Using Proven Material Handling Automation and Emerging Bot Technologies to Optimize DTC Order Fulfillment.

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## Systems Focus

Matthews Automation Solutions is an independent provider of material handling systems including software, controls, and MHE

Systems are built on appropriate technologies combined to provide a comprehensive solution

It’s not about the pieces – concentrate on the whole result

The goal should always be to solve a problem or provide quantitative value, not apply a specific technology

Guidance Automation – AMR solutions provider
Autonomous Mobile Robots

• AMRs are an exciting new tool that can be applied...
  • As a standalone system
  • As a component of a more complex system
Keep in Mind

End users should not be focused on implementing AMRs

End users should focus on the goals:
- Increased throughput
- Lower cost
- Increased flexibility
- Increased accuracy
- Decreased order processing time

Consider AMRs as a part of an overall solution
Objectives

• Discuss the benefits of adding robotics to new and existing fulfillment systems

• Introduce potential applications for bot-assisted material handling systems

• Discuss methods for successful adoption and best results
Bot-Assisted Material Handling Systems

• Combine robotic solutions with an operation’s existing automated technologies
• Allow DCs to tailor technologies to their unique needs
• Have the flexibility to handle myriad fulfillment channels and requirements
• Scalable for incremental implementation
Why Consider Robots?

- Customer service expectations are growing
- Labor pools are shrinking
- Save money
- Remove conveyors
  - Increase flexibility
  - Shrink aisle size
Where do Bots Really Fit in my DC?

Where will emerging robotic technologies – including Automatic Guided Vehicles (AGVs), Autonomous Mobile Robots (AMRs), Cobots – best fit my order fulfillment operation?

- Interaction with humans
- Low density/e-commerce picking activities
- Multiple feeds and destinations

Where do they not fit? Can existing operations be improved in other ways?

- Dense picking is more suitable to traditional picking methods
- Traditional MHE is more suitable for simple and high-volume material transfer
Areas of Improvement

• Reduce Labor Requirement
  • Keep workers focused, on task
  • Pick cart building process
• Material Movement Flexibility
• Picking / Putting Efficiency
• Ergonomics – Repetitive / Heavy Tasks
• Safety
• DC Size Constraints
  • Smaller facility
  • Larger facilities
    • De-couple far away areas
AMR Applications
Integration with MHE & Systems

• Where can integrating AMRs into your traditional material handling equipment and software provide benefits?

• Depending on the attachment configuration, AMRs can support receiving, putaway, picking, returns, and material movement.
Bot-Assisted Order Picking

- Equipped with shelves for order containers
- Multiple bots bring empty/full containers in and out of picking zones, throughout the picking area
- Ideal for areas that don’t justify conveyors or require space flexibility or have low pick density
- Enables the picker to focus on picking vs. container handling
Picking Systems – Pick / Put Bots

• Like the picker assistant bots but include light-directed picking modules mounted on the shelves
• Carry multiple order containers
• Act as mobile “put stations”
• Travel with operators from location to location as picks are completed
Picking Attachment – Application Note

• For batch or cluster picking without the need for conveyors, sleds, or picking carts

• Can replace manual methods for light-directed pick and put systems

• When picks are complete, navigates to pack-out stations for order consolidation, packaging and shipment

• Another AMR navigates to operator for continued picking
Bot-Assisted Picking

BOT WITH PICK-TO-LIGHT AND MULTIPLE ORDERS

BOTS SUPPORTING MULTIPLE PICKERS
Picking Systems – Tugger Vehicles / Bots

• Tuggers move full or empty carts in and out of the picking area

• Help operators do less walking and less pushing carts from zone to zone, allowing them to spend more time picking
Put Wall with Bots

• Fed by tote carrying bots from the pick area
• Sorting arms scan and sort ‘put and pack’ tasks for fast, accurate e-commerce order sortation
Box Transportation Bots

• Equipped with motor-driven roller (MDR) conveyors on their top decks – available as fixed or adjustable height

• Bots receive conveyed cartons or totes, then transport them to areas not otherwise connected by conveyor

• Adds flexibility to areas where a permanent conveyor installation doesn’t make sense
MDR Bot Attachment – Application Note

Load transfer to:

• Powered or non-powered conveyors
• Pallets for cross-docking
• Picking and sortation areas (pick-to-light, RF picking, voice picking, put-to-light, automated sorters, and more)
• Order finishing systems

MDR Attachment
Tray Delivery
Charge Swap
Navigation – Lines and Symbols

Lines on the floor, wires in the floor, magnets in the floor and symbols stuck to the floor.

