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Supply Chain Advisors LLC

The Packing Playbook

Manual Packing, Specialized Packing, Semi-Automated Packing or Fully-Automated Packing… Which is Right for Your Distribution Center



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Introduction

Many companies that have made great strides in improving order picking efficiency wind up missing out on another huge area of potential labor savings in their distribution centers: packing and shipping processes.

For companies that perform piece-picking and primarily ship via parcel carrier, picking the order is really only half the battle. Following this process, companies often find that they require almost as much labor and time to perform tasks such as order checking, packing, sealing, and manifesting.

As many companies learn, investing in technology such as Warehouse Management Software (WMS) can have a large impact in picking efficiency, but usually provides no guarantees that those efficiencies will carry on downstream in processes.

Companies that fail to optimize packing and shipping end up with higher labor costs and lower profits than their more savvy competitors. These inefficiencies often become more apparent when e-commerce orders ramp up. Orders may move quickly through the picking processes, only to logjam in packing as the company cannot throw enough labor and workstations at the workload quickly enough to address seasonal surges.

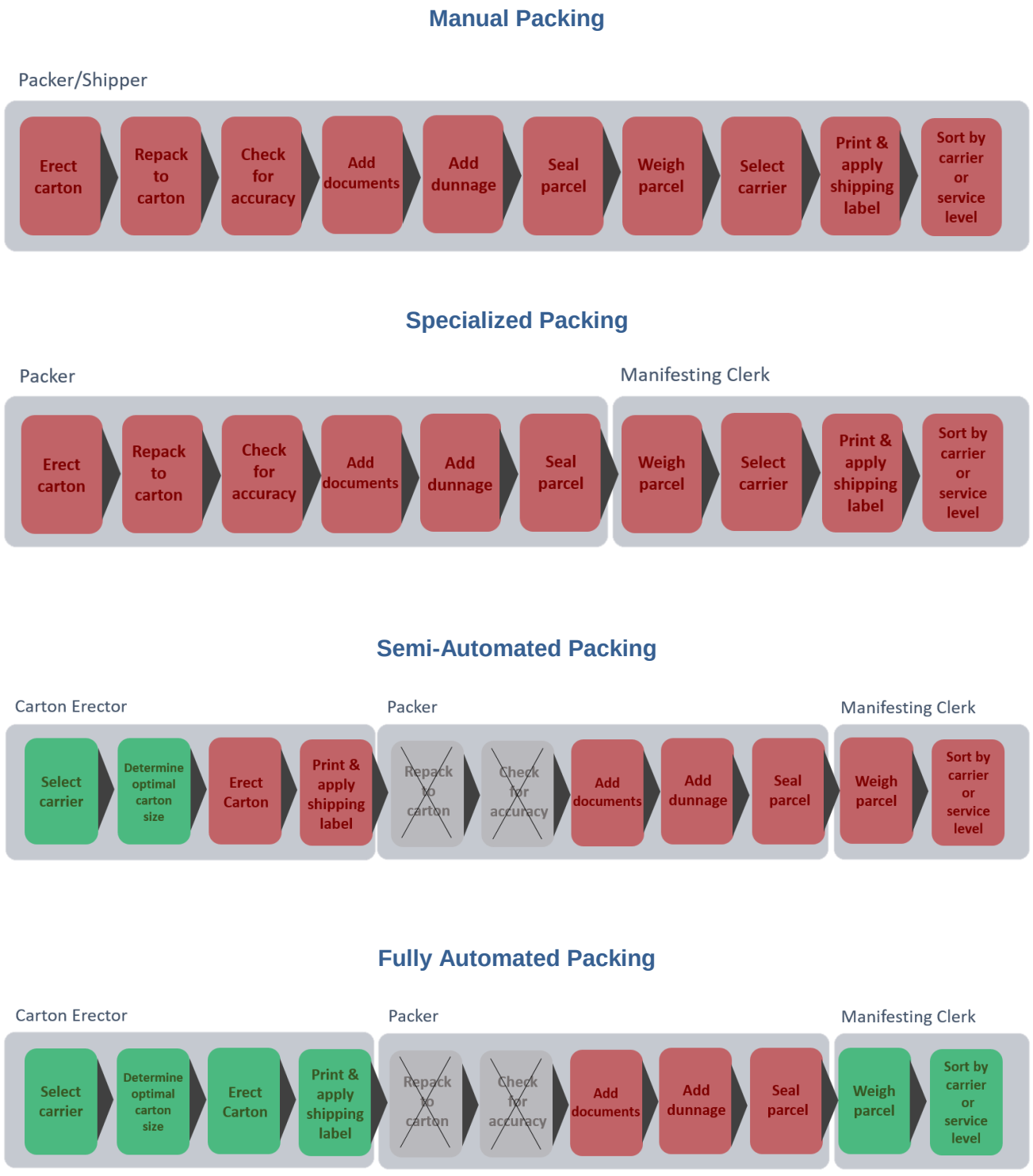
This report explores four specific tactics companies use to manage packing and shipping, and the pros and cons of each:

