Shipping Basics

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Shipping is the point of no return in a distribution center. It is the last chance to ensure that you have completed a perfect order for your customer. So while management is constantly trying to improve the efficiency of this process; they have to constantly balance that against quality control. The focus of the shipping department typically starts after the product is picked.

Outbound Quality Control

There are two standard opportunities for outbound quality control after picking. The first occurs when the picking portion of order fulfillment is completed. At this point, many companies will execute some form of verification. The primary options to trigger this verification are random sampling, checking for an expected weight discrepancy and 100% verification.

- For some companies, a simple random sample strategy is sufficient to ensure overall pick and order accuracy. A one out of x number of cartons is the principal methodology employed.
- When a WMS is employed, the ability to have an expected weight for a carton or tote becomes available. In a WMS environment, the system can predetermine what the carton or tote will weigh when all of the appropriate picks are made. Then, when the carton is placed on the conveyor, it can run across an in-line scale system equipped with a label scanner. The system will determine if the actual weight is within tolerance when compared to the expected weight. If it is not, the carton is diverted to a quality control area where a more detailed inspection can take place. This concept can even be applied to full case picks where the label is being manually applied. It ensures that the right label is on the right product.

- Finally, there are companies that inspect 100% of every order for accuracy.

Packing

In the loose piece picking area, there are two primary options for where the product is placed during the pick process. The first is into a temporary container. The other is into a final shipping container. Unless the final container is a tote, there is a need for carton erection.

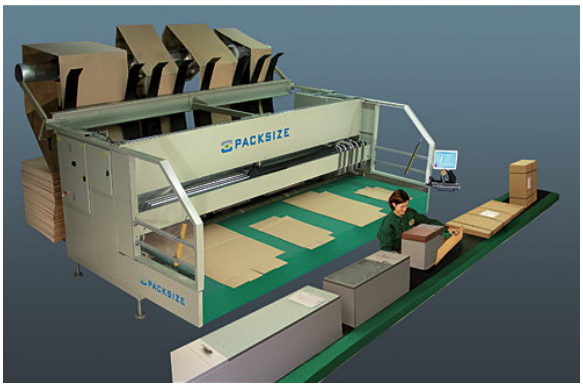
Carton Erection

Obviously the most basic and flexible option for carton erection is manual. However, at a certain level of outbound carton volume, assembling the outbound cartons by hand is longer viable. There are a couple of varieties of automated carton erectors available today. The first is the more traditional type of machine that takes standard corrugated blanks and folds them, taping the bottom in the process.

In order to maximize the efficiency of any carton erector, an overall analysis of the profile of cartons used needs to be done. Where possible, reducing the overall number of carton sizes used is beneficial. Many companies have accumulated a large number of carton sizes available for packing over time. Selecting one common size to service a group of existing cartons pays dividends in machine efficiency.

Traditional carton erecting machines are best utilized by erecting large quantities of a specific carton size at any one time. This is due to the fact that adjustments have to be made to the machine to allow it run each specific carton size. So to improve overall productivity, reducing these setups is a key factor. Further analysis of total usage of carton sizes can help narrow down the required carton sizes supported by a machine. For example, if a particularly large carton size only has a limited usage, it best to continue to erect those cartons by hand as opposed to trying to automate.

Once the cartons are erected they can be simply stored and moved to picking /packing areas when needed via a pallet jack or fork lift. They can also be placed on power and free conveyor and delivered via that method. Power and free conveyors are overhead conveying systems that have either hooks or carriers with flat trays hanging from the drive rail to transport empty cartons throughout a facility.



A more recent application of technology is machines that take corrugate rolls and cut and form the carton on the fly. While they can form an infinite number of specific carton sizes, they are typically set up with a limited range of carton sizes for a specific roll size. However, they can produce a much more specific carton size to match the need and reduce the amount of carton packing material required to protect product inside that carton. They also reduce the different types of raw corrugated on hand since one size roll services many different sizes of finished cartons.

Pack Stations

There are an infinite variety of pack stations. The type of station needed is based on what functions need to take place at the station. In the simplest form, the packer is placing product into the box and the station is a flat work surface equipped with a place to store corrugate. Often, more advanced stations are needed to support WMS / shipping terminals and quality control functions in addition to the basic functions.

Dunnage

The final item put into the carton is dunnage. A company needs to analyze their customer, product and business requirements to determine the best type of shipping protection for their product. There are many different types which offer various levels of product protection for all levels of cost.

- One source of dunnage is some type of paper product. It can be as straightforward as sheets of paper manually crumpled and placed into cartons up to semiautomatic paper crumpling machines.
- Peanuts provide a nice level of product protection. They do, however, present environmental and storage concerns. These issues make this option less favorable.
- The next step up is the air bag or bubble concept. Everyone has seen the traditional bubblewrap, but the same concerns that plague peanuts has made this dunnage type fall out of favor as well.
- Another high level of protection similar to the air bag/ bubble concept is the air pillow. This type can range in size from several small pillows in one carton to one large pillow for the carton. The air pillows also tend to be created on demand but there are some systems that produce the small pillows in advance of the need.
- One of the highest levels of protection are foam in place systems. These systems employ a two chemical system that when mixed produce the foam. This mixture is injected between two sheets of film and expands in the box to create form fitted fill product. They provide great protection and are relatively easy to store. However, they tend to be expensive and have some perceived environmental issues.

There are a couple of newer types of dunnage systems that are being used in distribution centers. There is a system that uses a cardboard wedge that is glued inside the carton to allow for product containment. A lid is then glued in place over this wedge to complete the carton. The wedge adds structural integrity to the carton and allows for the entire package to be recycled as it is all corrugate. Another category of dunnage is an offshoot of the air pillow system. It is a system where an uninflated air pillow of the appropriate size is placed inside the carton. Then as the carton is sealed, the pillow is inflated inside the carton to the exact level to fill the void and protect the product inside the carton.

