



PROMAT

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How AGVs Improve Safety and Flexibility at Minimal Cost in Warehouses and DCs

Sponsored by:



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Overview

- AGVs vs. conventional material handling
 - Storage
 - Replenishment
 - Picking
 - Transportation
- Safety
- Flexibility
- Cost/ROI



AGVs vs. “conventional material handling”?

- **Space-** Provide reliable horizontal transportation without impeding other traffic.
- **Economical-** Long distance delivery without fixed assets such as conveyor.
- **Agile-** Intelligently completes complex multi-point moves.
- **Flexible-** Capable of interfacing to a variety of stands, automation, manufacturing operations.
- **Dynamic-** Easy path modifications in changing environments.
- **Redundancy-** Natural redundancy built in due to multiple AGVs on same guide path



Business Drivers...

- **Labor** - 100% Labor reduction, overtime and turnover cost eliminated
- **Damage** – Elimination of facility and equipment damage by conventional fork trucks.
- **Shipping Accuracy** – Reduction in miss-shipments and product loss.
- **Energy**- Potential savings associated with lights out operations.
- **Safety**- Elimination of fork truck related accidents.

Transport/Storage – AGV forklifted vehicles

Material movement solutions when pick up and delivery points are at different elevations (floor, rack, stands, stretch wrapper and conveyor)

- Automated warehouse solutions
- Low to medium throughputs
- 2 and 3 shift operations
- 9'-12'+ rack aisle widths for storage
- Lift heights up to 30+'
- Pallets, bins, etc.



Transport/Storage – Case Study



Challenge

- Handle pallets in both open areas and very narrow aisles (1.8m/5.9ft wide)
- 81,200 pallet places up to a height of 10.65m/35ft

System Solution

- 7 AGVs
- Multi-navigation (laser and inductive wire)
- Lifting capacity of 1,000kg/2,200lbs (750kg/1,650lbs at 10.65m/35ft).
- Transport capacity is 173 pallets/hour

Benefits compared to using manual VNA (Very Narrow Aisle) trucks

- Minimized operational cost
 - less personnel and less damage to pallets, goods, racks and trucks
- Reduced energy consumption
 - the temperature in the narrow aisle racking area is lower and there is less light than in a traditional warehouse with manual trucks

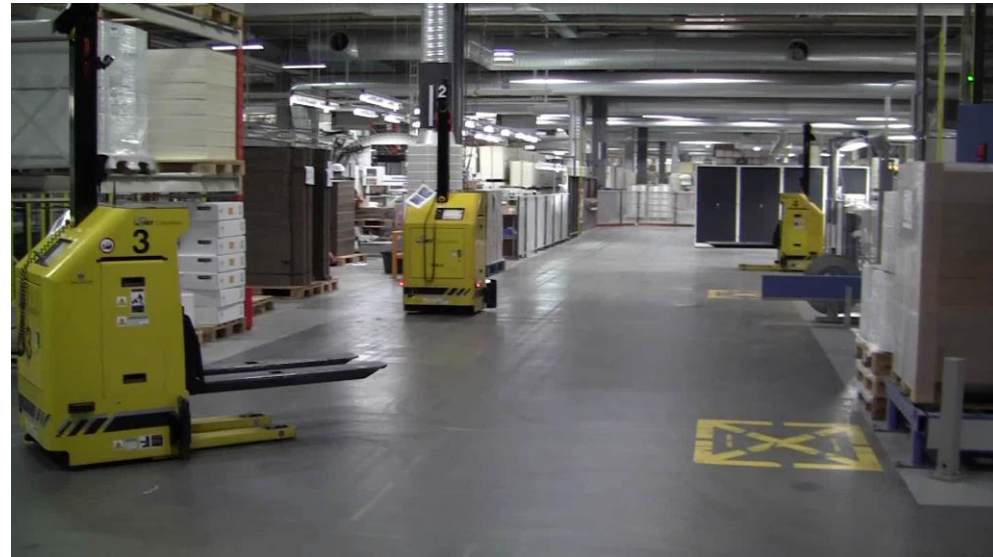
Transport/Storage – Case Study

Solution

- 4 compact laser guided forklift AGVs
- Material movements by AGVs
 - empty pallet stacks to pallet dispenser
 - Single empty pallets to the palletizer
 - Palletized loads to the stretch wrapper
 - Stretch wrapped loads to storage lanes
 - Move work-in-process
- System to be expanded in 2015

Benefits

- Improved efficiency with timely delivery
- Increased safety
- Increased productivity
- Payback in under 2 years



Transport/Storage – Case Study

The Objective:

- Transport pallets from palletizers to warehouse
- Production reporting and verification
- Communication with WMS

The Solution:

- 8 Dematic Fork AGVs with wireless navigation
- Chain Driven Live Roller Conveyor
- 2 Pallet Dispensers
- AGV control software