- Manual packing
- Specialized packing
- Semi-automated packing
- Fully-automated packing

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Figure 1 illustrates the major tasks which must be performed as a part of most parcel packing operations how these processes can evolve from fully manual to fully automated in several evolutionary steps.

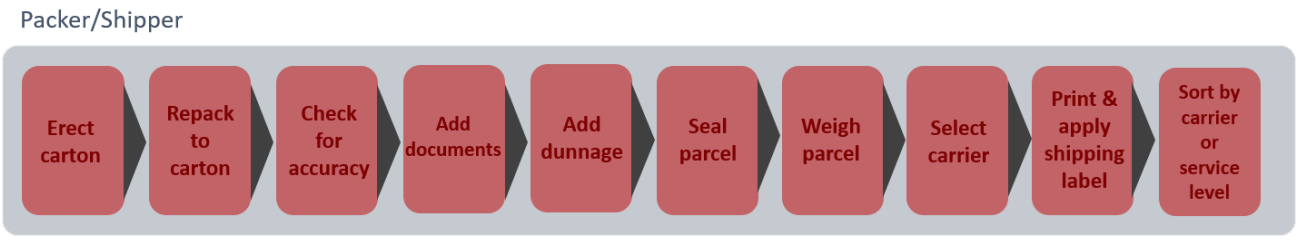
Figure 1: Evolution of Packing Methodology: From Manual to Fully Automated



Manual Packing

In manual packing environments, large pack stations are utilized, each staffed by a worker who performs all of the various packing and shipping functions themselves. While having a greater breadth of ability, this worker usually becomes a "jack of all trades," and is unable to execute the packing process in a very efficient manner.

Figure 2: Manual Packing Process



As Figure 2 indicates, there are as many as ten (10) steps in a packing process, and it takes a very talented worker to master all of these and be able to rapidly transition from one diverse task to another. Carton erection, order checking, dunnage & sealing, manifesting, and label printing require a highly specialized skill set. Having a single worker perform all of these functions does not lend itself well to economies of scale.

Additionally, with manual packing, each packing station must have a significant amount of equipment and supplies: stacks of knocked-down corrugate, case sealing devices, dunnage machines, bar-code scanners, parcel weigh-scales, label printers, computers, and other devices. The cost of acquiring and maintaining all of this equipment can be high.

Manual packing is often practiced in non-real-time warehousing environments, where the absence of bar-code scanning at picking necessitates a secondary checking process during packing. This amounts to significant additional labor requirements, as well as additional scanning equipment and computer terminals at each packing station. The job requirements for the packing role also increase to a higher level of sophistication than would otherwise be required.

Even within the realm of manual packing, however, it is possible to make simple changes which can lead to process improvements. For example, one often-overlooked device in this area is the automatic tape dispenser (Figure 3). These units can be programmed to dispense a specific length of tape that is suited to the size carton being used. Operators push one button, and a piece of tape is quickly fed out of the machine, and applied to the parcel. Pack times are reduced as is tape consumption.

Figure 3: Tape Dispenser



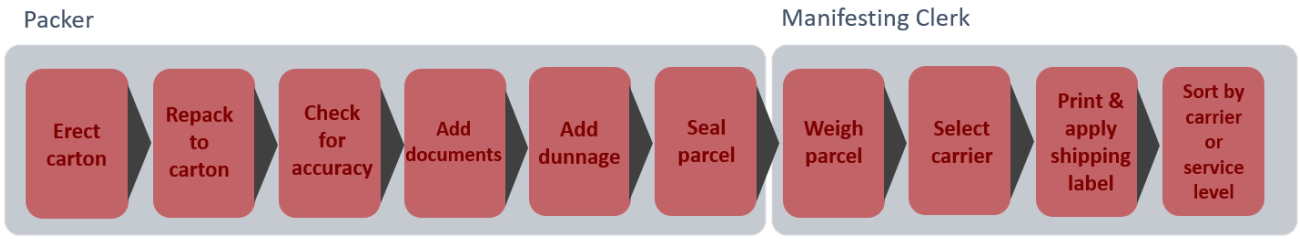
Image source: Betterpack

Specialized Packing

A natural evolution towards greater packing efficiency involves a simple division of labor into two basic roles:

