# Warehousing & Fulfillment Process Benchmark & Best Practices Guide
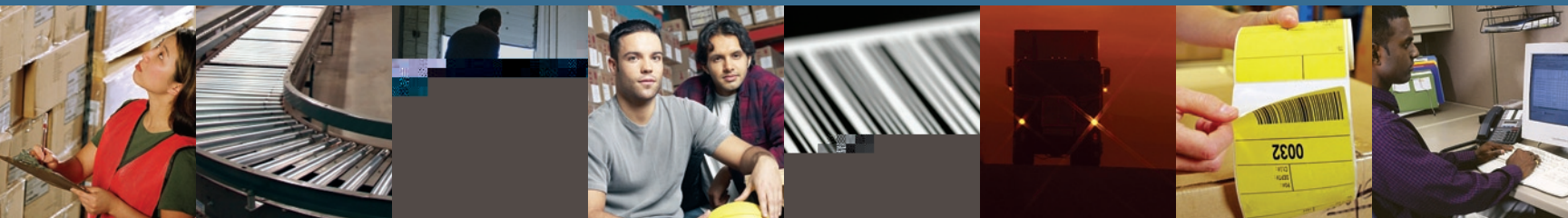
by Supply Chain Visions

**WERC**

*An Association of Distribution Professionals*

**Warehousing & Fulfillment**

# Process Benchmark & Best Practices Guide

**WERC**®

*An Association of Distribution Professionals*

# About the Authors

**Supply Chain Visions,** is a small specialized consulting firm focused on helping companies with Supply Chain strategy and education. ARC Advisory Group recently recognized Supply Chain Visions as "one of the 10 coolest boutique consulting firms" for their results-driven approach which reflects solutions that are strategic as well as practical, cost effective and focused on driving measurable performance improvements. Supply Chain Visions has been a key contributor to WERC's knowledge base in the area of benchmarking and distribution performance metrics, having developed (and teaching) both the Warehouse Metrics and Benchmark Now! Seminars. Supply Chain Visions is also the co-researcher in WERC's Annual Warehouse Benchmarking Study.

The four thought leaders from Supply Chain Visions contributed to this publication. Among them they have authored over 75 articles, visited over 350 facilities, given over 100 presentations and taught classes at over 20 different universities.

**Kate Vitasek,** founder and managing partner of Supply Chain Visions, is a well-recognized authority on performance management, benchmarking and metrics implementation for warehouses and DCs. She has been recognized for her leadership in the profession as a "Woman on the Move in Trade and Transportation" by the *Journal of Commerce* and was also recognized a as a "Rainmaker" by *DC Velocity Magazine*. She is also on the faculty for both University of Tennessee's Center for Executive Education and Wright State University. She is a frequent speaker and contributor for WERC. She has also served on the Board of Directors for the CSCMP. Kate received her MBA from the University of Tennessee in Logistics.

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**Kimberly O'Donoghue,** principal. Her background includes broad experience in distribution operations, account management, finance and international market-entry planning in both the United States and Asia. As a practitioner, Kimberly actively led key operational roles at R.R. Donnelley and Sons / Modus Media International. She went on to hold a variety of senior positions in sales management, strategic sales planning and large account management. Kimberly is a thought leader in goals and objectives alignment and tying the right measures to strategic objectives. She teaches WERC's Warehouse Metrics seminar. She also speaks and writes Chinese. Kimberly earned an MBA in Finance from the American Graduate School of International Management.

**Steven Symmes,** principal, has operational and consulting experience in start-up and high growth companies that span the retail, high technology, industrial equipment, medical equipment, software publishing, computer manufacturing, consumer electronics, third party logistics and distribution sectors. He has worked extensively throughout the United States, and in Europe, Asia and Latin America. Prior to Supply Chain Visions, Steve held senior positions in operations, supply chain management and sales/marketing organizations – including Managing Director, Director of New Business Operations, Director of Global Operations and Strategic Accounts and Global Director of Supply Chain Solutions. Steve graduated from the University of Colorado with an MBA in Production and Operations Management

# Process Benchmark & Best Practices

The Warehousing Education and Research Council (WERC) has compiled *The Warehousing and Fulfillment Process Benchmark & Best Practices Guide* as a workbook for warehouse practitioners to learn more about warehousing best practices. The workbook outlines processes that are typically found in warehouse operations and allows warehouse practitioners to identify process strengths and weaknesses in their organization. They can then craft a roadmap for improvement efforts.

This workbook complements CSCMP's *Supply Chain Management Process Standards* by expanding section **4.2 Warehousing and Fulfillment***.* It also serves as a companion workbook to the *Benchmarking Guide* published by WERC*.*

The workbook outlines eight topics that will help warehouse practitioners understand current warehouse performance as well as gain a solid understanding of best practices for key processes. The topics are:

1. Receiving & Inspection
2. Material Handling & Putaway
3. Slotting
4. Storage and Inventory Control
5. Picking & Packing
6. Load Consolidation & Shipping
7. Shipment Documentation
8. Warehouse Management System (WMS)

Each topic includes:

- **Process Benchmark Descriptions**

  - Explanations of the processes, practical examples and definitions.

  - Benchmarks. Lists the process groups that support the major warehouse activities and outlines attributes in five ranking columns: *Poor Practice, Inadequate Practice, Common Practice, Good Practice,* and *Best Practice*.

  - *Self Assessment Table and Ranking Ranges Table* are templates to self-evaluate and rank each process group.

- **Key Performance Metrics** from a recent WERC Benchmark Study.

- A **case study** illustrating best practices.

**NOTE:** Each industry is unique and the metrics provided here are from a number of industries and are good for general comparisons. Companies are encouraged to seek out additional benchmark data from the WERC Annual Benchmarking Survey, which includes benchmark detail for a number of specific industries. The complete benchmarking survey results are available to WERC members at www.werc.org.

## Using the Workbook

### STEP 1. Review the Process Benchmarks

Self-assessment begins with a comparison of your company's processes against the ranked process attributes in the Process Benchmarks table.

| Receiving & Inspection: Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| Dock Management | | | | | |
| Transactions | | | | | |

Attributes

### STEP 2. Fill Out the Self-Assessment

As you review the attributes for each process group, you can determine in which category your process falls: *Poor Practice, Inadequate Practice, Common Practice, Good Practice,* or *Best Practice.* These rankings are assigned a numeric value from 1 to 5.

| Receiving & Inspection: Key Performance Metrics (KPI) / Self-Assessment | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice 1** | **Inadequate Practice 2** | **Common Practice 3** | **Good Practice 4** | **Best Practice 5** |
| Dock Management | | X | | | |
| Transactions | | | X | | |
| Metrics | | | X | | |
| RFID | | | X | | |
| | | | Self-Assessment Score TOTAL | | **11** |

X = assess each process based on benchmark attributes & total the rankings for each process group.

### STEP 3. Rank Your Results

Compare the TOTAL from the self-assessment to the Ranking table. This will give you an indication of the relative ranking of your processes on the scale from *Poor* to *Best Practice.* The numeric value calculated is unique to the section. Each topic has its own ranking scale.

| Receiving & Inspection: Ranking Table | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Section Score Rankings | 9 | 18 | 27 | 36 | 45 |

Our self-assessment score TOTAL of ____11____ means that we rank as

☑ *poor* ☐ *inadequate* ☐ *common* ☐ *good* ☐ *best practice* in this area.

### STEP 4. Use Key Performance Metrics

Quantitative industry performance metrics can be a valuable benchmark to compare KPIs that your company may be gathering. This step identifies some KPIs that are relevant to the process group covered. Each KPI is scaled from *Major Opportunity* to *Best in Class.*

| Receiving & Inspection: Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| On time shipments | Less than 94% | >=94 and <97% | >=97 and <98.9% | >=98.9 and <99.7% | >=99.7% |

# Receiving & Inspection

# Receiving and Inspection

The basic function of the receiving and inspection process is to take responsibility for the inbound material, validate the material received to the purchase order (PO), check for any damage to the material received and complete any required material inspections. Getting it right when you receive material will reduce headaches in downstream processes. In this topic, these process groups are covered:

- Dock Management
- Transactions
- Product Labeling
- Advanced Ship Notice and Supplier Communication
- Process
- Inspection
- Cross Docking
- Metrics
- RFID

## Dock Management

Some of the most valuable square footage in the warehouse is dock space. All material must flow in or out of your docks, and these are limited in number (and not readily added to). Space on the inside and outside of the docks is some of the busiest in your warehouse. Dock best practice depends on the type of inbound you receive and for many companies balancing available dock doors, equipment and labor is difficult, so the receiving dock becomes a choke point in the supply chain. Docks in today's warehouses must be more flexible and must support a variety of receipts that are coming in at a fa

Receiving sortation can improve productivity of the receiving dock area and improve material flow. Sortation in receiving should be performed when materials arrive in partial or mixed pallets where products must be sorted, classified and sent to different areas for storage or when small quantities of materials are received that do not justify an immediate trip the to warehouse. Sortation in receiving requires that product is separated based on the putaway locations/areas. Set up consolidation areas for materials by putaway zone until there is enough material to move to the zone, reducing travel. Temporary consolidations can be maintained in your WMS.

Companies with good to best practice dock management processes use date codes, set firm delivery appointments to optimize dock and yard usage, balance labor to reduce costs, commit to quick trailer unloading times, and maintain enough room to do the work with no traffic jams, confusion or safety issues.

## Transactions

The receiving process is important because it causes the transfer of ownership of the goods. It is imperative that receiving personnel understand and be trained for this reality and that they understand the documentation involved.

Timely and accurate receiving transactions are critical. Incomplete or erroneous transactions cause inventory control issues and delay the movement of materials. Suppliers can help reduce transaction time by using ASNs and/or proper shipment labeling. Most systems support inputs from bar coded labels, so data entry can be accomplished by scanning rather than typing. Ideally, systems should pull up the Purchase Order details with a single scan of the product; the details (quantity, part number, due date, etc) can be quickly verified and accepted, allowing receipt of material with a single scan and a few keystrokes. Even if you do not have the most sophisticated system, eliminating typing reduces receiving labor. An economical "wedge" bar code reader can be used with most any data entry terminal. In addition, RF scanning guns and portable label printers make the process even more flexible.

Companies with a good to best practice transaction practice process all transactions in real time or at minimum the same day making material available for use as soon as possible.

## Product Labeling

Having material properly labeled when it arrives on your dock has huge benefits, including reducing receiving time and errors. Companies should have a material labeling specification that their procurement team can share with suppliers, and the supplier's performance to the standard should be measured and tracked as part of a supplier review process. A good labeling specification will require the following minimum information. Labels should have information in both human readable and bar code format:

- Pallet labels: Supplier information, Pallet quantity, Purchase order number, Product ID and description and package count
- Case labels: Case quantity & product ID and description
- Part or unit labels or markings: Each item in the case should have a product ID

There are number of label standards to use as a guide for a comprehensive specification. Start with one that supports your industry.

- Electronic Industries Alliance (EIA) www.eia.org
- Voluntary Interindustry Commerce Standards (VICS) www.vics.org
- Computer Technologies Industry Association (CompTIA) www.comptia.org
- Mil-STD129P www.dscp.dla.mil
- Alliance for Telecommunications Industry Solutions (ATIS) www.atis.org
- Automotive Action Group (AIAG) www.aiag.org
- Uniform Code Council (GS-1) www.uc-council.org

Most suppliers already conform to their industry's labeling standard so if you stick to a well know standard in your industry and do not ask for extra customization, suppliers are more likely to comply. Also, the major suppliers of labeling/scanning equipment and software are well versed in these standards and are an excellent resource for information and label templates. In some environments, particularly those with a retail aspect, there will be specific requirements around the use of pallet labels (UCC128) and carton labels (ITF-14) and product labels (UPC). Look into your options for leveraging these labels and product numbering.

It is important that material receive proper labels, at least to the case level, before being moved from the receiving area. If the product was not labeled by the supplier, the receiving team prints and applies the labels. This extra labor will pay dividends in the long run. It is important to *not* put the location of the product on a carton or pallet identification label because the location of that product will move as it flows through warehouse. A proliferation of labels can also create havoc. Warehouse operations where individual pallets and cartons have a rainbow of multicolored labels; some machine generated and some hand written, is not just confusing and messy – it is expensive. Every label you apply costs money – so keep it simple.

### Advanced Ship Notice (ASN) & Supplier Communication

Communicating with suppliers and carriers about shipment status helps to schedule the dock and labor. Many companies have a process to receive advance notes on shipments. The process my be informal, using fax, phone calls or emails. Or the process may include an electronic notification called an Advanced Ship Notice. An ASN is detailed shipment information transmitted to a customer or consignee in advance of delivery. The information designates the contents (individual products and quantities) and nature of the shipment. Carrier and shipment specifics including time of shipment and expected time of arrival may also be included. Container level detail is often shared and containers are presorted.

Best practice is to take material to the storage location with a few scans of the material label or by accepting the ASN, which enables the receipt of all related information into your WMS/ERP system. Some WMS systems support Pre-Receiving using the ASN sent by the supplier (process is also called Assumed Receipt). It is based on the principle of assuming that the contents of a shipment are the same as those presented on a shipping or delivery note. Shipping and receiving personnel do not check the delivery quantity. This practice is used in conjunction with bar coded labels (or an RFID tag) and an EDI-delivered ASN to eliminate invoices and facilitate rapid receiving. Most WMS will support the pre-assignment of the putaway path and pre-slot material based on the ASN. If the material is required for shipment or replenishment, most WMS systems will produce a cross docking notice. Utilizing ASNs can reduce the cost and labor to receive by as much as 70%, while improving the flow and throughput of product through the receiving process.

## Process

No matter how a company organizes the receiving and dock area, a detailed process document should be available to all employees. The process documents should clearly define ownership for actions. The best practice is to combine the unloading, checking and transaction steps to increase individual accountability and inventory accuracy. Assigning work to individuals improves accountability, and as a result more work gets done, if you need to assign work to teams keep them small.

Review and update processes, regularly, you may be surprised that documentation has not kept pace with changes to software, tools or how the work is performed. Processes are only as good as the training provided, training will ensure that processes are followed and that best practices are understood.

Eliminate waste, map out your processes and analyze each step to understand the value it provides. Eliminate non-value added steps in processes and look for ways to streamline and simplify your processes. Look to make small improvements, they add up over time and are more likely to get implemented. Pay particular attention to "exceptions" to your standard process. Exceptions drive up costs, so if your system or processes do not support a situation, look to standardize a set of process steps that do. If you find that you have many exceptions, your processes are not keeping up with your practices and technology.

## Inspection

Inspection as it is used in this standard primarily is limited to verification of the product to the purchase order, correct part, correct quantity, correct packaging/markings and correct pallet configurations. Also, received material is checked for damage so that claims can be made on the carrier. When product is found to be non-conforming it must be segregated to prevent use. In best practice companies, the inspection process initiates the returns process; information gathered at the time of receipt is entered into the system and communicated to the supplier.

## Cross Docking

The goal of cross docking is to rush high-demand items through the receiving process to replenish stock on the shop floor and in pick areas or to fill open orders. This process results in minimizing or eliminating putaway and retrieval as well as reducing stock-outs and ultimately lost sales. There are many "types" of cross docking; the purest form is moving items directly into waiting trucks.

Many companies have some process to manage expedited receipts; manual systems may include "hot lists" or shortage lists, or strings of emails from department to department. This "be on the lookout" type of process is never very effective but is simple and easy to put in place. A better way is to use a cross-docking module to help speed the flow of high-demand goods through the warehouse. Crossdocking modules are standard in most warehouse management systems. The software will match outgoing orders and factory orders against scheduled inbound deliveries to determine if required material or products are contained in the delivery. They are very effective and produce system flags and routing documents at the time of receipt or pre-receipt.

**Metrics**

It is very important that a company gather metrics that can be used to improve and manage the receiving operation. A number of measures and statistics to consider are:

- Dock to Stock Time. This is the total receiving time it takes product to move through the receiving process into storage (or shipment/replenishment)

- Receiving Errors. Errors made in processing materials to the PO or staging materials Processes should be in place to double check material through label scans, and verify counts through weight checks.

- Dock Utilization. Tracks the utilization of dock doors as well as floor space. A full dock may indicate problems with material flow.

- Supplier Shipping Errors. Track supplier shipment errors, such as wrong product, incorrect quantity, and paperwork errors. Be sure your process includes feedback to the supplier.

Metrics should also be posted and reported. Good and best practice companies will track metrics and take appropriate corrective actions drive continuous process improvement. Receiving KPIs are referenced later in this document in the Key Performance Metrics section.

**RFID**

Implementation of RFID is today's hot topic. Good practice and best practice companies have taken steps to understand how RFID fits with customer requirements and business needs. Depending upon the industry you support, you may be facing customer pressures to implement RFID. Some industries such as Retail/Consumer Packaged Goods, Pharmaceuticals and Defense are well down the path to implementing and using RFID within the supply chain.

In the context of receiving, RFID must be integrated into your ASN process to add value. RFID has a potential to provide value to many warehousing processes, especially the receiving process; however, RFID implementation must be considered in the larger context of customer requirements, industry specific needs, supplier capabilities and integration with existing WMS systems. RFID is not a magic bullet, but its potential merits serious consideration from warehouse practitioners.

# STEP 1. Process Benchmarks for Receiving & Inspection

Compare your company's processes against this chart of attributes.

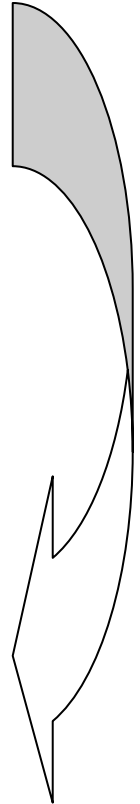| Receiving and Inspection – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Dock Management** | • Trailer deliveries not scheduled<br>• Trailers not unloaded in a timely way | • Shippers may notify of deliveries, but times not scheduled<br>• Trailers unloaded as they arrive and labor is available | • Receiving appointments manually tendered, shippers given delivery window.<br>• Trailer deliveries scheduled in broad time windows in a manual process | • Manual scheduling of trailer receipts to maximum labor and dock space utilization, shippers given delivery time<br>• Reduction of trailer switch times by pre-planning all trailer moves and yard staging of trailers<br>• Timely unloading to avoid detention/ demurrage | • Dock appointments are made and a commitment to unload every vehicle within two hours when the appointment is kept, labor and dock space utilization is optimized |
| **Transactions** | • Receipts processing is inconsistent | • Receipts posted in batches | • Receipts posted as PO is processed, posted as available inventory in 24 hours | • All receipts (received by 2PM) processed and posted as available inventory same day | • All receipts acknowledged, posted and added to available stock as received in real time |
| **Product Labeling** | • No product labeling | • Product inconsistently labeled | • Not all product is labeled by suppliers, but is labeled upon receipt | • Product is labeled by supplier, to specification receipt to PO can be made with bar-code scan into the system | • All product labeled, barcode scan verification of product receipt against the ASN, with system-directed assignment of put-away locations |
| **Advanced Ship Notice and Supplier Communication** | • Little or no communication with suppliers on shipment status | • No supplier shipment notification, informal communication on an expedited basis with suppliers | • Suppliers may give notice of shipment in an informal way (fax, email, web site), ASN not used in receiving process | • Advanced ship notices are received from some suppliers, may be used in receiving process | • Pre-receiving using Advanced Shipping Notices and pre-slotting of items to speed physical receipt<br>• Automated, paperless receiving (ASN Assumed Receipts) |

| Receiving and Inspection – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Process** | No clear ownership or process for unloading and receiving | Receiving process is written but not consistently followed | Receiving process are followed but ownership may not clear | Receiving processes documented and ownership clearly defined | Combined responsibility for physical unloading and checking functions to both increase individual accountability for inventory accuracy & eliminate unnecessary labor hours<br><br>Well documented receiving processes |
| **Inspection** | No inspection process | Insufficient inspection to identify non-conforming product is | Sufficient inspection to identify non-conforming product is quarantined to prevent use | Sufficient inspection to identify non-conforming product which is then quarantined to prevent use<br><br>Non-conforming product is referred to suppliers within a prescribed timeframe | Inspection process results in notification to suppliers & carriers and initiates return process |
| **Cross Docking** | No process to identify or expedite products | No cross docking process, informal expediting of products | Manual lists are kept to support cross docking of products needed for current orders and replenishment, informal process | Manual cross-docking or immediate replenishment requirements for received product not in inventory but needed for current orders | System-enabled alerts for incoming product's immediate order requirements, creating a cross-docking or immediate replenishment task upon receipt |

**Receiving and Inspection – Process Benchmarks**

| Process Group | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| **Metrics** | Inbound supplier receiving errors are not tracked (e.g. % of product received without a PO or % or product received mislabeled)<br><br>No established performance metrics or SLAs (service level agreements) established with suppliers<br><br>Internal performance indicators (e.g. dock to stock time) are not tracked | Ad hoc process to track inbound receiving errors or track internal functional metrics<br><br>Supplier receiving errors are not shared with suppliers | Basic receiving requirements are outlined in your companies routing guide and routing guide is shared with all suppliers<br><br>Formal process to collect Inbound receiving metrics , but data is not shared with suppliers<br><br>Internal performance metrics are collected but posted or shared with employees | Formal performance metrics and SLAs are established with suppliers in their routing guide or separate Statement of Work<br><br>Internal performance metrics/ standard clearly posted and shared with employees | Formal performance metrics and SLAs are established with suppliers in their routing guide or separate Statement of Work<br><br>Receiving errors monitored, reported and controlled by double check scanning and weight confirmation checks<br><br>Internal performance metrics/ standard clearly posted *and* used for continuous improvement |
| **RFID** | No knowledge of RFID capabilities or customer requirements | Have not investigated RFID capabilities or customer requirements | Aware of RFID as a tool, RFID program is under investigation | Plan in place to implement RFID capabilities to meet customer requirements | Capabilities available to capture and track RFID Electronic Product Codes when required. |

Supply Chain Visions- *Best Practice Process Attributes and Benchmarks*
(Copyright 2007 Supply Chain Visions)

## STEP 2. Assessment for Receiving & Inspection

**Directions:** Rank your processes against the receiving & inspecting Benchmark Table. Use this chart to check which column best represents your processes. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process is assessed, total the values for the group.

| Receiving and Inspection – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| *Rank* | *1* | *2* | *3* | *4* | *5* |
| **Dock Management** | | | | | |
| **Transactions** | | | | | |
| **Product Labeling** | | | | | |
| **Advanced Ship Notice and Supplier Communication** | | | | | |
| **Process** | | | | | |
| **Inspection** | | | | | |
| **Cross Docking** | | | | | |
| **Metrics** | | | | | |
| **RFID** | | | | | |
| **Self Assessment Score Total** | | | | | |

## STEP 3. Ranking Ranges for Receiving & Inspection

**Directions:** Use this table to compare your self-assessment score TOTAL to the receiving and inspection section rankings listed here.

| Receiving and Inspection – Ranking | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Section Score Rankings** | **9** | **18** | **27** | **36** | **45** |

Our self-assessment score TOTAL of _____ means that we rank as ❑ *poor* ❑ *inadequate* ❑ *common* ❑ *good* ❑ *best practice* in this area.

