Getting in the E-Commerce Game

Presented by:

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Seminar Agenda

- How is design done?
- What’s the setting?
- What do the numbers say?
- What should the facility look like?
- How did they get it done?
- Your questions…
Seminar Agenda

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Process Overview

To begin, a summary of the overall process will help visualize the destination. This will help in understanding the path to get there.

▪ **Where do we start?**
  - Operational Review
  - Data Collection
  - Data Analysis
  - Profiling

▪ **Select an Order Fulfillment Methodology (OFM)**
  - Based on order, customer and SKU profiles
  - Minimize handling, maximize service level

▪ **How big? & How fast?**
  - Forward pick? Which tools?
  - Numbers of slots, facings, locations
  - Sortation parameters and requirements.

▪ **Connect the dots**

Keeping this process in mind while examining each of the individual steps will help keep the forest in view while looking at each tree.
Profiling – Input to the OFM Decision

Identifying the correct OFM’s for each portion of the operation is the first step in developing the facility design.

Order Profiles
- Per ship method (parcel vs. truck)
- Per order distributions
- Per carton distributions
- Order completion
- Single line percentage
- Per day & hr distributions

Handling Unit Profiles
- Full Case %
- Broken Case %
- Full Pallet %
- Mixed Orders %
- Special handling

SKU Profiles
- ABC (Pareto) Distribution
- Full Case, Broken Case, Full Pallet Volumes
- Cube movement

ORDER FULFILLMENT METHODOLOGIES

Primary Manual vs. Automated Considerations:
- Throughput requirements (hourly volumes)
- Labor requirements (amount, cost, availability)
- Service requirements (accuracy, service levels, costs of non-conformance)

Broken Case OFMs

Full Case OFMs
OFM Matrix

Two primary factors in determining the appropriate order fulfillment methodologies (OFM) are facility volume and order profile.
Broken Case OFMs

Complexity (Automation & Technology)

- **Discrete (Single) Order Pick**
  - Low volumes
  - Small footprint (travel path)
  - High Lines/order
  - Large Cube/order
  - Limited WMS

- **Batch (Cluster) Order Pick**
  - Low Lines/order
  - Low Cube/order
  - Small footprint (path)
  - Frequent order release
  - WMS capable
  - >1 fit on pick vehicle?

- **Pick & Pass**
  - Med-high volumes
  - Med Cube/order
  - Limited SKUs complete orders
  - Med-high Lines/order

- **SKU Pick & Marry**
  - Low lines/order
  - Opportunity to batch many orders
  - High SKU commonality across orders

- **Pick To Tote**
  - Precise order cube cannot be pre-determined
  - Re-handling/VAS at packing

- **Pick To Carton**
  - Precise order cube can be pre-determined
  - Order ship ready at point of pick

- **Sequential (Static) Zone**
  - Low order complete % within pick zones

- **Dynamic Zone**
  - High order complete % within pick zones

- **Bulk Pick & Re-Pick**
  - Limited WMS
  - Large number of SKUs needed to complete orders

- **Pick To Put**
  - Low number of customer-order sort points per wave

- **Pick & Sort (Unit Sort)**
  - High hourly volumes
  - Sturdy/durable products

- **Auto. Pick (A Frame)**
  - Very high hourly volumes
  - Sturdy/durable products
  - Uniform/standard product shapes & sizes

**Enhancements:**
- RF
- Voice
- PTL
- RFID

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Project Overview

This client has been growing rapidly and saw the opportunity to enhance overall capacity while improving service to their west coast customers.

- **E-commerce**
  - Technology business
  - Q4 peak
  - SLAs critical

- **Current processes and methods robust**
  - Manhattan Associates WMS
  - Engaged, capable IEs on staff
  - Ownership focus on supply chain

- **Customer and associate experience paramount**
  - SLA compliance
  - Order quality
  - Operator proficiency & ergonomics

- **Appropriate levels of automation**
  - Labor availability (Amazon is everywhere!)
  - Enhanced order cycle time
  - Improved order quality
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Outbound – Daily Throughput

Daily ship volumes were plotted to understand throughput peaks and valleys. The peak holiday season, 11/25 – 12/22 was also isolated.