- Packer
- Manifesting clerk

Figure 4: Specialized Packing Process



There are many benefits from shifting to specialized packing:

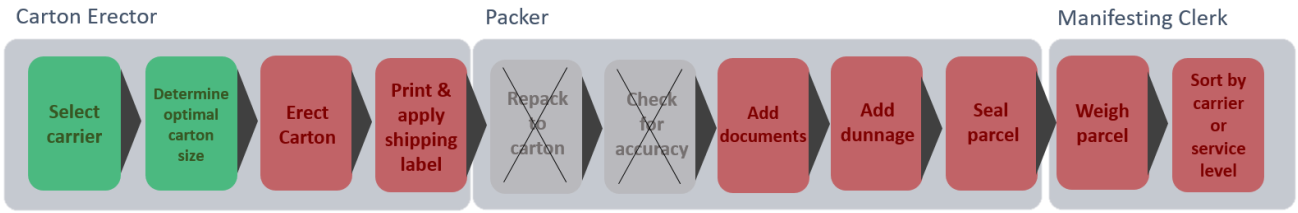
- The manual aspects of packing (case erection, sealing, etc.) can be performed by workers with those skill sets, and the more information-oriented function of manifesting can be performed by other workers. The only workers who need to be "tech-savvy" are now the manifesting clerks.
- Expensive equipment like computers, scales and printers can be isolated to just the manifesting function, and overall cost can often be reduced.
- Each worker has a specialized set of functions to perform, and they can often learn to do them more quickly than having the same group of workers performing all ten functions.

Another major advantage of using specialized packing is the relatively low cost of the transition. No additional automated equipment needs to be purchased – in fact, the total amount of equipment in an operation will actually decrease as computers, scales and printers are only used by a smaller sub-set of workers. While it can often be helpful to have the packers and manifesting clerks' workstations connected by conveyor for easier flow of parcels, this conveyor usually does not need to be expensive or complex.

Semi-Automated Packing

Semi-automated packing actually reduces a number of the packing steps by utilizing a "pick to shipping container" process. Migrating to this operating method can produce real savings.

Figure 5: Semi-Automated Packing Process



Case erection is performed en masse prior to order picking, sometimes using automated carton erectors. Ideally, the parcel carrier should also be selected prior to picking. This is usually possible if a good database exists of unit weights to enable effective multi-carrier rate shopping. [Related Reading: Gathering Cube Data on SKUs] Once the carrier is chosen, the shipping label is applied to the carton and serves as a "carton ID label" for the life of the order in the distribution center. Two very tedious functions – carton erection and label application – can be converted to repetitive, assembly-line style functions.

Picking to the shipping container is usually only practical where a robust Warehouse Management Software (WMS) system is used, and the pick transaction can be confirmed with a bar-code scan at the time of pick; this eliminates the need for a labor-intense secondary check at packing.

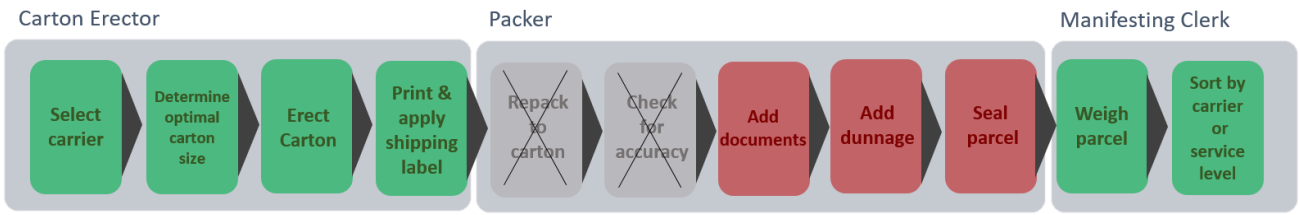


During the picking process, units are picked and placed directly in the appropriate shipping container, eliminating the need for extra handling at packing. The packing function is reduced to adding documents and dunnage, and case seal. The manifesting function is reduced to a simple weight verification and sortation by carrier.

Fully Automated Packing

The final step in the packing evolution is to Fully Automated Packing.

Figure 6: Fully Automated Packing Process



Fully automated packing involves the use of a variety of pieces of equipment to round out the packing and shipping process (Figure 7).