## STEP 4. Key Performance Metrics for Receiving & Inspection

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to receiving and inspection. Each KPI presented is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

| Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| On time receipts | Less than 85% | >=85% and <91.4% | >=91.4% and <95% | >=95% and <98% | >=98% |
| Perfect Order Index (POI) | <86.92% | >=86.92% and <95% | =95% and <98% | >=98% and <99.48% | >=99.48% |

| KPI | Definition | Calculation |
|---|---|---|
| On time receipts | The number of orders received from a supplier on the date requested. | # of orders received on time / total number of orders |
| Perfect Order Index (POI) | An order that meets all of the following criteria: complete, on-time (as defined by customer - could be on time delivery or on time shipment), perfect documentation, perfect condition. | % of on time orders x % of complete orders x % of damage free orders x % of orders with accurate documentation as defined by customer (e.g. invoice, ASN, labels) |

WERC Benchmarking Study 2007
(Copyright 2007 WERC/Georgia Southern University/Supply Chain Visions)

Additional metrics a receiving manager might track are Overtime Hours, Value Added per Employee, Annual Workforce Turnover, Employee Productivity vs. Standard and Productive Hours to Total Hours.

# Case Study: REMOVING CONGESTION
From the December 2001 *WERCSheet*

Ross Simons determined the right plan of action for its receiving operations with the help of Sedlak's consulting team. The process changes at Ross Simons took about two months for the receiving operations and four months for the entire operation.

Annually, Ross Simons ships over one million packages of its jewelry, sterling silver, china and linens to its store, catalog and Internet customers. Prior to the overhaul of its receiving operations, the company was handling all of those products in one small warehouse with about 5,000 square feet dedicated to receiving.

"Our receiving areas was very congested," says Petisce. "We not only handled receiving there, but we managed returns in the same area. We worked right from pallets and tables."

Recognizing that the ineffective receiving area affected the entire warehousing operation; Petisce's team, decided to spread out among three buildings totaling about 170,000 square feet. The first step Petisce took was to move returns to one those buildings. Another move Petisce made was to move "ship-alones" – those items that could ship on their own, into yet another building. These actions freed up crucial space for receiving. And the company made the most of it.

### "RECEIVING RESULTS"

The company worked closely with its carriers to not only bring trucks to the docks in an efficient order for unloading, but to also set up a just-in-time (JIT) inventory approach. "We met with the vendors with whom we had the most issues and designed a good plan for how and when to ship to us," says Petisce. "Saving both time and money, it's a win-win-because we share in the economies."

The company also worked with its vendors to put together vendor compliance manual. "They partnered with us in writing it, which allowed us to work out reasonable standards," says Petisce. "This has greatly strengthened our partnerships."

In addition to working with its carriers, the Ross Simons team also added about 500 linear feet of gravity roller conveyors to the warehouse. "This set up a flow line that takes product from receiving into storage," says Petisce.

The company also added an RF system to the receiving operations. "We're able to separate orders by zones, which makes put-a-way much quicker and has reduced our backlogs," explains Petisce.

As demand rises for higher service levels, it's clear that one of the best ways for meeting them is to take a good look at your receiving operations and make improvements. The payoff can be great, as was the case at Ross Simons. Since making the improvements, the company has been able to realize a productivity improvement of about 30 percent to 35 percent. The company was also able to reduce its labor force by eliminating the night shift for receiving and returns. Petisce says there's no looking back, "This has greatly helped us" The result has been a total turn-around – not just in receiving, but in all of the company's warehousing operations.

# Material Handling
# & Putaway

# Material Handling & Putaway

Material handling and the putaway function encompass all the processes that support the movement of material from the receiving area to the point of use or storage location. In this topic, these process groups will be covered:

- Material Handling
- Housekeeping and Safety
- Cross Docking
- Putaway
- Metrics
- Product Identification

## Material Handling

Material handling, managing the movement of products throughout the warehouse, can be as basic as using lift trucks and pallet jacks, to employing fully-automated systems made up of customized conveyor systems, automated guided vehicle systems (AGVS) and automated storage systems. Material handling can be enhanced when warehouse automation is utilized in line with well-thought-out putaway processes. Common automation in the putaway area includes RF equipment in fork trucks and portable/hand held RF devices that direct warehouse personnel, automated conveyor systems with sorters and diverters and automated storage and retrieval systems (AS/RS).

Employing RF terminals in lift trucks and portable devices, that can be carried by employees, boosts productivity while reducing data entry errors. These devices when integrated with the WMS (warehouse management system) send employees product move tasks and give information about the product that needs to be moved. Typically, systems are designed to work with barcoded labels or RFID tags.

An automated conveyor system with sorters and diverters will route product to the appropriate putaway zones, reducing travel time and handling. Productivity and labor costs can be significantly improved by automation if the transit time from receiving areas to storage zones is considerable or when product is moved and stored in case size lots.

AS/RS benefits might include maximized storage space, increased putaway productivity, reduced warehouse labor and improvements to putaway accuracy. AS/RS technology is especially effective when working with narrow aisles and extremely high racks found in some larger high volume distribution centers (DC). While AS/RS solutions are capital intensive, they can be tremendously cost effective in the correct applications.

## Housekeeping and Safety

Good housekeeping must be part of any best-in-class warehouse. Best-in-class processes cannot succeed in a workplace that is cluttered, disorganized, or dirty. Poor workplace conditions lead to waste, product damage and safety issues; such as extra motion to avoid obstacles, time spent searching for things, delays due to defects, machine failures, or accidents. Establishing basic workplace conditions is an essential first step in creating a safe and productive warehouse environment.

The U.S. Department of Labor's Bureau of Labor Statistics reported (2002) that lift trucks kill an estimated 100 people every year and cause serious injuries to an estimated 20,000 annually. Increased delivery truck traffic at the material transfer zone presents a challenge for warehouses. Just-in-time (JIT) and vendor-managed (VMI) inventory control programs, for example, have increased the number of deliveries and product moves. Educating employees about how to behave around lift truck traffic is a minimum safety requirement, as are forklift training and certification programs. Technology can also help make the workplace environment more productive as well as safe. Warning devices that alert workers and lift truck operators that an area is occupied or that a lift truck is moving into or out of an area are common on today's lift trucks. Establishing "no pedestrian" areas and well-marked traffic crossings in your warehouse will also separate people from equipment. Designing traffic flows that separate lift trucks from personnel reduces accidents and increases fork truck efficiencies.

Product damage can be reduced by setting up separate receiving and putaway staging areas. This helps to reduce congestion and traffic flow in receiving, staging and warehouse areas. Storing product off the floor using pallet flow rails reduces damage from fork trucks and helps keep staged product organized.

## Cross Docking

Crossdocking, as it relates to putaway and material handling, is the process of moving specific products to support an open order or replenishment request, with minimal handling and delay. Many companies have some type of process to manage expedited materials once they have been received. In a manual process, the product might be flagged as "hot" and placed in a special "expedite" staging area, so that the putaway team can move the product to the required location as quickly as possible. This can be a hit or miss arrangement and is less than effective.

In good and best practice companies, the crossdocking process is managed by the WMS (warehouse management system). The WMS flags the product for crossdocking by matching it to an open order or replenishment requirement, at the time of receipt, or when the ASN is received. The product may still end up in a special staging area, but the system is keeping track of it and will prioritize it over other material. The task to move the material is sent to the lift truck or hand-held RF (radio frequency) device for movement directly to the point of use. This is a far more effective system to get priority product moved. For more information about crossdocking, purchase the WERC publication, *Making the Move to Crossdocking*, at www.werc.org

**Putaway**

Putaway is the process of moving material from the dock and transporting it to a storage, re-plenishment or pick area. Best practice companies manage the putaway area by calculating resource and space requirements based on expected receipts and current backlogs. Product is also put away the same day, because not doing so impacts space, causes congestion, increases transaction errors and makes product more susceptible to damage. Optimal use of labor is when product is unloaded and immediately put away.

In a busy warehouse, product putaway tends to fall behind other tasks such as picking, replenishment, shipping and loading. Pulling away resources from putaway can impact fill rates by not having product in pick racks, bring about congestion in staging areas that over-flow into aisles. And delaying putaway may result in product damage as the product is moved, again and again, to make way for higher priority receipts. Proper staffing of the putaway team will support downstream processes of picking and shipping, and in the long run lead, to better customer order fill rates.

The putaway process is typically managed by one, or a mix of, these methods: staging product from the receiving area, based on the purchase order, based on the part number, or based on a putaway zone or by using direct delivery (putaway) to the storage location.

- Most commonly, companies stage **all products received on the purchase orders** together, ensuring that the entire receipt is validated (matching them to the packing list and other documents) prior to moving product the warehouse. While this process identifies discrepancies and is easier to manage, it requires large staging areas and increases the time product spends on the dock.

- Another common method is to **stage product by part number**. This allows putaway to occur prior to receiving every item on the purchase order. Less storage space is needed and it reduces the time it takes to get product to its final location. Vendor compliance rules, such as product marking and standard case and pallet sizes, must be in place for this option to be effective.

- Less common is to **stage product by the putaway zone**. A putaway zone creates like groups, which may be defined by travel time (mapping out the warehouse storage areas), location of use (such as storage, replenishment, pick area, assembly area) or by product velocity. No matter how the zone is defined, the WMS assigns a storage location and a staging zone. The product is moved to the staging area for that zone to await transfer to the storage location. Staging by putaway zone uses less space, but requires a WMS that is capable of pre-slotting. Utilizing putaway zones will reduce travel time for lift trucks.

- The most efficient practice is to **put away directly from receipt to final location**. This process uses the least space for staging, and product is handled less and ready for use sooner. This putaway program requires a more sophisticated WMS that has the ability to assign locations from an ASN or upon receipt on the dock. Assigning locations and using direct putaway can be optimized by using automated conveyor systems that are capable of sorting and diverting materials by zone and location.

By understanding the travel time from receiving to storage areas, pick locations and re-plenishment areas; the best putaway route can be selected. The result is putaway travel paths that are sequenced based on the shortest route for the product in the load, with reduced aisle conflicts and congestion. The putaway process is critical and significantly impacts overall warehouse efficiency.

Task interleaving is fairly common in many warehouses. Basically, it is a form of multi-tasking in which the operator performs different tasks as they move through the facility. For example, they may put away product and on the return trip, they pick product for shipping.

## Metrics

Metrics should always be posted in the area where the metrics are gathered and employees should be aware of performance to goals or standards. Performance metrics should be used to drive and assess continuous improvement projects. Some area performance metrics that should be tracked in the putaway process are:

- **Putaway errors**. Errors such as product placement in the wrong locations, wrong part identification and incorrect counts should be included in the metric. *This metric was not reported in the recent WERC benchmarking study.*

- **Staging area utilization**. Tracks the utilization of staging areas and floor space. If the staging areas are overflowing, it may indicate understaffing, receiving issues, or equipment utilization issues. *This metric was not reported in the recent WERC benchmarking study.*

- **Equipment utilization**. Measures the up-time of material handling equipment. (R*eported in the WERC benchmarking study as equipment/forklift capacity used.*)

- **Warehouse damage**. Measures product damage due to warehouse activities.

Additionally, the Perfect Order Index is a measure of performance from a customer viewpoint and as such is an important measure for all warehousing functions to understand. A low Perfect Order index may be indicative of performance issues in upstream processes such as material handling and putaway.

## Product Identification

Good and best practice companies identify products using some form of barcoded or RFID label. Product identification labels, zone or location labels and pallet license plates should all be utilized in the putaway process. Both bar code and RFID can work equally as well to identify product, with bar code labels far more common in today's warehouses. The advantage of RFID is that it works better in harsh environments: it has a fast read from almost any position, and the tag can hold a lot of information that can be changed as the product flows through the warehouse. Bar code labels however have been used for years, successfully, to identify and manage the flow of materials in the warehouse.

Machine-readable ID labels allow for the use of scanning equipment to identify product as it is moved through the warehouse. Employees can, with a simple scan of the product (bar code or RFID tag) get product information and direction from the WMS system as to the location the product is in or that the product needs to go to, or they can transact a location move or issue product to an order. If product is placed on an automated conveyor system or AR/AS system the identification label can be scanned and used to direct sorters and diverters to deliver product to where it is needed. Utilizing product ID labels in your process will reduce transaction errors and improve productivity.

## STEP 1. Process Benchmarks for Material Handling & Putaway

Compare your company's processes against this chart of attributes.

| Material Handling and Putaway – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Material Handling** | Primarily manual handling with poor ergonomics. | Mechanized but material flow issues are evident | Efficient material handling, but not designed well for the current task, seasonal spikes or forecasted growth | Efficient material handling characterized by well ordered staging areas, clear aisles and clearly marked locations, well suited for current and future tasks | Flexible and efficient material handling with appropriate automation tailor made for current and forecast business needs |
| **Housekeeping & Safety** | Poor housekeeping<br><br>High levels of product damage<br><br>Poor safety record. | Inconsistent housekeeping, many problem areas<br><br>Safety hazards visible<br><br>Apparent damage to product and property. | Adequate Housekeeping in place<br><br>Problem areas are evident<br><br>Maintain safety | Good house-keeping, aisles and work areas are clear of debris, goods are neatly stacked, no excess moisture, dirt, etc evident<br><br>No safety concerns due to housekeeping<br><br>Little product damage | Excellent Housekeeping work areas are clear of debris, goods are neatly stacked, no excess moisture, dirt, etc evident<br><br>Excellent Safety record<br><br>Insignificant product damage |
| **Crossdocking** | Products which are destined for immediate shipment or cross-docking are not managed well<br><br>No process is in place to identify required material at receipt | Inconsistent handling of products which are destined for immediate shipment or cross-docking<br><br>Material expedited by exception form hot lists and emails<br><br>Material must be "walked through" the warehouse | Products which are destined for immediate shipment or cross-docking are expedited manually using off line lists<br><br>Cross docking or replenishment task is manually created<br><br>Material is manually expedited through the warehouse | Products which are destined for immediate shipment or cross-docking are flagged by system<br><br>Manual cross-docking or replenishment task is created<br><br>Material is "expedited" through the warehouse with system flags or notes<br><br>Product is staged for movement to cross-docking or replenishment location | System-enabled alerts for incoming product's immediate order requirements<br><br>Upon receipt a cross-docking or immediate replenishment task is created by the system<br><br>Use of automated self sorting conveyor systems to move product when appropriate. |

| Material Handling and Putaway – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Putaway** | No putaway process | Manually selected putaway locations<br><br>No or limited staging area for product to be putaway | WMS selects putaway locations<br><br>Paper based transactions batch processing<br><br>Product may be staged for putaway | WMS selected putaway locations<br><br>Some RF based transactions<br><br>Clearly defined staging areas - support putaway by zone | System selected putaway locations, based on minimizing travel time and product velocity<br><br>In truck RF transactions in real time<br><br>Clearly defined staging areas- support putaway by zone and travel time |
| **Metrics** | No performance metrics | Inconsistent performance metrics | Performance metrics tracked not posted or reported consistently | Performance metrics/standard clearly posted | Performance metrics support customer requirements and are tracked, posted and reported and used for continuous improvement |
| **Product Identification** | Product is not marked | Product is not identified well. License plates not utilized. | Product marking is inconsistent, most product have bar coded labels or license plates<br><br>Product marking is a mix of bar coded and non-bar coded, product marking is not used consistently in warehousing processes<br><br>Aware of RFID product identification tags, RFID program may be under investigation | Product marking using barcode printed license plates<br><br>Product marking supports the use of portable and truck mounted RF devises to identify product and product locations using bar codes<br><br>RFID capability in place or plans to implement and integrate with WMS, depending on customer requirements | Product is properly marked for identification using bar coded license plates<br><br>Product labeling supports the use of automated sorting and diverting equipment and AR/AS equipment integrated with WMS<br><br>RFID enabled product identification tags, integrated into WMS system location map |
| Supply Chain Visions- *Best Practice Process Attributes and Benchmarks* (Copyright 2007 Supply Chain Visions) | | | | | |

## STEP 2. Assessment for Material Handling & Putaway

**Directions:** Rank your processes against the material handling & putaway Benchmark Table. Use this chart to check which column best represents your processes. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process has been assessed, total the values for the group.

| Material Handling and Putaway – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Rank** | 1 | 2 | 3 | 4 | 5 |
| **Material Handling** | | | | | |
| **Housekeeping & Safety** | | | | | |
| **Cross-Docking** | | | | | |
| **Putaway** | | | | | |
| **Metrics** | | | | | |
| **Product Identification** | | | | | |
| **Self Assessment Score Total** | | | | | |

## STEP 3. Ranking Ranges for Material Handling & Putaway

**Directions:** Use this table to compare your self-assessment score TOTAL to the material handling & putaway score rankings listed here.

| Material Handling and Putaway - Ranking | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Section Score Rankings** | 6 | 12 | 18 | 24 | 30 |

Our self-assessment score TOTAL of _____ means that we rank as
❐ *poor* ❐ *inadequate* ❐ *common* ❐ *good* ❐ *best practice* in this area.

