Subject:

“Automated guided vehicle”.(AGV)

CONTENTS

Introduction

AGVs increase **efficiency** and **reduce costs** by helping to automate a manufacturing facility or warehouse.

AGVs can **carry loads or tow objects** behind them in **trailers**. The trailers can be used to move raw materials or finished product. The AGV can also store objects on a bed. some AGVs use fork lifts to lift objects for storage. AGVs are employed in nearly every industry, including, **paper, metals, newspaper and general manufacturing**.

An AGV can also be called a **laser guided vehicle(LGV**) or self-guided vehicle (SGV). In Germany the technology is also called **Fahrerlose** Transport system (FTS) and in Sweden Forarlosa trucker.

AGVs are available in a variety of models and can be used to move products on an assembly line, transport goods throughout a plant or warehouse.

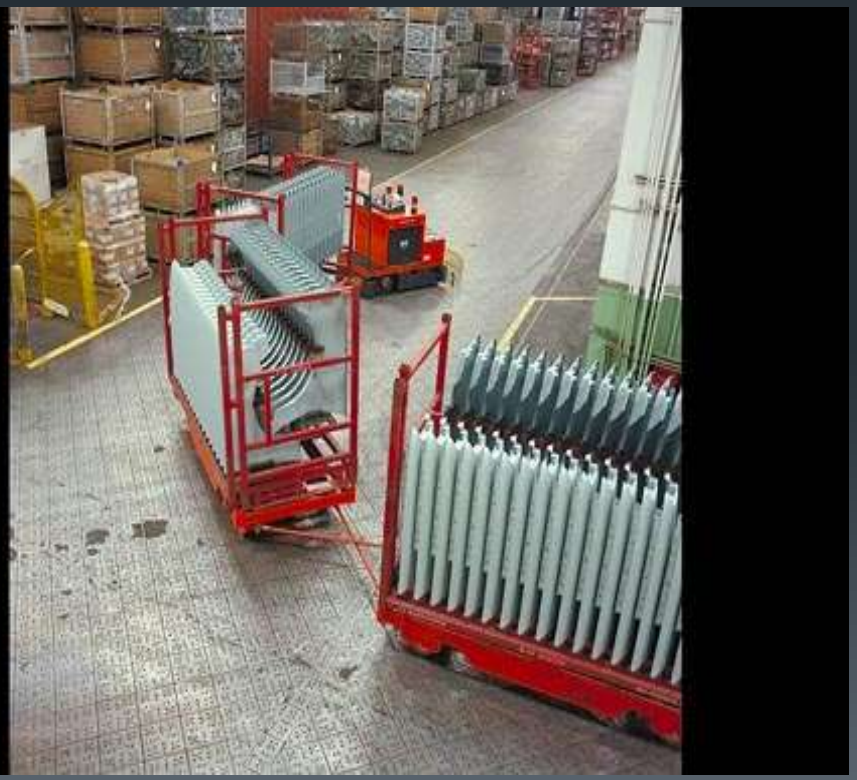
History of AGV'S

The first AGV was brought to market in the **1950s**, by **Barrett Electronics of Northbrook**, and at the time it was simply a tow truck that followed a wire in the floor instead of a rail. over the years the technology has become more sophisticated and today automated vehicles are mainly **Laser navigated** ex: LGV.

In an automated process, LGVs are programmed to communicate with other robots to ensure product is moved smoothly through the warehouse, whether it is being stored for future use or sent directly to shipping areas. Today the AGV plays an important role in the design of new **factories** and **warehouses.**

What is AGV?

