Automated Receiving
Saving Money at the Dock Door
Today’s warehouse management and automated sortation systems are far easier to integrate than in the past. As a result, distribution centers are better able to implement automated receiving to improve efficiency and cut costs.

This article explains how to analyze the movement of goods into and through a warehouse or distribution center to minimize handling and costs. It also provides a step-by-step procedure for designing an automated receiving operation.

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Brick and mortar retailers, dot com retailers and distribution centers fight a constant battle to cut costs to stay competitive in the marketplace. One place everyone looks to reduce costs is in the distribution process because these savings go directly to the bottom line. Today, the capabilities of modern warehouse management systems (WMSs) and scanning and sortation technology make it possible to save significant amounts of money at the dock door by automating the receiving process.

Receiving is one of the most labor intensive, non-value added processes in a warehouse or distribution center. Therefore, it makes sense to take any opportunity to make the process as efficient as possible. Automated receiving offers the potential to significantly cut operating costs, and it provides a way to streamline the entire distribution process, further reducing costs.
Value in the Distribution Process

Products pass through a number of steps in traveling from receiving to shipping:

- Receiving
- Quality Assurance
- Put-Away or Storage
- Order Picking
- Repacking
- Shipping

All these steps add cost to a product, so each needs to be examined to determine where efficiency can be improved and costs reduced. The best place to start is the beginning – the receiving process. The reasons are obvious.

First, manual receiving is inefficient and labor intensive; therefore, automating the process can improve efficiency and cut labor costs. However, while the main objective of any automation project is reduced labor cost, the reasons to automate receiving go well beyond labor savings. For example, manual receiving is also slow. To compensate, facilities must store more product in inventory to ensure that an adequate supply is available for shipping.

Another reason to automate is that most facilities have limited capacity. Making the receiving process as efficient as possible could allow a company to grow and ship more product without having to expand or build additional distribution centers. Shipping a product to a customer as quickly as possible converts that product into revenue and profits.
Finally, making receiving more efficient can eliminate some of the costs associated with the other processes. In particular, automated receiving can significantly reduce the amount of product that needs to be put away in storage, and then re-picked for shipment. Both these steps are labor intensive and costly.

The Receiving Process

In its simplest form, receiving consists of unloading products from a truck, determining how many of each item was received in the shipment, recording the receipt in the warehouse management system while matching the goods to a purchase order, labeling or marking product for storage or shipment, and moving products to another part of the warehouse or distribution center. The process is complicated by many factors, including sorting through and separating consolidated freight deliveries, consisting of many different products of various shapes and sizes.

Automating the process can make all these steps faster and more efficient, and provides the framework for cross-docking, which enables product to flow through the facility as quickly and efficiently as possible. For example, equipment in an automated line can read labels on in-coming boxes, send the data to the WMS to record receipts from suppliers, determine if there is demand for the product, label the product for shipping or put-away, confirm the accuracy of the process, and then route and deliver the boxes either to storage or to the shipping area. In the most efficient flow scenario through the distribution center, the only human intervention is at the beginning – placing boxes on a conveyor – and at the end – loading a truck.
Automated receiving can make the following steps more efficient:

- **Unloading trailers and recording inventory** – This involves physically lifting packages, carrying them off the truck and placing them on pallets. In an automated process, a conveyor extends directly into the truck, and the only physical labor is placing cartons on the conveyor. This puts less physical stress on workers, enabling them to unload more cartons in a given time. An extendable conveyor offers the potential for the greatest efficiency gain, and the reduced labor costs quickly offset the conveyor cost.

- **Allocating product for storage or reshipment** – This involves hand scanning bar codes and manually looking up the data to determine where to send each carton. In an automated process, bar codes are scanned automatically, and the system performs the data look-up to determine the proper allocation of each package. Automated receiving improves efficiency by greatly reducing or eliminating the handling and movement of pallets from place to place.