## STEP 4. Key Performance Metrics for Material Handling & Putaway

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to material handling and putaway. Each KPI is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

**Key Performance Metrics (KPI)**

| KPI | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Equipment / Forklift capacity used | <40% | >=40% and <65% | >=65% and <76.08% | >=76.08% and <89.2% | >=89.2% |
| Material handling damage | >=2.24 | >=1 to <2.24 | >=0.05 and <1 | >=0.00074 and <0.05 | Less than 0.00074 |
| Lines received & put away per hour | Less than 8 | >=8 and <15 | >=15 and <25 | >=25 and <60 | >=60 |

**KPI Definitions**

| KPI | Definition | Calculation |
|---|---|---|
| Equipment / Forklift capacity used | The amount of up time logged for equipment / forklifts | Amount of time equipment is used / total amount of time available for use |
| Material handling damage | Measures damage caused by warehouse operations. | Warehouse damage (damage caused by warehouse operations) as a percent of cases or units |

WERC Benchmarking Study 2007
(Copyright 2007 WERC/Georgia Southern University/Supply Chain Visions)

Additional metrics productivity metrics that may be of value for the warehouse manager are Overtime Hours, Value Added per Employee, Annual Workforce Turnover, Employee Productivity vs. Standard and Productive Hours to Total Hours. These metrics are reported in the complete study as broad metrics for the entire warehouse. The study currently does not report these metrics specifically for the putaway processes.

## Case Study: RFID-Enabled Lift Trucks Signal New Era

*The traditional material movers are being transformed into valuable mobile data hubs.*
From the June 1007 *WERCSheet*

The RFID revolution has taken a detour. Initiatives because of mandates or compliance requirements have slowed markedly over the past year or two. However, the rising awareness of RFID technology and its potential has led to other areas of concentration. One area that has garnered attention is the warehouse and DC, specifically, mounting RFID readers in lift trucks.

"Compliance mandates have caused warehouse operators to consider not only RFID technology and the benefits of that technology, but how to make better use of it," says Chris Kelley, director of RFID, Intermec Inc., Everett, Wash. It wasn't long before the operators began thinking: "If I can equip my lift trucks with RFID after I have equipped them with mobile computing, barcode readers and other devices, I can gain some internal benefits."

### Mobile RFID

The lift truck industry is interested. "There's a substantial amount of activity in the lift truck community," observes Kelley. "We have a number of partnerships that we've either announced or we're in the middle of. The companies we're working with have strategic initiatives focused on RFID."

At the 2007 ProMat show, several RFID-enabled lift trucks were on display.

- The Raymond Corporation, Greene, N.Y., exhibited an RFID-ready reach truck. Jim Malvaso, president and CEO commented, "We are researching how fuel cells and RFID work with lift trucks to help warehouse owners further reduce costs and increase productivity."
- LXE Inc., Norcross, Ga., displayed a prototype of a new RFID reader designed to be installed overhead of a lift truck.
- Intermec introduced the Adaptable Load Backrest and Antenna Cell system. The forklift installation system, co-developed with Cascade Corporation, Portland, Ore., is an outgrowth of their Forklift of the Future initiative to develop a forklift system that incorporates RFID technology into a forklift's very infrastructure, "replacing today's cumbersome and inefficient bolt-on approach," says Kelley.

### There's ROI, too

RFID-enabled lift truck operation, Kelley affirms, "improves ROI." He claims that benefits include reducing the capital expenditure required for RFID deployment, increasing asset utilization, providing scalability and supporting labor-saving processes.

"Adding mobility to RFID systems with forklift-mounted readers adds value to compliance, shipping, receiving and other RFID implementations," states an Intermec white paper (*How Mobile RFID Systems Improve Operations and ROI*). It goes on: "Mobile systems can be implemented for a fraction of the cost of many traditional RFID infrastructure configurations, while supporting more uses. Forklifts can be much more than vehicles for moving goods. When integrated with RFID and vehicle-mounted computers, forklifts become mobile data hubs that deliver strong return-on-investment from lower implementation costs, more operating flexibility, and a more complete real-time view of inventory."

One example of the lower cost is described in an LXE white paper (*Raising RFID Value & Performance with Forklift-Mounted Readers*): When RFID has been used for pallet handling operations, such as outgoing shipment verification, cross docking, or automated receiving, organizations typically installed individual RFID read/write units at each door. Contrast this to how material handling equipment is deployed, where one forklift per 10 dock doors is a common ratio. By RFID-enabling the forklift, instead of the dock door, organizations can have a ratio of one RFID reader per 10 dock doors. This approach provides significant savings in implementation costs and improvements in asset utilization compared to fixed readers.

Another example is provided by Kelley in reference to the Adaptable Load Backrest and Antenna Cell system. "This system allows forklift drivers to use RFID and other data collection technologies to gather complete real-time inventory data efficiently and safely without leaving their vehicle," he explains.

RFID-enabled lift trucks are definitely on the horizon. As Kelley maintains, "We're investing capital and R&D into building products for RFID-enabled lift trucks, the lift truck manufacturers have their people focused on RFID, and the warehouse operators understand how RFID can benefit their operations."

The Raymond Corporation, www.raymondcorp.com
LXE Inc., www.lxe.com
Chris Kelley, Intermec, www.intermec.com

# Slotting

# Slotting

**Warehouse slotting** is defined as the placement of products within a warehouse facility. Its objective is to maximize the use of a warehouse's available cube space by improved storage and picking efficiency and reductions in warehouse handling costs, by optimizing product location and balancing workload. In this section, best practice attributes for the following process groups will be covered:

- Strategy
- Business Rules Review and Maintenance
- Location and Product Velocity
- Re-slotting (Re-warehousing)
- Product Configuration and Packaging
- System

## Review of Slotting Processes

A company's slotting strategy, or the rules that govern how product will be placed in the optimum warehouse location, impacts both productivity and warehouse costs. The goal of slotting is to optimize the use of the building's cube space and to reduce travel time for putaway, replenishment and picking. Slotting strategy can be based on a number of considerations; from product velocity to the physical characteristics of the product to how products are related to other products. Possible factors to consider in forming a slotting strategy are:

- **Activity or Product Velocity:** Slotting based on the volume shipped per period or the number of orders for which the product is picked. High-usage products are placed in prime locations that have the least travel time and best ergonomics.

- **Seasonal Usage:** Product is moved into prime storage and pick areas during the high-volume season and into less prime areas in the off-season. Recognizing seasonality in a product allows for efficient use of prime locations and favorable re-slotting processes.

- **Storage or Pick Types:** Example; full pallets vs. partial pallets vs. cases vs. partial cases vs. single units. Will help to optimize utilization rates for material handling equipment and prime pick and storage locations that are sized to meet the product.

- **Special Product Characteristics or Requirements:** Slotting products that require special handling or storage such as secure storage, environmental controls or material handling equipment, may be necessary and should be included in a product's profile.

- **Sorting by Product Similarity:** Slotting like products or products that may be used or ordered together can improve efficiency.

- **Sorting by Customer Base:** In some cases, grouping products by customer will gain efficiency.

- **Sorting by Product Loading or Retail Layout:** In some cases, developing location layouts that support truck-loading sequences or store delivery routes improve efficiencies.

Information about the storage or pick locations is also required to develop a slotting strategy and business rules. This includes the location measurements, carrying capacity, distance, location restrictions and the type of product that can be placed there.

When determining a slotting strategy, a company must consider multiple factors, but be careful to not "over rule" the slotting strategy. Attempting to apply rules to too many attributes at one time could become cumbersome to manage and implement and ultimately may not result in the desired gains in productivity and reductions in cost.

## Business Rules Review and Maintenance

Slotting is a dynamic process. As your products and your customer base changes so too must your business rules for slotting and warehouse layout. Industry experts have found that it is not uncommon for companies to review the business rules used in slotting programs at less than yearly intervals, and in many cases, no review has been done since the system was installed. As a result, many companies are not seeing the expected improvements in productivity from slotting programs.

Business rules should be reviewed and changed to support current and expected business requirements. Best practice companies will review their slotting strategy against:

- Forecasted volumes

- Seasonality

- Marketing plans and promotions

- Changes to product profiles and product mix

- Changes to customer requirements and customer mix

- Changes to warehouse layouts and material handling equipment changes

The most common change is to the velocity and cube of the products that move through a warehouse. It is not uncommon for as much as 35% of the SKUs to be gone in a year's time. If the business rules are not reviewed to keep up with the changes in product mix, large gaps can occur in expected productivity from slotting programs to the productivity experienced in the warehouse. Review your slotting strategy on a regular basis to get the expected value from your slotting program.

## Location & Product Velocity

One consideration for slotting is to reduce travel time or labor associated with picking and replenishment. Travel time, in its broadest usage, includes time to lift product in and out of shelving locations; travel within the warehouse by hand, lift trucks or conveyors; and the time pickers take to locate and pull product. To reduce travel time, most companies start by looking at product order patterns and product velocity through the warehouse. The fastest-moving items are located so that the least amount of travel is required to pick or pull product for replenishment.

Example of these prime locations may be the first bays in an aisle, storage close to central conveyors or areas closest to shipping or assembly cells. Product is also placed at the best ergonomic levels, and prime locations are balanced across aisles, flow racks and shelving to reduce labor and equipment congestion and conflicts. Product cube characteristics are another consideration when selecting locations. Slotting programs help maximize space utilization by matching the products to the locations based on cube density.

## Re-slotting (Re-warehousing)

Re-slotting is the process of assigning a new location to a product based on changes to its profile or usage. It is common for product volume and velocity to change through its lifecycle and each industry has its own rate of product change. Review of slotting assignments can be as infrequently as once per year, as in a service parts inventory, or as frequently as once per month in as in some retail distribution settings. No matter the correct review frequency, re-slotting best practices can be characterized by:

- Use your WMS system to assess the optimal location and reassign the product to the correct slotting priority.

- Use picking and putaway process to reallocate product from fast-moving locations to slow-moving locations or vice versa. Pull product from sub-optimal locations first to real-locate as part of your normal pick and replenishment process. Put away product into the optimal location as it is received.

- Review location cube utilization to optimize the rack height or storage area in the location. Be willing to make changes to warehouse layouts and racking configurations. Small changes can yield considerable efficiency improvements.

- Consolidate product to optimize storage. Run consolidation reports to look for product in multiple locations, where the product is not filling the location. Either pull this product first or combine product locations as part of re-slotting activities.

- Adjust for product seasonality in advance, move forecasted fast movers into prime locations before seasonal orders are received. Also move product out of prime locations before the demand dies off. Product with little demand in a prime location will reduce pick and replenishment efficiency.

- Make time for re-slotting because re-slotting product will reduce pick and replenishment time down stream. One company found that for each hour of labor used re-slotting product into optimal pick locations, they saved up to 9 hours of picking labor. This example reminds us to analyze the total warehouse labor impact of the re-slotting process.

Best practice companies continually review slotting assignments and have an aggressive re-slotting process.

## Product Configuration & Packaging

Product specifications should optimize the product cube and allow for efficient transport and storage. Specifications should be enforced with the Supplier. Specify the number of units to a case and the number of cases to a pallet. Have standards for pallet height, width and depth to optimize rack heights. Require proper product marking and labeling. Re-stack pallets in receiving if required, but have a process in place to notify Suppliers that product was not delivered properly. In the retail industry, it is common to charge compliance fees to Suppliers who do not ship product to specification. Maintain product specifications in your WMS system and use to establish product profiles. Best practice companies manage product configuration with their Suppliers.

## System

Although there are still companies that have manual slotting processes, as the number of products a warehouse manages increase, so too has the complexity of managing and getting benefit from slotting processes. Best practice companies have turned to integrated slotting software programs for help.

Data drives slotting programs. Data gathering, maintenance and validation are a major undertaking and commitment. Data is required about the product, the warehouse layout and locations and product usage orders and forecasts.

A **product profile** must be maintained for every SKU. When setting up a new slotting strategy, access at least a year's worth of historical data as well as current forecast data. Product characteristics needed include cube size, weight, number of products in a case, cases to a pallet and storage requirements. These requirements may need to be gathered from other systems, from product specifications, from suppliers or manually gathered by measuring and weighing the product.

Data must also be gathered about the **storage/pick locations**. This includes the measurements of the space (allowing for required clear height, columns and sprinkler heads), the carrying capacity (in terms of weight and number) distance and the type of product that can be placed in the location.

Finally, data must be gathered about the **movement of product**, such as the number picks per product as well as forecasted demand. Once the data is gathered, it must be verified as correct and then maintained in the WMS.

Slotting systems basically work by balancing constraints and goals. Goals include what you want to optimize, such as travel time, space utilization and labor utilization. Constraints are location characteristics or product characteristics that must be met. The system makes location suggestions by calculating goals and constraints and is far more efficient than manual processes.

## STEP 1. Process Benchmarks for Slotting

Compare your company's slotting processes to the listed attributes. You may want to check or highlight the description that sounds most like your operation.

| Slotting – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Strategy** | No process or capability to manage slotting<br><br>Warehouse locations not identified | Product is placed on racks with no well defined methodology<br><br>Warehouse location map may be used | Slotting strategy is poorly defined and products are assigned based on a warehouse map<br><br>Slotting assignments are static | Slotting strategy is employed to assign products to locations based on product velocity<br><br>Slotting assignments may be static or dynamic, user rules are not well defined | Pre-slotting strategy is employed to assign products to locations based on product velocity<br><br>Slotting assignments are dynamic based on user defined rules |
| **Business Rules Review and Maintenance** | Slotting assignments not reviewed | Warehouse layout may be reviewed annually, location assignments not reviewed | Slotting strategy may be reviewed annually<br><br>Business rules not normally reviewed The slotting assignments are reviewed annually | The slotting strategy is reviewed quarterly<br><br>Business rules reviewed at least once a year to current requirements | Slotting strategy reviewed monthly and adjusted in advance for seasonality<br><br>Business rules are reviewed and changed to support current and expected business requirements |
| **Location & Product Velocity** | Products are not stored based on usage or product velocity | Some fast moving products may be grouped together near pick area | Locations may be based on product velocity<br><br>Fast-moving items are located together near the pick area | Fast-moving items are located at the most ergonomic levels, while balancing the volume across aisles to reduce order and labor congestion<br><br>Slotting based on proximity to the prime pick location | Fast-moving items are located at the most ergonomic levels, while balancing the volume across aisles to reduce order and labor congestion<br><br>Slotting based on proximity to the prime pick location and cube utilization |

| Slotting – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Re-slotting (Re-warehousing)** | Product is not re-slotted or con-solidated | Re-slotting hap-pens as an event such as annual inventory or annual location audit/clean up or consolidation<br><br>Manual re-slotting process based on loca-tion map | Effort is made to re-slot at least once per quarter<br><br>Product is con-solidated as encountered<br><br>System tools not adequate to support re-slotting process | Monthly or more frequent re-slotting and con-solidation<br><br>System support for slotting analysis<br><br>Process clears non-optimal storage locations as part of pick process | Re-slotting is part of normal picking and stor-age process<br><br>System supports re-slotting as part of optimiza-tion program<br><br>System directed process clears non-optimal locations as part of pick and put-away processes |
| **Product Con-figuration and Packaging** | Pallets not con-figured for stor-age | No consideration for pallet con-figurations | Product pallet configurations may be defined but not enforced | Pallet configura-tion on some products allows for efficient stor-age<br><br>Pallets are re-stacked in re-ceiving if re-quired | Pallets config-ured to allow for efficient storage without re-stacking<br><br>Suppliers ship pallets optimized for storage and internal transport |
| **System** | No WMS or system support for slotting<br><br>Product data not maintained | WMS are inade-quate to support needs<br><br>Product data poorly main-tained<br><br>Mix of manual processes and offline systems may be used | WMS may sup-port space utili-zation and put-away/ replen-ishment func-tions<br><br>Product data is maintained, may not be part of WMS<br><br>System may be standalone and not fully inte-grated | WMS supports space utilization and put-away/ replenishment functions<br><br>Product data is maintained in the WMS<br><br>May be part of the WMS or an integrated pack-age | WMS designed to maximize space cube utili-zation while enabling efficient putaway and replenishment functions<br><br>Product data is maintained in the WMS and used with business rules to deter-mine slotting assignments<br><br>Part of inte-grated system |

Supply Chain Visions- *Best Practice Process Attributes and Benchmarks*
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## STEP 2. Assessment for Slotting

**Directions:** Rank your processes against the slotting Benchmark Table. Check which column best represents your processes. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process has been assessed, total the values for the group.

| Slotting – Self-Assessment | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| *Rank* | *1* | *2* | *3* | *4* | *5* |
| **Strategy** | | | | | |
| **Business Rules Review and Maintenance** | | | | | |
| **Location and Product Velocity** | | | | | |
| **Re-slotting (Re-warehousing)** | | | | | |
| **Product Configuration and Packaging** | | | | | |
| **System** | | | | | |
| Self Assessment Score Total | | | | | |

## STEP 3. Ranking Ranges for Slotting

**Directions:** Use this table to compare your self-assessment score TOTAL to the slotting section score rankings listed here.

| Slotting - Ranking | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| **Section Score Rankings** | **6** | **12** | **18** | **24** | **30** |

Our self-assessment score TOTAL of _____ means that we rank as
❏ *poor* ❏ *inadequate* ❏ *common* ❏ *good* ❏ *best practice* in this area.

## STEP 4. Key Performance Metrics for Slotting

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to slotting. Each KPI is scaled from *Major Opportunity* to *Best in Class.* The values are from a recent WERC Benchmarking Study.

| Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Peak Warehouse Capacity Used | <90% | >=90% and <95% | >=95% and <98% | >=98% and <100% | >=100% |
| Honeycomb Percentage | <65.8% | >=65.8% and <80% | >=80% and <88.4% | >=88.4% and <93% | >=93% |
| Average Cubic Capacity Used | <78% | >=78% and <85% | >=85% and <87% | >=87% and <95% | >=95% |

**KPI Definitions**

| KPI | | |
|---|---|---|
| Peak Warehouse Capacity Used | The amount of warehouse capacity used during designated peak seasons | peak capacity used / capacity available |
| Honeycomb Percentage | Measures how well actual cube utilization within the warehouse is managed. Especially important where slots may be only partially full. An example would be if 1 unit is in a location, and it has room for 10, the utilization for that slot/bin location is 10% | actual cube utilization / total warehouse cube positions available |
| Average Cubic Capacity Used | Measures how well a warehouse is using its capacity of slots. For example, if there is product in a slot (even if it is only 1 carton) that slot would be 100% utilized. | % of slots used / total capacity of slots |

WERC Benchmarking Study 2007
(Copyright 2007 WERC/Georgia Southern University/Supply Chain Visions)

Additional metrics that may be of value for the warehouse manager are Overtime Hours, Value Added Per Employee, Annual Workforce Turnover, Employee Productivity vs. Standard and Productive Hours to Total Hours. These metrics are reported in the complete study as broad metrics for the entire warehouse. The study currently does not report these metrics specifically for the slotting processes.

## Case Study: Optimized Slotting: Increase Productivity & Reduce Costs
*WERCSheet,* January 2004

### Adding Technology to the Mix (a case for slotting technology)

While many companies still slot manually, Stan McLean, president of Intek Integration Technologies, believes that with such a large number of products coming into the marketplace, slotting technology can benefit many companies.

"The explosion of product is wonderful for consumers; however, when you look at the supply chain, at the distribution channel and the manufacturing process, the number of products expands exponentially," says McLean. "The more SKUs you have, the more space you need, which means increasing the travel path and the time it takes to pick and ship orders. Twenty years ago, it was probably easier to prioritize where to put the faster items. Today, with so many more SKUs, it is less obvious."

### Enter slotting technology.

While you can do slotting manually, says McLean, the more products a warehouse has the more manpower you need. The goal with slotting technology is to simplify the process so that once configured, the technology is really running on its own.

Slotting tools mirror the key data that is required and already in the WMS, says Paul Maurer from Manhattan Associates. There really isn't much manipulation or editing down with Manhattan's tool, he says, but rather the slotting tool provides an idea of how much racking is needed and how SKUs should be allocated to that racking.

Intek's tool allows users to simulate future slotting layouts to make informed decisions on how to optimize their facility. Data from new layouts can be compared to current processes and managers can then determine which processes function best.

"The tool provides different scenarios," explains McLean. "Slotting should be a process that you tweak at different times. It isn't a big-bang process. However, for one-time slotting, where you are taking a company from no slotting to complete slotting, the process is often large-scale."

In addition, the tools can help managers determine whether moving product will be worth the effort involved. For instance, says Maurer, you don't want to move product whose velocity is not changing much. However, when SKUs are gaining or dropping in popularity, slotting tools can indicate, at the appropriate time, that the cost of moving product makes sense.

"A lot of people in the warehouse ignore or slot an item inefficiently," says Maurer. "They are then constantly replenishing or going to the back of the aisle, without realizing the time saved by moving the item once. That is where slotting technology can really help."