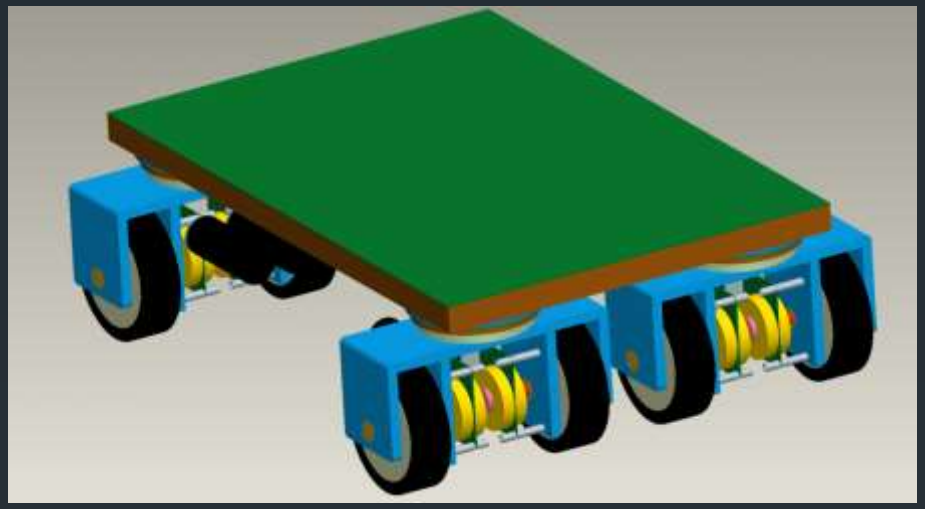
AGV is a material handling system that uses independently operated, self-propelled vehicles guided along defined pathways.

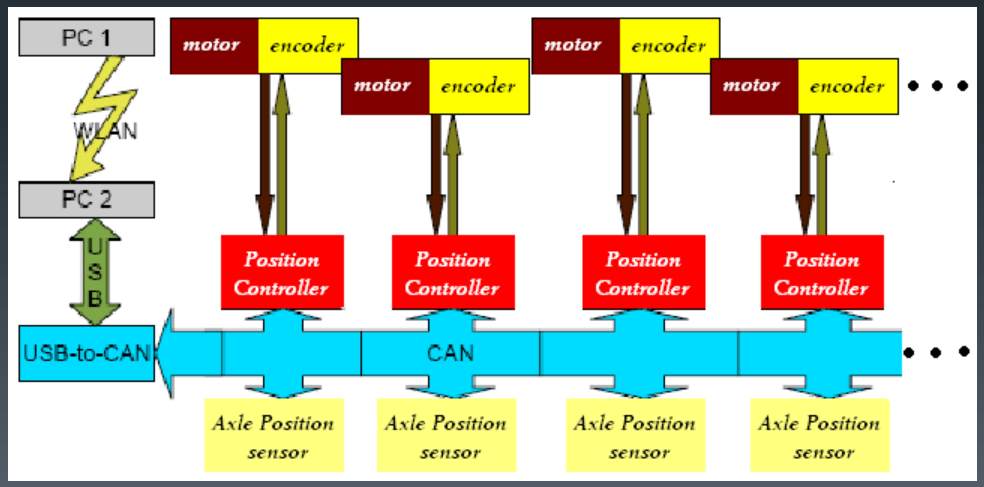


System Features

- High dynamic operation
- Innovative steering method
- Robust design
- CAN Bus system communication
- Speed control separately for each wheel
- Angular position control separately for each axle
- Low energy consumption by self charging

