Evolution of AGVs – What’s Available and What’s to Come?
Session Abstract

AGV systems have quickly become a disruptive force leading the way to Intralogistics 4.0. Industry estimates forecast near double digit growth of AGVs through 2020. There is a growing need for automation in material handling processes across segments, learn where to begin and what's possible in the world of AGVs.

In this presentation you’ll:
• Learn about simple & more challenging AGV applications
• Gain a better understanding of what is possible in the world of AGVs
• Learn how AGVs can solve complex material handling challenges
So What is an AGV?
Says Wikipedia…

- An **automated guided vehicle** or **automatic guided vehicle** (AGV) is a portable robot that follows markers or wires in the floor, or uses vision, magnets, or lasers for navigation. They are most often used in industrial applications to move materials around a manufacturing facility or warehouse. Application of the automatic guided vehicle broadened during the late 20th century.
History of AGVs

• Brought to market in the 1950s
  – Grocery warehouses and auto assembly
  – Originally followed wires
    • Vehicles were “dumb”, with intelligence in the wire controllers

• Evolved into manufacturing workstreams
  – Unit load carts
  – Tow carts
  – Counterbalanced trucks

• Modern growth in warehousing & distribution
  – Increased vehicle capabilities/designs-functionalities
    • Narrow aisle (reach style trucks)
    • Very narrow aisle (VNA trucks)
AGV = Driverless vehicles to move goods from A to B

### Functional Applications of AGVs
- Repetitive transports
- Low/medium throughput
- Multi-shift & 24/7 operations
- Short to mid-distance travel
- Complex production flow
- Material flow with buffer locations

### Benefits of AGVs
- Increased Safety
- Reduced operating costs & manpower
- Increased efficiency
- Less product damage
- Lower operational cost

### Operational Issues Addressed by AGVs
- Safety
- Labor cost
- Aging of Fork Truck fleet
- Shipping accuracy
- Productivity
- Order Mix Changes
Today’s AGVs…

• Applications
  – Horizontal transport of pallets, cases, totes
  – Storage and retrieval of materials
  – Inventory management for distribution and order fulfillment
• Safety – Share work space with people and manual vehicles
• Integration – Tightly integrated with WMS, ERP
• Navigation – Single or multiple systems without changes to environment
  – Laser and inertial navigation and increasing use of ‘natural target’ or contour navigation
• While historically, AGVs were more purpose-built for each project – now more modular and “standardized” products – similar to their ForkTruck ancestors where they can be easily “configured” for unique projects

An AGV can do just about anything that a fork truck can, without a worker
AGV Use Examples
Horizontal Transport

• Project Description/Features
  – Assembly line fulfillment
  – Tunnel under jack-pin style AGC
  – Spot guidance augmented by Inertial Navigation
  – Traffic Management optimization
  – Transport loads > 5,000 lbs.

• Project Benefits
  – Improved productivity & operations
  – Improved safety
  – Requires minimal space
  – Reduced labor costs
  – Increased facility throughput
  – Rapid ROI
Horizontal Transport

- Project Description/Features
  - Engine manufacturing
  - Workers had to manually move equipment throughout the facility
  - AGVs are called via buttons at each workstation, making transport immediately available when needed

- Project Benefits
  - Increase from 100 to 220 engines a day
  - No longer need to manually move engines between workstations
  - Labor is being used where it should be
  - AGVs use off-the-shelf components, so easier parts/maintenance
Horizontal Transport

- Project Description/Features
  - Deliver steel sheets to laser cutting machine
  - Deliver components to work stations
  - Negotiate tight layout without disrupting operations
  - Wireless navigation, bi-directional travel
  - Call/send pushbutton stations

- Project Benefits
  - Timely delivery of steel and components
  - No modifications to existing equipment
  - Two way travel in and out of machining area
EoL to Storage or Shipping

• Project Description/Features
  – Pick up full pallets of bottled beverages from 12 stretch wrappers
  – Deliver to storage lanes or directly into outbound trucks
  – 20 AGVs with single double attachment
  – Integrated to WMS

• Project Benefits
  – 2 year payback
  – Reduced plant and product damage
  – Eliminated “lost” product and product returns
EoL to Storage or Shipping

• Project Description/Features
  – Warehouse storage and order staging
  – 23 Clamp AGVs
  – Integrated WMS
  – Single site pilot for potential corporate roll out