# Storage & Inventory Control
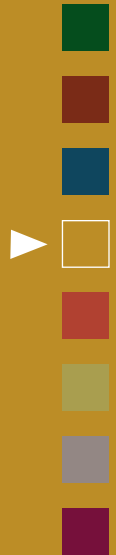
# Storage & Inventory Control

Storage and Inventory Control include the activities related to holding material and the processes of counting and transacting the material as it moved through the warehouse. Best practice attributes for the following process groups are covered:

- Location Management and Review
- Product Data and Special Requirements
- Inventory Control System
- Transaction Processing
- Cycle Count
- Inventory Strategy

### Location Management & Review

Companies need to match the layout of storage areas with the basic operation of the warehouse. The layout of a warehouse that supports an adjoining manufacturing facility will have different requirements than a facility supporting product distribution or a facility that supports end-user fulfillment. Some operations place emphasis on replenishment, others on product picking or order fulfillment.

Regardless of the mission of the warehouse, best practice companies have designed storage systems to meet the needs of the current and planned mix of storage types. They have **optimized storage locations and layouts** to fit product without the need to restack or re-palletize it once received. Best practice companies have excellent cube fill rates.

In addition to optimizing fill rates, storage locations should **minimize travel time**. If a product is in high demand, it should be placed close to its next point of use. In this case, demand should be based on the number of times the product is require—not on the number of units required. The difficulty of retrieval should also be considered in travel time: higher demand product should be placed on the most easily-accessed storage space, typically floor level for racking and between waist and shoulder level in pick racks (golden zone).

Not all companies have the requirement to track product by lot or serial number, but if required, best practice companies have integrated that capability into their warehouse and shipping processes and use the system of record to manage the lot and serial number data.

Most companies put a lot of effort into the initial layout of the warehouse; however, industry surveys will tell you that as many as half the companies do not have an ongoing process in place to review their layouts. Many only look at layouts when prompted by a major change in volume, a large shift in efficiency or some other event.

Reviewing how storage areas are configured and having processes in place to reconfigure storage areas as product mix changes is critical to maintaining high levels of space utilization and efficiency. Making continuous small adjustments to racks, shelving or other storage equipment can have a great impact on space utilization.

## Product Data & Special Requirements

All warehousing software runs on data; therefore, product and storage location data must be kept current and accurate. Product data should include all characteristics including cube data and lot/serial number information. Special requirements should also be noted in the system so that product can be directed to special storage areas.

Special storage areas may segregate items with odor transfer, fire risk or those that require temperature control. High-value product might require caged and/or controlled access storage. Best practice companies maintain all information on a single system of record and keep it current and accurate.

## Inventory Control System

It's often said that inventory is money; and that you should keep track of inventory as you would money. The activities and technology to maintain inventory accuracy are typically referred to as **inventory control**. The basics of effective inventory control programs are:

- **Processes and Procedures:** Well-documented and defined processes are the foundation of inventory control. Processes should detail specific tasks and requirements. The procedures should be the only way inventory is managed and transactions processed.

- **Training:** Employees need to have a complete understanding of procedures and expectations.

- **Compliance:** Address any non-compliance issues quickly. Documented processes should be the only acceptable way.

- **Cycle Counts:** Perform counts to determine both inventory accuracy and to identify problem areas that need to be addressed.

- **Inventory Metrics:** Measure the accuracy of inventory activity and transactions to minimum standards. Use measurements to drive process improvements.

- **Employees:** Control employee turnover in positions that perform inventory transactions. New employees are much more likely to make mistakes. Also address poorly-performing employees. If re-training is not helping an employee, you need to remove him or her from positions that impact inventory accuracy.

- **Storage:** Crowded, unorganized and improperly or poorly-marked storage areas subject product to damage and are prone to inventory transaction errors. Inventory control benefits from good housekeeping and warehouse organization.

- **System:** The process of controlling and managing inventory is made easier by having a single system of record. Transactions should flow seamlessly between Order Management, Warehouse Management, Transportation Management and Financial Management Systems.

- **The Right Company Mindset:** Just like customer service, safety or quality, inventory accuracy must be seen as every employee's responsibility, not just the responsibility of those who perform inventory transactions. All levels of the organization should promote it and support it.

Best practice companies follow the basics and ensure systems are in place to support inventory accuracy.

### Transaction Processing

Accurate and timely inventory balances are required to meet customer satisfaction goals. Personnel and lift trucks should be outfitted with portable RF devices that allow employees to perform transactions as product is moved. Using barcode and RFID tags helps to improve transaction accuracy and reduce keystroke errors. Best practice companies use a single system of record and perform transactions in real time.

### Cycle Count

Cycle counting is an inventory accuracy audit technique, in which inventory is counted on a cyclic schedule rather than once a year. Most effective cycle counting systems require the counting of a certain number of items every workday with each item counted at a prescribed frequency. The key purpose of cycle counting is to identify items with on-hand quantity errors, thus triggering research, identification, and elimination of the cause. Benefits to a cycle count program include:

- Improvement to ongoing inventory accuracy

- Resolution of invitatory discrepancies and the problems that caused them

- Reduction of the need for physical inventory counts

- Improvements in operational efficiency: when you are continuously counting, the warehouse must be well organized and employees become more attuned to both physical inventory control and to inventory accuracy in the system

- Facilitates continuous improvement programs, stock reduction programs, excess and obsolete monitoring programs and identification of damaged or spoiled stock

- Improved customer service through more accurate order commitments

The real power of cycle count is in identifying problems and resolving the root cause so that the errors do not occur in the first place. Put processes in place to drive accuracy at the front end, train personnel, have documented procedures, use barcodes to help validate product, and motivate employees to be accurate.

Cycle counting should be continuous and system generated. Commonly, companies use an **ABC analysis** to prioritize counting. To determine the ABC classification, the number of units sold (the velocity) is multiplied by the unit cost, and then the material is ranked from highest to lowest. Typically the top 70% of the value makes up the "A" class, the middle 20% make up the "B" class and the bottom 10% makes up the "C" class; however, this will vary from company to company. Some companies may also assign a "D" class to obsolete or very slow moving inventory or expensed inventory.

Based on the 80/20 rule, the "A" parts make up the majority of the inventory value but a minority of the number of parts in inventory. Most companies adjust the ABC groupings so that the "A" parts can be counted at least once per month, "B" parts once a quarter and "C" parts at least once per year. When a company is using storage locations, the cycle count process should record the total part count as well as the location count accuracy. RF transactions should also support the cycle count process.

**Inventory Strategy**

Best practice companies use vendor managed inventory (VMI) and supplier stocking programs that are system supported. VMI is the practice of holding suppliers responsible for determining order size and delivery timing, usually based on inventory data. In vendor stocking programs, the supplier is asked to deliver product to a specific stocking or pick location. The supplier is required to replenish only material used from the location or to an established stocking level. The goal of these programs is to increase inventory turns and reduce stockouts.

Systems and processes should also support **just-in-time** (JIT) and **Kanban-based replenishment processes**. JIT is an inventory reduction strategy that feeds production lines and pick-areas with products delivered when they are needed ("just in time"). Developed by the auto industry, it refers to shipping goods in smaller, more frequent lots. Kanban, as it refers to replenishment, is an inventory process where standard container or lot sizes are used.

Companies should have an aggressive program to manage excess and obsolete inventory. Slow-moving, obsolete and excess inventory that fills warehouse space is costing the company money. When assessing the impact of this inventory, consider the cost of the inventory AND all related costs, including warehouse space (cube) cost, insurance costs, inventory taxes, as well as the cost of maintaining (moving, counting and re-shelving) the inventory.

There are indirect costs too, obsolete inventory takes up what could be productive warehouse space and impacts a company's return on assets performance. Looking at this class of inventory as a percentage of the total inventory value may be sobering. Many experts have found that 25%, and as much as 45%, of a company's inventory value including carrying costs fall into this category. Best practice companies understand the financial implications of holding non-productive inventory and have processes and strategies to minimize its impact.

## STEP 1. Process Benchmarks for Storage & Inventory Control

Review this chart and consider your processes as they relate to the listed attributes. You may want to check or highlight the description that sounds most like your operation.

| Storage and Inventory Control – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Location Management and Review** | No WMS to control location and rotation.<br><br>No process for serial number tracking<br><br>Poor cube fill rates, cube fill not tracked<br><br>Review of locations for sizing and access is not completed regularly | Storage locations do not consider SKU volume<br><br>No capability to track serial number and lots<br><br>Poor cube fill rates<br><br>Storage locations are not regularly reviewed for proper sizing | High volume SKUs may be grouped together<br><br>Capability to track serial number and lots, may be stand-alone system<br><br>Average cube fill rates<br><br>Storage locations are reviewed annually to assure best access and proper sizing | Storage locations for high-volume SKUs are contiguous, and FIFO rules assure proper lot control<br><br>Systemized capability to track serial number and lots<br><br>Good cube Fill rates<br><br>Storage locations are reviewed regularly to ensure best access and proper sizing | Storage systems designed well for current mix of storage types and needs<br><br>Capability in WMS system to track serial number and lots, integrated into warehouse and shipping processes<br><br>Excellent cube fill rates<br><br>Storage locations are reviewed regularly to ensure best access and proper sizing |
| **Product Data and Special Requirements** | No product cube data available on system<br><br>No process to segregate products with special requirements | No product cube data available on system<br><br>Inconsistent manual process to segregate items with odor transfer, fire risk or requiring temperature control<br><br>No controlled access areas | Basic product cube data available but not held on system<br><br>Manual process or standalone data base, to segregate items with odor transfer, fire risk or requiring temperature control<br><br>Caged and controlled access available for high value items | Product cube data and basic product data, available, held on system<br><br>System supported process to segregate items with odor transfer, fire risk or requiring temperature control, items are stored in special areas<br><br>Caged and controlled access for all high value items | System includes all product data characteristics including cube data & lot/serial numbers<br><br>System driven process to segregate items with odor transfer, fire risk or requiring temperature control, items are stored in special areas<br><br>Caged and controlled access for all high value items |

| Storage and Inventory Control – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Inventory Control System** | Multiple systems used to manage warehouse and inventory<br><br>Multiple systems that must be manually reconciled | WMS operated manually to control location and rotation. Inventory control system manually reconciled or batch interface<br><br>Multiple systems that must be reconciled | Standalone systems. WMS, inventory control managed across multiple systems that must be reconciled<br><br>Multiple systems that are reconciled through system integration | WMS integrated or interfaces with ERP system, inventory control reconciled by system interface<br><br>Single system of record | Order Management to WMS to Transportation Management Systems integration<br><br>Single system of record |
| **Transaction Processing** | Manual or paper transactions<br><br>Transactions may require data entry into multiple systems<br><br>Inconsistent transaction processing | Manual data entry<br><br>Transactions batch processed | Some RF-based inventory transactions<br><br>Transactions may be batch updated | RF-based truck mounted and portable, inventory transactions<br><br>Transactions in near real time | RF-based truck mounted and portable, inventory transactions<br><br>Transactions in real time |
| **Cycle Count** | No cycle count program | Inadequate manual cycle count program in place | Manual cycle count program in place<br><br>Cycle count process only records count variance | System generated cycle count program<br><br>Cycle count process records total count and location count accuracy<br><br>Cycle count process is supported by RF transactions | Continuous system generated cycle count program in place<br><br>Cycle count process records total count and location count accuracy<br><br>Cycle count process is supported by RF transactions |
| **Inventory Strategy** | JIT and Kanban processes not used<br><br>Poor excess and obsolete processes | No or limited JIT and Kanban processes used to support replenishment<br><br>No vendor managed inventory VMI) programs<br><br>Excess and obsolete inventory not managed or tracked well | Processes support JIT and Kanban replenishment programs<br><br>Limited VIM programs in place<br><br>Excess and obsolete managed and tracked well | System and processes support JIT and Kanban replenishment programs<br><br>VMI may be used for some products<br><br>Programs in place to manage excess and obsolete inventory | System and processes support JIT, Kanban replenishment<br><br>VMI and supplier stocking programs are used and are system supported<br><br>Aggressive programs to manage excess and obsolete inventory |
| Supply Chain Visions- *Best Practice Process Attributes and Benchmarks* (Copyright 2007 Supply Chain Visions) | | | | | |

## STEP 2. Assessment for Storage & Inventory Control

**Directions:** Rank your processes against the Storage & Inventory Control Benchmarks in STEP 1. Use this chart to check which column best represents your process groups. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process is assessed, total the values for the group.

| Storage and Inventory Control – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| ***Rank*** | **1** | **2** | **3** | **4** | **5** |
| **Location Management and Review** | | | | | |
| **Product Data and Special Requirements** | | | | | |
| **Inventory Control System** | | | | | |
| **Transaction Processing** | | | | | |
| **Cycle Count** | | | | | |
| **Inventory Strategy** | | | | | |
| **Self Assessment Score Total** | | | | | |

## STEP 3. Ranking Ranges for Storage & Inventory Control

**Directions:** Use this table to compare your self-assessment score TOTAL to the Storage and Inventory Control section score rankings listed here.

| Storage and Inventory Control - Ranking | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Section Score Rankings** | **6** | **12** | **18** | **24** | **30** |

Our self-assessment score TOTAL of _____ means that we rank as
❐ *poor* ❐ *inadequate* ❐ *common* ❐ *good* ❐ *best practice* in this area.

## STEP 4. Key Performance Metrics for Storage & Inventory Control

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to Storage and Inventory Control. Each KPI is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

| Storage and Inventory Control – Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Average warehouse capacity used | <78% | >=78% and <85% | >=85% to <87% | >=87% and <95% | >=95% |
| Peak warehouse capacity used | <90% | >=90% and <95% | >=95% to <98% | >=98% and <100% | >=100% |
| Inventory count accuracy | <95.6% | >=95.6% and <98.4% | >=98.4% and <99.3% | >=99.3% and <99.9% | >=99.9% |
| Days raw material on hand | >=86 | >=38.8 and <86 | >=25 and <38.8 | >=14.8 and <25 | >14.8 |
| Days of finished goods inventory on hand | >=90 | >=51 and <90 | >=30 and <51 | >=14 and <30 | >14 |
| Inventory shrinkage as a percent of total inventory | >=1.25 | >=0.544 and <1.25 | >=0.074 and <0.544 | >=0.0043 and <0.074 | >0.0043 |
| Lost sales (% SKUs Stocked Out) | >=5% | >=3% and <5% | >=1.08% and <3% | >=0.14% and <1.08% | >=0.14% |

**KPI Definitions**

| KPI | Definition | Calculation |
|---|---|---|
| Average warehouse capacity used | The average amount of warehouse capacity used over a specific amount of time (month to month or yearly). | average capacity used / average capacity available |
| Peak warehouse capacity used | The amount of warehouse capacity used during designated peak seasons. | peak capacity used / capacity available |
| Inventory count accuracy | Measures the accuracy (by location and units) the physical inventory compared to logical inventory: If the warehouse system indicates that 10 units of part number xyz are in location 29, inventory count accuracy indicates how frequently one can go to such a location and find that the physical count matches the system count | absolute value of the sum of the variance between physical inventory and perpetual inventory (by location and by units) |
| Days raw material on hand | The number productive days before raw material supply are consumed. | gross raw material inventory / (value of transfers / 365 days) |
| Days of finished goods inventory on hand | The number of days of finished goods inventory on hand. Measures the volume of finished goods inventory needed to support your business. Lower is better - pending service levels are being met. | average daily balance of inventory / average rate of "sales" or use for past 3 months in units per day |
| Inventory shrinkage as a percent of total inventory | The amount of breakage, pilferage, and deterioration of all inventories relative to total inventory. Usually stated in terms of value; not unit | sum (value of breakage, pilferage, deterioration to all inventory) / total value of all inventory |
| Loss Sales (% SKUs Stocked Out) | An important risk indicator: what percent of sales were lost due to stockouts. | $ sales that were lost (i.e. they did not become backorders) / total sales |

## Case Study: Consider Cycle Counting to Improve Inventory Processes and Procedures

*WERCSheet June 2006, f*rom "Taking on the Responsibility of Inventory Management"

If the warehouse doesn't yet have a cycle counting program, William F. Latham, president, Leading Principles for Dynamic Management, Sumner, WA, urges that one be started so that the warehouse management team can begin to identify and improve inventory processes and procedures.

There are four primary activities in cycle counting: counting, reconciliation, problem research, and problem correction. While all four are necessary and each requires some type of cost, which one will ultimately improve the business?

For the answer, consider a person in your receiving area who has difficulty counting. If your cycle counting initiative only included counting, and you only corrected the record, nothing has changed. The operator is still introducing wrong counts into the system. Even if you counted the part, reconciled the records, and made some minor adjustment, the problem still isn't corrected.

However, if you do some research to locate the source of the problem, yet do not attempt to institute a change in the receiving process or personnel, errors will still occur as the source of error remains. It's only when you go through the entire process and take action by correcting what's "broken" in the receiving area that you improve the process and business.

That's not to say that, upon investigation, the operator in receiving did anything wrong. In fact, other error-causing reasons that might have been uncovered can range from incorrect data on the packing slips to a broken counting scale. But once the root cause is identified and repaired, the process should be corrected.

There are several benefits to a cycle counting program, one of which is a definite improvement in inventory accuracy. Another not so obvious benefit is that, typically, large quantities of safety stock are specified to mitigate against problems related to the original inventory levels. "Once the problems are eliminated and you have accurate data, you can then take down a significant amount of that safety stock investment, which will result in a tremendous reduction in your carrying costs as well" Latham explains.

As a case in point, he tells of a distributor who was engaged in an industry and product where even though process improvements might be made, no appreciable market share gains were made. Nevertheless, the distributor implemented a cycle counting process, and even though no market share increase was realized, the organization was able to maintain the same level of customer service, but with a 50% less inventory requirement. Once the distributor got the processes under control it found that it also didn't need as much safety stock as before.

# Picking & Packing

# Picking & Packing

Picking and packing is the process of locating and pulling product from inventory and packing it into shipment containers to fill a customer order. In this section, best practice attributes for the following process groups are covered:

- Strategy and Methods
- Tactics and Equipment
- Pick Documents
- Transactions
- Performance

## Strategy and Methods

Assess your order profiles. The picking process should support both customer order profiles and product activity profiles. Typically, customer order profiles, or the way customers order your product, fall into three categories:

**Order Mix:** Understanding both the mix of high and low volume product and the percentage of order lines that use full pallets, full cartons, broken cartons, single units or some combination of these, allows you to plan pick area layouts and staffing.

**Order Size:** Understanding the number of units that customers typically order allows you to set carton size or to encourage, through marketing programs and pricing, customers to order in full carton quantities.

**Order Lines:** Understanding the number of lines in each order is important to setting picking strategies. A warehouse with mostly single line orders vs. one with mostly multi-line orders will have significantly different pick strategies.

Understanding product activity facilitates pick area layouts. It is important to review the order or pick frequency, how many times the product is picked, and the order volume, how much of the product is picked. Most will find their orders follow the 80/20 rule, where 80% of the orders are made up of 20% of the product stockkeeping units (SKUs). By identifying the top 20% of products, you can define the correct picking strategy. As your product mix changes you should review the impact on your picking strategy.

With an awareness of your product profile, an appropriate pick method or methods can be selected. Some common order management or order release methods are:

**Single Order Picking:** The most common pick method is to pick to a single order; in this process the entire order is picked. The order may be issued to the pick area as a printed-to-a-pick list, a pick label or dropped to an RF (radio frequency) terminal. The entire order may be picked and placed directly into the shipping container, eliminating downstream handling. Typically, orders are prioritized by customer-requested ship date.

**Multi-Order Batch Picking:** Batch processes are most effective when operators have to travel long distances in the pick area. By batching a number of orders together, a picker can pull the product for a number of orders as they pass by the product's stocking location. Batch picking works best when you have a large number of product SKUs and the products are located across a large area.

**Order Consolidation:** This method groups orders by destination or by customer. This has the benefit of pulling product for multiple orders in a single pass through the pick area.

**Wave:** A wave is an automated grouping of orders by a specific set of criteria so that these orders are released to the pick area as a group. Grouping might be based on criteria such as priority orders, orders by freight carrier, order by shipment type or orders for a specific store, location or customer. The purpose is to break the day's work into manageable segments.

**Zone:** Orders may be grouped by warehouse zone, such as single unit pick area, case pick area or bulk or pallet pick areas. In this case, an order may be split and consolidated in the shipping area.