System Concept

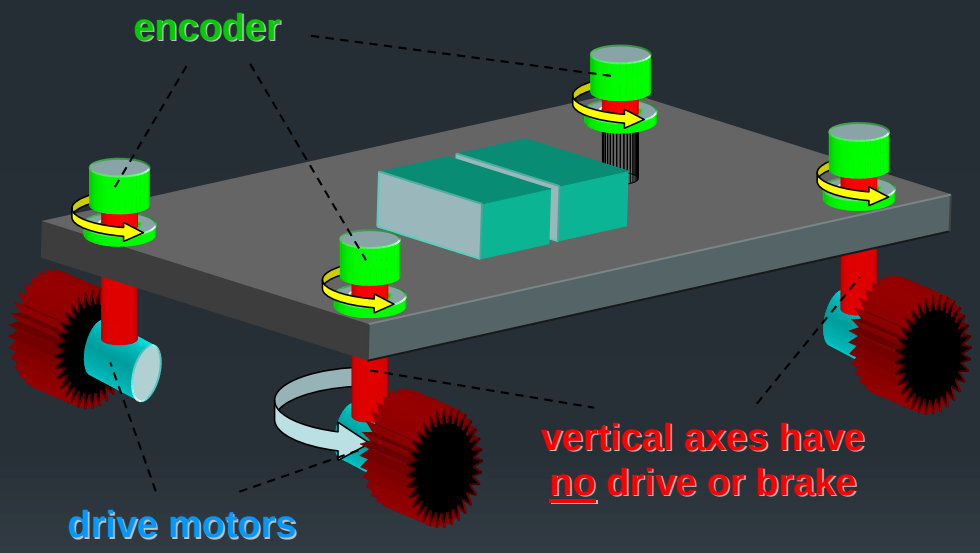




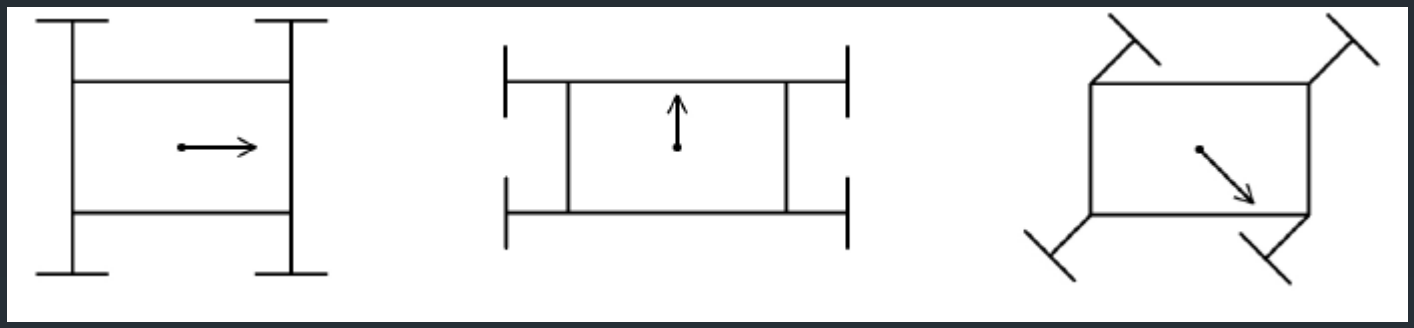
- 4 drive units - 4 steering axles
- 2 motors for each unit
- 1 Controller for each motor
- Communication with CAN Bus
- Host computer gets speed-position information and determines the drive path