Average Daily Shipments for 12 month period = 9,214

Average Daily Shipments for Holiday Peak = 37,612

Active SKUs @ Holiday Peak = 171,593
Outbound – Per Shipment Profiles

Per shipment profiles were developed to help understand order characteristics.

Lines per Shipment

- Average: 1.7
- 64% of the orders & ~40% of the lines are single line orders
- Multi-Line Orders Avg. 2.8 lpo

Units per Shipment

- Average: 1.8
- Units per shipment profiles are virtually identical to lines per shipment profiles

Cube per Shipment

- Average: 0.2
- 99% of the orders are ≤ (1) cubic foot
SKUs – ABC Analysis

**Values**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>N</th>
<th>Grand Total</th>
<th>Excluding N Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count of ItemNumber</td>
<td>84,530</td>
<td>100,961</td>
<td>78,874</td>
<td>54,332</td>
<td>40,257</td>
<td>358,954</td>
</tr>
<tr>
<td>Sum of LinesShipped</td>
<td>4,435,238</td>
<td>831,616</td>
<td>221,762</td>
<td>55,441</td>
<td>5,544,057</td>
<td>5,544,057</td>
</tr>
<tr>
<td>Sum of QtyOrdered</td>
<td>4,760,130</td>
<td>869,596</td>
<td>227,673</td>
<td>57,511</td>
<td>5,914,910</td>
<td>5,914,910</td>
</tr>
<tr>
<td>Sum of QtyShipped</td>
<td>4,758,453</td>
<td>869,180</td>
<td>227,558</td>
<td>57,470</td>
<td>5,912,661</td>
<td>5,912,661</td>
</tr>
<tr>
<td>Sum of CFShipped</td>
<td>423,288</td>
<td>77,936</td>
<td>22,286</td>
<td>5,817</td>
<td>529,326</td>
<td>529,326</td>
</tr>
<tr>
<td>Sum of LinesRecd</td>
<td>111,391</td>
<td>63,702</td>
<td>34,691</td>
<td>17,696</td>
<td>30,933</td>
<td>258,413</td>
</tr>
<tr>
<td>Sum of QtyReceived</td>
<td>3,732,593</td>
<td>799,010</td>
<td>371,599</td>
<td>207,920</td>
<td>431,288</td>
<td>5,542,410</td>
</tr>
<tr>
<td>Sum of CFReceived</td>
<td>319,357</td>
<td>64,705</td>
<td>32,151</td>
<td>18,829</td>
<td>37,810</td>
<td>529,326</td>
</tr>
<tr>
<td>Sum of OnHand</td>
<td>1,800,960</td>
<td>777,150</td>
<td>452,061</td>
<td>250,918</td>
<td>475,961</td>
<td>3,281,089</td>
</tr>
<tr>
<td>Sum of CFOnHand</td>
<td>159,320</td>
<td>66,259</td>
<td>39,950</td>
<td>22,860</td>
<td>44,065</td>
<td>332,454</td>
</tr>
<tr>
<td>Sum of WeightOnHand</td>
<td>1,042,749</td>
<td>471,710</td>
<td>293,170</td>
<td>159,416</td>
<td>332,611</td>
<td>2,299,656</td>
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<tr>
<td>Sum of Fragile</td>
<td>543</td>
<td>626</td>
<td>275</td>
<td>153</td>
<td>230</td>
<td>1,827</td>
</tr>
<tr>
<td>Sum of HazMat</td>
<td>30</td>
<td>45</td>
<td>46</td>
<td>29</td>
<td>13</td>
<td>163</td>
</tr>
<tr>
<td>Sum of ShipAlone</td>
<td>143</td>
<td>312</td>
<td>423</td>
<td>228</td>
<td>277</td>
<td>1,383</td>
</tr>
<tr>
<td>Sum of SecureArea</td>
<td>2,997</td>
<td>4,917</td>
<td>4,002</td>
<td>2,491</td>
<td>4,000</td>
<td>18,407</td>
</tr>
<tr>
<td>Sum of Baggable</td>
<td>66,281</td>
<td>83,729</td>
<td>67,839</td>
<td>47,650</td>
<td>34,908</td>
<td>300,407</td>
</tr>
<tr>
<td>Sum of Aerosol</td>
<td>42</td>
<td>175</td>
<td>184</td>
<td>106</td>
<td>193</td>
<td>700</td>
</tr>
<tr>
<td>Sum of Oversize</td>
<td>235</td>
<td>425</td>
<td>452</td>
<td>382</td>
<td>846</td>
<td>2,340</td>
</tr>
</tbody>
</table>

