Automated Guided Vehicles

10th Sep 2018

Technology has always altered the landscape of manufacturing. The advent of steam engine marked the "**First Industrial Revolution**" leading to the birth of factories. Subsequently, the mutton shops of Cincinnati shaped the entire assembly line operations and paved the way for what was eventually termed as "**Second Industrial Revolution**" leading to bigger factories having big production capacities. One of the most critical aspects to be managed in these factories was moving the material or goods from one work station to another in a reliable manner, after all this movement of material formed the backbone of the assembly line operation. Traditionally these material movement solutions have varied from having a **fixed conveyor network**, which has its own limitations in the form of installation time, fixed layout and rigidity to using material handling equipment, where the performance of the **material handling equipment** depends on the skill of the driver and as such brings a lot of variability.

As such, a system which can provide the mobility of MHEs and reliability of conveyors is very much required for today's dynamic factories where the scale of operations has increased manifolds, and in such applications Automated Guided Vehicle proves handy as they offer the best of both worlds, since

they can provide reliable movement through advanced computer-controlled programs and navigation systems and are completely mobile and flexible solutions.

A brief history of AGV-

AGVs has been in the industrial arena for quite some time. Conceptually they were born in early 1950s, in the grocery warehouse of Mac Barret, who thought of driverless vehicles to carry the loads from one point to another point. He modified a towing tractor with a trailer to pull loads that tracked the signal in a wire, mounted on the ceiling of the warehouse. Later he went on to build these 'Driverless Vehicles' under the brand 'Guide-O-Matic', from his company Barret Electronics. However, the name AGVs were coined only in mid 1970s with the introduction of unit-load vehicles, by then the wires in the ceiling were moved to magnetic tapes under the surface of floor. The advent of these unit load AGVs brought high hopes to material handling industry, in fact, they were touted as a technology that would revolutionize the entire material handling industry. However, because of some of the early day limitations like lack of flexibility as the guidance of AGVs was on fixed path, reactive pattern instead of being proactive in case of obstacle encounter, and lack of intelligence hampered their ability to live up to the hype created & drew some negative experiences to the early adopters of this technology. As the research continued, the initial wired navigation technology, which guided the vehicle by determining the position of AGV & the path, through communication between the signals emitting from the wire & the sensor on AGV, was replaced with the 'Guide-Tape Technology'. This tape technology worked by creation of magnetic field & the vehicles that traversed based on this navigation were named to 'Automatic Guided Carts (AGCs)'. This technology was an improvement over the wired one in terms of flexibility as the tape could be easily replaced & relocated in case the course needed to change. However, the damage to the tape posed a major hindrance to this technology and as such limited its application.

The Turning of the Tide: AGVs Galore:

The AGVs have reached an inflection point in the recent years as they have become common sight across manufacturing & distribution centres, carrying a load of raw materials to feed the assembly line in manufacturing or carrying a tow truck load of finished goods for storage or the neatly packed pallets of finished goods for shipping, now AGVs are gaining the place they were hyped for once. This run for AGVs is being fuelled by multiple factors, the primary one being maturing of technology as companies from different fields like automobiles, software, robotics entered the fray leading to a faster learning curve in general and faster maturity of technologies like LIDAR, Sensors, Cameras, Computer Vision etc. Another critical factor for the push of AGVs came in the form of the rise of organized retail and ecommerce. The nature of the operations demanded a very dynamic warehouse with highly mobile solutions, as such AGVs proved to be the only viable option and the companies operating in this domain proved to be one of the early adopters of Mobile Robotics. Along with this, the businesses were looking to scale up and as such the warehousing operations must be automated to meet the scale and automated solutions based on AGV have proven to be one of the most reliable solutions.

Due to these developments, the primitive "Wired Navigation Technology" & "Guide – Tape Technology" paved the way for, 'Laser based Navigation technology' and "Camera Based Navigation Technology" wherein a laser head / Camera mounted on the vehicle scans & compares the area where reflectors are placed, which is already mapped & stored in vehicle's computer memory. This allows the navigation system to triangulate the position of the AGV & guides the path of the vehicle.

What makes up an AGV, the critical components?

An Automated Guided Vehicle is more than a single vehicle; it's a system with integration of several components that form the building blocks. As observed earlier, the navigation system & the control systems are at the heart of the system that acts as the guiding force for these vehicles. Other principle components include the safety system, traffic management system, battery charging system and the payload. Understanding these components is very critical to understand the strength of the navigation system, to know in depth about these systems, watch this space.!!!!!!