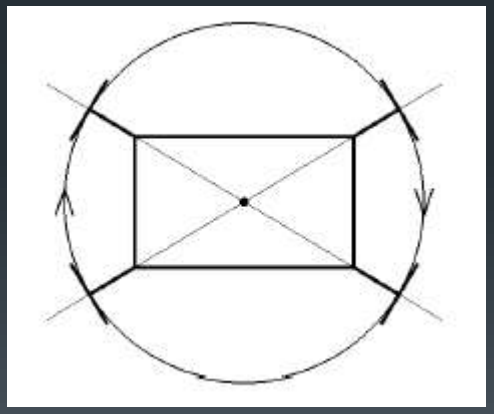
Innovative Steering-The Max

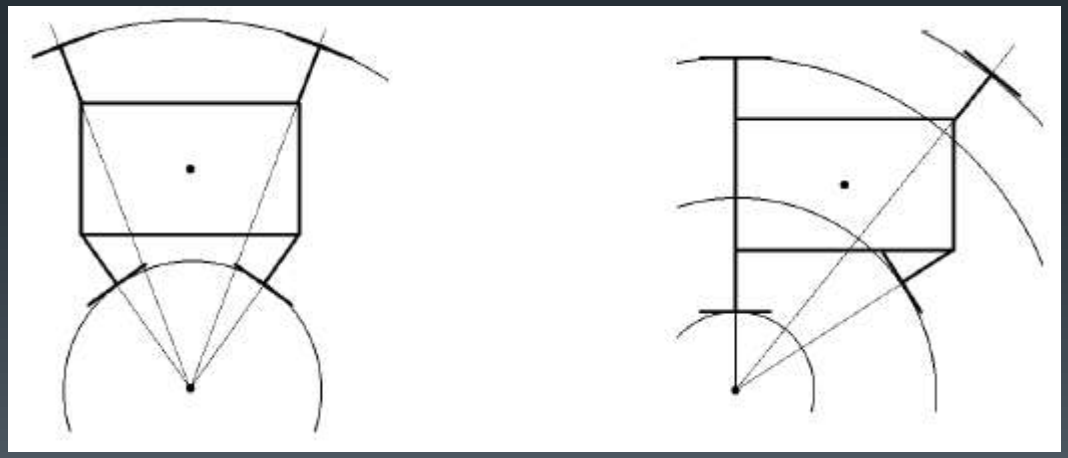
- Each unit (axle) is steered around its origin by the torque difference between two motors
- Closed loop control is established by angular position information of each axle



High Dynamics Movement







Battery Charging with Generative Braking

- 4-quadrant mode for motor-generator driving.
- Circuit integrated to obtain braking energy form the drives.
- Special capacitor for storing voltage and charging the battery.
- Its optimised by “self charging programme “ at specific charging place after periodic time.
- Some manufacturers are providing “battery swap options” .

Types of AGV’S

- Driverless trains
- AGV’s pallet trucks
- Unit load carriers

Driverless trains:-

- It consists of a **towing vehicle** that pulls one or more trailers to form a train.
- This type is applicable in moving **heavy pay loads** over **large distance** in **warehouses or factories** with or without intermediate pickup and drop off points along the route.
- It consists of **5-10 trailers** and is an **efficient** transport system.
- The towing capacity is up to **60,000** pounds (27,000 kilos) approx.

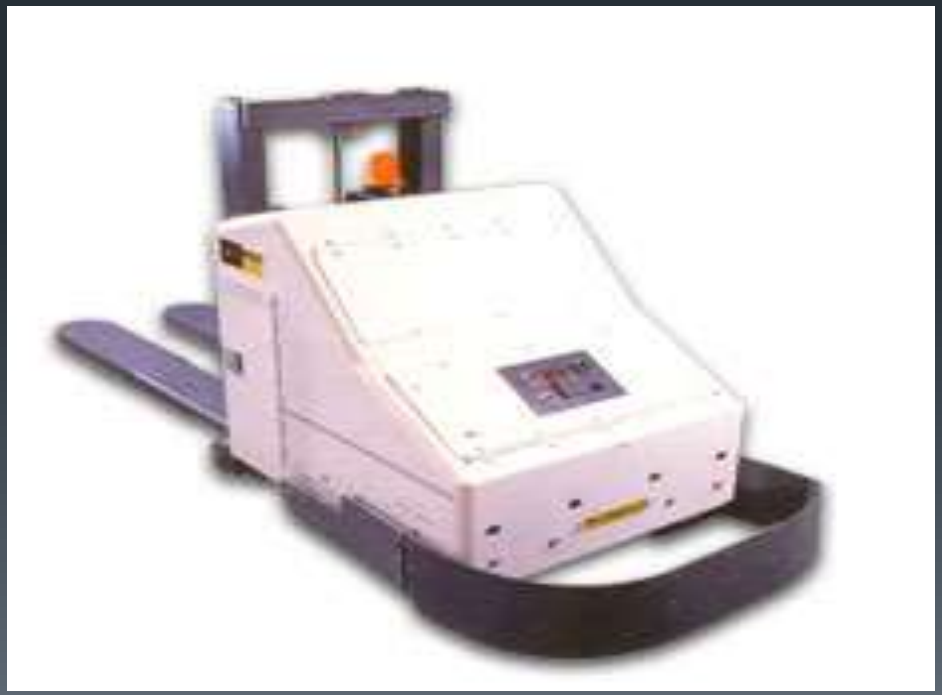
Like a locomotive pulling rail cars, a tugger pulls trailers through a facility to pick up and deliver products.

