Orchestrating Man and Machine

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Automation
Significant growth trend

• Tight labor markets
• Need more capacity
• Fulfillment as a competitive weapon
Automation
Growing in variety and sophistication

Traditional MHE
Sophisticated Storage & Retrieval
Cutting Edge Robotics

POWERED BY POSSIBILITIES.
Automation
Complex DCs!!!
Automation
Complex Systems?

WMS
WES
WCS
**Automation**

Visibility from key systems

<table>
<thead>
<tr>
<th>Category</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orders</td>
<td>WMS</td>
</tr>
<tr>
<td>People</td>
<td>WMS</td>
</tr>
<tr>
<td>Work</td>
<td>WMS</td>
</tr>
<tr>
<td>Equipment</td>
<td>WCS</td>
</tr>
<tr>
<td>Inventory</td>
<td>WMS</td>
</tr>
</tbody>
</table>
Along came the WES

Warehouse Management

Warehouse Control

WMS

WCS

Orders/Order Status
Inventory
Task Plan

3rd Party Warehouse Execution

Item Status
Weigh oLPN
Container Status

MHE Diverts
Flow Paths

Cumbersome
Redundant
Expensive!!!
Automation

Is there a better way?

Warehouse Management

Warehouse Execution

Pick to Light
Put to Light
MHE Diverts

Status
Key Metrics
Visibility

Item Status
Weigh oLPN
Container Status

Warehouse Control

Warehouse Control

Warehouse Control

Automation

POWERED BY POSSIBILITIES.

MODEX 2020
Automation
Only part of the story

- Nothing can replace human decision making
- Some tasks cannot be automated (yet)
- Man + Machine can yield great efficiency
Orchestrating Man And Machine
So many questions!!!

• Where is the item?
• Which order takes precedence?
• What type of automation can move the inventory?
• What resource is available right now?
• What carrier/service is required?
• What delivery requirements exist?
• What is the most efficient travel path?
• How long will the work take?
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Wave vs. waveless?

Waves require user attention to release batches of orders which create tasks (work).

Throughput and utilization rise and fall naturally throughout the batch release & execution processes.

Manual intervention may be needed to expedite High Priority Orders after a batch (wave) is set in motion.

<table>
<thead>
<tr>
<th>W4</th>
<th>W3</th>
<th>W2</th>
<th>W1</th>
</tr>
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Traditional Order Fulfillment via Wave-Driven Batches

Peaks and valleys in labor

<table>
<thead>
<tr>
<th>% Utilization</th>
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<tbody>
<tr>
<td>100</td>
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<tr>
<td>90</td>
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<tr>
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<td>20</td>
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<tr>
<td>10</td>
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<tr>
<td>0</td>
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</tbody>
</table>

- Picking
- Time
- Sorter
- Packing
Wave vs waveless?

Throughput and utilization metrics are improved. Just-in-time release allows for late-stage reprioritization and better accommodation of higher priority orders. Streaming eliminates peaks and valleys leading to consistent asset utilization. Throughput and utilization metrics are improved.

More Consistency via Waveless Fulfillment

Peaks and valleys in labor

% Utilization

0 10 20 30 40 50 60 70 80 90 100

Picking Sorter Packing

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Putting it all together

- Goods to Person
- AS/RS
- Unit Sorter
- Put Wall
- Pack from Tote
- Pack Station
- Pack from Tote
- Replenish Active

Orders

Shipping

Human Driven  Machine Driven

POWERED BY POSSIBILITIES.
Order Streaming + WES – Saves Time

The system continuously evaluates the order pool to prioritize orders and advance orders through the process **without human intervention**.

High priority orders are completed in less time.

Order Streaming + WES – Improves Asset Utilization

Work release delayed… until *Human* or *Equipment* capacity is available.

Pull-based processing based on real-time human and automation status honors capacities and constraints in real-time.
Final thoughts

• Which system is right for me?
  • Don’t use a hammer when a screwdriver is required
  • WMS – intelligence, optimization, inventory, prioritization, etc.
  • WCS – all move logic
  • WES – communication between WMS and WCS

• The most sophisticated, complex, and cognitive machine in the warehouse is the human brain

• Automation most often augments, not replaces, the workforce

• Applying right mix of optimization and automation can
  • Reduce cycle time
  • Improve asset utilization
  • Increase throughput
  • Eliminate upgraded shipments
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