

How AGV Systems Improve Safety at Material Handling Facilities

BY JEAN FEINGOLD

An automatic guided vehicle (AGV) system consists of one or more computer controlled wheel-based load carriers. Typically battery powered, these systems operate on plant or warehouse floors or on paved areas outdoors without onboard human operators. Navigating using pre-defined paths, AGVs provide automated material movement, which can reduce labor and material costs, improve worker safety and reduce product and equipment damage.

When to use AGVs

"The repetitive and consistent handling of loads is where an AGV has most value," said Carlos Millan of MHI member Oceanering® AGV Systems. When done by humans, "this task can cause personnel fatigue, errors, damage to goods and safety risks. AGVs can handle loads that are high in weight and are low/high in height, which could otherwise cause ergonomic harm to personnel." Jayesh Mehta of MHI member Transbotics recommends installing an AGV system in "any situation that would put people into hazardous conditions like dealing with high or low temperatures or handling corrosive or

hazardous materials, for long distance material movements and any repetitive functions." Other good applications include raw material delivery to point-of-use and finished goods movement from the end-of-line to staging or onto trailers, picking things up and moving them to another location without altering them and putting things on racks or on the floor.

Setting up a new AGV system involves mapping the facility where it will be used so the locations and dimensions of aisles, racks and work areas can be added to the AGV system software

before assigning work to the system, explained John Clark of MHI member Dematic. Each unit comes with on-board navigational software to operate its sensors along with fleet management software shared with all AGVs in the system.

The safety benefit of AGVs comes from their predictability, noted Laura McConney of MHI member JBT Corporation. "They travel in the same spaces over and over again, which means human beings can better anticipate what they're going to do," she said. "Compare this against manual vehicles that can often move errantly. AGVs also stop and start in a more controlled manner. They check and recheck conditions so the loads they transport are within the scope of what they're expecting. This results in fewer dropped loads and reduced overall plant damage and leads to a safer overall environment for facility workers."

AGV systems follow pre-defined "roads" through a facility. Today these are mostly software-based without tape or wires in the floor. "Because vehicles follow these roads, they're not going to cut corners too close and hit stationary objects like racks and columns," said



SOURCE: TRANSBOTICS



SOURCE: DEMATIC



SOURCE: JBT

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McConney. “In the extreme case that an AGV starts to get off its pre-defined path, it will trigger an audible alarm to alert workers.”

“AGVs operate at a consistent speed,” Clark said. “The sensors on them project outward so if nothing’s in the way, they will go at the same speed. They slow down if they detect something in the outer edges of their range and then stop if the thing doesn’t move.”

“AGVs automatically slow down and stop for obstacles like people,” Millan agreed. He explained this is accomplished by their hardware emergency stop circuit, which continuously

monitors several internal and external error conditions. This circuit has several safety input devices including contactless obstacle detection sensors, emergency stop buttons, pressure sensitive bumpers and a software watchdog to monitor speed and curves to ensure they are within the set range. During an emergency stop, drive motors are disabled and fail-safe brakes are applied to the driven wheels. Redundant architecture enables failure detection and correction before the AGV malfunctions. By comparison, manually operated forklifts might go too fast and operators may have limited visibility

in dense infrastructural areas containing production equipment or at blind corners inside buildings.

“Using AGVs removes redundant work,” Clark said. “We want to eliminate human touches in the supply chain because they increase potential for damage and miscounting, which means higher costs. AGVs do the same thing every time. They won’t try to sneak into a space where it ‘might’ fit. It knows whether it can fit or not while a fork truck driver can’t always tell for sure.” Should an aisle be narrowed after the AGV path is established, its sensors will keep it from entering the now too small space.

Investment in AGVs benefits both safety and the bottom line

While Millan says facility size does not necessarily matter, throughput and facilities of approximately 200,000 square feet with 24/7 operations are more likely to have a greater ROI from AGV use. McConney said having any routine material movements can justify

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AGV installation. "Typically, facilities running three shifts receive the greatest payback from an AGV system," she said. "The physical size of the facility has a smaller overall impact on the financial justification of a project. The number of material movements across an entire day plays a larger role." Mehta agrees with McConney, saying, "Size will not matter. To be cost effective, the AGV system would need either to move employees to more value-added functions or decrease the amount of possible injuries and/or damage."

Here's an example of how AGVs can reduce costs. One Dematic customer installed about 80 total AGV units at four sites. Two years later they did a product damage audit. "They found before having AGVs their product damage rate was 15 percent, and with them it was less than 5 percent," Clark reported. This reduced cost and customer chargebacks.

One cost advantage of AGVs compared to other forms of automation is that they can be installed incrementally. "Unlike conveyor systems, you don't have to put a whole system in at once," Clark said. "Many customers put in only a few AGVs initially, maybe for only one or two production lines, and add more over time."

Determining how many AGVs to install is based on the number of shifts, the number of forklifts and the labor

rate. Maintenance costs for AGVs are less than fork trucks because they experience less wear and tear.

Inherently safe

"AGVs don't run into things, things run into them," Clark noted. Mehta said OSHA has only periodic reports of accidents involving AGVs "and a majority of those were caused by misuse of the AGVs, like putting them in manual."

Top speed for AGVs is around 300 feet per minute. If there is concern about

human/machine interaction, crossing gates can be set up where footpaths and AGV roads intersect so people will be forced to wait until they pass.

"The main safety risk AGVs cause is the lack of understanding by the employees about what an AGV does," said Mehta. "This can be mitigated by creating an AGV Champion on each shift and training personnel who will be in contact with the AGVs."

To learn more about this technology, visit mhi.org/agvs.

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