Many companies use a number of order release strategies. Most WMS systems will support the above methods of order release.

## Tactics and Equipment

Picking product tends to be the most labor-intensive operation in the warehouse. It is important to manage the flow of orders in the pick area to manage congestion and bottlenecks to optimize labor utilization. When laying out the pick area, seek to eliminate non-value added steps and excess travel distances. Think about product placement: place more frequently picked product in the easiest to reach locations, between the waist and shoulder in pick racks and shelving (called the "golden zone"), use storage fixtures when warranted to properly present product to pickers and locate odd-shaped, bulky or heavy product in locations that facilitate safe handling. Proper ergonomics reduce operator fatigue and injury.

The design of the pick line should support the type and volume of product you fulfill for your customers. Common examples of pick lines:

**Straight Line:** The pick shelving is laid out in a straight line with the most popular products placed at the front of the line to reduce the travel distance for the pick operator.

**Branch and Pick Zone:** In this layout there is a center aisle or conveyor and the pick shelving is placed at right angles to the center aisle. The most popular items are placed closest to the center aisle.

**Serpentine Line:** The operator walks from row-to-row, front to back until the order is picked completely. The most popular items are placed on the front rows closest to shipping with the least popular items on the back rows.

**Pick to Conveyor:** There are a number of variations with this layout, but essentially an order is passes down the conveyor from operator to operator, the operator will pick product in their pick zone and pass the order along until the entire order is completed.

**Pick-to-Light:** Pick-to-light systems position lights on shelving and pick racks. These lights signal the location and often the quantity of product to be picked for an order. This mix of automation and human interface greatly increases pick efficiencies and accuracy.

**AS/AR (Automatic Storage and Retrieval, Automated Conveyors and Automated Carousels:** There are a number of automated or semi-automated systems that hold and move product to the operator when a customer order is entered. These systems move product to the operator so that it can be packed and shipped to the customer order.

Striking a balance between manual and automated systems is the goal. It is dependant on volume, throughput requirements, order mix and available capital.

### Pick Documents

How a pick task is presented to the operator varies from company to company. Technology is playing an important role in changing how orders are managed in the pick operation. Some common methods used in the warehouse are:

**Paper Pick Tickets** are the most common form of pick documentation. The order picker uses the document to determine the pick location and quantity. The operator must also verify that correct parts are picked and perform transactions. Paper pick tickets work well for many fulfillment operations, but are prone to human error.

**Label Pick Documents** work well in single order pick environments. They are a form of paper pick ticket and are used in a similar way. The added benefit is that labels are printed as part of the order release; the operator uses the label as the pick document. When the order is picked into the shipping carton, it can be packed and the labels applied. The product is ready for shipping eliminating any downstream packing steps.

**Hand Held RF Terminals and Portable Label Printers** are used by many warehouses to aid the picking process. A pick task is sent to the RF device and the operator picks the product. The product is validated by scanning the product barcode ID or RFID tag. At the end of the task, a shipping or consolidation label may be printed either on a portable printer or within the work area. The process can be virtually paperless.

**Pick-to-light** allows for paperless picking, when pick-to-light equipment is linked to the order management and inventory system. The operator picks product based on the lighted location and then confirms each pick in the system. The system is then able to carry out inventory transactions, complete order records and drive replenishment requirements.

**Voice** recognition technology sends voice messages to operators and allows operators to use common speech to give commands to the system. Pick tasks are delivered to the operator and the system helps to direct the operator to the pick location. Voice systems are flexible and allow for order priorities to be quickly changed. Many companies have set up dual systems, using pick-to-light for the 20% of the items that make up 80% of the product volume and voice for the 80% of the parts that make up 20% of the product volume.

There are a number of methods available to manage the picking process, selecting the correct one for your operation will help you achieve operational efficiency. And remember to factor in ergonomic considerations.

### Transactions

Technology plays a part in a company's ability to perform transactions as a seamless part of the picking process. It is common practice for transactions to be performed at the end of the pick process as part of order consolidation or confirmation. Best practice companies have integrated transactions into the process by using RF terminals, wireless speech system or similar WMS system enabled transaction automation. This allows transactions to take place in real time and in a single system of record.

**Performance**

Performance metrics must measure both what the customer sees and what drives improvement in warehouse processes. Good metrics are ones that are linked to customer satisfaction, are documented with operations definitions, and that drive improvement. Good and best practice companies will:

- Measure daily activity by major task
- Measure individual accuracy and performance
- Display performance metrics on the warehouse floor
- Include employees in continuous improvement programs
- Gather feedback, suggestions and information from the operators
- Train and cross train
- Report metrics to customers

Improving performance in the pick area will help to reduce labor and increase efficiency; it will also boost customer service levels.

### STEP 1. **Picking & Packing Process Benchmarks**

Review this chart and consider your pick and pack processes as they relate to the listed attributes. Check or highlight the description that sounds most like your operation.

| Pick and Pack – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Strategy and Methods** | No picking strategy<br><br>No review process of pick methods | Picking strategy is not adequate to support current customer requirements<br><br>Process to review pick methods not well defined | Picking strategy supports current customer requirements and may include more than one pick/pack process<br><br>Review pick processes and strategy by product group typically once per year<br><br>Simulations and modeling may be used on a project basis | Picking strategy supports current customer requirements and may include a number of pick/pack processes (Zone, Wave, Batch/consolidation, Pick and pass, Single order pick, Kit picks)<br><br>Review pick processes and strategy for each product at least once per year<br><br>Modeling and simulations may be performed as part of review process | Picking strategy supports current and forecasted customer requirements and will include multiple optimized pick/pack processes<br><br>Optimized wave picking and task interweaving<br><br>Review pick processes and strategy for each product at least once per quarter<br><br>Modeling and simulations are run frequently |
| **Tactics and Equipment** | Pick/pack areas are not arranged to support current demand, issues meeting current volume<br><br>Little or no specialized material handling equipment<br><br>Operator efficiency not managed<br><br>Poor ergonomics of pick areas, issues with operator fatigue and injury<br><br>Poor housekeeping | Pick areas are not arranged to support current demand<br><br>Little specialized material handling equipment used<br><br>Operator pick efficiency is monitored but not managed well<br><br>Pick/pack areas are not laid out well, poor ergonomics, issues with operator fatigue<br><br>Moderate housekeeping, obvious safety issues | Pick areas are laid out well to support current demand<br><br>Some specialized material handling equipment is used to improve efficacy<br><br>Operator pick efficiency is monitored and managed<br><br>Pick/pack areas are laid out well, good ergonomics, operator fatigue minimized<br><br>Good housekeeping, some safety issues | Pick areas are laid out well to support current and peak demand<br><br>Material handling equipment used to improve efficacy and reduce travel time (Pick to light, carousels, flow rack may be used)<br><br>Operator pick efficiency and travel time is monitored and managed<br><br>Pick/pack areas laid out ergonomically with the objective of reducing employee fatigue and injury<br><br>Good housekeeping | Pick areas are optimized to support current and future demand<br><br>Conveyors or other automated material handling equipment to bring the orders into each required pick zone, eliminating travel time for pickers (Pick to Light, AR/AS, flow rack, auto pick equipment, may be used)<br><br>Operator pick efficiency and travel time is monitored and optimized<br><br>All pick/pack areas laid out ergonomically to reduce employee fatigue and injury<br><br>Excellent housekeeping |

**Pick and Pack – Process Benchmarks**

| Process Group | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| **Pick Documents** | Manual and paper based pick lists<br><br>Pick jobs not well managed | Pick documents are not sequenced<br><br>No consistent process for job release | Pick documents support limited sequencing based on locations<br><br>Jobs are released in batches | Pick process supports pick sequencing based on travel path or locations<br><br>Release of pick jobs in waves, documentation supported by RF | Pick travel path minimization through order picking in travel path sequence<br><br>Batch picking of the same SKUs for multiple orders, or wave pick sequencing to plan picks per zone in advance |
| **Transactions** | Stationary terminals used in pick areas | Stationary terminals used in pick areas<br><br>Systems do not support transaction process well, possible multiple systems with batch processing | Mix of RF and stationary terminals used in pick areas<br><br>Transactions may be batch processed<br><br>Multiple integrated systems may be used, transactions are integrated among systems | Pick areas use RF terminals in combination with portable printers and stationary terminals and printers<br><br>Transactions are in near real time<br><br>If multiple systems are used there is seamless system integration among systems<br><br>Systems support RFID tag / Electronic Product Code tracking when required | RF terminals, wireless speech system or similar WMS system enables automated order communication to personnel, portable printers used<br><br>Transactions are in real time<br><br>Single system of record<br><br>RFID tag / Electronic Product Code tracking integrated into pick process when required |
| **Performance** | Inconsistent record of activity by major task<br><br>No measures of staff productivity<br><br>Customers are not included in the performance review process | Record of monthly activity by major task and manning levels held by manager<br><br>Measure shift performance<br><br>Customers may receive performance information | Record of weekly activity by major task and manning levels held by manager<br><br>Measure shift productivity performance<br><br>Customer receive quarterly performance reports | Record of weekly activity by major task and staffing levels displayed on warehouse floor.<br><br>Measure shift or individual productivity performance<br><br>Customers receive or have access to performance reports | Record of daily activity by major task and staffing levels displayed on warehouse floor. Employees are included in continuous improvement programs<br><br>Productivity targets set and measured, showing an improving trend and / or meeting goals<br><br>Customers can review performance activity level via on-line reporting |

### STEP 2. Assessment for Picking & Packing

**Directions**: Rank your processes against the Picking and Packing Benchmarks in STEP 1. Use this chart to check which column best represents your processes. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process is assessed, total the values for the group.

| Pick and Pack – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| Process Group | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
| *Rank* | 1 | 2 | 3 | 4 | 5 |
| Strategy and Methods | | | | | |
| Tactics and Equipment | | | | | |
| Pick Documents | | | | | |
| Transactions | | | | | |
| Performance | | | | | |
| Self Assessment Score Total | | | | | |

### STEP 3. Ranking Ranges for Picking & Packing

**Directions:** Use this table to compare your self-assessment score TOTAL to the Picking and Packing section score rankings listed here.

| Picking and Packing - Ranking | | | | | |
|---|---|---|---|---|---|
| | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
| Section Score Rankings | 5 | 10 | 15 | 20 | 25 |

Our self-assessment score TOTAL of _____ means that we rank as ❒ *poor* ❒ *inadequate* ❒ *common* ❒ *good* ❒ *best practice* in this area.

## STEP 4. Key Performance Metrics for Picking & Packing

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to Picking and Packing. Each KPI is scaled from *Major Opportunity* to *Best in Class.* The values are from a recent WERC Benchmarking Study.

| KPI | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| On time shipments | < 94% | >=94% and <97.0% | >=97% and <98.9% | >=98.9% and <99.7% | >= 99.7% |
| Fill Rate - Line | < 92% | >=92% and <97% | >=97% and <98.54% | >=98.54% and <99.66% | >= 99.66% |
| Fill Rate - Order | < 92% | >=92% and <96% | >=96% and <98.5% | >=98.5% and <99.7% | >= 99.7% |
| Average time from order placement to shipment | >=60 hours | >=36 and <60 | >=24 and <36 | >=8 and <24 | < 8 |
| Order picking accuracy | <98% | >=98% and <99% | >=99% and <99.5% | >=99.5% and <99.9% | >= 99.9% |
| Percent of orders shipped complete | <92% | >=92% and <96% | >=96% and <98.5% | >=98.5% and <99.3% | >= 99.3% |
| On time delivery | <92% | >=92% and <95% | >=95% and <98% | >=98% and <99% | >= 99% |
| Perfect Order Index | <86.92% | >=86.92% and <95% | >=95% and <98% | >=98% and <99.48% | >= 99.48% |
| Cases shipped per person hour | <30 | >=30 and <70 | >=70 and <145.36 | >=145.36 and <286.4 | >= 286.4 |
| Pallets shipped per person hour | <4.6 | >=4.6 and <10 | >=10 and <18 | >=18 and <34.4 | >= 34.4 |
| Backorders as a % of total orders | > =10% | >=5% and <10% | >=2.12% and <5% | >=0.484% and <2.12% | > 0.484% |

| KPI Definitions | | |
|---|---|---|
| **KPI** | **Definition** | **Calculation** |
| On time shipments | Off the dock, on the truck and in transit to its final destination. | # of orders shipped on time / # of total orders shipped. On time is defined by the customer request and SHOULD NOT be moved once it is entered into the system |
| Fill Rate - Line | This metric measures the percentage of line items on a specific order shipped from stock within 24 hours of order release. | # line items filled from stock within 24 hours of order release / total number of lines on the order |
| Fill Rate - Order | This metric measures the percentage of orders shipped from stock within 24 hours of order release. | # of orders filled from stock shipped within 24 hours of order release / total number of stock orders |
| Average time from order placement to shipment | The time between order placement by the customer and order shipment from the supplier. | date order shipped - date order placed |
| Order picking accuracy | This measures the accuracy of the orders picked. Errors may be caught prior to shipment. | orders picked correctly / total orders picked |
| Percent of orders shipped complete | Complete means that all lines / units ship with the order. | # of orders shipped with all lines & units / total number of orders shipped |
| On time delivery | The percentage of orders that arrive at their final destination on the date agreed upon. | # of orders delivered on time / total number of orders |
| Perfect Order Index | An order that meets all of the following criteria: complete, on-time (as defined by customer - could be on time delivery or on time shipment), perfect documentation, perfect condition. | % of on time orders x % of complete orders x % of damage free orders x % of orders with accurate documentation as defined by customer (e.g. invoice, ASN, labels) |
| Cases shipped per person | The number of individual cases of product shipped by an employee. | # of cases shipped by employee / total number of cases shipped |
| Pallets shipped per person | The number of pallets of product shipped by an employee | # of pallets shipped by employee / total number of pallets shipped |
| Backorders as a % of total orders | The portion of total orders that are held and shipped late due to lack of availability of stock. Can be measured by lines or by PO, by units or by $ value. | # or $ of orders (or lines or units) held and not shipped / total # or $ of orders (lines or units) |
| WERC Benchmarking Study 2007 (Copyright 2007 WERC/Georgia Southern University/Supply Chain Visions) | | |

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# Case Study: Talking About an Evolution

*Wireless technology is giving DCs a big boost to productivity*

*WERCSheet,* October 2005

While everyone is busy talking about the many benefits of radio frequency identification (RFID), there's a quieter evolution going on with other wireless products in the DC. While RF products like handheld computers, barcoding and voice technology may not be in the limelight, their role in the DC is critical. You might even say wireless technology is rapidly becoming the backbone of DC operations.

"Just about every DC today has some sort of RF network," says Bill Hubacek, director of distribution technologies at FKI Logistex North America, a global provider of automated material handling solutions located in St.

Dessommes points to several specific wireless applications that are on the horizon. The first is WiMax - high-speed, wireless communication technology. "This is being developed to solve problems in the WAN world," he says. "It will have a role in outdoor storage applications."

Another is what he calls "mesh networking." This is a scenario where wireless devices are able to use each other for connecting back to the host. "Expect to see mesh networking options for logistics applications sometime in 2006," he says.

Also look for open standards, which are rapidly becoming reality. The advantage is that wireless devices from different vendors can communicate with one another. This allows companies to piece together the ideal system and tools for their needs rather than having to make their processes fit the technology.

Interconnectivity between wired and wireless tools is also improving, making for better tracking of processes on the DC floor. A pick-to-light system combined with voice technology is a good example of this new technology "relationship."

Finally, all of the vendors say that wireless tools are becoming increasingly advanced and that will lead to an even faster return on your investment, something that is already usually in the six- to nine-month range, according to Dessommes. "All of the tier one DCs have gone wireless," he says, "and now the small DCs are starting to get there as well."

And that's something that, today, can't be said about RFID.

**Making it happen – an example**

Everyone in the warehouse or DC understands the importance of speed—customers want their products yesterday, so there's no room for error. No one knows this better

than Martin Bros. Distributing Co., a full-line foodservice distributor that delivers products to foodservice establishments, schools and care facilities in the Midwest and foodservice and restaurant equipment nationwide.

With over 2,500 customers, Martin Bros moves approximately 150,000 items through its DC each week. To meet customer demands, the company cannot afford miss-picks, missing items or delays. Recognizing this, the company decided that implementing wireless systems was necessary. Martin Bros. focused in on automating the data capture process of goods moving in, through and out of its DC.

The company decided on a variety of wireless solutions from Symbol Technologies, Inc. For receiving and storage, they selected legacy mobility solutions that include a portable data terminal designed for rugged environments, along with Symbol's forklift-mounted reader. Both products move data over frequency hopping (FH) wireless networks. In addition, Martin Bros. added a wearable scanning system that could receive stock picking and inventory management information over Wi-Fi networks.

This required that Symbol add a wireless switch to centralize the DC's entire wireless network. Symbol and its partner, Systems Application Engineering (SAE), then deployed the new mobile Wi-Fi shipping system using the Symbol wearable computer and data capture system. The switch technology allowed Martin Bros. to preserve old applications while adding new and to run them over the same wireless network. The distributor now has a centralized wireless switch architecture with a fully functioning FH and Wi-Fi wireless network infrastructure that supports all necessary mobile applications.

Best of all, Martin Bros. was able to reduce stock picking errors and increase productivity, resulting in lower administration costs and improved customer satisfaction.

# Load Consolidation & Shipping

# Load Consolidation & Shipping

Load consolidation and shipping consist of the processes that support the transport of products and the infrastructure that supports delivery. In this topic, best practice attributes for the following process groups are covered:

- Shipping Process
- Shipping Transactions
- Managing Customer Requirements
- Consolidation
- Transportation Management
- Performance Management

## Shipping Process

Product should flow seamlessly from the picking process and crossdocking processes. Whenever possible avoid additional packing and processing steps by including these steps in the picking process. The flow of orders into shipping must be balanced. Your process must be capable of consolidating product by customer, delivery location, carrier and shipping mode. The system should allow for changes to order priority and shipping method until late in the process. Orders should be confirmed as "shipped" when the product leaves the dock to avoid timing issues for customer invoicing and shipment notification.

## Shipping Transactions

RF (radio frequency)-enabled terminals, voice/speech technology and barcode readers in the shipping transaction process support accurate and timely data entry. Best practice companies perform transactions in real time and on a single system of record. Your WMS (warehouse management system) should produce all required shipping labels and documents, including packing lists, bills of lading, and export documents. Most companies request suppliers to provide an Advanced Shipping Notice (ASN) when product is shipped from their dock. Today's WMS and TMS systems are fully capable of producing a detailed ASN that includes customer-required information.

## Managing Customer Requirements

Customer data needs to be stored in your WMS/ERP system and it needs to be available, in the form of business rules; to drive the output of customer-specified documentation and instructions to shipping personnel.

Business rules should be flexible enough that they can change with revisions to customer requirements (routing guides). Companies should establish a systematic process to monitor customers for changes in requirements and to update the system and to communicate changes to shipping operators. Some WMS programs have added this capability to newer software releases.

Customer data may include

- product data, such as pricing, packaging, part and carton marking
- shipping information like pallet labels, packing specifications and pallet types
- carrier data; like ASN requirements, carrier selection and shipping/delivery windows

Good and best practice companies use system-generated, customer-specific shipping instructions and documents. All internal processes that rely on customer data, such as shipping, invoicing, customer service and marketing should utilize the same data source and update in real time. Using a single data source for customer information reduces errors and data management time.

Stored customer data and information has no value unless the system can apply it to warehouse processes and rules-based document output. Customer requirements are used by transportation management software to select carriers and routings. If RFID tags are required, data should be provided by the system. An investment in customer compliance management will pay dividends in driving correct order documentation and shipment compliance—eliminating non-compliance penalties' chargebacks from retailers. Best practice companies have processes in place to manage chargebacks and to perform corrective action and root cause analysis.

## Consolidation

Processes and the WMS should support load consolidation including consolidating orders to carriers, consolidating orders to locations (DC or store) and combining all open orders to the same ship-to address. The WMS system should build out a truck loading sequence that supports delivery routing (i.e., first truck destination loaded last). Utilizing load and routing optimization software may have value for some companies.

## Transportation Management

Transportation modes include trucking (truckload, less than truckload, and small parcel), airfreight, rail and ocean; there are also inter-modal carriers that combine two or more modes of transport. Carriers make transportation service available to the general public; the services are the same for all customers and tariffs and terms are published and often can be negotiated.

