Sort it out! Making smart sortation automation decisions

Satyen Pathak, senior product manager
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Your presenter

Satyen Pathak

*Senior product manager, Intelligrated*

Satyen is responsible for Intelligrated’s tilt-tray and cross-belt sortation product lines. He provides strategic oversight and technical guidance to ensure solution sets address market requirements for challenging distribution applications, including e-commerce and omnichannel operations.

Satyen led the development of Intelligrated’s dynamic discharge compensation technology for cross-belt sortation systems — a 2016 MHI Innovation Award winner. His input has been featured in several material handling and logistics trade articles.

Satyen has more than 18 years of experience in industrial product management, engineering and business development, including stops at Cirrus Logic and Siemens prior to joining Intelligrated.

He is involved with MHI and holds an MBA from Ashford University.
Adapting to the times

The evolution of retail logistics*

1970s
Direct store replenishment by suppliers or wholesalers

Mainly domestic suppliers
Retail distribution centers
Shops

1980s
‘CENTRALIZATION’ of deliveries through retailer distribution centers

Overseas supplier
Retail import centre
Retail distribution center
Shops

1990s
The rise of global sourcing

Domestic supplier

2000s
E-commerce model involving parcel network

E-fulfillment center
Parcel hub
Sortation center
Parcel delivery center
Local depot (urban logistics)

* Based on non-food distribution in developed markets

Source: JLL.com
Units of movement

- Pallet or unit load
- Layer
  - Retail = carton or case
  - Manufacturers = “each”, carton or case
- Full case
- Inner or warehouse pack
- Item or each
- Totes
- Parcels
- Gaylord
- Polybags
- Jiffy bags
- Envelope
  - parcel = flats
- Mixed SKU pallets

http://www.inventoryops.com/dictionary.htm
DC/FC metrics (typical)

- 100K – 1+ million building sq. ft.
- 25 – 200 acres (building and yard)
- 24 – 32 ft. ceiling heights
- 10 – 100+ receiving / shipping doors
- Cost: $10 – $100 million USD
- 6 – 18 months to build
- 8 – 24 hours of operation
- 100 – 1,200 staff (multiple shifts / schedules)
- 1K – 250K stock keeping units (SKU’s)
- 7 – 20 inventory turns per year
- 1K – 50K ft. of automation
- Ship 5,000 – 250,000 cartons per day
- 10 – 100+ trailers shipped per day
- 100+ stores or 100,000+ customers

Retail distribution center
Typical customer: retail shop or other business
Operation: store replenishment, inventory stock
Additional processes required for storage, processing and picking

Order fulfillment center
Typical customer: direct end user
Orders received online
Order sizes are smaller
More SKU’s
Operation: pick and ship for e-commerce
Automation poll question

In regards to DC automation, what is your operational status currently?

a) Have automation
b) Considering automation
c) Do not require automation yet
d) Just listening, because I have nothing else to do
North American warehouse metrics

<table>
<thead>
<tr>
<th>Performance Metric**</th>
<th>Rank</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Time Shipments</td>
<td>1</td>
<td>&gt;99.8%</td>
</tr>
<tr>
<td>Internal Cycle Time</td>
<td>2</td>
<td>&lt;3.8 Hours</td>
</tr>
<tr>
<td>Dock-to-Stock Time</td>
<td>3</td>
<td>&lt;2 Hours</td>
</tr>
<tr>
<td>Total Order Cycle Time</td>
<td>4</td>
<td>&lt;7 Hours</td>
</tr>
<tr>
<td>Order Accuracy</td>
<td>5</td>
<td>&gt;99.8%</td>
</tr>
</tbody>
</table>

Same top five metrics as 2015. Dock to stock moved from #4 to #3. No significant change in fulfillment mix.

Operation metrics focus on managing opposing forces:
- Available inventory vs. inventory cost
- Speed of fulfillment vs. order accuracy
- Cycle time vs. fulfillment costs

What matters to you?

