Advanced Warehouse Management and Distribution Center Techniques

Ignify
Igniting Ideas. Delivering Results.
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Introduction

Velocity and accuracy: For any supply chain business, the velocity at which goods move and accuracy of shipments are the cornerstone of success. Mis-shipments not only cost more but also cause customer dissatisfaction and churn. In this paper we will discuss how a set of good business processes and an efficient system can ensure frequent turn of goods (velocity) coupled with high accuracy.

We will focus on the following key areas in this paper:

- Warehouse and Distribution Center Structure: Locations and Location labelling, Setting up Default Locations for Put Away/Pick and Bulk Storage
- Inbound Logistics: Incoming Shipments, Quality and Quarantine Management and Put Away
- Warehouse and DC Operations: Cycle Counting and Physical Inventory, ABC Classifications of Goods
- Outbound Logistics: Order Picking Vs. Consolidated Pick, FIFO and FEFO-based Directed Pick, Creating and Scheduling Shipments, including Transportation Management

*Figure 1. Warehouse operations require careful tracking and responsive management of goods in transit, from warehouse overview and operations to inbound and outbound logistics.*
Consider two warehouses, Warehouse A and Warehouse B. Warehouse A keeps a consistent inventory of products in the warehouse, but neglects to record where each item is stored or organize the layout or shipments based on longevity of items. Warehouse B employs an advanced system that tells workers where to put away goods and to pick goods by using location control, and ensures that an adequate stock of merchandise is available at all times to meet service levels yet not over-stock goods to manage cash flows.

Let’s assume both warehouses service a business that has $200Mn in revenues. Let’s look at the potential ROI of a good warehouse system and good warehouse processes. All dollar figures are in US Dollars in the table below:

<table>
<thead>
<tr>
<th></th>
<th>Warehouse A</th>
<th>Warehouse B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Serviced</td>
<td>$200Mn</td>
<td>$200Mn</td>
</tr>
<tr>
<td>Inventory on hand</td>
<td>90 days</td>
<td>15 days</td>
</tr>
<tr>
<td>Shrinkage due to expiration of product</td>
<td>3%</td>
<td>0.1% (by using FEFO pick and ship techniques)</td>
</tr>
<tr>
<td>Warehouse workers</td>
<td>40</td>
<td>20</td>
</tr>
</tbody>
</table>

**Financial Impact**

<table>
<thead>
<tr>
<th></th>
<th>Warehouse A</th>
<th>Warehouse B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Inventory on hand</td>
<td>$50Mn ($200Mn * 360/90 days)</td>
<td>$8Mn</td>
</tr>
<tr>
<td>Interest cost of Inventory assuming an annualized interest rate of 10%</td>
<td>$5Mn</td>
<td>US$800K</td>
</tr>
<tr>
<td>Cost of Shrinkage</td>
<td>$1.5Mn (3% X $50Mn)</td>
<td>$8,000 (0.1% X $8Mn)</td>
</tr>
<tr>
<td>Annual Labor and Software Maintenance cost</td>
<td>$2Mn (40 people * $50,000 average fully loaded annual cost per warehouse worker)</td>
<td>$1.5Mn = $1Mn (20 people * $50,000 average fully loaded annual cost per warehouse worker) + $150,000 (System administrator of software) + $350,000 (Annual Software + Hardware Support)</td>
</tr>
<tr>
<td>Annual Cost of running the warehouse</td>
<td>$8.5Mn ($5Mn Interest cost + $1.5Mn Shrinkage + $2Mn Labor cost)</td>
<td>$2.3Mn ($800K + $8K + $1.5Mn)</td>
</tr>
<tr>
<td><strong>Annual Savings</strong></td>
<td>$6.2Mn</td>
<td></td>
</tr>
</tbody>
</table>

This illustration ignores tools, parts, and equipment running costs for the sake of simplicity and focuses only on things that lead to significant differences. A $6Mn+ (3% of revenue) difference is very significant for a $200Mn business. Many distribution businesses operate on a gross margin of 20% or less and this difference could
potentially double the operating margin of the business. It is not very difficult to transform Warehouse A into the well-oiled machine that Warehouse B represents with a set of good business processes and a powerful warehouse software solution.

**Steps to Success**

We will focus on the two elements discussed earlier to having an effective warehouse/distribution center – Business Process Modeling and an effective Warehouse Management System. Ignify specializes in implementing the Microsoft Dynamics line of products, so where relevant we will support the point by showing how functions are done in Microsoft Dynamics AX.