Carriers must have comprehensive shipment tracking systems with detailed daily reporting. It is important that your carrier is able to support the integration of shipment tracking, proof of delivery and manifesting into your system. In transit status updates should be automated with update frequencies that support your customer reporting requirements.

Carrier best practices are characterized by:

- Select provider by least-cost per shipment and rate using actual rates prior to release to billing. Select least-cost carrier program to meet customer requirements. Select provider based on on-time and quality performance.

- Integration with shipping system to automatically update shipment documentation with manifest information.

- Error-free, fully-automatic tracking of consignments at each stage of journey.

- Full daily management reporting system delivered proactively.

- Carrier/Route Optimization based on continuous movement and consolidation/pooling.

- Automated load tendering and acceptance ensures contract compliance.

- Carrier report cards utilized to measure on-time delivery, shipments accepted, on-time arrival at the shipment warehouse, damage, etc.

- Carrier website provides tracking, rate information, documentation including insurance coverage, and pickup information. Transit times and rating available on the website.

- Carrier damage/quality data provided along with root cause analysis and improvement plans.

A Transportation Management System (TMS) is a computer-based system, standalone or part of an integrated WMS package, which focus on freight movements and physical distribution. They are designed to provide optimized transportation management along with associated activities. TMS systems assist companies in:

- Selecting the best routing and transportation method for shipments

- Determining shipping rates and tariffs

- In monitoring carrier service levels and rates and making carrier selections

- Supporting shipment and delivery scheduling

- Supporting documentation management (especially when international shipping is involved),

- Supporting third party logistics management.

Having a system in place to select and tender loads based on your customer requirements, costs and service level will optimize the total shipping costs, improve your on-time shipment measures and ensure that carrier selection is correct based on the customer routing guide. Most TMS will manage updates and send shipping notices (ASN) and manifests to customers and carriers.

Proof of delivery is the information a carrier provides showing the delivery status of your shipment. In the broadest definition, it can include electronic updates as the shipment proceeds through the various stages of the shipping process. In the narrowest definition, it could be a copy of the signature of the individual who received the shipment. In any case, it is important to know when an order is delivered to your customer. By receiving an electronic proof of delivery (POD) for your shipments and linking that to your WMS system, you can easily track when an order was received.

## Yard Management

In addition to TMS and WMS, companies can use a yard management system (YMS) to schedule inbound and outbound appointments and manage yard resources. Implementing a YMS can help increase load flow and throughput, enhance yard security and accountability, improve carrier scheduling and appointment processes, increase inbound and outbound load visibility and reduce detention and demurrage charges.

A YMS usually links to the TMS or WMS and provides real-time information and complete visibility of trucks, trailers, drivers, goods and materials—from when they arrive at the gate to the moment they leave.

## Performance Management

Best practice companies are customer-focused and align organizational structures, processes and performance measures to support customer requirements and agreements. Employees should receive feedback on customer satisfaction surveys and performance measures; when they understand the impact their performance has on customers, they will understand the need for accurate and timely processing of orders.

Shipping metrics should reflect both internal shipping performance and carrier delivery performance. Carriers should track and proactively report shipment metrics. They must have handling processes that support damage free shipments, damage should be proactively reported and corrective actions taken. Carriers must also be responsive to resolving issues by means of proactive problem notification and corrective action. Carrier selection should be based, in part, on the reported performance of the carrier.

## STEP 1. Load Consolidation & Shipping Process Benchmarks

As you review this table, consider your own shipping and load consolidation processes as they relate to the listed attributes. You may want to check off or highlight the description that sounds most like your operation.

| Shipping and Load Consolidation – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Shipping Process** | Products moving from the pick and pack area are not reliably processed for shipping, shipping requires data entry into multiple system<br><br>Shipments are processed as shipped at the end of the day or in large batches<br><br>No system in place for ASN generation and carrier manifesting | Products moving from the pick and pack area are placed into queues for processing, shipping requires data entry into multiple systems<br><br>Shipments are processed as shipped at the end of the day<br><br>Customer ASN generation and carrier manifesting is in stand-alone system, data must be reentered and batch processed | Products moving from the pick and pack area are easily processed for shipping, may require additional data input<br><br>Shipments are processed as shipped when order confirmed<br><br>Customer ASN generation and carrier manifesting may be processed by stand-alone system in batch process without reentering data | Products moving from the pick and pack area are easily processed for shipping on the same system of record<br><br>Shipments processed as shipped, manually, when truck leaves the dock<br><br>Shipping process integrated with customer ASN generation and carrier manifesting | Shipping processes and support system are seamlessly integrated with the pick and pack processes to eliminate additional processing<br><br>Orders to be shipped are prioritized and updated in real time, and balanced between work zones to prevent over/under-utilization.<br><br>Shipments processed, as shipped, automatically, when truck leaves the dock. Driver accepts documentation.<br><br>Shipping process integrated with real time customer ASN generation and carrier manifesting |
| **Shipping Transactions** | Transactions are batch processed, multiple standalone systems may be used | Shipments are batch processed from shipping documents, on multiple systems | Some RF and wireless terminals in use for transactions, paper documents used for processing<br><br>Transactions are in near real time or batch processed, on an integrated system | RF and wireless terminals in use for transactions<br><br>Transactions are in near real time and on a seamlessly integrated system | RF terminals, wireless speech system or similar WMS system enables automated shipping information communication to personnel<br><br>Transactions are in real time and on a single system of record |

**Shipping and Load Consolidation – Process Benchmarks**

| Process Group | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| **Managing Customer Requirements** | Shipping process is inadequate to support client requirements and routing guides<br><br>Retailer charge-backs are not managed | Specific customer shipping requirements are inconsistently met<br><br>Retailer charge-backs are inadequately managed | Specific customer shipping requirements (routing guides) are kept in shipping area, requirements met using checklists and forms<br><br>Retailer charge-backs are managed on a case-by-case basis | Customer shipping requirements (routing guides) drive shipping processes and documentation and are maintained in a stand-alone database. Operators have easy access to information<br><br>System generates customer specific shipping instructions<br><br>Process in place to track and manage Retailer chargeback'<br><br>RFID tag / Electronic Product Code tags are applied when required | Customer shipping requirements (routing guides) drive shipping processes and documentation & information is maintained in the system<br><br>System generates customer specific shipping instructions and documents as part of normal shipping documents<br><br>Retailer charge-backs (non-compliance) are tracked and managed, corrective actions are generated to determine root cause<br><br>RFID tag / Electronic Product Code tracking integrated into shipping process when required |
| **Consolidation** | No order consolidation processes in place | Exceptions-based process to combine open orders | Manual process to combine some open orders to a single ship-to | System assisted process in place to combine all open orders for single ship-to within time window agreed by customer / client<br><br>Build load in stop sequence (i.e., 1st truck destination loaded last, etc.) | Integrated/ System driven process in place to combine all open orders for single ship-to within time window agreed by customer / client<br><br>Optimized 3D trailer loading<br><br>Load consolidation with break-bulk processing at remote terminals |

| Shipping and Load Consolidation – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Transportation Management** | Shipments may be tracked through carrier systems by exception<br><br>Proof of delivery from carriers when requested<br><br>Little scheduling and coordination of order pick-up by carrier<br><br>No carrier selection process | Some shipments may be tracked through carrier systems<br><br>Electronic proof of delivery from carriers when requested<br><br>Some manual scheduling and coordination of order pick-up by carrier<br><br>Carrier selection process managed as an event related to cost reduction | Shipments tracked through carrier systems, tracking data and in transit visibility provide for all shipments from carrier system<br><br>Electronic proof of delivery available for shipments through carrier's system<br><br>Manual scheduling and coordination of order pick-up by carrier<br><br>Carrier selection process is in place with periodic cost reviews | Shipments tracked through link to carrier systems, tracking data integrated into system of record, In transit visibility provided for all shipments from carrier's system<br><br>Electronic proof of delivery available for every shipment, batch loaded to system of record<br><br>TMS may be part of an in-house system or supplied by a Third Party Logistics provider. System supported scheduling and coordination of order pick-up by carrier, includes dock management and scheduling<br><br>Carrier selection process is in place with annual cost reviews | Shipments tracked through link to carrier systems, tracking data integrated into system of record, In transit visibility provide for all shipments from system of record, Carrier's GPS capability can be accessed to provide real-time visibility to CSRs.<br><br>Electronic proof of delivery provided for every shipment, uploaded to system of record<br><br>Automated Transportation Management Systems (TMS) provide carrier selection and routing based on multiple criteria, includes dock management and scheduling<br><br>Carrier selection process is in place with continuous cost tracking |
| **Performance Management** | Do not track carrier performance<br><br>Inconsistent shipping performance tracking and reporting | Carrier performance reviews held as part of corrective action<br><br>Shipping performance is tracked and reported to management | Track Carrier performance with periodic reviews<br><br>Shipping performance is monitored and reported | Track Carrier performance with annual reviews<br><br>Shipping performance is monitored, posted and reported and meets all customer requirements | Track Carrier performance with quarterly reviews<br><br>Customers can review performance activity level via on-line reporting |

## STEP 2. Assessment for Load Consolidation & Shipping

**Directions:** Rank your processes against the Load Consolidation & Shipping Benchmarks in STEP 1. Check which column best represents your processes. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process group is assessed, total the values for the group.

| Shipping and Load Consolidation – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
| **Rank** | 1 | 2 | 3 | 4 | 5 |
| **Shipping Process** | | | | | |
| **Shipping Transactions** | | | | | |
| **Managing Customer Requirements** | | | | | |
| **Consolidation** | | | | | |
| **Transportation Management** | | | | | |
| **Performance Management** | | | | | |
| Self Assessment Score Total | | | | | |

## STEP 3. Ranking Ranges for Load Consolidation & Shipping

**Directions:** Use this table to compare your self-assessment score TOTAL to the Load Consolidation & Shipping section score rankings listed here.

| Shipping and Load Consolidation - Ranking | | | | | |
|---|---|---|---|---|---|
| | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
| **Section Score Rankings** | 6 | 12 | 18 | 24 | 30 |

Our self-assessment score TOTAL of _____ means that we rank as ❒ *poor* ❒ *inadequate* ❒ *common* ❒ *good* ❒ *best practice* in this area.

### Step 4. Key Performance Metrics for Load Consolidation & Shipping

This table provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to Shipping and Load Consolidation. Each KPI is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

| Load Consolidation & Shipping – Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Percent of orders shipped complete | < 92% | >=92% and <96% | >=96% to <98.5% | >=98.5% and <99.3% | >= 99.3% |
| Percentage of orders sent damage free | < 96.24% | >=96.24% and <98.5% | >=98.5% to <99% | >=99% and <99.8% | >= 99.8% |
| On time delivery | < 92% | >=92% and <95% | =95% to <98% | >=98% and <99% | >= 99% |
| Perfect Order Index | < 86.92% | >=86.92% and <95% | >=95% and <98% | >=98% and <99.48% | >= 99.48% |
| Pallets shipped per person hour | < 4.6 | >=4.6 and <10 | >=10 and <18 | >=18 and <34.4 | >= 34.4 |
| Backorders as a % of total orders | >= 10% | >=5% and <10% | >=2.12% and <5% | >=0.484% and 2.12% | < 0.484% |
| Distribution cost per unit shipped | >= 4 | >=1.254 and <4 | >=0.524 and <1.254 | >=0.175 and <0.524 | < 0.175 |
| Distribution cost as a % of sales | >= 9.5 | >=6.04 and <9.5 | >=3.588 and <6.04 | >=2.2 and <3.588 | < 2.2 |

| KPI Definitions | | |
|---|---|---|
| **KPI** | **Definition** | **Calculation** |
| Percent of orders shipped complete | Complete means that all lines / units ship with the order. | # of orders shipped with all lines & units / total number of orders shipped |
| Percentage of orders sent damage free | This measures the fact that the customer got their product in good and usable condition. | # of orders shipped damage free / # total orders shipped. *Note. This can be based on a statistical quality sample and extracted.* |
| On time delivery | The percentage of orders that arrive at their final destination on the date agreed upon. | # of orders delivered on time / total number of orders |
| Perfect Order Index | An order that meets all of the following criteria: complete, on-time (as defined by customer - could be on time delivery or on time shipment), perfect documentation, perfect condition. | % of on time orders x % of complete orders x % of damage free orders x % of orders with accurate documentation as defined by customer *(e.g. invoice, ASN, labels)* |
| Pallets shipped per person hour | The number of pallets of product shipped by an employee. | # of pallets shipped by employee / total number of pallets shipped |
| Backorders as a % of total orders | The portion of total orders that are held and shipped late due to lack of availability of stock. Can be measured by lines or by PO, by units or by $ value. | # or $ of orders (or lines or units) held and not shipped / total # or $ of orders (lines or units) |
| Distribution cost per unit shipped | The cost to run distribution relative to the units shipped through distribution. Distribution costs include management activities, track inventory deployment, receive, inspect, and store inbound deliveries, track product availability, pick, pack, and ship product for delivery, track inventory accuracy, track third-party logistics storage and shipping performance. | total cost of operating distribution / total units shipped |
| Distribution cost as a percent of sales | Activities included in the operate warehousing process are management activities, track inventory deployment, receive, inspect, and store inbound deliveries, track product availability, pick, pack, and ship product for delivery, track inventory accuracy, track third-party logistics storage and shipping performance. | total cost to operate warehousing / (total revenue * .001) |
| Direct distribution cost as a percentage of total cost | The portion of total expense required by distribution activities. Distribution activities include the following: management activities, track inventory deployment, receive, inspect, and store inbound deliveries, track product availability, pick, pack, and ship product for delivery, track inventory accuracy, track third-party logistics storage and shipping performance. | distribution cost / total cost |
| Average value of backorders as a % of sales | The value of sales orders that are held up in backorders as a percent of total sales orders. This is a key risk indicator. | average value of backorder (over some defined period of time) / average value of sales (during the same period) |

WERC Benchmarking Study 2007
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## Case Study: Lean and Mean

*It's not an overnight process, but with hard work, companies can implement a successful lean logistics approach.*
*WERCSheet*, September 2005

Anyone who has ever tried to lose weight knows that "going on a diet," which amounts to a temporary lifestyle change, doesn't work in the long run. Real weight loss requires a behavioral change, modeling how you do things, from the way you eat to how often you exercise.

The same holds true for companies attempting to establish lean logistics operations. A quick change to the way you do things won't bring lasting results. To achieve true lean logistics, you have to make big changes and then maintain those changes.

And like a weight-loss program, before you embark on a lean logistics program, you first need to understand if it's right for you.

In some cases, more inventory is required to optimize customer service levels. In some cases, goods should be moved less frequently in larger quantities to offset high transportation costs. In some cases, goods should be purchased in large, bulk quantifies when a special opportunity to procure arises and obsolescence is not a high-risk or cost factor. Lean logistics, then, isn't for everyone. But if it is right for your organization and you can put it into practice correctly, you stand to make substantial improvements.

### The Basics

A couple of years ago, Solectron Corp., based in Milpitas, Calif., was searching for a way to differentiate itself from its competitors. An electronics manufacturer whose customers include companies like Cisco Systems and Hewlett-Packard, Solectron was impressed with the lean approach that Toyota had adopted in the automotive industry. "We had a vision of becoming the Toyota of the electronics industry," says Ravi Ramanan, vice president of functional excellence. "Lean is a key competency around which we position everything."

Solectron's goal of becoming a lean operation meant that every facet of its supply chain would need to "slim down." "It's an evolutionary process and logistics and warehousing are a part of our approach to the overall supply chain," says Ramanan. "We treat manufacturing and logistics as a whole, making it seamless to our customers."

This total approach to lean is often the path companies choose, says Robert Martichenko, president of LeanCor, based in Burlington, Ky. "You find lean logistics in place to support lean manufacturing, or in some cases, companies might apply lean principles specifically to logistics," he says.

Either way, the general principles of lean are the same:

- Reduce setup/purchase order costs
- Reduce cycle times
- Increase operating flexibility
- Reduce/eliminate errors
- Use demand data to pull inventory
- Reduce/eliminate operating variability
- Move smaller quantifies more frequently
- Improve operating efficiency
- Reduce inventory

Martichenko says that successful lean logistics programs will include three key elements—flow, capability and discipline.

**Flow:** There are three things that should "flow" in the supply chain: inventory, information and finances.

**Capability:** Activities must be predictable, planned and actionable. "A big difference between lean and traditional logistics is that there is a plan for every aspect of lean," he says. "You don't see that kind of upfront planning in traditional logistics programs."

**Discipline:** Some 80% of logistics functions are invisible to the management who is responsible for it, according to Martichenko. "Lean is all about eliminating waste, which is where discipline comes in."

### Slimming Down

Solectron began its lean approach with its manufacturing operations. "We optimized and improved manufacturing, and then we connected our other operations to the philosophy," says Ramanan. "We have eliminated waste and now mandate that every company activity adds value to our customers." The company has laid out five key principles that guide its approach to lean:

**Value:** Understanding the value of the work the company performs by defining it as something that its customers want to pay for.

**Value chain:** Mapping the process steps that the company performs throughout the supply chain—identifying the steps that add value and striving to eliminate those that add waste.

**Pull:** Eliminating the primary source of waste—overproduction—by only producing what customers want, when they want it.

**Flow:** Removing other major sources of waste—bloated inventory and waiting—by ensuring that goods flow continuously through the supply chain and never stop.

**Kaizen/continuous improvement:** Striving for total elimination of waste through a succession of small, action-oriented (kaizen) events within the production process.

To make its warehousing operation an integral part of this process, Solectron got very creative. "We have turned our DC into a supermarket," says Ramanan.

Ramanan says that the team determined that it wanted lots of product visibility in the DC, with "no cardboard boxes." The DC operates in a first-in, first-out (FIFO) environment and all of the products are arranged according to the frequency with which they are pulled. Because of this product visibility, the DC has been able to eliminate any dependence on software—with the exception of a database to order materials. "Instead, we are hardware dependent," says Ramanan. "We keep our inventory so low that we don't need to stay on top of it."

Ramanan says, "We've created a standard of work and have empowered our people to achieve it."

The results support Ramanan's claims. Before the company began its lean approach, it turned inventory 6.7 times annually. Now turns are over 8 and Ramanan hopes to improve that to 12. In addition, the company has been able to reduce its warehouse space by more than 100,000 sq. ft. It ships smaller shipments more frequently than in the past, changing the type of transportation Solectron uses to less-than-truckload.

After focusing on internal operations initially, Solectron moved on to include its key suppliers in its lean approach. The company hopes that this step will lead to collaboration that will take customer service up another notch. "This is a journey, not a fly-by-night process," says Ramanan.

For other companies considering a move to lean logistics, Ramanan offers this advice: "Make sure you have proper leadership and support at the highest level," he says. "Leadership right up to the CEO level must be 100% committed to the process."

Once that buy-in is there, build a small but dedicated team to help support the effort, says Ramanan. "Your kaizen team should be where the value is added," he explains.

When pulled off successfully, the sky is the limit, says Ramanan. "You can improve so much," he says. "But you have to build a vision and have the courage and tenacity to see it through."

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# Shipment Documentation

# Shipping Documentation

Shipping documentation includes the process of generating all required documents and labels for a shipment in compliance with customer, carrier and government regulations. In this topic, best practice attributes for the following process groups are covered:

- Document Generation
- Compliance with Regulations and Customer Requirements
- Manifesting
- Advance Ship Notice (ASN) Generation
- RFID (AutoID) Tags

**Document Generation**

Proper shipping documentation is required for both domestic and international shipments. Your customers may also have very specific requirements for product labeling and shipping documents.

*Good* and *Best Practice* companies use electronic downloading and generation of shipping documents from the system of record. All documents and labels are produced by the system, including all export documents, shipping documents and labels based on customer-specific requirements and governmental regulations.

Customer requirements are typically stated in routing guides and agreements. The requirements may include pallet and carton label formats and information needs, packing list requirements and formats and requirements for advance ship notice (ASN) files. Customers may also specify routing requirements.