We have our own floor symbol solution, which unlike many other symbol-based solutions, the vehicle is not required to drive from code to code, the symbols regulate the AGV’s position in the environment and prevent accumulation of error.

This is more flexible than rigid lines, but still requires material to be stuck on the floor which is undesirable in many facilities.
Navigation – Triangulation of Reflectors

By mounting an array of reflective targets around a wide-open area, a rotating laser scanner with use triangulation to calculate its position.

Our own in-house laser scanner design relies mainly on its very high accuracy bearing measurement to achieve 4 mm positional accuracy.

This exceptional processing capability produces the X and Y coordinates and heading that directs the AGV with maximum flexibility, unconstrained by the targets.
Natural feature navigation or contour navigation is becoming very popular due to its flexibility. Using data from the laser safety scanners already mounted on the vehicle, there is a reduced cost of hardware.

We created our own 2D laser navigation solution using any laser scanner which outputs range and bearing (safety scanner or other, indoor or outdoor).

All of these navigation solutions have pros and cons and we were in a lucky position to have tried and tested them all to see which work best. Often this depends on the environment that we plan to work in.

Not all solutions will work in all facilities.
Navigation - Contour
The Vehicle
Application of Vehicles

The function of the vehicle needs to be defined by adding the extra hardware and sensors to achieve this.

The vehicle controller operates this hardware as needed to perform the function of the vehicle.
Application of Vehicles
A fleet of vehicles need a suitable software package that can control them in the most optimal way.

This is the most important component of the vehicle system. So again we developed our own solution.

‘Jobs’ are passed to the fleet manager. The FM decides which vehicle to use for the task. This is a complicated and streamlined process which sets the efficiency of the vehicle flow and job completion.

Independent of vehicle function
Summary

• Vehicle designed for 100 kg, easy to change if needed
• Base design flexible for various tops and functions
• Flexible fleet management controller – independent of application – mixed fleet
• Issue jobs to FMC and it selects the vehicle based on priority, time, type and location
• Vehicle completes task and reports when job complete
• Charges as needed or opportunity charging can be employed
• Functions performed by vehicle are stored in vehicle controller
Successful Implementation Depends on a Proven System Development Strategy

- Early Customer Involvement in the Planning Process
- Long Term Customer & Integrator Relationships
- Understanding of End-to-End Supply Chain
- Holistic View of DC Operations
Planning & Design

• Determine and document customer requirements and system design in a manner that is easy for both parties to understand
• Identify technologies for meeting the requirements
  • Part of this process involves identifying where AMRs can provide unique benefits
• Configure solution to best fit the system
  • If adding robotics, start small by identifying good areas to test and acclimating employees, maintenance, and management; then measure the initial results
Simulation

• Determine how the addition of robotics will effect end-to-end operations

• Exact facility size and MHE placement, as well as real software and robotics logic, order volume, and SKU count ensure an accurate representation of a proposed system

• Low risk

• Cost-effective
Implementation Strategies

Incremental Phasing Strategy

Software Updates

Customer Approval for Interface Testing

System Requirement Changes

Conference Room Pilot

Aftermarket Technical Support

Integration Testing

User Training/Go-Live Support
Software Integration is Key

• Fully integrated fleet management software aligns bot activity with other automation, unifying communications

• Fleet Management Integrated with WES, WCS, Pick Software, etc.

• One host interface (WMS, ERP) and one centralized User Interface

• Balance operations

• Enables scalable AMR adoption
Diagnostics

- Reporting
- Camera Integration
Strategic Advantages

• Provide flexibility by replacing permanent conveyor for material movement
• Allow humans to do the challenging, value-added jobs that can’t be easily automated, while robots take up the mule work and reduce repetitive task errors
• Increase sortation accuracy
• Enhance warehouse safety and ergonomics
Key Takeaways

• New robots can expand the agility and performance of existing material handling automation equipment and systems

• The name of the game is “evolution” not “revolution” – Incrementally adding emerging robotic products to proven material handling technologies delivers process flexibility with less risk and a higher probability of a solid ROI

• Demonstrated software and controls interfaces (such as WES) and end-to-end system experience are crucial in effective automation adoption
For More Information

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