**SKUs were classified as A, B, C, D or N items based on the following criteria:**

- **A items:** top SKUs that generate 80% of lines shipped (~85K SKUs)
- **B items:** SKUs that generate next 15% of lines (~101K SKUs)
- **C items:** SKUs that generate next 4% of lines (~79K SKUs)
- **D Items:** SKUs that generate bottom 1% of lines shipped (~54K SKUs)
- **N items:** SKUs with on-hand or receipt activity but no outbound volume (~40K SKUs)
SKUs – Shipping Frequency

Additionally, SKUs were profiled based on frequency of demand to help understand pick behaviors. Over 50% of the active SKUs are picked less than 6 days per year.

<table>
<thead>
<tr>
<th>Ship Freq Range</th>
<th>SKUs</th>
<th>Lines</th>
<th>Units</th>
<th>SKUs</th>
<th>Lines</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40,257</td>
<td>-</td>
<td>-</td>
<td>54.6%</td>
<td>9.4%</td>
<td>9.2%</td>
</tr>
<tr>
<td>&gt;0&lt;=6</td>
<td>174,096</td>
<td>523,210</td>
<td>545,339</td>
<td>37.2%</td>
<td>38.7%</td>
<td>38.2%</td>
</tr>
<tr>
<td>&gt;6&lt;=30</td>
<td>118,438</td>
<td>2,148,047</td>
<td>2,257,617</td>
<td>6.1%</td>
<td>24.7%</td>
<td>24.6%</td>
</tr>
<tr>
<td>&gt;30&lt;=60</td>
<td>19,599</td>
<td>1,370,871</td>
<td>1,453,094</td>
<td>1.8%</td>
<td>18.0%</td>
<td>18.6%</td>
</tr>
<tr>
<td>&gt;60&lt;=120</td>
<td>5,653</td>
<td>997,062</td>
<td>1,098,179</td>
<td>0.2%</td>
<td>5.2%</td>
<td>5.4%</td>
</tr>
<tr>
<td>&gt;120&lt;=180</td>
<td>708</td>
<td>286,996</td>
<td>318,376</td>
<td>0.0%</td>
<td>2.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>&gt;180&lt;=240</td>
<td>154</td>
<td>133,626</td>
<td>143,983</td>
<td>0.0%</td>
<td>1.5%</td>
<td>1.6%</td>
</tr>
<tr>
<td>&gt;240&lt;=365</td>
<td>49</td>
<td>84,245</td>
<td>96,073</td>
<td>0.0%</td>
<td>1.5%</td>
<td>1.6%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>358,954</td>
<td>5,544,057</td>
<td>5,912,661</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OB SKUs Only</strong></td>
<td>318,697</td>
<td>5,544,057</td>
<td>5,912,661</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![SKU Ship Frequency Chart]

**SKU Ship Frequency**

- Count of Days Shipped
- SKUs: 54.6%
- Lines: 37.2%
- >0<=6: 6.1%
- >6<=30: 1.8%
- >30<=60: 0.2%
- >60<=120: 0.0%
- >120<=180: 0.0%
- >180<=240: 0.0%
- >240<=365: 0.0%
SKUs – Current OH Inventory

Around 188K SKUs have on-hand inventory. Nearly 85% of the SKUs have ≤ (2) cubic feet on-hand. About 3% of the SKUs account for half of the cube on-hand.

