



PROMAT

2015

McCormick Place South | Chicago

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Top 5 Ways AGVs Drive Lean Efficiency and Reduce Costs in Manufacturing

Sponsored by:



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What are Automatic Guided Vehicles?

- AGVs are driverless vehicles used to increase efficiency in plants and warehouses
- AGVs have been used in manufacturing for the past six decades
- Types of AGVs include:
 - Unit load
 - Automatic Guided Carts (AGCs)
 - Tow or tuggers
 - Forked vehicles
 - Custom vehicles



AGV Applications in Manufacturing

- Line side delivery of parts/tooling
- Assembly
 - Paced
 - Continuous moving line
 - Unpaced
- Material movement
- Removal of trash
- Engine marriage



Challenges Facing Today's Manufacturers

- Reduce costs
- Improve safety
- Increase efficiency
- Attract and retain employees
- Decrease cycle times
- Improve bottom-line/show ROI
- Floor space constraints
- Lean manufacturing and Just-In-Time delivery goals



Conventional Material Handling Methods

- Towline conveyer
- Powered conveyer
- Lift trucks
- Manual labor



Today's AGVs

- More affordable
- Better controls and software
 - Easy to program
 - Centralized controls
- Safer
- Increased battery and charging options
 - Flooded Lead Acid, NiCad, Lithium Ion, Sealed, Inductive Power, Fuel Cells
 - Battery charging options including fast opportunity charging



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Navigation Options



Laser



Spot



EyeWay



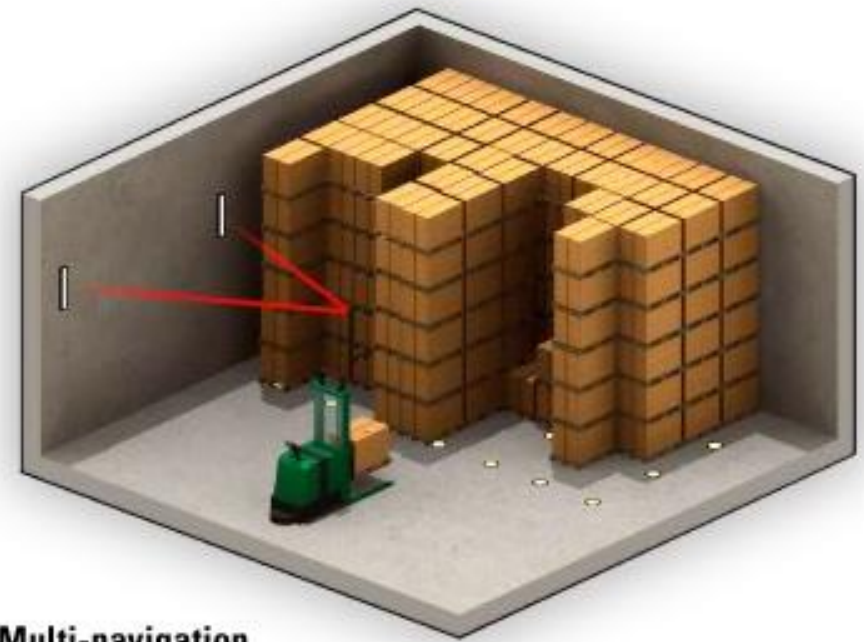
Magnetic tape



Range



Inductive wire



Multi-navigation

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TOP 5 WAYS AGVs IMPROVE MANUFACTURING



#1 Reduce Costs

- Labor costs
 - Compared to fork trucks and manual methods
 - No overtime, breaks, missed time
 - Finding and retaining labor more difficult today
- Product and building damage
 - Predictable movement at a consistent speed
- Quick, easy and cost-effective installation versus conveyors



#2 Ultimate Flexibility

- Easy modification of guidepath
- Change carriers to accommodate future product changes
- Scalable – add or subtract vehicles to change capacity
- Fast opportunity charging allows vehicles charge in process



#3 Improve Safety and Ergonomics

- Less accidents versus fork trucks
 - ANSI B56.5 industry-accepted standard
 - Warning and protective fields
- Improved ergonomics for employees
 - Scissor lifts
 - Cleaner and quieter than conveyors



#4 Reduce Floor Space

- Less floor space required than conveyors
- No fixed assets required by conveyors
- Guidepath does not impede other traffic
- Customize guidepath to your building
 - Path can twist and turn around structures without costly conveyor turns



#5 Increase Productivity and Efficiency

- AGVs operate as independent carriers versus conveyors
 - AGVs can increase speed at any time
 - Redundancy – one AGV breaking down does not shut down entire system
- Reduces cycle time
- Integrates easily with other equipment and management systems
- Lean manufacturing goals are easier to achieve