**Business Process Modelling**

The flow of goods is critically important and defining a good business process for key areas of the warehouse lays the foundation of a good process. It is important to have a good starting point for the business process before it is tailored to your organization. We typically use Microsoft Sure Step for best practice business processes and Microsoft Lifecycle Services for the business process modelling. A sample best-practice business process is shown below:

![Flowchart of Business Process Modelling](image)

*Figure 2. Return to Vendor Warehouse Business Process from Microsoft Sure Step. Best Business Processes like this used a starting point for your business process modelling are a critical part of*
The key warehouse processes are listed below:

**Item Arrivals/Inbound Processes**

This includes receipt of purchases from vendors and returns of goods from customers, stores, or other partners. Key processes for these are listed below:

![Inbound Processes Diagram](image)

*Figure 3. A well-defined inbound process as shown above can help ensure smooth supply of goods, avoid bottlenecks at the inbound docks, and prevent a shortage of goods.*

(1) **Purchases from Vendors:** Items from Vendors arrive into the warehouse. A well-planned warehouse will monitor its expected arrivals and plan for workload accordingly. Steps involving the purchases for vendors workload would include:

   a) Arrivals Monitoring
   b) Inbound Staging of Goods
   c) PO to Goods Receipt Match: Match goods received with the original transmitted purchase order. This is typically done by doing wireless scans of the incoming goods
   d) Quality Control: Visual inspection, other testing, e.g. color fast testing to ensure the goods are of the right quality
   e) Directed Put Away: System-directed put away to bulk or pick locations depending on the size and need of the warehouse
   f) Return to Vendor: Return any product that failed testing back to the vendor
(2) **Returns from Customers/Stores:** Customers may return goods – or for retail businesses, stores – may send back returned or otherwise damaged goods to the warehouse/DC. Best business practice requires anticipating a certain percentage of sales as returns, and planning for handling that workload in the warehouse.

![Figure 4. Example of an Arrivals Overview screen in Microsoft Dynamics AX that shows anticipated workload by day or by hour in the warehouse with expected transactions](image)

**Warehouse Operations:** There are several in-warehouse processes that are required to ensure success in the warehouse. We’ve listed these below:

1. **ABC Categorization of Products:** Good categorization of products into ABC categories is critically important to ensure that high value or high velocity products get the attention needed in terms of replenishment. Most advanced warehouse systems are able to automatically categorize ABC based on multiple dimensions such as Inventory Value, Item Carrying Cost, Sales (Amount), Sales (Quantity). Based on the categorization, you may do faster cycle counts for your A products and/or undertake more frequent replenishment of your A and B products. Typical best practice for A-B-C is as follows, though this can be unique to you:
   a) **A:** Top 20%
   b) **B:** Next 30%
c) **C: Bottom 50%**

(2) **Cycle Counting**: A good warehouse operation will cycle count its goods fairly regularly to ensure that actual on-hand ties with what is on the books. A good warehouse management system will allow cycle counting to be as minimal impact as possible so that warehouse operations are not disrupted.

<table>
<thead>
<tr>
<th>Date</th>
<th>Item number</th>
<th>Store</th>
<th>Warehouse</th>
<th>Location</th>
<th>CW on-hand</th>
<th>CW counted</th>
<th>CW quantity</th>
<th>CW unit</th>
<th>On-hand</th>
<th>Counted</th>
<th>Quantity</th>
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</table>

*Figure 5. Cycle counting process shown in Microsoft Dynamics AX where any differences in quantity between on-hand physically in warehouse and on-hand in books is caught and reconciled.*

(3) **Warehouse Layout**: A well designed warehouse will ensure smooth flow of goods. The main areas of the warehouse are

i. Inbound Area

ii. Storage Area

iii. Outbound Area

iv. Yard

How this is designed depends on the business and the needs of the business. For example, if cross-docking is a common requirement, which it is in the retail industry, then there should be very easy and quick access from the Inbound Area to the Outbound Area so that goods are not unnecessarily sitting in the warehouse, and can be shipped to store the same day that they come in the warehouse. Similarly, some high velocity items may have pick areas and bulk areas, and a pick area refill process may be set up as part of the regular warehouse operations. Also, if you have inventory with varying characteristics – e.g. meat and dairy – that require special handling vs. coffee that is just stored in a dry area, then your storage area will be zones depending on the storage needs.
Image 3. The storage areas in a warehouse are divided based on velocity, temperature, etc. of an item in order to determine the preferred location for picking and put-away.

A well-organized warehouse will typically have Aisles, Bins, Racks and Shelves clearly labelled and set up for wireless operations.
**Outbound Processes:** Well-designed outbound processes are the final area to ensure goods get to customers in a timely manner. An example of a business process model for outbound is shown below, but this can be as little steps as needed.

