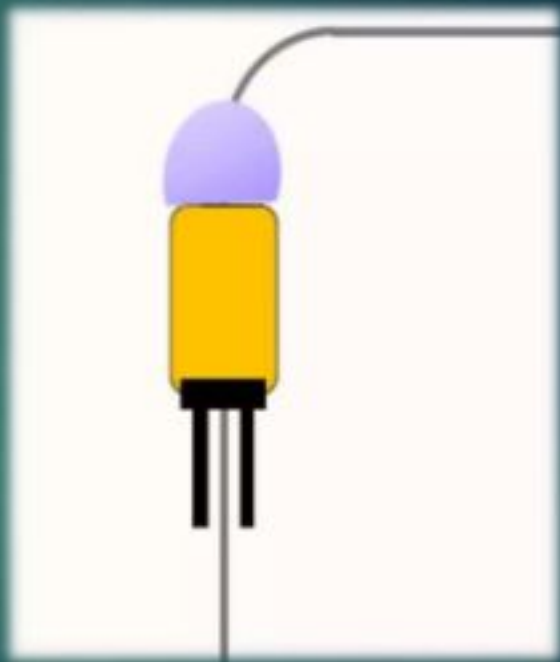
In the imbedded guide wire method, electrical wires are placed in a small channel cut into the surface of the floor. The guide wire is connected to a frequency generator, which emits a low-voltage, low-current signal with a frequency in the range 1-15 kHz. This induces a magnetic field along the pathway that can be followed by sensors on-board each vehicle.

- Faster and safer
- More accurate
- Less costly
- Simpler and less programming required.



Paint strips (optical navigation system)

- **Chemical or tape strip is fixed or painted to the floor which contain fluorescent particles that reflect UV light source from vehicle.**
- Vehicle has an onboard sensor which allows it to detect the path.
- **Useful in environment where guide wires in the floor surface is not practical.**



Self Guided Vehicles

(Laser triangulation navigation system)

- **Most popular method of AGV navigation.**
- Operate without continuously defined pathways.
- **Use combination of dead reckoning (capability of a vehicle to follow a given route in the absence of a defined pathway) and beacons located throughout the plant, which can be identified by on board sensors.**
- Continuously verify position by comparing the calculated position with one or more known position.

AGV Control System

- **Computer Control Systems**

Most efficient but most expensive and complex controller

- **Remote dispatch control system**

- **Human interactions take place using remote controls.**
- **Human factor is not directly involved in performing the task.**
- **Only destination and material information are sent.**

- **Manual control systems**

- **Operator loads the vehicle.**
- **Inputs the location and path information on the board.**
- **Vehicle is routed by itself.**
- **Unloading is being done by humans as well.**

Bibliography:

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By-Siddhartha Roy

Thank You

