



8 Improvements to Boost Inventory Management and Warehouse Efficiency

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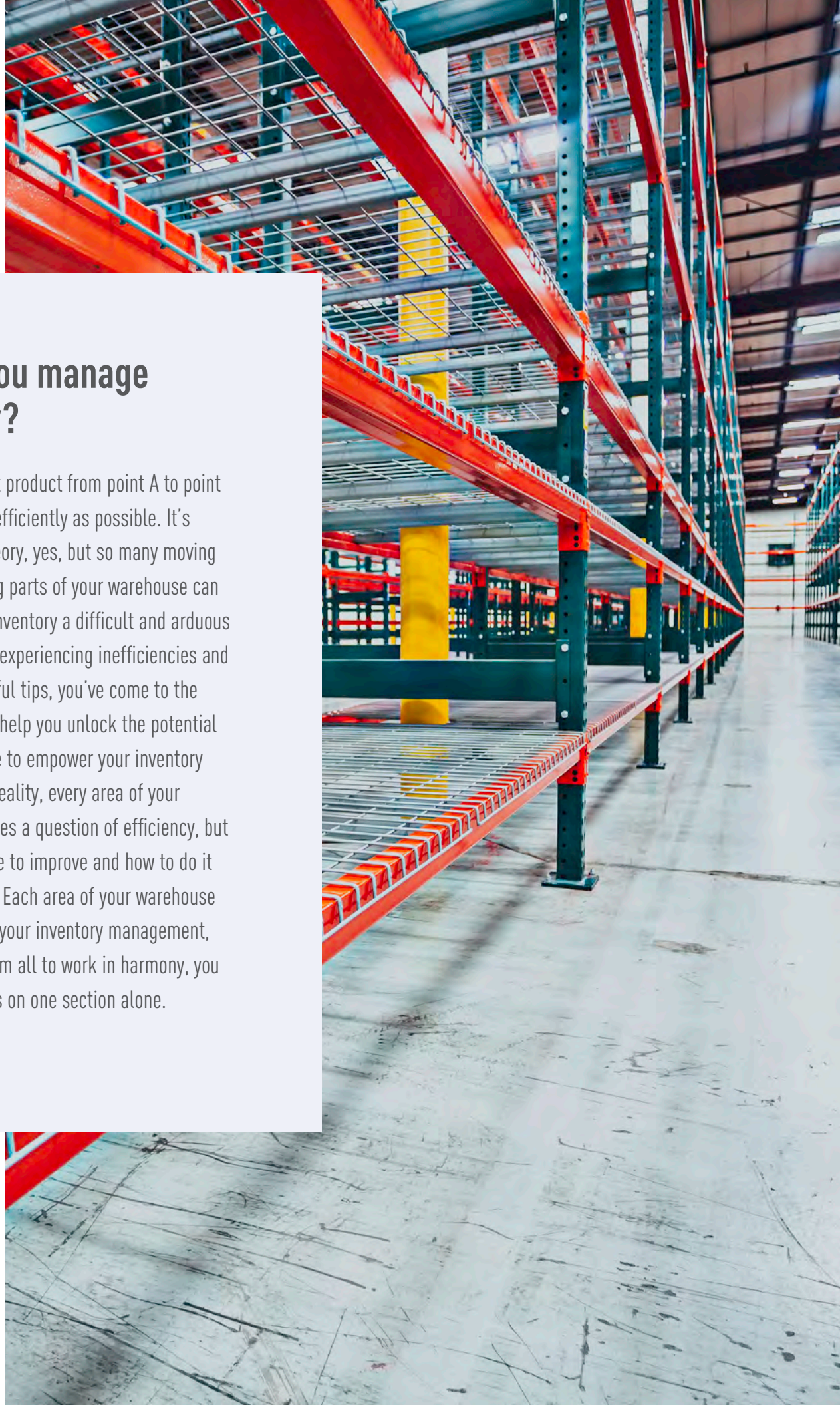
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How do you manage inventory?