Main processes for outbound are:

- **Directed Pick:** A well-running warehouse will tell the warehouse operator what is the best location to pick from.
- **Stage and Load:** Products are staged to be loaded by truck or by carrier.
- **Ship:** Shipments can be consolidated for a route, be individualized by order or be grouped by customer. Advanced shipping notices can be set up to send information to the receiver to alert them on what shipment is on the way and when it should be received.
Warehouse Management System
A good Warehouse Management System (WMS) will automate the business processes listed above as well as enable a wireless warehouse.

Automated System
Most Advanced WMS systems will be able to automate things like directed pick and directed put-away. Examples of these are shown below:

*Figure 6. Location Directives in Microsoft Dynamics AX enable things like Directed Pick and Directed Put Away*
A good WMS would not only be able to process transactions but also do advanced analysis, automated replenishment, and also show Available to Promise (ATP).

Figure 7. Ability to view Available to Promise for an item by date. In this example, Microsoft Dynamics AX is looking at on-hand stock as well as incoming goods such as Purchase Orders and Outbound Shipments to provide an accurate ATP.
Wireless Warehouse

Advanced warehouse systems will support a complete wireless warehouse where the inbound processes including put away, warehouse operations including cycle counting, and outbound processes including pick and shipments are fully supported through wireless hand-holds.

**Inbound**
1: Purchase Receive
2: Purchase Put-away
3: Transfer receive
4: Transfer receive LP
5: Back

**Purchase orders : Put**

<table>
<thead>
<tr>
<th>Loc</th>
<th>06A01R1S1B</th>
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</thead>
<tbody>
<tr>
<td>LP</td>
<td>LP-X07</td>
</tr>
<tr>
<td>Item</td>
<td>L0100</td>
</tr>
<tr>
<td>Qty</td>
<td>20 ea ; 20 ea</td>
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</table>

**Speaker driver**

<table>
<thead>
<tr>
<th>Qty</th>
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<tbody>
<tr>
<td>Unit</td>
<td>ea</td>
</tr>
<tr>
<td>Loc</td>
<td>Recv</td>
</tr>
<tr>
<td>LP</td>
<td>Recv</td>
</tr>
</tbody>
</table>

**Outbound**

1: TO Picking
2: SO Picking
3: SO Loading
4: Back

*Figure 8  Wireless warehouse as supported with Microsoft Dynamics AX*
If you don’t have an adequate warehouse management system in place, then you should put a good WMS first to support these processes, and then in a subsequent phase roll out a wireless warehouse. A potential rollout is shown below.
Boardroom Benefits

Noticeable benefits will occur immediately upon implementation of a warehouse management project. This includes lower inventory costs, increased customer satisfaction due to better fill rates, a decreased margin of error, and lower labor costs in the warehouse.

While typically not associated with increasing Shareholder Value, a good WMS implementation can do just that with the incremental (but significant) improvements in Fill Rates, Service Levels, Margin Improvement, and improving Return on Assets.

Shareholder Value

<table>
<thead>
<tr>
<th>Corporate Objective</th>
<th>Financial Objective</th>
<th>Opportunity</th>
</tr>
</thead>
</table>
| Increase Revenue    |                     | ✓10-20% Fill Rate Improvement  
|                     |                     | ✓1-3% Increase in Service Level  
|                     |                     | ✓10-15% Increase in Revenue  
| Increasing Shareholder Value | Increase Profit Margins | ✓2-4% Margin Improvement  
|                     |                     | ✓30-40% Increase in ROA  
|                     |                     | ✓10-15% Inventory Reduction  
|                     | Increase Asset Utilization | ✓5-10% Lower Fulfillment Cost  
|                     |                     | ✓15-25% Lower Labor Cost  
|                     |                     | ✓10-20% Transportation Savings  
|                     |                     | ✓Improved Operating Efficiencies  

About Ignify


Ignify has been included as the fastest growing business in North America for seven years in a row by Deloitte, Inc. Magazine and Entrepreneur Magazine. Ignify has team members worldwide including Los Angeles, Silicon Valley, Seattle, Nashville, Phoenix, Toronto, Manila, Singapore, Kuala Lumpur, Pune, Bangalore, Hong Kong, and Bangkok.

For more information, visit http://www.ignify.com or call +1(888) IGNIFY5. Follow Ignify on Twitter @ignifydax, or read its blog at blog.ignify.com.

If you would like guidance about optimizing your warehouse or implementing a new Warehouse Management System, email us at WMS@ignify.com