FIND YOURS.

A Practical and Cost Effective Approach to Deploy Autonomous Robots in Picking

Presented by:
Numina Group
Objective

Autonomous Mobile Robots and Traditional Automation can play well together; it’s all about the ROI!
Autonomous Mobile Robots, AMR Technologies

The investment decision is complicated!

Automation Technologies for Order fulfillment
Automation Driving Factors

To be competitive a DC must:
1. Reduce costs
2. Improve Accuracy
3. Eliminate and streamline manual operations*
   *Labor scarcity and economic growth continue to drive up wages
   2017-18 average wage increase was 11%

Companies that implement leaner, better processes and magnify the improvements with the right automation will:
1. Accelerate revenues
2. Gain market share
3. Obtain higher profitability
First Step - Think Lean - Value Stream Mapping

- Discover and document non essential touches and waste in the operation
- What’s limiting order fulfillment bottlenecks and choke points
- Replace or bolt on Automation to existing ERP
- What process improvements and technologies provide the highest gains?
- Identify and document improvements & technologies that drive the ROI!!!
Slotting Improvements

- SKU velocity is “Key to Slotting”
- **Slotting**- SKU’s based on A,B,C Velocity Profiling
- Define your 80/20 and slot high movers closest to shortest work path
- Highest Movers in “Golden Zones” and use of proper storage equipment lowers replenishment labor
- Zones/Areas reduce travel path for fast/slow movers
- Improve Picking and Packing Ergonomics

* Better slotting practices alone can add 10% or more efficiency gain in picking
Which Automation Investment drives the highest ROI?

Industry average: **55% of a DC’s operating costs** is associated with **order picking**

Do the Basics- before the selection of automation technologies

1. Eliminate “wasted touches and steps”
2. Use the “Right Type” of storage equipment matched to SKU cube and velocity
3. Reduce walking/drive travel path (wander-time) so operators perform more work
4. Cartonization - pick and pack direct to the shipping carton
Design to Perfect Order Fulfillment

The WERC Supply Chain Council describes perfect order as meeting 99% in all components of all order fulfillment processes:

- Shipped to the right place and person
- With the right product and quantity
- At the right time
- In the right condition
- In the right package
- With the right documentation and labels

**Failure to perform consistently in every order fulfillment step damages customer service and profitability!**
TOP 5 BENEFITS

Supply Chain Management Survey 2018 Investing in Robotics

- Improve quality, reduce errors or rework: 72%
- Increase capacity without increasing headcount: 71%
- Reallocate employees to higher value tasks: 69%
- Cut costs: 67%
- Streamline / simplify processes: 57%
WES-WCS Order Fulfillment Automation Increasing Duties

Enterprise Wide Decisions
Inventory Tracking

Balance Pick, Pack & Ship
Capture SKU & Lot
Labor and Technology
Supervision & Coordination

Tier-1 WES-WCS - Order Release
Voice Directed Pick & Pack

Conveyors – Sorters - ASRS
AMR’s AGV’s

Packing Automation
Print and Apply Labeling

Shipping Optimization

ERP / WMS

Warehouse Execution and Control Systems WES-WCS Increasing Duties and Optimization role

Real-time Control and Intelligent Component Management & Control

TMS & Parcel Manifesting Automation
Artificial Intelligence (AI) are systems designed to perceive their environment and take actions with minimal human intervention. AI software does not simply execute a particular task; it’s program learns and adapts to user behaviors and performance patterns.