• Project Benefits
  – Reduce labor and forklifts
  – Increased inventory accuracy cancelled need for quarterly inventory counts
  – Reduction in product damage by utilizing clamp style AGV
  – Successful pilot justified expanding AGV roll out to 3 other sites and nearly 100 AGVs
Receiving and Putaway

• Project Description/Features
  – Transport of finished goods to the warehouse
  – 10+ Laser Guided Tugger AGVs (65,000 lb cap)
  – IP-65 rated for outdoor operation
  – Integrated with AS/RS and WMS
  – Automated hitch engagement

• Project Benefits
  – Improved safety
  – Reduced labor costs
  – Improved material tracking
  – Increased facility throughput
  – Rapid ROI
Inventory/Material Management

• Project Description/Features
  – Automate product movement in dairy warehouse
    • Aged cheese from warehouse to processing area
    • Processed cheese to warehouse
    • Finished goods to shipping
  – 10 laser guided AGVs operating in chilled areas
• Project Benefits
  – Under 2 year payback
  – Reduced labor and product damage costs
  – System is flexible for future changes
Storage and Retrieval

• Project Description/Features
  – Automate storage/retrieval in 780,000 sq. ft. DC containing 700,000 cases
  – 5 laser guided AGVs store/retrieve product in lanes
  – AGV mounted bar code scanner identifies product
  – Integrated with WMS

• Project Benefits
  – Improved inventory accuracy
  – Reduction in breakage & energy costs
  – Flexibility/scalability/mobility
  – Payback 1.5 years
Storage and Retrieval

• Project Description/Features
  – Address growth and cramped storage situation in manual warehouse
  – Removed outsourced storage and related costs
  – Automated warehouse with 3 dual-use reach trucks and 4 dual-use VNA vehicles

• Project Benefits
  – Doubled capacity
  – Removed need for outsourced offsite storage
  – Increased efficiency
  – Less product damage
Are AGVs Right For You?
The ROI for AGVs in your Operation

• How do you know AGVs are right for you?
  – High Non-Value Added Costs
  – High Damage Rates
  – High Inventory Loss
  – 24 Hour Operation (or related labor costs)

• How AGVs improve your organization
  – Reduced Damage
  – Increased Efficiency
  – Reduced Costs
  – Increased Inventory Accuracy
Sample ROI for AGVs

- Example
  - 24/7 Operation
  - 3 Shift
  - $60,000/yr
  - 5 Operators Per Shift

- $(60,000) \times (5 \text{ Operators}) \times (3 \text{ Shifts}) = $900,000 \text{ Yearly}
- $(1,750,000 \text{ AGV System}) / ($900,000 \text{ Savings}) = 1.94$
- 2 Year Payback

‘Rule of Thumb’ for AGV replacement: 1.5 AGV for each fork truck
What’s The Future for AGVs?
The Alphabet Soup of Mobile Automation

AGV – Automatic Guided Vehicle
AGC – Automatic Guided Cart
LGV – Laser Guided Vehicle
AMR – Autonomous Mobile Robot
Robots, mobile robots, autonomous mobile robots are newer buzzword terms used to describe machines that can plot their own path, but these terms could also apply to AGVs. Confusing?

**Sorting Out the Terminology**

**AGC**

Automatic Guided Carts (AGCs) are lower-cost entry points to mobile automation and are used for material transportation and assembly line tasks. AGCs automate material movement and help reduce non-value-added labor cost in distribution as well as manufacturing operations.

**AGV (LGV)**

Automated Guided Vehicles (AGVs) offer increased flexibility, additional capabilities and numerous design variations compared to AGCs. AGVs are also more sophisticated and offer features not found in AGCs. (Also called LGV, but not by many)

**AMR**

Autonomous Mobile Robots (AMRs) refer to more of a navigation style and not a vehicle type, and the industry is beginning to zone in on ‘autonomous’ being a vehicle that doesn’t have to follow a strict path and is able to plot its own course from A to B within a defined area.

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What’s the Future for AGVs?
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Who we are

- Leading AGV/C system and component suppliers
- Mission: Promote the growth and effective use of automatic guided vehicle systems (AGVS) in manufacturing, warehousing, distribution and other key key markets
For More Information and/or copy of the presentation:

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Visit MHI AGVS booth booth 8285