Carton Erectors

This equipment is most effective when the number of overall carton sizes which the operation uses is relatively low. Traditional carton erectors are used to create a large number of the same size carton at once in large runs. These cartons must then be stored somewhere close to the beginning of the picking process, so sufficient space must be allocated for this purpose. Some companies have setup carton erectors on a mezzanine, and then used chutes to drop the completed cartons down to floor level. This serves to keep the high-cube corrugate up in the air and away from higher-traffic areas.

Figure 7: Carton Erector



Image source: Wayne

Case Sealers

Case sealers come in a variety of styles. Semi-automated sealers require the operator to manually start feeding the carton through the machine, while fully automated sealers automatically induct the carton into the equipment. Fixed-height sealers process large volumes of cartons of uniform height, while random-height units can process a variety of different shapes and sizes of parcels.

Figure 8: Case Sealers



Image source: 3M

In-Motion Weigh Scales

In-motion weigh scales are a reliable way of capturing the weight of parcels after the packing process. There are a variety of reasons why this weight-capture can be effective:

- ***Inability to use database weights:*** In some cases, parcel carriers may not permit the use of database weights to compile the manifest. This may be due to a historical lack of accuracy with using this method, or it may simply be due to the way that the carrier contract is structured.
- ***Dunnage:*** The addition of dunnage to the carton after picking can sometimes throw off the accuracy of database weights and be difficult to properly account for.
- ***Pick accuracy check:*** Even with the use of bar-code scanners in the picking process, it can still be very difficult to catch errors of quantity (i.e. the picker picks the correct item but the wrong amount). The weight of the package can be compared to the calculated weight, and if these vary by more than an allowable tolerance, then the package can be flagged for additional checking. Note: in these instances, it is best to place the weigh scale prior to the case sealer to avoid having checkers open the cases after they have been sealed.

Figure 9: In-Motion Scale



Image source: Mettler-Toledo

Printer-Applicators

Printer applicator technology can be very time consuming, but also very finicky. This equipment can be used to automatically apply labels to a variety of faces on a carton. Labels can either be pre-printed or printed "on-the-fly" in real time, which is the most common use in this context. In a fully automated packing system, printer-applicators are often deployed prior to picking, following the carton erection process. If they are used in this area, then care must be taken to ensure that the equipment can properly handle the very light weight of empty cartons. If this proves to be problematic, then a simple order ID label can be manually applied up-front, with the parcel shipping label applied using the automated process after packing. Note: One key area where printer-applicator systems can experience problems lies in data delays. As the carton moves down the conveyor line, a bar-code reader scans a bar-code on the box, and then the warehouse control software (WCS) must very quickly lookup and determine the data which must appear on the shipping label. This information must then be relayed to the printer-applicator equipment, often in fractions of a second to allow the correct label to be printed and applied in time. If various equipment and software vendors are involved in this process, it can be a recipe for frustration as none of the parties truly take ownership of the end-to-end process. To mitigate the likelihood of problems here, companies are advised to create a very clear data specification for all parties, outlining exactly what data must be transmitted form one system to another, and outlining the required response times. This can force vendors to assume more accountability for making sure that all of the pieces of the data puzzle fit together quickly and that the system works.

Figure 10: Printer Applicator Technology



Image source: Weber

Sortation Technology:

Depending upon the number of different shipping carriers and service levels to be used, there is sometimes value in using a conveyor-based shipping sorter to ensure that each parcel winds up in the correct trailer. Some companies may use zone-skipping strategies, where they may build full-trailers of parcels and truck these directly to a parcel carrier's hub to reduce the freight charges. In these cases, properly routing each parcel to the correct dock door becomes even more important. Sortation technology is not inexpensive, but there are a variety of different types of equipment available to choose from depending on shipping volumes. High-speed operations may require

Dimensional Weight Billing:

Over the last twenty-four months, both Ups and FedEx have transitioned to a higher degree of dimensional weight billing in most of their client contracts. [Related Reading: Dimensional Weight Billing for Parcel Shipments – An Action Plan for Minimizing its Toll on Your Costs] This means that many parcels which were previously billed by weight, now get billed by their size – a significant game changer in industries like housewares and hardware which often have product that is light-weight but bulky or oddly-sized.

Prior to this change, many companies were working on reducing the number of different size shipping containers that they used. Having too many size boxes creates a lot of complexity for packers, and inflates the storage requirements for corrugate. Many companies were largely trying to standardize on a few basic sizes of boxes to simplify things. Sometimes items shipped in a box that was bigger than it needed to be, but the financial impact of this was minimal since parcel billings were generally based on weight, not size.