Example: Order Release AI model-based & Machine Learning Algorithms take into account multiple attributes to improve Order Throughput and Equipment Performance

- Delivery Priority and Carrier cut off times
- Conveyor, Pick Modules, AMR’s - historical and real-time capacity
- Work Load ( # of operators required and assigned based on lines/per hour)
- Pick Zone(s) - measures historical and real-time performance to learn patterns
- Equipment capacity & status-carton erector, print and apply label applicators, sorters
- Work demand in a Zone - current zone picks and in flight (destined to the zone)
- Order start, expected completion/travel time models, pick time
- Customer specific pick, pack, and ship rules (carton, case, padded bag)
- Area work standards with real-time measured feed-back control
## Picking Technologies

### Lines per Operator Hour

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### Velocities
- **0-100 lines per man hour**: Racks and Static Shelving
- **100-200 lines per man hour**: Pick to Belt Carton & Pallet Flow
- **200-300 lines per man hour**: Carousels & Semi-Automated Systems
- **300-400 lines per man hour**: Automated / Semi-Automated Picking Technologies (e.g., A-Frame, Kiva...)
- **400+ lines per man hour**: Horizontal Carousels, Shuttles

### Notes
- **Higher capital cost per SKU**
- **Voice - High Speed, Accuracy & ROI**
- **Good Performance, Good Accuracy**
- **Higher Error Rate & Low Accuracy**

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Independent Study by MWPVL - LPMH by Picking Method
1. Hands free - eyes focused - **single touch** pick with hands free barcode scan validation
2. Accuracy - to 99.98% to 99.99%
3. Voice commands occur in parallel with movement
4. Enforces uniform work practices across all workers
5. Process interleaves voice commands and scan validation of location, item, lot code, serial # based on specific SKU!
6. Latest voice technology order and tracking with ability **to move pickers to highest work demand zones**
Voice Pick - Batch Cart or Fork Truck Pick Process

Batch Pick and Pack vs. Discrete Order Picking:

- Intelligent Order Release includes Cartonization for order selection and assignment to the cart based on Priority/Business Rules, Path Optimization and “like pick visit” logic
- Voice directs picking and confirms pick and put to the shipping carton for:
  1. Single touch - high order fulfillment accuracy
  2. Eliminating touches in the pack process
  3. 150-180 lines per work hour

Batch Order Picking – Direct to the Shipping Carton

- Cartonization selects carton/tote using SKU size and weights
- Carts are built with 12 or more orders based on order prioritization and like SKU location visits to optimize the path
- “Speed Pick” sweeps all single line shipments to a tote for efficient pack and ship processing

Push Cart, or Fork Truck Cart Batch Picking 12 or more orders direct to the shipping carton and speed pick tote in the same batch in an optimized travel path
Pick Modules Advantages - SKU Velocity Slotted by A, B, C Reduces Replenishment to 7 - 10 day cycles

Walk Back Aisles Shelving
B & C SKUs

3 Deep Carton Flow or Pallets
A Moving SKUs

Routing Diverter
For Two Zones

Zone 1
Zone 2
Zone 3
Zone 4

Pick Module – Multiple Levels with Zone Routing Man to Goods

Traditional Automation
Pick Module Man to Goods

Pick to Voice direct to the shipping Carton in Zone Routing Modules can provide single touch pick and pack rates of 250+ lines per operator.
Batch Pick Slow Movers to Combine with High Mover SKU’s in the Pick Modules

- Carts pick slow mover SKU’s from shelf and rack storage aisles, then induct cartons to the PM induct conveyor
- Cartons requiring additional picks transport and divert to the required SKU storage zone
- Voice directs pick and pack validation process

Pick completed cartons convey and sort to the pack automation area.
Roaming Shuttles - fast, self contained AMR technologies

• AS/RS goods to man applications:
  • GTP: Goods-to-Person
  • ACP: Auto-Case Picking
  • ATP: Auto-Tote Picking
  • BPS: Batch Picking System

1. AS/RS stores and retrieves totes and cases fast cycle 2,400 totes/hr.
2. Handle SKU counts 20,000 to 240,000+.
3. SKU velocity typically B+ to C movers to reduced replenishment cycles.
4. A SKUs stored and picked from traditional carton flow or pallet flow using Voice Pick or Pick to light
Growing Choices - AMR’s Designed for Warehousing