- **Labeling product for shipping** – In a manual system, printed destination labels are applied manually to each carton before it is sent to another location in the facility. In an automated process, the labels are applied automatically to each carton, scanned and verified before the carton is sent either to storage or to the shipping area (cross-docking).
Where to Start

The basic steps in designing an automated receiving system are:

1. Identify objectives.
2. Identify the process.
3. Design the system.

Objectives – Typical reasons for installing an automated receiving system are labor savings, increased productivity (throughput per employee), increased accuracy, improved response time (faster fulfillment and improved customer service) and lower operating costs. Once objectives have been identified and prioritized, critical concept and design requirements will come into focus, namely:

- **Equipment/Process Redundancy** – A system usually consists of two to ten distribution lines so that the failure of one line does not disrupt movement of packages through the facility. In addition, a back-up manual process should be in place for emergencies.

- **Floor space** – Evaluate the amount of space available to install automated conveyors.

- **Item orientation or justification** – For a single scanner to be used, boxes must be oriented in a specific way so that the scanner can read the label. This may require training and add to unloading time. Package orientation is less critical if multiple scanners are used.

- **Expandability** – Consider the future needs of the facility, not only in terms of distribution lines but also in terms of the computer system needed to support data flow.

- **Information flow** – Consider the amount of data that will be entered and how quickly the system will have to respond to ensure maximum flow of product through the facility.
• **Integration with other material handling equipment** –
  Consider whether existing material handling equipment can be re-purposed, particularly in a cross-docking operation. Connection points between conveyors are of particular importance.

**Process** – Most systems follow these steps:

1. **Identify the carton (item)** – Manual process involves hand sorting product by purchase order, followed by handling of the product and hand scanning. In an automated environment, the operator simply places each carton on the conveyor, in any sequence, and cartons are identified using fixed position scanners. Operator’s hands remain free to load cartons on the conveyor.

2. **Item look-up and verification of correctness for a particular order or process** – Manual processes require the operator to find each purchase order and key PO and item numbers into a computer system. In an automated process, the scanned data is passed directly to the host WMS without operator intervention.

3. **Download data to label printer and print labels.**

4. **Apply labels** – In the manual environment, an operator applies individual labels by hand. The automated solution uses automatic using label printer applicator(s), eliminating manual handling.

5. **Verify label placement, data and readability** – This typically is not done in a manual environment. In an automated solution, the applied label is scanned and the data verified to provide additional accuracy.
6. **Record data/activity and upload to corporate enterprise system** - Automation provides data feedback to the WMS, confirming the disposition of the labeled carton. This level of data traceability is not typically captured, recorded and reported in a manual mode.

**System Design** – Design usually addresses two issues: material handling and information flow.

*Material handling* involves unloading or staging goods for processing. It also identifies areas of special importance, such as box sizes and weights, and hand-off points between conveyors or areas of the facility. A critical checkpoint in the design is expected throughput, which helps determine the number of conveyor lines that will be needed.

Maximum throughput is the maximum capability of the labeling line, which may not be sustainable for more than short periods during the day. Average throughput is the end-of-day expectation, taking into account downtime, changeovers, box size and shape, etc.

*Information flow* involves the interface to the enterprise system and where the data resides. Data storage can be either centralized on the enterprise system or distributed at the label system.

In centralized data handling, a scanner reads a bar code and sends data to the host computer. The computer performs a look-up and sends data back to a label printer to prepare an outbound label. A second scanner then reads the label and verifies that it has been placed on the correct box, and sends data back to the host.
In distributed data handling, all these functions are performed locally, with feedback to the central system only at the end of the process. Types of distributed data include ASN data, purchase order files, label formats and allocation algorithms.