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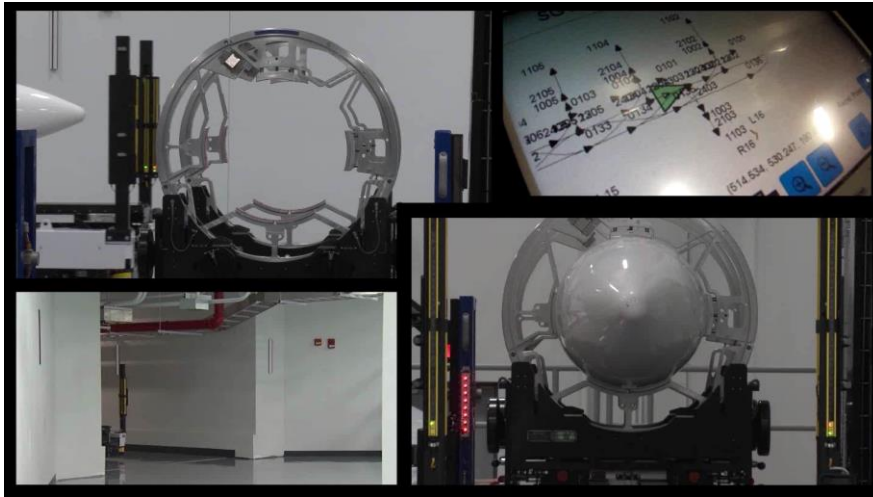
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AGVs CASE STUDIES



Mission Critical Manufacturing Automation



Solution

- Interceptor missile manufacturing
- All material movements now by AGVs
- 2 – 24' long and 1 – 10' long custom AGV
- Product transport between assembly areas and test areas
- Replaced manual carts that were pushed

Benefits

- Manufacturing now done with zero “lifts”
- Eliminated requirements for crane usage
- Product is ergonomically positioned
- Increased safety
- Increased flexibility for future changes

Line Side Delivery

- GM's CAMI plant uses 14 tuggers Automatic Guided Carts for line side delivery of fascias to the assembly line
- Parts are placed on a custom-designed carriers that deliver five parts at once Just-In-Time (JIT) and Just-In-Sequence (JIS)
- Magnetic tape guidance
- Nearly quadrupled production rates with same number of employees



Movement from Line to Heat Treatment

Project Description

- Material movement from line to heat treatment
- 4000 lbs. Skids
- Pick/drop to conveyors using proximity sensors
- Laser Guided Fork Truck
- 3+ AGVs
- Variable load sizes, loading into high temperature ovens



Movement from Line to Heat Treatment



Benefits

- Improved safety
- Reduced labor costs
- Increased productivity
- Reduced damage to facility
- Increased facility throughput
- More flexibility for layout changes
- ROI

Line Delivery from ASRS to Binders

Project Description

- Material movement from ASRS to Binder Lines
- 3,000 lbs. skids
- Pick from conveyors/floor
- Drop to floor
- Laser Guided Fork Truck
- 23+ AGVs
- Variable load sizes interfacing with overhead gantry



Line Delivery from ASRS to Binders



Benefits

- Improved safety
- Reduced labor costs
- Increased productivity
- Reduced damage to facility
- Increased facility throughput
- Flexibility and expandability for future operations
- ROI

Engine Manufacturing

Objective:

- Deliver steel sheets to laser cutting machines
- Deliver components to workstations
- Negotiate tight layout
- Move in & out of cutting machines without disruption to the existing process

Solution:

- AGVs with lift deck, bi-directional travel
- Wireless navigation
- Call/send pushbutton stations

Results:

- On-time delivery of sheet to cutting machines
- Delivery of components to work cells
- Modification to existing equipment not required
- Two way travel into and out of machining area



Magna's Mobile Assembly Line

- Magna uses 36 Automatic Guided Carts (AGCs) to assemble front-end modules and fascias for Jeep SUVs
- AGC system replaced carousel conveyors
- Parts are transported between subassembly stations on AGCs guided by magnetic tape
- Finished products are delivered just-in-time (JIT) and just-in-sequence (JIS) with vehicles coming off paint line at auto plant



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Benefits of Magna's Mobile Assembly Line



Operating Costs - Conventional

- Typical fully-burdened fork truck operator per shift is ~\$35k-45k
 - Two-shift operation
 - Varies geographically, labor pool
- Conventional sit down vehicle ~ \$50k
- Monitors, software for WMS tie in
- Five vehicles
- Annual costs for damage/loss \$10k
- Initial cost \$250k
- Annual operating cost ~\$400k



Operating Costs AGVs

- 8 - 3000 lbs. capacity AGVs, laser navigation ~\$1.3M
- Elimination of 10 FTEs + \$400k
- Elimination of facility/product damage budgets +10k
- Same annual maintenance costs
- $$\frac{(\text{AGV Cap Cost}) - (\text{Conv. Cap Cost})}{(\text{Annual Cost savings})}$$
- 2.3 years

**assumes similar annual maintenance, uptime, utilization rates, 1:1.5 rounded up replacement ratio



Key AGV Takeaways

- Reduces costs by decreasing labor, product damage and lower installation costs
 - Resolves turnover and training of employees
- Provides ultimate flexibility to scale up and down, modify guidepaths, and accommodate future product and process changes
- Improves safety and ergonomics
- Reduces floor space and eliminate barriers that come with conveyors
- Increases productivity and efficiency by reducing cycle times, providing redundancy and consistent throughput, and integrating easily with other equipment and systems
- Typical 2-3 year ROI is based on multi-shift operation, median labor rates (burdened)

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