Driverless train

AGV Pallet Trucks:-

- Pallet trucks are used to move palletized loads along predetermined routes.
- The capacity of an AGV pallet truck ranges up to several thousand kilograms and some are capable of handling two pallets.
- It is achieved for vertical movement to reach loads on racks and shelves.

AGV Pallet Trucks



Unit load carriers:-

- These are used to move **unit loads** from one station to another.
- It is also used for **automatic loading** and **unloading** of pallets by means of rollers.
- Load capacity ranges up to **250 kg** or less.
- Especially these vehicles are designed to move **small** loads.

Why consider AGVs?

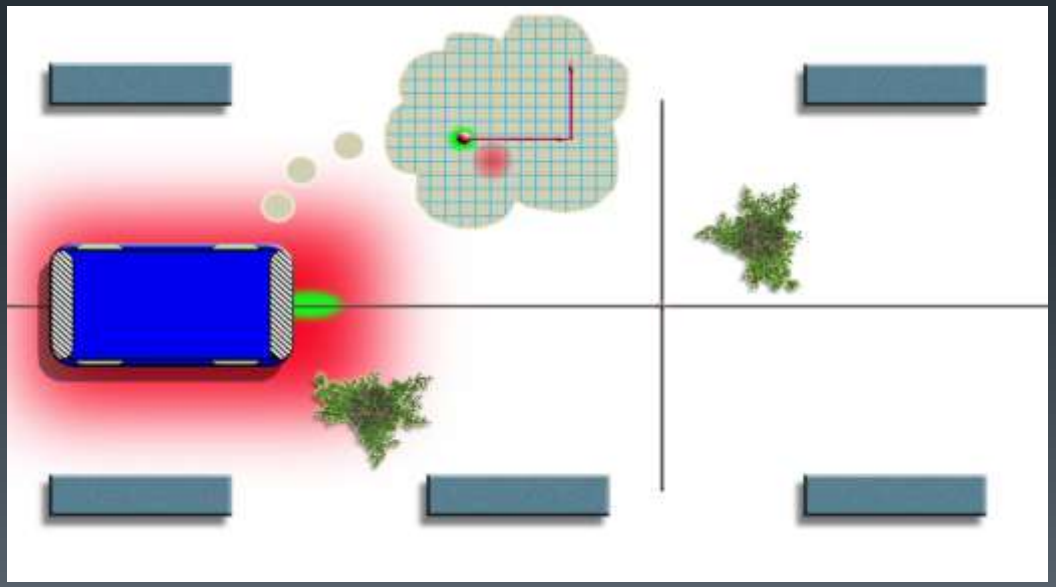
- Reduces the labor cost.
- Flexible.
- Intelligent.
- Less time consuming.
- Can significantly reduce production & warehouse costs.
- Transforming the materials handling industry.

Types of navigation in AGV'S

- Wired navigation
- Guide tape navigation
- Laser target navigation

Wired navigation

- The wired sensor is placed on **bottom** of the AGV'S and is placed facing the **ground**.
- A **slot** is cut in the **ground** and a wire is placed approximately **1 inch** below the **ground**.
- The **sensors** detects the **radio frequency** being transmitted from the **wire** and follows it.



Guide tape navigation

- The AGV'S(some known as automated guided carts or AGC'S) use **magnetic tape** for the guide path.
- The AGC'S is fitted with the appropriate **guide sensors** to follow the **path** of the **tape**.
- It is considered a "**passive**" system since it does not require the guide medium to be energized as wire does.

Laser target navigation

- The AGV'S carry's a **laser** transmitter and **receiver** on a rotating **turret**.
- The **laser** is sent off then received again the **angle** and **distances** are **automatically** calculated and stored into AGV'S **memory**.
- The AGV'S has **reflector map** stored in **memory** and can correct its position based on **errors** between the expected and received measurements.
- It can then **navigate** to a destination target using the constantly updating position.