The pros and cons of each approach are outlined below:

### Centralized vs. Distributed Information Handling

<table>
<thead>
<tr>
<th>System</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized Data</td>
<td>• Real time, full time data control at the host computer</td>
<td>• Inability to function if enterprise system connection lost</td>
</tr>
<tr>
<td></td>
<td>• Easy, on-the-fly record updates</td>
<td>• Time required to transmit data to and from enterprise system can cause delays</td>
</tr>
<tr>
<td>Distributed Data</td>
<td>• Continual operation if enterprise system lost</td>
<td>• Potential loss of data control</td>
</tr>
<tr>
<td></td>
<td>• Less demand on host computer</td>
<td>• Limited ability to update and download records</td>
</tr>
<tr>
<td></td>
<td>• Eliminates message timing issues</td>
<td>• Difficult to respond to last-minute changes</td>
</tr>
<tr>
<td></td>
<td>• On-floor data management</td>
<td>• Near real time data</td>
</tr>
<tr>
<td></td>
<td>• Greater speed and throughput</td>
<td></td>
</tr>
</tbody>
</table>

### Putting it all Together

Equipment needed to automate the receiving process includes:

**Extendable conveyor** – Extending the conveyor into the trailer reduces handling and facilitates unloading. It also eliminates the need to manually sort incoming freight for receiving.

**Bar code/RFID readers** – Bar code scanners and RFID readers automatically identify products and record incoming products without manual data entry. Factors that affect scanner performance include the location and orientation of bar codes, bar code size and quality, and depth of field (distance from scanner to carton). Fewer scanners will be
The performance of laser and camera bar code scanners depends on the location and orientation of bar codes, bar code size and quality, and distance from scanner to carton. If boxes and bar codes can be oriented properly, fewer scanners will be required.

Applying labels to the side of a carton provides the easiest and fastest throughput. Top labeling requires adjustable applicators and can reduce throughput.

required if boxes and bar codes can be oriented properly as they come off the truck. Similarly, bar codes are easier to scan (with fewer errors) if they are larger and if the scanner can be located close to the conveyor.

Means to integrate receiving, allocation and shipping systems – Software integrated with the WMS records each package received and determines its destination: shipping, quality audit, storage, repack.

Labeling equipment – Labeling and tagging equipment automatically prints and applies labels that mark packages with their destination. Factors affecting the performance of label printer/applicators are the number of labels required per carton, label size, required throughput, label location (top, side, front, rear), stroke, print speed and maintenance requirements (stock change, head cleaning, low media sensors, etc.). In general, side application provides the easiest and fastest throughput. Applying labels to the top of a carton requires adjustable applicators and can reduce throughput. Front and rear apply modes are extremely complex to design.

Label verification readers – Verification scanners and readers confirm that the correct marking or tag has been applied, and that it is readable. They also verify routing to the correct destination and reconcile of out-of-spec packages.
Conclusion

An automated receiving system can provide more efficient handling of packaging through a warehouse or distribution center by greatly reducing labor costs. Following a logical, step-by-step process to evaluate needs and design the system can greatly improve productivity, accuracy and response time, while reducing overall operating cost. All this results in a rapid return on investment.

(Please see next page for ROI calculation of automated receiving.)
Calculating the ROI on Automated Receiving

The table below summarizes the return on investment for a typical automated receiving system based on savings in labor costs alone. The data shows that an automated receiving system pays for itself in a little over a year simply through the reduced manpower required. This return can be cut even further if the reduced cost of inventory is factored into the equation.

<table>
<thead>
<tr>
<th></th>
<th>Manual Receiving</th>
<th>Automatic Receiving with Print/Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dock doors</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Trailers/door/shift</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Total trailers/shift</td>
<td>16</td>
<td>16</td>
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<tr>
<td>Unload (people per door, per shift)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Scan/Audit (people per door, per shift)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Put away/Picking labor (people)</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Total people per shift</td>
<td>44</td>
<td>26</td>
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<tr>
<td>Average wage</td>
<td>$17.50</td>
<td>$17.50</td>
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<tr>
<td>Cost per shift (8 hours)</td>
<td>$6,160</td>
<td>$3,640</td>
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<tr>
<td>Yearly cost (260 days, 2 shifts)</td>
<td>$3,203,200</td>
<td>$1,892,800</td>
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<tr>
<td>Yearly savings</td>
<td></td>
<td>$1,310,400</td>
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<tr>
<td>Cost of automated receiving system</td>
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<td>$1,470,000</td>
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<tr>
<td>ROI (months)</td>
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<td>13.44</td>
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<tr>
<td>Reduction in manpower</td>
<td></td>
<td>18</td>
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