Summary

<table>
<thead>
<tr>
<th>CFPerSKU</th>
<th>Items</th>
<th>QtyOnHand</th>
<th>CFOnHand</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=0.5</td>
<td>107,477</td>
<td>862,502</td>
<td>17,111</td>
</tr>
<tr>
<td>0.5-1</td>
<td>26,837</td>
<td>406,213</td>
<td>19,227</td>
</tr>
<tr>
<td>1-2</td>
<td>21,844</td>
<td>495,325</td>
<td>31,001</td>
</tr>
<tr>
<td>2-5</td>
<td>18,957</td>
<td>685,758</td>
<td>59,415</td>
</tr>
<tr>
<td>5-10</td>
<td>7,532</td>
<td>459,054</td>
<td>52,168</td>
</tr>
<tr>
<td>10-30</td>
<td>4,592</td>
<td>490,143</td>
<td>73,069</td>
</tr>
<tr>
<td>&gt;30</td>
<td>1,146</td>
<td>358,115</td>
<td>80,468</td>
</tr>
</tbody>
</table>

Pct

<table>
<thead>
<tr>
<th>CFPerSKU</th>
<th>Pct Items</th>
<th>Pct QtyOnHand</th>
<th>Pct CFOnHand</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=0.5</td>
<td>57%</td>
<td>23%</td>
<td>5%</td>
</tr>
<tr>
<td>0.5-1</td>
<td>14%</td>
<td>11%</td>
<td>6%</td>
</tr>
<tr>
<td>1-2</td>
<td>12%</td>
<td>13%</td>
<td>9%</td>
</tr>
<tr>
<td>2-5</td>
<td>10%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>5-10</td>
<td>4%</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>10-30</td>
<td>2%</td>
<td>13%</td>
<td>22%</td>
</tr>
<tr>
<td>&gt;30</td>
<td>1%</td>
<td>10%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Cube OnHand per SKU

<table>
<thead>
<tr>
<th>Pct</th>
<th>Items</th>
<th>Pct CFOnHand</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=0.5</td>
<td>57%</td>
<td>14%</td>
</tr>
<tr>
<td>0.5-1</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>1-2</td>
<td>10%</td>
<td>4%</td>
</tr>
<tr>
<td>2-5</td>
<td>12%</td>
<td>2%</td>
</tr>
<tr>
<td>5-10</td>
<td>12%</td>
<td>1%</td>
</tr>
<tr>
<td>10-30</td>
<td>10%</td>
<td>1%</td>
</tr>
<tr>
<td>&gt;30</td>
<td>10%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Average 1.8

Current Ohio Bins

<table>
<thead>
<tr>
<th>Name</th>
<th>Active</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Slot CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH - Active Flow - 16</td>
<td>1.00</td>
<td>23.50</td>
<td>16.00</td>
<td>11.75</td>
<td>2.56</td>
</tr>
<tr>
<td>OH - Active Flow - 8 Tall</td>
<td>1.00</td>
<td>22.00</td>
<td>8.00</td>
<td>11.75</td>
<td>1.20</td>
</tr>
<tr>
<td>OH - Active Flow - 8 Cab</td>
<td>1.00</td>
<td>23.00</td>
<td>8.00</td>
<td>6.50</td>
<td>0.69</td>
</tr>
<tr>
<td>OH - Active Flow - 4 Cab</td>
<td>1.00</td>
<td>23.00</td>
<td>4.00</td>
<td>6.50</td>
<td>0.35</td>
</tr>
<tr>
<td>OH - Pallet</td>
<td>1.00</td>
<td>40.00</td>
<td>48.00</td>
<td>70.00</td>
<td>77.78</td>
</tr>
<tr>
<td>OH - Non-Convey Flow Pick</td>
<td>1.00</td>
<td>0.24</td>
<td>0.72</td>
<td>0.19</td>
<td>0.00</td>
</tr>
</tbody>
</table>
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Process Definition

The process alternatives that were considered were:

1. Zone pick and sort by batch to put walls (pick to tote by put wall) - Baseline
2. Zone pick and sort by wave to put walls (two level sort)
3. Direct order pick by family group
4. Goods to person enhancement for certain families

These areas will be scaled by the anticipate volumes and the capital cost, labor and space impacts were compared to find the best applications for the outbound process.
Facility Overview
Outbound Platform
Simulation
Simulation
Simulation
Seminar Agenda

• How is design done?
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• Your questions…
Site Photos – The Expected...
Site Photos – The Expected...
Site Photos – The Expected…

- Implementation timing…peak
- E2E WMS/WCS testing
- Stress tests? What stress tests?
- Cyber Week
Site Photos – The Unexpected…
Site Photos – The Unexpected…
Site Photos – The Unexpected…
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For More Information:

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