Laser target navigation AGV’S

Common AGV Applications

Automated Guided Vehicles can be used in a wide variety of applications to **transport** many different types of material including **pallets, rolls, racks, carts, and containers.**

Raw Material Handling:-

AGVs are commonly used to transport **raw materials** such as **paper, steel, rubber, metal, and plastic.**

Work-in-Process Movement:-

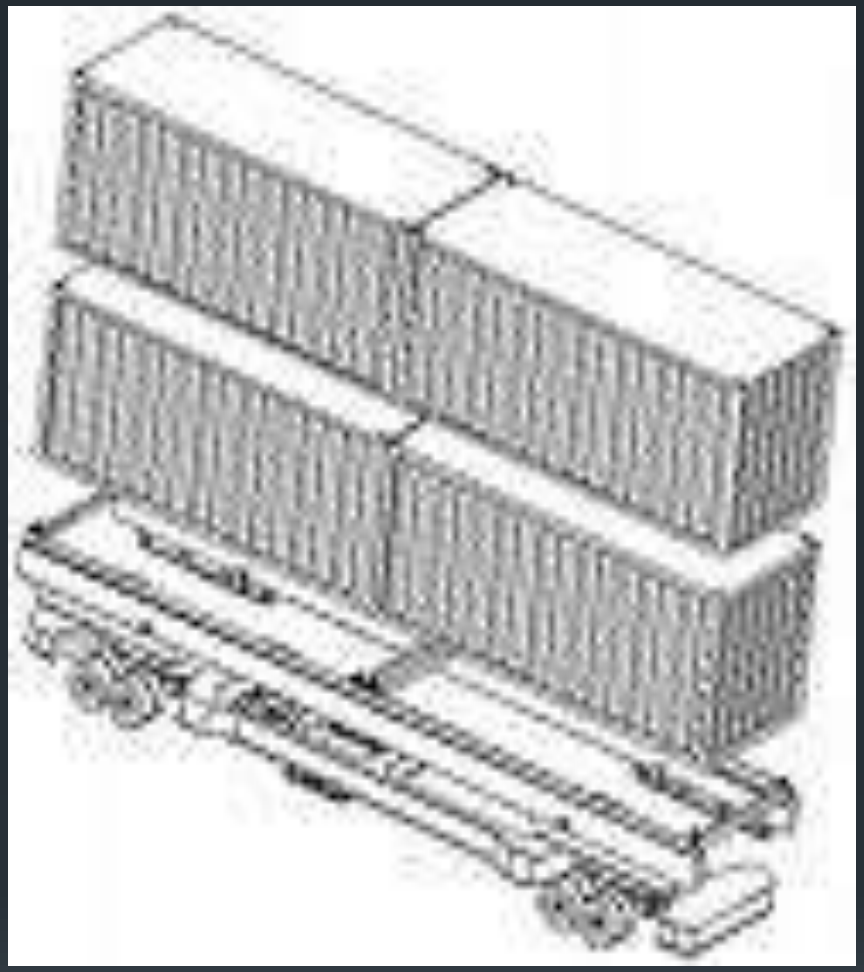
Work-in-Process movement is one of the first applications where automated guided vehicles were used, and includes the repetitive **movement** of **materials** throughout the manufacturing process.

Pallet Handling:-

Pallet handling is an extremely popular application for AGVs as repetitive movement of pallets is very common in manufacturing and distribution facilities.

Finished Product Handling:-

Moving **finished** goods from **manufacturing** to **storage** or shipping is the final movement of materials before they are delivered to customers. These movements often require the gentlest material handling because the products are complete and subject to damage from rough handling.



Pallet handling

Finished goods handling

Next generation AGV systems in “Automobile”

- Projects like “google car” are assuring us the next big “auto guided vehicles” coming in automobile sector.
- “Audi has recently tested their “A7” remotely on self-driving mode till 560 miles.
- “Chevrolet is providing 4G (LTE) connectivity in their vehicles for faster “Navigations” & for updating the “OS” of their “infotainment”.
- Volvo is providing “apple’s IOS “as infotainment for their all 2015 models.

Refrences:

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Thank you