Exporters in the United States are governed by a number of agencies that may include:

- the Bureau of Industry and Security (BIS) that oversees the Export Administration Regulations (EAR)
- the Department of Commerce, the Department of Agriculture
- the Department of Defense
- the Treasury's Office of Foreign Assets Control

Requirements for export vary by the commodity being exported and the country that the product is being exported to. Export shipments must be properly labeled and documented to meet all U.S. and foreign government requirements. Shipping labels commonly include:

- Shipper's information (name, address and contact information)
- Carrier's/Exporter's information (names, shipment numbers, port of entry)
- Country of origin
- Weight marking (in pounds and kilograms)
- Number of packages/cases/pallets
- Hazardous Material labels (as required) using internationally-recognized symbols

Informational markings ("this side up", "do not stack", etc.) in English, internationally recognized symbols and/or the language of the destination country

Shipping documentation commonly includes:

**Bill of Lading:** A transportation document that is the contract of carriage containing the terms and conditions between the shipper and carrier. The document includes all delivery information and instructions. A dock receipt may also be used to transfer shipments from domestic to foreign carriers.

**Commercial Invoice:** A bill for the goods from the seller to the buyer. Governments use the commercial invoice to determine the true value of goods when assessing customs duties and taxes. A commercial invoice is often the primary document used for import/export control and may include the following information:

- Name and address for both the shipper and the consignee and contact information (phone numbers)

- Terms of the sale

- Reason for export

- Complete item description (including harmonized code)

- Country of origin for each commodity on the invoice

- Number of units, unit value and extended value for each item

- Shipment information including the number of packages, pallets, containers, and total weight

- Signature of the shipper

A destination control statement may be required for some commodities or when product is exported to some countries. The statement advises all parties that the product can only be exported to specified destinations.

**Shippers Export Declaration (SED):** A document used by the U.S. government to control exports and used as a source for official export statistics.

**Export Packing List:** A detailed, itemized list of the material in each package, case, box, pallet or container. The packing list includes unit weights and gross shipment weights. It may also include the dimensions of each package or pallet. Measurements and weights are shown in pounds and metric.

**Certificate of Origin:** Document/statement that gives the origin of the export item.

**NAFTA Certificate:** Certificate required for product trades between NAFTA countries.

**Export License:** Some goods require the shipper to have an export license, which is government approval to export a specific product in designated quantities to a specified consignee. An export license may be required for all exports to specific countries or for only particular commodities to some countries.

- *Shipper's Letter of Instruction:* An optional document that provides instructions to the freight forwarder and carriers.

- *Inspection Certificate:* May be required by some countries or consignees, this document verifies the specifications of the product in the shipment and may need to be obtained from an independent third party or testing company.

- *Consular Invoice:* Is a document that may be required by some countries. The document lists information similar to the commercial invoice. The document is certified by the consular official of the country the product is exported to.

▪ *Insurance Certificates:* May be required to show proof to the consignee that the shipment is insured for damage and loss.

The actual documentation requirement for a specific export shipment depends on the commodity and the destination, because countries have differing documentation regulations.

It is important that shipping documentation be complete, accurate and clear; even small errors or omissions can prevent product from being exported or imported into the foreign country. Incorrect documentation will cause shipping delays and could cause shipments to be seized by the U.S. Customs or by foreign governments' customs officials. The exporter is responsible for the accurateness of shipping documentation.

Not all products are subject to hazardous material regulation, but when required the U.S. Department of Transportation's, Pipeline and Hazardous Materials Safety Administration has the responsibility for regulating the safe and secure movement of hazardous materials on all modes of transportation. Your shipping system should support the generation of appropriate documents when necessary.

## Compliance with Regulations and Customer Requirements

Export/Import records are required to be maintained for five years. Records should include copies of commercial invoices. The documents should be available in the form you sent/received them in, paper or electronic. Electronic documents should be available in the system of record. Records are subject to inspection and review by both domestic and foreign government agencies.

Custom-Trade Partnership Against Terrorism (**C-TPAT**) is a voluntary government-business initiative to build cooperative relationships that strengthen and improve overall international supply chain and U.S. border security. Although this program is aimed at importation of goods, your customer may require compliance and participation in the program. Through this initiative, businesses ensure the integrity of their security practices and communicate and verify the security guidelines of their business partners within the supply chain. U.S. Customs and Border Protection published the *Supply Chain Security Best Practices Catalog* that is a useful guide to C-TPAT requirements.

Customers may list very specific documentation requirements in routing guides and agreements. Proper documentation ensures timely and accurate receipt of shipments and eliminates chargebacks related to documentation errors. Data and business rules for creating documents should be held on your system of record, which should generate all customer-required documents as part of the shipping process. Manual systems are prone to errors.

## Manifesting

A system-driven manifesting system should be used in the shipping process. There are a number of software products on the market that support direct interfaces with most small parcel and many major common carriers. The software electronically transmits manifests to the carriers.

A **manifest** is a list giving details of cargo, its destination, and other particulars for customs. For exports, the U.S. Customs and Border Protection (CBP) department supports the Automated Export System (AES)—a paperless way to file the Shipper's Export Declaration (SED) and manifest information directly to CBP. Your manifesting system should interface with equipment such as weigh scales, package dimensioning/sizing systems, scanners (barcode and RFID) and label printers to streamline shipment processing.

### Advance Ship Notice Generation

**Advanced Ship Notices (ASN)** should be automatically generated and sent by the system and sent via EDI, FTP or the Web. The system should be capable of formatting the ASN to customer specifications and able to generate multiple file types.

An ASN includes detailed shipment information designating the products and quantities shipped. An ASN may also include carrier and shipment specifics including time of shipment and expected time of arrival. The ASN should be sent to the customer when the product has actually left the dock.

An accurate ASN is critical to many customers; it allows them to quickly receive product and to pre-receive a shipment, assign slotting locations in advance and perform crossdocking of product. All these activities make the customer's warehouse more efficient.

### RFID (AutoID) Tags

A key requirement of shipping documentation is in product and shipment labeling. *Best-in-class* companies have the ability to generate, from their system, customer compliant labels including barcode and AutoID label/tags at the time of shipment. There are a number of label types that can contain or point to all relevant order information on shipment, enabling single scan receiving by the customer.

## STEP 1. Process Benchmarks for Shipping Documentation

Compare your company's processes against this chart of attributes.

| Shipping Documentation – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Document Generation** | Inconsistent generation of shipment documents<br><br>Hazardous materials documents are not generated | Manually generated customer, export and shipping documents/ labeling<br><br>Hazardous materials documents generated on some shipments<br><br>Lack capability to determine export / customs duties and fees, in advance | Customer and export (customs) compliant shipping documents and labeling can be generated manually or from standalone systems<br><br>Appropriate hazardous materials documents generated as necessary<br><br>Manual determination of export / customs duties and fees, in advance, by exception | Customer and export (customs) compliant shipping documents and labeling for all shipments (e.g. retailer specific labeling) can be generated by the system<br><br>Appropriate system generated, hazardous materials documents generated as necessary<br><br>Pre-determination of all export / customs duties and fees, and settlement processes. | Electronic download and generation of shipping documents from system of record, including all export documents, shipping documents and labels based on customer specific requirements<br><br>Appropriate system hazardous materials documents generated as necessary<br><br>Integrated system for pre-determination of all export / customs duties and fees, and settlement processes. |
| **Compliance with Regulations and Customer Requirements** | Export/Import records not maintained as required<br><br>Not compliant with Custom-Trade Partnership Against Terrorism (C-TPAT)<br><br>Documents, labels and files may not meet customer requirements, documents generated through manual processes | Export/Import records not consistently maintained<br><br>Not yet compliant with C-TPAT<br><br>Documents, labels and files meet requirements for key customers, documents may be generated by offline or manual systems | Export/Import records keep as required<br><br>Fully compliant with Tier One C-TPAT requirements<br><br>Documents, labels and files meet customer requirements, documents may be generated by offline systems and verified by checklists | Export/Import records keep as required<br><br>Fully compliant with Tier Two C-TPAT requirements<br><br>Customer required documents, labels and files are created by the system, or as part of the shipping process and meet the customers contractual requirements | Export/Import records maintained as required and available in WMS system<br><br>Fully compliant with Tier Three C-TPAT requirements<br><br>Customer required documents, labels and files are created by the system and meet the customers contractual requirements |

| Shipping Documentation – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Manifesting** | Paper manifesting | Paper manifesting, some access, through on line accounts, to carrier systems for tracking and information | Paper or carrier system manifesting, no systems interfaces<br><br>Share in batch processing, manifest data to selected carriers | Automated shipment manifesting system with tracking<br><br>Selected carriers are linked to system of record | Automated manifesting integrated with carriers and WMS systems<br><br>All carriers are linked to system of record for real time manifesting |
| **Advance Ship Notice Generation** | No ASN | No ASN or informal notification process | ASN can be generated fir specific customers | ASN available for all customers by EDI, fax, or email (note: not all customer may want ASNs but they should be available) | ASN automatically sent by EDI or Web |
| **RFID (AutoID) Tags** | No capability for AutoID label/tag | No capability for AutoID label/tag | AutoID label/tag compliance for specific customers, may be manual or stand-alone process | AutoID label/tag compliance available for all customers, tag supported by system of record | Apply customer compliant AutoID label/tag to shipment at dock<br><br>Product shipped with a single barcode or RFID device that contains or points to all information on entire consignment, enabling single scan receiving by the customer |
| Supply Chain Visions- *Best Practice Process Attributes and Benchmarks* (Copyright 2007 Supply Chain Visions) | | | | | |

## STEP 2. Assessment for Shipping Documentation

**Directions:** Rank your processes against the Shipping Documentation Benchmark Table. Use this chart to check which column best represents your processes groups. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process is assessed, total the values for the group.

| Shipping Documentation – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Rank** | **1** | **2** | **3** | **4** | **5** |
| **Document Generation** | | | | | |
| **Compliance with Regulations and Customer Requirements** | | | | | |
| **Manifesting** | | | | | |
| **ASN Generation** | | | | | |
| **RFID (AutoID) Tags** | | | | | |
| **Self Assessment Score Total** | | | | | |

## STEP 3. Ranking Ranges for Shipping Documentation

**Directions:** Use this table to compare your self-assessment score TOTAL to the Shipping Documentation section score rankings listed here.

| Shipping Documentation - Ranking | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Section Score Rankings** | **5** | **10** | **15** | **20** | **25** |

Our self-assessment score TOTAL of _____ means that we rank as
❒ *poor* ❒ *inadequate* ❒ *common* ❒ *good* ❒ *best practice* in this area.

## STEP 4. Key Performance Metrics for Shipping Documentation

This table provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to Shipping Documentation. Each KPI is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

| Shipping Documentation – Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Percent of orders shipped complete | < 92% | >=92% and <96% | >=96% to <98.5% | >=98.5% to <99.3% | >= 99.3% |
| Percent of orders sent damage free | < 96.24% | >=96.24% and <98.5% | >=98.5% to <99% | >=99% to <99.8% | >= 99.8% |
| Percent of orders with correct documentation | < 98% | >=98% and <99% | >=99% to <99.54% | >=99.54% to <99.99% | >= 99.99% |
| On time delivery | < 92% | >=92% and <95% | >=95% to <98% | >=98% to <99% | >= 99% |
| Perfect Order Index | < 86.92% | >=86.92% and <95% | =95% and <98% | >=98% and <99.48% | >= 99.48% |

| KPI Definitions | | |
|---|---|---|
| **KPI** | **Definition** | **Calculation** |
| Percent of orders shipped complete | Complete means that all lines / units ship with the order. | # of orders shipped with all lines & units / total number of orders shipped |
| Percent of orders sent damage free | This measures the fact that the customer got their product in good and usable condition. | # of orders shipped damage free / # total orders shipped. <br> *Note - this can be based on a statistical quality sample and extracted.* |
| Percent of orders with correct documentation | The portion of total orders for which the customers received an accurate invoice / ASN with the order. | # of orders with correct invoice / # of total orders |
| On time delivery | The % of orders that arrive at their final destination on the date agreed upon. | # of orders delivered on time / total number of orders |
| Perfect Order Index | An order that meets all of the following criteria: complete, on-time (as defined by customer - could be on time delivery or on time shipment), perfect documentation, perfect condition. | % of on time orders x % of complete orders x % of damage free orders x % of orders with accurate documentation as defined by customer *(e.g. invoice, ASN, labels)* |

WERC Benchmarking Study 2007
(Copyright 2007 WERC/Georgia Southern University/Supply Chain Visions)

## Case Study: Order Accuracy: How High Is the Hurdle?     *WERCwatch,* May 2000

A one-page survey was mailed to over 2200 WERC members in the first and third party sectors. A total of 312 surveys were returned, a 14.3% response rate.

**Research Objectives**

The order accuracy rate, as defined for this survey, is the *percentage of the total orders that a warehouse picked, packed and shipped correctly to customers*. Specifically, the questionnaire was to gather information from WERC members about how high the order accuracy hurdle actually had become as well as an indication of how successful firms have been in meeting these standards. Information was also gathered on variables that are often considered part of the "perfect shipment" metric.

**What factors influenced management's decision to increase order accuracy?**

| Factors Influencing Increased Order Accuracy   (n=312) | |
|---|---|
| Push for quality improvements in products/services | |
| Top mgmt interest in industry best practices | 46% |
| Customer suggestion/requirement | 44% |
| Competitive pressure | 39% |
| Top mgmt pressure to reduce costs | 36% |
| Establishment of mgmt controls process | 34% |
| Warehouse layout | 10% |

Additional factors reported by respondents included pressure from sales department, to be the best in the business, charge-back from customers, customer service advantage, hassle free customer service, improvement of customer service quality and to be competitive in e-commerce. Overall, companies indicated an average of three (3) factors had influenced the firm's decision to increase order accuracy. Ten individuals marked no influencing factors while six surveys indicated that all seven factors had a direct impact on their decision.

**What are the targeted rates for order accuracy?**

| Range | % Reporting Range | # of Firms |
|---|---|---|
| 100% - 99.5% | 65% | 203 |
| 99.4 - 99.00 | 17 | 53 |
| 98.9 - 98.5% | 7 | 22 |
| 98.4 - 98.0% | 7 | 22 |
| 97.9% or Less | 4 | 12 |
| *Total* | *100%* | *312* |

**How successful are firms at reaching their targeted order accuracy goals?**

Only about one-third, approximately 110 firms, reported meeting their target goal for order accuracy.

| Estimates In Meeting Targeted Accuracy Rate | | |
|---|---|---|
| **Estimates of Success** | **% Reporting** | **# of Firms** |
| 100% | 35% | 110 |
| 75% | 50 | 156 |
| 50% | 12 | 37 |
| 25% | 3 | 9 |
| *Total* | *100%* | *312* |

Then they were asked to estimate, (ranging from 97% to 100%) the *actual level of order accuracy*.

While over 65% of respondents reported that they were <u>targeting</u> a 99.5% to100% range for order accuracy, only 20%, slightly more than 60 firms were <u>actually reaching</u> the goal.

| Actual Percentages of Overall Accuracy   (n=312) | | | |
|---|---|---|---|
| **Ranges** | **% Reporting** | **# of Firms** | |
| 100% - 99.5% | 20% | 62 | 85% |
| 99.4% – 99.00% | 33 | 103 | |
| 98.9% – 98.5% | 17 | 53 | |
| 98.4% – 98.0% | 11 | 35 | |
| 97.9% or Less | 18 | 59 | |
| *Total* | *100%* | *312* | |

**What are firms doing operationally to improve the order accuracy levels?**

No one single activity stood out in terms of importance for firms in their efforts for increased order accuracy. Individuals reported that their companies were using, on average, a combination of *five different activities* to reach their goals.

| Operational Activities to Increase Order Accuracy  (n=312) | |
|---|---|
| Refining pick methods/practices | 63% |
| Increasing inventory controls | 60% |
| Improving shipping processes | 59% |
| Checking orders | 56% |
| Refining layout & flow | 47% |
| Implementing quality initiatives | 41% |
| Changing management procedures | 36% |
| Upgrading material handling systems | 32% |
| Improve sorting/consolidating processes | 29% |
| Increasing supervision | 27% |
| Revamping receiving systems | 25% |
| Changing storage techniques | 19% |
| Upgrading packaging procedures | 17% |
| Upgrading storage equipment | 15% |

There were two categories of activities, not on the survey's list of operational strategies that WERC

members also mentioned in response to this question—technology and personnel.

Personnel activities included incentives for order pullers, additional training, negative reinforcement if below average and revisit procedures with the workforce.

Technology activities included adding radio frequency technology, scanning, barcoding, implementation of a warehouse management system (WMS) and integration of technology. Other activities included asking customers to help identify areas for improvement, cycle counting and improving demand forecasting.

**Are customers expecting operational excellence in all aspects of an order?**

Responsibilities such as modal and carrier selection, preparation of shipment documentation and loss and damage claim filings are often outside the typical job description for warehouse personnel. However, the warehouse plays an integral role in the success of these activities.

WERC members were asked to estimate their company's performance in four areas of the distribution function:

(1) overall shipping accuracy
(2) percentage of orders shipped on time
(3) orders shipped with correct documentation
(4) damaged orders

**What is the percentage of orders shipped accurately in the last 12 months?**

For the survey, overall shipping accuracy can be broadly defined as making sure the correct items & document-tation arrive damage free within customer requirements.

Overall, 82% of the respondents indicated that their firms achieved a 98% or above performance level on shipping accuracy. On average, the percentage of shipping accuracy was between 99.0% and 99.4%.

**Orders Shipped Accurately, Fall 98-Fall 99** *(n=312)*

| Percent of Orders | % of Companies |
|---|---|
| 100% - 99.5% | 22% |
| 99.4% - 99.0% | 30 |
| 98.9% - 98.5% | 16 |
| 98.4% - 98.0% | 14 |
| 97.9% or Less | 18 |
| *Total* | *100%* |

**What is the percentage of orders shipped on time according to customer expectations?**

It is important to note that this question investigated the on-time *shipping* of customer orders, but <u>not</u> on-time *delivery*. Overall, 77% of the respondents estimated a 98%+ on time shipping performance for their companies.

**Total Orders Shipped On Time Based On Customer Expected Ship Date, Fall 98 – Fall 99** *(n=312)*

| % of Total Orders | % of Companies |
|---|---|
| 100% - 99.5% | 29% |
| 99.4% - 99.0% | 25 |
| 98.9% - 98.5% | 12 |
| 98.4% - 98.0% | 11 |
| 97.9% or Less | 23 |
| *Total* | *100%* |

**What was the estimated percentage of orders shipped with correct documentation?**

Many contractual and legal relationships are defined by the documentation that accompanies a shipment once it leaves the warehouse. This can include a bill of lading, manifest or packing lists, freight bills and delivery receipts for a typical domestic shipment. The amount of paperwork and documentation required for an international shipment can increase by five- to ten-fold to that of a domestic shipment.

In addition to defining many legal aspects of the shipper/carrier/consignee relationship, it also is an important element in transportation rating and invoice payment processing. If incorrect or missing paperwork accompanies an order, a firm's cash flow can be impacted and, for international orders, shipments may not move through customs.

Over 90% of the respondents estimated that their firms had accomplished a 98% or better documentation accuracy level. More importantly, more than three-quarters of the firms reported 99% or better.

**Orders Shipped w Correct Documentation, Fall 98–Fall 99** *(n=312)*

| % of Total Orders | % of Companies |
|---|---|
| 100% - 99.5% | 47% |
| 99.4% - 99.0% | 28 |
| 98.9% - 98.5% | 8 |
| 98.4% - 98.00% | 7 |
| 97.9% or Less | 10 |
| *Total* | *100%* |

The reported figures are quite impressive considering the many factors that can cause documentation to be incorrect including customer service policies that allow customers to change orders until the shipping time, the amount of information required, and the number of times data is transcribed between incompatible computer systems within companies and among trading partners.

**What was the estimated percentage of orders that were received damaged?**

Overall, 96% indicated that their firms experience a 2% or less damaged rate.

**Orders Received Damaged, Fall 98–Fall 99** (n=312)

| % of Total Orders | % of Companies |
|---|---|
| 0% - .5% | 53% |
| .51% - .99% | 23 |
| 1.0% - 1.5% | 14 |
| 1.51% - 2.00% | 6 |
| 2.1% or more | 4 |
| *Total* | *100%* |

**What are the primary benefits that firms have received from improving order accuracy?**

The main benefit was improved customer service with nearly 96% of the respondents indicating this variable. The traditional benefits of reduced warehousing costs, improved standard warehouse operating procedures, better management controls, reduced inefficiencies in order processing and improved utilization of facility, while important, finished a distant second.