The Results:

- On time removal & accurate delivery of pallets from palletizers to warehouse.
- Detailed production & transportation reporting
- Seamless communication & visibility to WMS



Replenishment

Material movement from full/split pallets down to case handling by order pickers within pick modules or pick lines

- Density is large driver: NA and VNA style vehicles
 - Minimum turning radius, high reach
- Lower cost alternative to ASRS or “turret truck” forklifts
- Eliminates ergo-issues
- Fully automated into WMS, reduces “operator error”
- Ability to change aisles, redundancy



VNA to replenish pick lanes – Case Study

1.25 million square foot distribution center, supplies 495 retail stores in Canada

Very Narrow Aisle AGV system and software to receive, store, track and ship products to stores.

The Objective:

- Decrease Order Fulfillment time
- Productivity
- Decrease Labor while meeting increased throughput
- Maximize Storage Capacity in Existing Warehouse

The Solution:

- 19 Laser guided automated guided vehicles (AGVs) with turret fork attachments.
- Aisle changing capability with a 35ft lift.
- Material Tracking and Control Software to Manage Fork Trucks (RF Terminals) AGVs and ASRS

The Results:

- Significant decrease in product and facility damage
- Increased productivity (significant improvement of “missed diverts”) measured by a drop in misdirected pallets and canceled orders to stores
- No facility modification required



Picking – Case Study

Applying Proven Automation technology (AGVs) to a typical warehouse manual case order selection process

Objective:

- Remove non-productive tasks from pick process
- Increase productivity
- Improve working conditions keep orderfiller “in the zone”



Solution:

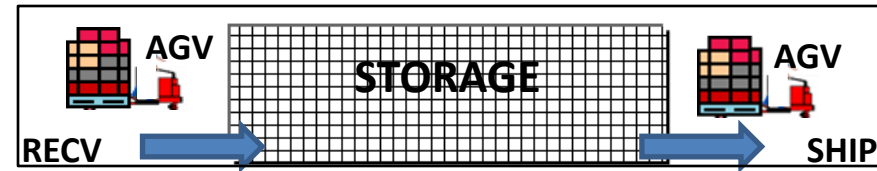
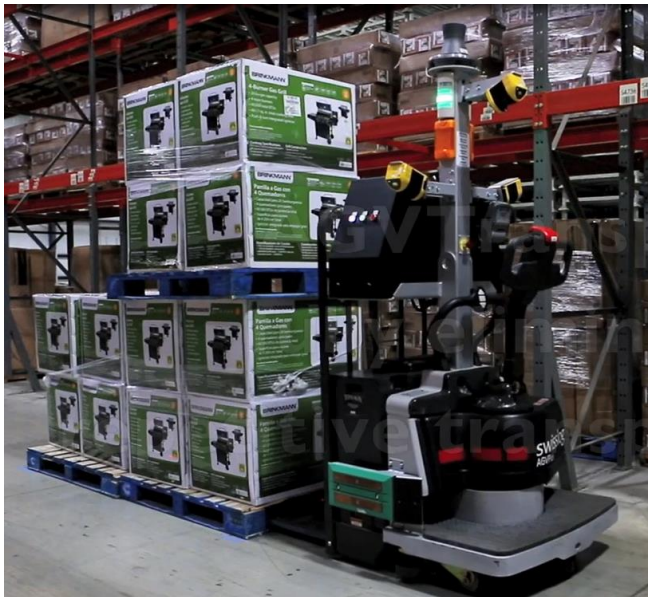
- 40 Swisslog dual pallet laser guided AGVs, voice picking, AGV traffic control system, automatic pallet dispensers

Results/Benefits:

- 25% gain in pick productivity, 2 shifts/day x 7/365
- Green solution 11% increase in battery life
- Improved Safety (guided) AGV movement directed by voice
- AGV autonomous delivery to stretchwrap and shipping dock
- Less Facility & Product Damage (racks & trucks)
- Reduced Fatigue on Order Fillers
- Safe & Productive w/ other manual trucks and forklifts

Transport – Case Study

A standard laser guided pallet truck AGV to haul products from receiving to warehouse storage and from warehouse storage to shipping



Objective:

- Eliminate labor associated with repetitive movement of products around large bulk store warehouses

Solution:

- 15 Swisslog dual pallet laser guided AGVs, AGV traffic control system, improved coordination of movements/warehouse activities

Results/Benefits:

- Elimination of over 40,000+ hours of hauling transport
- Green solution 14% increase in battery life
- Improved Safety (no labor involved)
- Less Facility Damage (racks & trucks)
- Safe & Productive w/ other manual trucks and forklifts
- Real-time graphic monitoring of warehouse movements