Carton Sealing

The final step in the pack process is actually sealing the carton. There are still some companies that use hand tapers or carton gluing system to seal cartons. However, the vast majority of companies use semi automatic tapers to accomplish the final carton sealing. With these machines, a carton is fed by an operator into the machine and the machine then grabs the cartons and advances the carton through the machine while applying and cutting the tape. The two major decisions when selecting these systems is whether you need to tape on both sides and what width of tape. There are machines that tape both bottom and top of a carton or just the top of the carton. However, in the majority of the applications, top taping is the machine selected. The two most common widths of tape width are 2" and 3". Again, this decision is based on the specific requirements of the company.

An area to consider with both dunnage and carton sealing equipment are options for acquisition. If the carton volume is high enough and the company is willing to sign on for guaranteed future purchase of consumables, many vendors will supply the machine(s) for no cost.

Shipping Dock

The shipping dock is the last place to make sure that everything is in order for a customer's order. For facilities that are picking to order the quality control is typically taking place during the pick process. Since all of the cartons for the order are together throughout the process, the primary task at the shipping dock is to make sure all of the order gets there at one time after the QC and pack process are completed. However, when picking for an order is done by separate people, the dock becomes the place where processes and systems must work in concert to ensure that the order is assembled correctly.

Ideally, when using separate picking processes to fulfill a customers order, the final destination for the components is predetermined. With a WMS in control, freight orders can be pre-assigned during the order management process to specific dock locations or staging areas in the shipping area. Sometimes, the specific cartons of an order are assigned to these locations in advance. If the order takes up more than one physical pallet position, the order is split to multiple locations.

The first step at the dock in these environments is to dock confirm the carton to its predetermined spot. There are various options to accomplish this task. One option is to have the conveyor system confirm the carton to its location when the carton is diverted on the shipping spur. This method then relies on the dock operator to manually place the carton on the correct pallet. There are some inherent possibilities for errors with this process. Several methods to reduce errors with this process are listed below with their associated pros and cons.

- **Check individual carton IDs off a dock spot report** – As cartons are placed on the corresponding spot, the carton id is checked off a list. An accurate method but it is time consuming and bears the additional costs of paper for reports.
- **Use a tick mark system or marking pre-numbered sheet** – An accurate method as well but the operator can still forget to mark the report and there is no easy way to fix the error short of counting all the cartons.
- **Use a peel away label on shipping label** – In this method, the shipping label has a special duplicate die cut area where the dock spot is printed. It can be peeled off and placed on a sheet at the dock consolidation location. This sheet can then be given a quick visual inspection later to confirm that all cartons are for that spot. Labels for misplaced cartons stick out very conspicuously. There is the extra cost of special labels to consider.
- **Use RF / Voice confirmation** – This provides very accurate confirmations but the additional cost of equipment must be considered. There is also the potential for a productivity hit if the process is not streamlined.
- **Secondary equipment aggregation** – This solution takes cartons off the main shipping sorter and accumulates them in rack like equipment. When all the cartons for a location are present and ready to be wrapped, the machine releases only those cartons to be assembled on the pallet. Since it also has all the cartons, it can support case sequencing logic e.g. heaviest cartons on the bottom.
- **Automatic / Semi-automatic palletizers** – This solution uses robots with case grabbing accessories to take cartons off of the conveyor and place onto pallets. This is a very accurate solution but has a limitation on the number of spots that can be supported at one time.

In all of these alternatives, the WMS is tracking what cartons have been confirmed to the location versus what is expected. When all the cartons have arrived, a dock supervisor or worker is notified. Manually, a notification method is to prop a colored cone on the pallet when the last carton is placed on the spot. Systematically, options to identify orders that are ready for shipment include automatically printing the manifest when the last carton is confirmed or periodically running a report to check for outstanding cartons. One company incorporated a custom, graphical view of spots and their associated status.

Dock Spot Status Graphical View

Other carriers (usually small parcel carriers) will support fluid loading. This is where completed cartons are directly conveyed into the carrier trailer and loaded on the trailer, typically on to the floor of the trailer.

When a spot is deemed to be complete, an inspection is made to verify systemically that all the cartons on confirmed on the spot. Choices are then made to physically confirm the pallets. At a minimum, many operations do a secondary supervisor count of cartons to confirm total quantity of cartons and others will sample random pallets to insure integrity. Once the pallet has been QC'd, it is wrapped and ready to load on a trailer.

Trailer and Shipment Confirmation

When under WMS control, many operations assign a trailer number for a carrier, customer or order to specific shipping dock doors. As pallets are wrapped, a loading operator uses an RF unit to confirm the dock door number of the trailer they are loading the pallet onto. If the door is the correct one, then the WMS will allow the loader to put the pallet on the trailer. If the dock door is incorrect or has not been assigned a trailer number, the WMS will not allow the loader to put the pallet on the trailer. This ensures that the pallet is put on the correct trailer. When all the pallets that are expected to be on a trailer are present, the user is able to ship confirm the trailer at which point all the documentation is printed and made ready to give to the trailer's driver.

While the shipping processes are still very much "block and tackle" activities, there have been advances in equipment to support these processes. It is worthwhile to examine these advances both from a productivity and quality control perspective. Since this is the last line of defense to ensure order quality, it is critical to have solid shipping processes. Mistakes in these processes are very noticeable as they usually involve a larger quantity of product and really affect the customer's perspective.