Individuals described their companies as having received an average of three different benefits from increasing order accuracy practices. Three respondents did not identify any of these benefits while 38 (over 10% of the total responses) indicated that their firms had received all six benefits.

**Primary Benefits From Improving Order Accuracy (n=312)**

| Benefits | % of Companies |
|---|---|
| Improved customer service | 96% |
| Reduced warehousing costs | 56% |
| Improved warehouse SOPs | 50% |
| Better management controls | 47% |
| Reduce inefficiencies in order processing | 44% |
| Improve utilization of facilities | 25% |

**What is the future of order accuracy practices during the next two years?**

WERC members predicted that 270 of 312 (nearly 86%) firms represented in the survey will increase their order accuracy practices.

**Order Accuracy Practices, Fall 1999 - Fall 2001** (n=312)

| Practices Will | % of Companies |
|---|---|
| Increase | 85.8% |
| Remain the same | 13.0% |
| Decrease | 1.2% |
| Discontinue | 0.0% |

**Nearing Perfection**

Data from the November 1999 *WERCwatch* survey revealed [that] order accuracy rate targets as well as other performance metrics such as shipping accuracy, on-time shipping and correct documentation has increased significantly in the last few years. It appears that order accuracy levels nearing perfection will transition from an activity once performed to gain a competitive advantage or differentiate a firm to become a standard warehouse practice.

**NOTE: Data from the 2007 DC Measures report confirms the prediction of this report that order accuracy metrics would continue to increase.**

| Perfect Order Metrics 2007 | Best in Class | MEDIAN |
|---|---|---|
| % of Orders **Delivered** on Time | >= 99% | 97% |
| % of Orders Shipped Complete | >= 99.3% | 98% |
| % of Orders Shipped Damage Free (Outbound) | >= 99.8% | 99% |
| % of Orders Sent / Correct Documentation (Invoice/ASN) | >= 99.99% | 99% |
| % of Orders **Shipped** On Time | >= 99.70% | 98% |
| Perfect Order Index performance | >= 99.48% | 96% |

# Warehouse Management System (WMS)

# Warehouse Management System

A Warehouse Management System (WMS) is the software product(s) used by a company to effectively manage warehouse business processes and activities; such as, receiving, put-away, picking, shipping, and inventory. It also includes support for radio-frequency communications, allowing real-time data transfer between the system and warehouse personnel.

The WMS should support your company's goals to reduce transaction errors, maximize space utilization and minimize material handling and travel time, by optimizing warehousing processes.

There are many WMS companies selling products, each product has its pros and cons, and some products may fit better for companies in specific industries or with specific product mixes or capital expenditure budgets. This document does not address product selection; it lists a number of WMS attributes that support companies to be *best in class*. (*WMS: Phase I: Assessment and Selection* is an excellent guide for WMS selection, WERC, www.werc.org.)

In this topic, best practice attributes for the following process groups are covered:

- Basic System

- Core Warehousing Capabilities

- Output

- Flexible Communication & Interfaces

- Reporting

- System Management

## Basic System

An efficient WMS should be fully integrated with other business systems used by your company. Interfaces should be seamless and not require batch processing or double entry of data. Many WMS programs have robust interface features with popular ERP systems and other supply chain management software.

Data should be on a single system of record that is updated in the background, if required, by other systems. Your WMS should process transactions in real time. The WMS should be flexible enough to support variable, customer specific, documentation output and to meet current and future requirements.

## Core Warehousing Capabilities

Warehouse Management Systems on the market today are designed to manage and track all activity from receipt to shipment. The core functionally of a WMS should manage these common warehouse business processes and activities:

- **Receiving:** A WMS should allow for quick product receipt and verification to the Purchase Order (PO). Pallet license plates and carton labels should be generated by the system. The system should support notification of crossdock requirements, acceptance of Advance Ship Notices and have the ability to perform pre-receiving. Any receiving inspection requirements should also be supported by the WMS.

- **Putaway:** System-directed and operator-directed putaway should be available within the WMS. Directed putaway can reduce travel time and operator cycle times.

- **Location Management:** A main function of a WMS is to maintain a positive location record of each product in the warehouse. Many systems will also support dynamic location assignment including lot control and zoned putaway. Cube optimization logic is also available as part of many WMS products so that the overall warehouse space cube utilization can be maximized. Location management should also identify empty bins and slots so product can be re-located and consolidated easily for increased space utilization.

- **Inventory Management:** A major benefit of a WMS is inventory control, the ability to know where stock is and how much is available. The system facilitates tracking product movements while reducing inventory mistakes and shrinkage. The system can also identify the need for product rotation of date-sensitive product. Most WMS systems also accommodate cycle counting of products on a location and entire product count basis.

- **Replenishment:** A WMS makes product replenishment to picking and manufacturing locations faster and more accurate. The system can direct the replenishment activity by tracking on hand balances and usage ensuring product is available when needed.

- **Order Management:** The WMS should allow for multiple methods of order release (single order, multi-order, order consolidation, wave and zone picking) to the pick area. If orders are managed on another system, the interface between the systems must be seamless allowing transactions and information to flow between systems.

- **Picking:** Picking and packing product to a customer order should be managed by the WMS. It should interface with material handling and automated equipment used in the pick process. This may include pick-to-light, carrousels, automated retrieval systems, automated sortation and conveyors and voice recognition systems. The system should print all required labels and documents for product picking.

- **Shipping:** Most WMS products support basic shipping functions including the output of shipping documents/labels and shipment manifesting. The WMS should also interface with transportation carriers' systems to provide shipment tracking and proof of delivery.

- **Productivity and Metrics Reporting:** The WMS should aid in the tracking of performance and cost analysis.

RF interfaces allow transactions to take place at the point of processing. Most WMS products allow RF remote data terminals and RF voice recognition technology to be used to process transactions. This capability is an important element of the productivity enhancements that WMS brings to warehouse processes.

## Output

Document output, especially in support of shipping processes, should be a seamless and integrated process. The system should automatically produce all required labels and documents. The WMS package should support barcode and AutoID (RFID) label output and interface with any equipment required to print or read the labels.

## Flexible Communication & Interfaces

Many Warehouse Management Systems have expanded capability, either integrated into the software, as additional modules or as interfaces with other software. Some of the more popular capabilities are:

- **Transportation Management Systems (TMS)** aid in the efficient and economical routing, scheduling and carrier selection.

- **Yard Management Systems (YM)** support the movement and scheduling of trailers for delivery and pick-up.

- **Labor Management Systems (LMS)** help companies optimize labor in the warehouse.

- **Order Management Systems (OMS)** support the order flow from customers. These programs my also include web interfaces that customers can use to place and track order progress.

- **Supply Chain Inventory Visibility (SCIV)/Supply Chain Event Management (SCEM)** software that focuses on tracking products across the supply chain and allows for multiple supply chain stakeholders to interact and exchange information.

- **Enterprise Resource Planning (ERP) Systems** typically support inventory, procurement, order management and financial functions. Many have expanded offerings that include WMS functions and many WMS packages now include functions that are found in ERP systems.

- **Manifesting Systems** automate shipping manifests with carriers, reducing documentation errors and improving tracking.

- **Automation Support** and interfaces allow equipment to be interfaced with the WMS for data transfer and control.

- **System Interface Tools** ease interfacing with other software, EDI messaging and links to carrier systems to form seamless information flow across all software packages.

- **Value Add Capabilities** such as returns management, postponement and order configuration, customization, kitting and de-kitting and other industry specific processes may be included in some WMS software.

## Reporting

A fully functional WMS provides flexible management reporting and customer based performance reporting. Management reporting should include:

- Order statistics, tracking and status repots

- Receiving accuracy and statistics

- Inventory availability, accuracy, turnover and statistics

- Warehouse utilization, location status

- Picking statistics and tracking/status of pick jobs

- Shipping statistics and tracking reports, carrier utilization and cost reports

- Labor utilization, statistics, and resource requirements

Performance metrics must measure both what the customer sees and what drives improvement in warehouse processes. Key performance metrics should be available from the WMS. Good metrics are ones that are linked to customer satisfaction, are documented with operations definitions and used to drive improvement.

## System Management

Customer and product data must be rigorously maintained in the WMS. Accurate product data supports optimized storage, slotting and picking. Accurate customer data and requirements facilitate picking and shipping and will ensure that orders are in compliance with customer requests.

The ability of your WMS to keep pace with and adapt to changing business requirements, driven by the market and by your customers, and to keep pace with changes to technology is important. System management and updates should be performed regularly to keep your WMS current. Avoid if you can customizing code that may make upgrades more difficult and burdensome to manage and implement.

## STEP 1. WMS Process Benchmarks

As you review this table, consider your WMS processes as they relate to the listed attributes. You can check off or highlight the description that sounds most like your operation.

| Warehouse Management System – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Basic System** | No WMS, manual records. | Informal WMS with manual records only<br><br>WMS processes not typically integrated with other systems<br><br>Systems do not support transaction process well, possible multiple systems with batch processing | Formal WMS with mixed manual and computerized records<br><br>WMS commonly a standalone system.<br><br>Transactions may be batch processed<br><br>Multiple integrated systems may be used, transactions are integrated between systems | Formal WMS with fully computerized records<br><br>WMS Integration with order management and manufacturing systems for visibility<br><br>Inventory control and reconciliation practices verify inventory accuracy<br><br>Transactions are in near real time<br><br>If multiple systems are used, there is seamless system integration between systems | Formal WMS with fully computerized records and integrated<br><br>WMS fully integrated with other business systems<br><br>All transactions are processed in real time<br><br>Single system of record<br><br>Supports variable customer specific documentation output |

| Warehouse Management System – Process Benchmarks | | | | | |
|---|---|---|---|---|---|
| **Process Group** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Core Ware-housing Capa-bilities** | No WMS system or system support for slotting<br><br>Product data not maintained | WMS is inade-quate to support needs<br><br>Product data poorly main-tained | WMS addresses receiving, put-away, inventory, slotting, pick and shipping as a set of standalone processes,<br><br>WMS may sup-port space utili-zation and put-away/ replen-ishment func-tions<br><br>WMS may con-tain some prod-uct data | WMS addresses receiving, put-away, inventory and slotting, supports RF Remote Data Terminals<br><br>WMS supports space utilization and put-away/ replenishment functions<br><br>WMS supports product data | Dynamic location assignment in-cluding lot con-trol, zoned put away, quality assurance, ABC frequency of access<br><br>Location and rotation con-trolled by Re-mote Data Ter-minals (RDTs)<br><br>Slotting and picks controlled by RF Remote Data Terminals (RDTs), voice or pick-to-light<br><br>WMS supports maximized space cube utili-zation and effi-cient putaway and replenish-ment functions<br><br>WMS supports product data |
| **Output** | Document and label output not supported by WMS | WMS supports selected docu-ment outputs<br><br>WMS system supports se-lected labels | WMS supports most document outputs<br><br>WMS system supports re-quired labels (barcode) | WMS supports document out-puts in an inte-grated process<br><br>WMS system supports all re-quired labels including bar-code and se-lected AutoID (RFID) labels | WMS supports all document outputs in a seamless inte-grated process<br><br>WMS can pro-duced all re-quired labels including bar-code and AutoID (RFID) labels |

**Warehouse Management System – Process Benchmarks**

| Process Group | Poor Practice | Inadequate Practice | Common Practice | Good Practice | Best Practice |
|---|---|---|---|---|---|
| **Flexible Communication & Interfaces** | No WMS | WMS and Carrier systems not linked | WMS may link to Carrier systems<br><br>WMS may support transportation management systems (TMS)<br><br>WMS may support labor management systems | WMS supports postponement<br>WMS links to Carrier systems to form integrated information flow<br><br>WMS may support integrated or standalone TMS<br><br>WMS may support integrated or standalone labor management systems | WMS support "Value added services" and postponement<br>WMS links to Carrier systems to form seamless information flow<br><br>WMS supports integrated or standalone TMS<br><br>WMS supports integrated or standalone labor management systems |
| **Reporting** | No WMS | WMS provides limited reporting | WMS provides reporting to support standard KPIs<br><br>WMS provides standard package of management and cost reports | WMS provides reporting to support chosen KPIs<br><br>WMS provides flexible management reporting<br><br>WMS supports costing reports | WMS provides reporting to support customer centric KPIs<br><br>WMS provides flexible management reporting and customer based performance reporting<br><br>WMS supports Activity Based Costing / Management reports |
| **System Management** | No WMS | System updates inconsistent<br><br>WMS is not updated when there are changes to customer requirements | System updates performed at least annually<br><br>WMS is updated when there are major changes to customer requirements | System management and updates are performed regularly<br><br>WMS software is updated regularly to support best practices in SCM<br><br>WMS is updated when customer requirements change | System management and updates are performed regularly<br><br>WMS software is updated to support best practices in SCM<br><br>WMS is flexible enough to stay up to date with customer requirements |

Supply Chain Visions- *Best Practice Process Attributes and Benchmarks*
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## STEP 2. Assessment for WMS

**Directions:** Rank your processes against the WMS Benchmark Table. Use this table to rank your process groups. In some cases, you may find that you fall between rankings and you can add 0.5 to the lower rank. Once each process is assessed, total the values for the group.

| Warehouse Management System – Self-Assessment | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| *Rank* | *1* | *2* | *3* | *4* | *5* |
| **Basic System** | | | | | |
| **Core Warehousing Capabilities** | | | | | |
| **Output** | | | | | |
| **Flexible Communication & Interfaces** | | | | | |
| **Reporting** | | | | | |
| **System Management** | | | | | |
| Self Assessment Score Total | | | | | |

## STEP 3. Ranking Ranges for WMS

**Directions:** Use this table to compare your self-assessment score TOTAL to the WMS section score rankings listed here.

| Warehouse Management System - Ranking | | | | | |
|---|---|---|---|---|---|
| | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| **Section Score Rankings** | **6** | **12** | **18** | **24** | **30** |

Our self-assessment score TOTAL of _____ means that we rank as
❑ *poor* ❑ *inadequate* ❑ *common* ❑ *good* ❑ *best practice* in this area.

## STEP 4. Key Performance Metrics for WMS

The table below provides <u>quantitative</u> benchmark data on a selected number of KPIs relevant to a WMS. Each KPI is scaled from *Major Opportunity* to *Best in Class*. The values provided are from a recent WERC Benchmarking Study.

| Warehouse Management System – Key Performance Metrics (KPI) | | | | | |
|---|---|---|---|---|---|
| **KPI** | **Poor Practice** | **Inadequate Practice** | **Common Practice** | **Good Practice** | **Best Practice** |
| | *Major Opportunity* | *Disadvantage* | *Average* | *Advantage* | *Best in Class* |
| Percent of orders shipped complete | < 92% | >=92% and <96% | >=96% to <98.5% | >=98.5% to <99.3% | >= 99.3% |
| Percent of orders sent damage free | < 96.24% | >=96.24% and <98.5% | >=98.5% to <99% | >=99% to <99.8% | >= 99.8% |
| Percent of orders with correct documentation | < 98% | >=98% and <99% | >=99% to <99.54% | >=99.54% to <99.99% | >= 99.99% |
| On time delivery | < 92% | >=92% and <95% | >=95% to <98% | >=98% to <99% | >= 99% |
| Perfect Order Index | < 86.92% | >=86.92% and <95% | =95% and <98% | >=98% and <99.48% | >= 99.48% |

### KPI Definitions

| KPI | | |
|---|---|---|
| Percent of orders shipped complete | Complete means that all lines / units ship with the order. | # of orders shipped with all lines & units / total number of orders shipped |
| Percent of orders sent damage free | This measures the fact that the customer got their product in good and usable condition. | # of orders shipped damage free / # total orders shipped. <br> *\*\*Note - this can be based on a statistical quality sample and extracted.* |
| Percent of orders with correct documentation | The portion of total orders for which customers received an accurate ASN / invoice with the order | # of orders with correct invoice / # of total orders |
| On time delivery | The percentage of orders that arrive at their final destination on the date agreed upon. | # of orders delivered on time / total number of orders |
| Perfect Order Index | An order that meets all of the following criteria: complete, on-time (as defined by customer - could be on time delivery or on time shipment), perfect documentation, perfect condition. | % of on time orders x % of complete orders x % of damage free orders x % of orders with accurate documentation as defined by customer *(e.g. in-voice, ASN, labels)* |

WERC Benchmarking Study 2007
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## Case Study: Plow & Hearth
*Increases Picking, Reduces Errors, Lowers Return Rates and Manages Seasonal Peaks*

Plow & Hearth is a national catalog, retail and Internet company specializing in "Products for Country Living." The company began in 1980 with a small retail store and produced their first catalog in 1981. Today, the original Plow & Hearth catalog offering unique, high-quality products for country living continues to thrive—and two additional catalogs, HOME and Problem Solvers, have been launched. The company also has four retail stores and two catalog outlet centers.

Since its humble beginnings in rural Madison, Virginia, Plow & Hearth has grown tremendously. The company received a spot on *INC.* magazine's list of the 500 fastest-growing companies in America for four consecutive years. In 2002, Plow & Hearth mailed more than 65 million catalogs and exceeded $100 million in sales, establishing the company as a true leader in the catalog industry and the premier source of products for country living.

### Facts at a Glance

- Number of warehouses: 2
- Size of warehouses: 265,000 sq.ft. & 165,000 sq.ft
- Employees: 100+ concurrent users at all locations
- Number of SKUs: 10,000
- Throughput: 400,000 orders / month during peak periods

This enormous growth posed numerous challenges to Plow & Hearth's distribution process. In early 2000, an assessment of the company's DCs located in Madison, Virginia, and Vandalia, Ohio, revealed that the company's operations were restrained by a *lack of inventory visibility and an inefficient use of space*. The company was concerned that the legacy WMS would be unable to keep pace with Plow & Hearth's growing level of transactions.

### The Implementation

Plow & Hearth installed Manhattan Associates' Warehouse Management solution for both inbound receiving and outbound order processing. At receiving, orders arrive as both individual orders and full pallets of product. For each receipt, the purchase order detailing the shipment's inventory and associated case number(s) is verified against the original order. Most receipts are then moved directly to a reserve storage location. During an average month, outbound orders number about 40,000. However, business ramps up tremendously during the peak season between Thanksgiving and Christmas, when Plow & Hearth ships 10 times the number of orders. Resourceful slotting and an efficient picking/packing process make it possible to meet this tremendous demand.

Similar to the way slotting optimization groups items for picking, Plow & Hearth's outbound orders are grouped into pick waves according to rules determined by the products' locations. "Ship-alone" items, frontline conveyable goods and "large-racking" merchandise (shoes, cushions, etc.) are grouped into distinct zones according to physical attributes like size and weight. As waves are compiled, they are released to order selectors and as each order is completed, it is placed onto a conveyor to be transported to a shipping location. Manifesting and invoicing occurs at the end of each day.

Because Plow & Hearth's product mix and demand fluctuate throughout the year, the company's slotting process requires ongoing maintenance—which is greatly simplified using the WMS solution. Keeping fast-moving items front and forward within each pick zone is the key to shipping orders within 24 hours of receipt. To do so, Plow & Hearth runs a forecast every two weeks and continually balances its pick layout against this data.

### The Benefits

Since implementing Manhattan Associates' Warehouse Management solutions, Plow & Hearth has experienced a significant gain in productivity. There has been an *average increase in picks per hour of 11%*, yet this number has been as high as 28% in a given month. And, for the first half of Plow & Hearth's current fiscal year, the average increase in picks per hour was 15%. Picking and *packing errors have been reduced by one-half*; in fact, returns this past holiday season were well under projections and can be directly tied to *dramatic improvements in order accuracy*.

The ability to efficiently manage seasonal peaks has been a major benefit for Plow & Hearth. Seasonal labor demands are satisfied through temporary help with little time to learn about the company's unique products and distribution processes. By optimally organizing picking zones, Plow & Hearth can limit each order selector's picking area and keep the fastest moving merchandise within easy reach. The result is a seasonal workforce that can be productive from day one.

Additionally, the WMS solution has enabled Plow & Hearth to make the most of their facilities' size constraints. Being able to locate the right product, at the right place, at the right time, greatly expands the facility's volume throughput.

### The Future

A lot has changed for Plow & Hearth over the past 22 years, but the company's belief in the values of country living is as strong as ever. It is these values and the spirit of country living that guide Plow & Hearth's business today. The company treats its customers like neighbors and friends. They offer only products they would use themselves and they offer them at fair prices— guaranteed without conditions.

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