Order fulfillment

Operation

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Pallet</td>
<td>20%</td>
</tr>
<tr>
<td>Partial Pallet</td>
<td>14%</td>
</tr>
<tr>
<td>Full Case</td>
<td>30%</td>
</tr>
<tr>
<td>Split Case</td>
<td>37%</td>
</tr>
</tbody>
</table>

Technology*

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>60%</td>
</tr>
<tr>
<td>RF</td>
<td>54%</td>
</tr>
<tr>
<td>Voice</td>
<td>14%</td>
</tr>
<tr>
<td>Lights</td>
<td>4%</td>
</tr>
<tr>
<td>Automated</td>
<td>11%</td>
</tr>
</tbody>
</table>
Where to automate

Objections to automation

- Not easily flexible or scalable
- Not enough volume
- Difficult to maintain
- Implementation too disruptive
- Must do “all or nothing”
- Too expensive
It depends

The requirement to move into automation as a solution depends on several variables:

- Pick density — how close things are stored together
- Peak to average volume
- # of SKU’s, unit movement, orders across SKU’s (80/20)
- Conveyability — liquids, fragile, eaches, full cartons
- Level of service
- Orders per day
- The cost of labor
- Accessibility to labor
- Volume of product
- Customer delivery commitments
- Expected future growth of the company
- CAPEX budget requirements
- ROI expectations
Case picking

Solutions vary from manual to highly automated. Results vary based on order profiles, slotting, travel distance, type of directed activity (paper/RF/voice), etc.

- **Pick to cart**: Good for low to moderate volumes.
- **Pick to powered pallet jack**: Better for moderate to high volumes.
- **Pick to conveyor**: Best for higher volumes.
Each / piece picking solutions

- Labor-only operations peak at 2,000 – 3,000 orders per day
- Solutions vary by product and order profiles
- Solutions starting at 1,000 orders per day
- E-commerce orders are typically 1.2 lines

Typical methods of each picking
- Batch-picking
  - Total order: Low
  - Picks-per-order: Moderate to high
- Discrete orders
  - Total order: Low
  - Picks-per-order: Moderate to high
- Zone-picking
  - Total order: Moderate to high
  - Picks-per-order: Low to moderate
- Bucket brigade
  - Total order: Moderate to high
  - Picks-per-order: Low to moderate
Up to 10,000 orders per day
Conveyor

• Belt conveyor
  – Generally the most cost-effective method of transporting items over a significant distance
  – Good product control, especially in elevation change areas
  • For most horizontal and incline transportation, belt conveyor is usually the standard choice
  • For decline applications, belt will be higher installed cost than gravity conveyors
GoKart order fulfilment execution solutions

Software-driven solutions for up to 10,000 orders per day

- Paper, RF, voice or light-directed cart picking solutions
- Advanced software to plan and batch order release, monitor operational productivity and make real-time adjustments
- Increase picking rates by up to 60 percent
- Fill up to 60 orders per cart
- Add carts as volume increases
- Range of scalable solutions enables increased capacity and accuracy, while reducing labor

<table>
<thead>
<tr>
<th>GoKart type</th>
<th>Lines per hour</th>
<th>Labor</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-based</td>
<td>130</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>RF-directed</td>
<td>180</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Voice-directed</td>
<td>190</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Light-directed</td>
<td>300</td>
<td>+</td>
<td>++++</td>
</tr>
</tbody>
</table>
Voice picking

- Achieve over 99.9 percent accuracy
  - Speech recognition combined with data capture (scanning) allows for quick quality checks throughout the order fulfillment process

- Up to 45 percent productivity increase over paper picking
  - Automate complex tasks with easy-to-use voice directions

- Fastest training for new or temporary workers

- Increase safety
  - Voice-directed automation keeps hands free and eyes on the tasks at hand

Supports rugged phones, smartphones and other non-proprietary handheld and wearable devices, reducing hardware costs and ongoing maintenance
Sweeper sorter

• The sweeper sorter is ideal for sorting large quantities of small products.

• This concept has proved itself many times not only sorting post, but also sorting pharmaceutical products.

• The basis of the machine is a linear conveyor belt. There are outlets to the left and right of this conveyor belt.

• Containers, bags or even complete removal conveyor belts can be placed at the outlets.

• The sweeper sorter is a modular unit installed above a conveyor belt.
10,000 – 50,000 orders per day
Zone-routing, pick-and-pass, and sortation

- Fill up to 50,000 orders per day
- Integrates pick-to-light, RF or voice-directed pick modules with intelligent conveying and sortation system
- Intelligent zone routing automatically routes product to the best available picking station
- Allocate orders on the fly
- Initiate orders anywhere
- Route discrete orders and/or batched totes
Pop-up wheel divert

- Pop-up wheel in belt conveyor
- Rates up to 100 cartons per minute
- Removable divert module
  - Quick replacement for minimum downtime
  - Replace divert tub in less than five minutes
- Tray design prevents belt damage
- Clutch wheel drive for long life
Shipping sortation

• Omnichannel operations include warehouse, fulfillment center and parcel sortation

• Increased need for high throughput, reliable and accurate sortation

• Drive for sortation that handles polybags, parcels, cases and totes

• Applications include shipping, cross-docking, line balancing, routing, defect rejection and order consolidation
50,000 – 150,000 orders per day
Tilt-tray and cross-belt sortation solutions

- Fill up to 150,000 orders per day
- Sort ~25,000 items per hour
- E-commerce applications include order fulfillment, shipping and returns
- Batch pick inventory, use sorter for order consolidation
- Manual, automatic and semiautomatic inductions
- Software provides supply and demand order consolidation
- Traditionally one active, one buffered order per chute
  - Store order
  - E-commerce order
- Order packed at chute
Scaling automation

What matters in your selection of automation?