However, the increased use of dimensional weight billing has created a situation where using a box that is "a little too big" can meaningfully increase the cost to ship. This has created a quandary for many operations – how can they properly match the box size to the product without creating a huge proliferation of box sizes in the warehouse?

In recent years, several companies have developed carton erectors which operate on a principle of "mass customization". These machines take dimensional data on the size of the product to be shipped, and literally build a custom-sized box on the spot for each order. This equipment has the ability to truly tailor the box to the product without creating a nightmare of different box sizes to store on site. The companies that have developed these products typically provide them at reduced or no-charge in exchange for a long-term contract to supply the corrugate supplies.

While this equipment offers an innovative solution to complex packaging needs, caution should be exercised. Companies considering implementing this technology should carefully research throughput rates to ensure that bottlenecks will not exist, and should also have a backup plan in place if the equipment breaks down.

sliding-shoe type sorters which can sort over 200 cartons per minute, while operations with lower throughput requirements may be able to save money by using pop-up wheel sorters or narrow-belt sorters.

All of the above-mentioned equipment must, of course, be tied together with a well-designed conveyor system with an appropriate amount of accumulation capacity. Detailed modeling of the system should be performed to ensure that processing rates in all areas are aligned and bottlenecks are avoided.

So, readers may ask, is it possible to create a fully automated packing operation with no human involvement whatsoever? While this is theoretically possible, it is not advisable. A key function where manual labor is usually still required is in the addition of dunnage or void-fill material. This function can be very difficult to fully automate and is usually still imperfect at best. Because an operator is still required at a dunnage station, many companies elect to not invest in fully automated case seal technology. Less-expensive semi-automated sealing equipment requires an operator to guide the carton into the in-feed of the sealing unit – a simple task for the dunnage operator to perform.

Additionally, there can be real benefit to having one or more workers in the packing area to be able to quickly respond to any issues which may develop there – backups, jams, and malfunctions should be rare, but will occur. Having a dunnage operator close by to be a "first responder" when things don't go as planned can be a real help to the operation.

Conclusion

Whether a company is large or small, there are a variety of approaches which can be taken to ensure that the packing operation is as efficient as it can possibly be. These approaches don't all involve implementing a lot of automation – they often can be achieved with basic process changes.

Whatever your company's situation, it is prudent to review packing and shipping processes on a regular basis to ensure that you aren't "leaving money on the table" by achieving cost savings in the picking process, only to give those savings back a little further downstream.

Additional Resources

Whitepaper: The Packing Playbook

Whitepaper: Selecting the Right WMS

Whitepaper: Distribution Center Design Series - Part I - Developing a Storage Design Tool

Whitepaper: Distribution Center Design Series Part II - Developing a Throughput Design Tool

Article: A Tier 1 Warehouse Management System – When to Consider…and When to Be Cautious

Article: Material Handling System Simulation: A Valuable Tool for Distribution Center Design

Article: Gathering Cube Data on SKUs

Article: Dimensional Weight Billing for Parcel Shipments – An Action Plan for Minimizing its Toll on Your Costs

Article: Very Narrow Aisle Rack in the Warehouse: When to Use It, When Not to Use It

About the Author: Ian Hobkirk



Mr. Hobkirk is the founder and president of Commonwealth Supply Chain Advisors. Over his 20-year career, he has helped hundreds of companies reduce their distribution labor costs, improve space utilization, and meet their customer service objectives. He has formed supply chain consulting organizations for two different systems integration firms, and managed the supply chain execution practice at The AberdeenGroup, a leading technology analyst firm. His career has provided him with a broad perspective on how to solve supply chain problems without automatically resorting to expensive technology. Mr. Hobkirk has authored dozens of white papers on supply chain topics, and his opinions have been featured in publications such as The Wall Street Journal, Supply Chain Management Review, DC Velocity, Modern Materials Handling, and The Journal of Commerce.

About Commonwealth Supply Chain Advisors

Commonwealth is a distribution-focused supply chain consulting firm that provides companies with the technical expertise and objective guidance required to design, implement and operate successful distribution centers. The firm is recognized as one of the "Top 100 Great Supply Chain Partners," by SupplyChainBrain, for consistently making a significant impact on its clients' supply chain efficiency, customer service and overall performance.

Commonwealth is based in Boston and works with clients across the globe. For more information, visit www.commonwealth-sca.com or contact Jennifer Thomas at (617) 948-2153.