Transport – Case Study



Challenge

Minimize damage to paper rolls

System Solution

- Two AGVs transport paper rolls from the strip station to a temporary storage
- The temporary storage is filled with paper rolls to be used during the day/night
- The AGVs also transport paper rolls from the temporary storage to the printing presses when new rolls need to be loaded

Benefits

- Elimination of material damage
- Increased material movement accuracy
- Repeatable accuracy and consistency when interfacing with other equipment
- Lower operational costs and fewer interruptions in the printing process

Transport – Case Study



Project Description/Features

- Transport of Building Materials
- 3,000 kg (6,600 lbs)
- Five (5) Multi-Conveyor AGVs
- Optical Guidance
- Integrated with Customer WMS
- Omni-Directional Travel

Project Benefits

- Reduced labor costs
- Improved material tracking
- Reduced damage to facility
- Improved safety
- Increased facility throughput
- Product Traceability

Tugger – Case Study



Project Description/Features

- Transportation of trains from finished goods to the warehouse
- IP-65 Rated for Outdoor Travel
- Laser Guided Tugger
- 10+ AGV System
- Integrated with an ASRS and a WMS
- Pulls loads of up to 65,000 lbs.

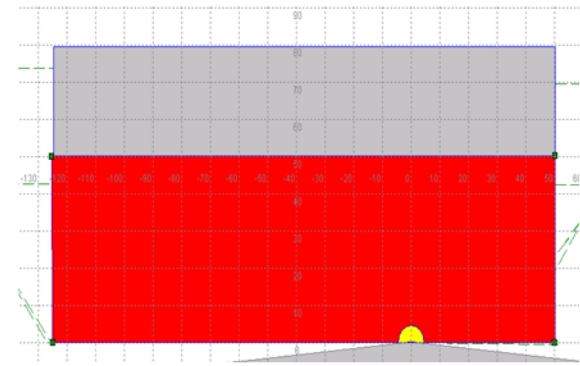
Safety

- ANSI B56.5 is industry-wide accepted safety standard
 - Owner & operator responsibilities
 - Manufacturer responsibilities
 - Clear markings
 - E-Stops
 - Safety rated scanning, multiple fields

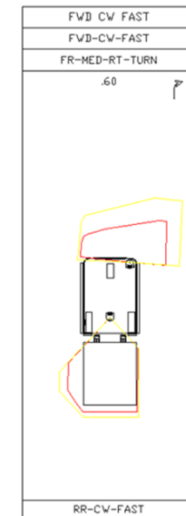
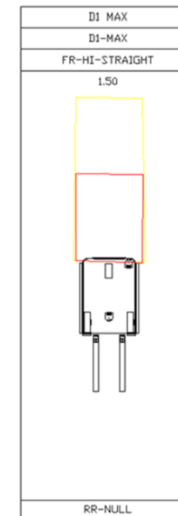
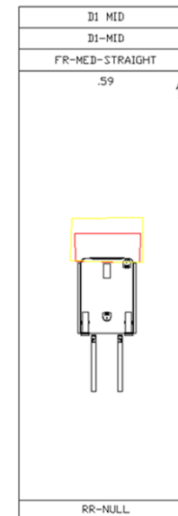
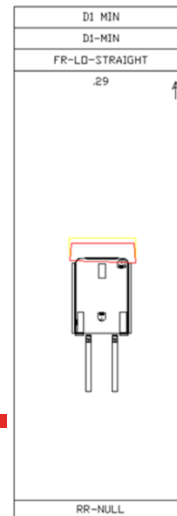


Safety Fields (ANSI B56.5)

- Gray is Warning Field
 - When an object enters this field the AGV decelerates to a predetermined travel speed of .1 m/sec
- Red is Protective Field
 - When an object enters this field the AGV will come to an immediate stop locking the drive and steer functions. The error will produce flashing lights and an audible beep. Upon clearing a bumper stop, the vehicle will automatically resume operation.



Typical Laser Field for a straight forward movement (top view)





Operating Costs - Conventional

- Typical fully-burdened FT operator per shift is ~\$35k-45k
 - 2 shift operation
 - Varies geographically, labor pool, VNA operators higher
- Conventional sit down vehicle ~ \$50k
- Monitors, software for WMS tie in
- 5 vehicles
- Annual costs for damage/loss \$10k
- Initial cost \$250,000, Annual operating cost ~\$400,000



Operating Costs AGV

- 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 Takeaways

- Higher upfront capital cost on equipment
 - Similar annual maintenance/operating costs
 - Reduction in emissions within facility compared to LP machines
 - LEASING may be attractive option, 1st month potential savings
- Elimination of manual labor
 - Levels demand fluctuations
 - Consistent throughput
 - Resolves turnover, training
- Systems are flexible in design, scalable, redundant and provide maximum material handling flexibility
- Typical 2-3 year ROI is based on multi-shift operation, median labor rates (burdened)
- Safety is built-in

**FIND WHAT'S
NEXT.**



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