- Order fulfillment speed
- Order fulfillment volume
- Improved throughput, efficiency
- Inventory accuracy
- Ergonomics / safety
- Reduced product damage
- Reduced shipping costs
- Space savings
- Other

The basics of automation

Automation in any setting is all about finding repetitive tasks that consume large amounts of time or commonly lead to errors. Once you find those points in your process, you can start to think about automating them.

Warehouses have these repetitive pain points. You walk to a bin, pick a thing out of a bin, and put that thing in a new location over and over. You enter shipments into tracking systems over and over. You sort, categorize, and store items over and over.

Each of these repetitive tasks is an opportunity for automation.

Sortation technologies — throughput rate

<table>
<thead>
<tr>
<th>Typical technology rate capability</th>
<th>Items/min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Process</td>
<td>450</td>
</tr>
<tr>
<td>Pusher</td>
<td>400</td>
</tr>
<tr>
<td>MDR Transfer / Divert</td>
<td>350</td>
</tr>
<tr>
<td>Strip Belt Transfer</td>
<td>300</td>
</tr>
<tr>
<td>Pop-up Wheel Belt</td>
<td>250</td>
</tr>
<tr>
<td>Pop-up Wheel Belt</td>
<td>200</td>
</tr>
<tr>
<td>Sweeper Sort (Single Induct)</td>
<td>150</td>
</tr>
<tr>
<td>HDS Sliding Shoe</td>
<td>100</td>
</tr>
<tr>
<td>Sliding Shoe, Dual Sided</td>
<td>50</td>
</tr>
<tr>
<td>Sliding Shoe, Single Sided</td>
<td>30</td>
</tr>
<tr>
<td>Push Tray</td>
<td>27,000</td>
</tr>
<tr>
<td>Bomb Bay</td>
<td>24,000</td>
</tr>
<tr>
<td>Tilt Tray</td>
<td>21,000</td>
</tr>
<tr>
<td>Cross Belt</td>
<td>18,000</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>12,000</td>
</tr>
<tr>
<td></td>
<td>9,000</td>
</tr>
<tr>
<td></td>
<td>6,000</td>
</tr>
<tr>
<td></td>
<td>3,000</td>
</tr>
</tbody>
</table>
Sortation technologies — item type

- Manual Process
- Pusher
- MDR Transfer / Divert
- Strip Belt Transfer
- Pop-up Wheel Belt
- Pop-up Wheel Strip Belt
- Sweeper Sort (Single Induct)
- HDS Sliding Shoe
- Sliding Shoe, Dual Sided
- Sliding Shoe, Single Sided
- Push Tray
- Bomb Bay
- Tilt Tray
- Cross Belt

Item size handling capability:
- Small / difficult to handle
- Large cartons or totes

Intelligrated is now part of Honeywell
Sortation technologies — operating noise

- Manual Process
- Pusher
- MDR Transfer / Divert
- Strip Belt Transfer
- Pop-up Wheel Belt
- Pop-up Wheel Belt
- Sweeper Sort (single induct)
- HDS Sliding Shoe
- Sliding Shoe Dual Sided
- Sliding Shoe Single Sided
- Push Tray
- Bomb Bay
- Tilt Tray
- Cross Belt
Sortation technologies — energy usage

- Manual Process
- Pusher
- MDR Transfer / Divert
- Strip Belt Transfer
- Pop-up Wheel Belt
- Pop-up Wheel Strip Belt
- Sweeper Sort (single induct)
- HDS Sliding Shoe
- Sliding Shoe Dual Sided
- Sliding Shoe Single Sided
- Push Tray
- Bomb Bay
- Tilt Tray
- Cross Belt
Sortation technologies — max destinations

1. Maximum destinations per single machine and highly dependent on the application
2. MDR diverts and transfers are stand-alone units
   Vertical axis not to scale
For more information, contact:
satyen.pathak@intelligrated.com