Robots Boost Traditional Automation Productivity
AMR and AGV’s Require the Right Software for efficient use and safe operation

AGV AMR  Dispatch Traffic Control Software
- Traffic control software monitors and dynamically manages each vehicle assignment and path
- Vehicle activities, routing, stops and charging are managed and optimized to deliver the best performances across multi-vehicles used in the system

AGV-AMR - Guided Supervision Software
- Graphical user interface manages and monitors real time movement and navigation, constantly communicating to manage priorities and traffic control across the fleet, sending work task instructions to each vehicle and assigning the worker where to go and what to do within the facility
AMR - Boosts productivity in batch cart picking

- Combining voice and AMRs directs both the picker & robots movement and duties into a united system
- Reduce voice picker travel time by 20-30% dependent on the pick travel path
- Integrates picking with the pack and ship conveyors and pack automation technologies providing a complete order fulfillment solution
- ROI - dependent on picker daily walk time and DC size!

Cart tugger with hook allows AMR’s to pull 700 lbs. loads

Robots path training is done in hours

Carts automatically travel to required pick locations

Pick Complete Carts moved by AMR to the pack conveyor line.
• Voice optimizes picking vehicle in a mixed case multiple pick to pallet process
• Pick rates of 200+ cases/hr. in high mover SKU pick tunnels
Self Driving Vehicles work both standard Pick Aisles and VNA applications.

Vehicle self drive in pick aisles
Productivity gains from 20-25%
Self Driving Picking Vehicles
- Reduces the operator walk time
- **AMS automatically moves** to each required pick location
- Pick to Light or Voice directs the pick and put validation using wearable hands-free scanner for location
- **Parallel Picking** extended forks allow picking of 2 or 3 pallet orders
- **Pick to a store or department** in a route/trailer optimized order loading pattern
- **Highly scalable** - Add AMR’s based on ROI

**Operator** drives the **AMR** to the first pick aisle/location
Autonomous Mobile Robots
Picking Shelves - Goods to Man technology

Next generation Kiva robots are coming to DC operations!
• Goods To Operator – Fulfillment - OmniChannel
• Swarm AI Logic AMR’s Work Task assigned collective
• Faster speeds than co-operative AMR’s due to operating in a controlled work space (no humans!)
• Simple rollouts – Flexible Automation
• Requires a flat surface
• Applications - Mid to large DC
**Autonomous Mobile Robots**

Picking Shelves are Goods to Person Technology

- Think de-coupled Horizontal Carousels
- Application - Split Case each picking
- Optimizes shelf moves on demand
- Automated product moves to several parallel (4 or more) Put Wall order consolidation areas

Operator is directed using pick to light to pick from the shelf and put to the order consolidation shelf

- Requires slotting decisions to minimize daily replenishment
- Primarily a “flat floor” based technology requires a mezzanine over pick area to optimize the DC space
- Weight distribution and safety cages required with current generation of AMR’s
Blending traditional Automation and AMR Produces the Best ROI!

DC’s will invest in the right blend of automation that produces 40% or higher productivity gains and better than a 2.5 year ROI.
Justifying Automation Investment can be Complicated

- Document the processes and current practices to identify the gains
- Define current operation labor cost per SKU pick
- Account for all moves, receiving, put-away, replenishment, pick, pack, and ship
- ROI includes:
  1. *More than Lowering Labor - important but not the only factor!*
  2. Quality
  3. Accuracy
  4. Improved throughput
  5. Shorter delivery window
Traditional Automation and Increasing AGV-AMR Technology will be Blended Together in the Future

- AMRs and AGVs offer a lot of emerging choices with different roles
- Focus on process improvements and which technologies provide the highest gains
- AI will play an increasingly significant role in managing today’s DC
- More choices make automation selection more complex
- Get educated and enjoy the ride!

Automation Technologies for Order Fulfillment
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