Your goal is to get product from point A to point B as quickly and efficiently as possible. It's easy, right? In theory, yes, but so many moving and ever-changing parts of your warehouse can make managing inventory a difficult and arduous process. If you're experiencing inefficiencies and searching for useful tips, you've come to the right place. We'll help you unlock the potential of your warehouse to empower your inventory management. In reality, every area of your warehouse becomes a question of efficiency, but determining where to improve and how to do it can be confusing. Each area of your warehouse has an impact on your inventory management, so if you want them all to work in harmony, you simply can't focus on one section alone.



Engineered warehouse solutions

In this guide, we'll take you through eight improvements of a warehouse to illustrate how you can unlock its potential, better your inventory management, and grow your business. You will learn about proven processes that various companies implemented to immediately improved their productivity.

Every aspect of the warehouse plays a part in the overall ability to manage inventory effectively.

For example, businesses will come up against a spacing problem from time to time. As a company grows, SKUs can be placed in random areas to accommodate for the lack of space. They may get scattered in the warehouse and become difficult to find. Among many issues, this can lead to unnecessarily long picking routes and less efficient workflows. Order fulfillment, labeling, and packing can become bottlenecks that negatively impact profits. On the flip side, a professionally engineered warehouse can create solutions that address multiple, interconnected deficiencies to maximize space and increase profits. Maximized space leads to shorter picking routes, quicker replenishment, and many other efficiencies that create better order fulfillment. The business can then focus on its core competency and not let the warehouse bog it down.

Over a dozen industry experts with more than 150 years of combined experience contributed to this guide. It is highly advised to consult professional warehousing engineers when making some of the changes outlined here. These experts span the following disciplines:

- + Warehouse Design Engineers
- + Logistics Engineers
- + WMS Software Developers
- + Systems Integration Specialists
- + Sales & Account Managers
- + Service & Dispatch Managers



Warehouse Operating Systems

The Powerhouse to Total Warehouse Efficiency

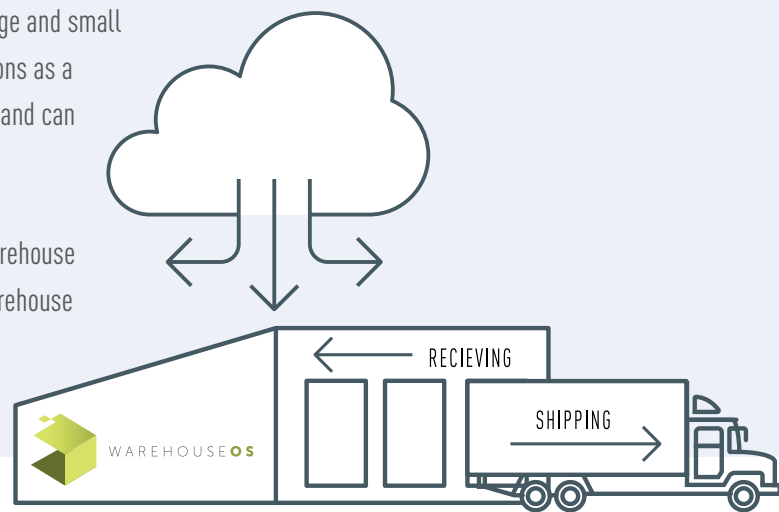


Warehouse Operating System

This is the underlying software that powers a warehouse, and it has a large impact on your inventory management abilities.

This software enables the various systems in the warehouse to function more efficiently. There is a new class of such software that is thinner: cloud-based and lower cost. It has been proven to handle massive scale when needed. Called a Warehouse Operating System (WOS), it offers some powerful advantages over the larger "Warehouse Management System" (WMS) that was pioneered over a decade ago when the order mix was quite different. A Warehouse Operating System is simpler and more focused on the new realities of the warehouse operation, namely, handling both large and small order quantities. Although it performs most of the same functions as a WMS, the WOS solution requires less manpower, less training, and can be implemented faster.

Consulting with professional warehouse engineers for a full warehouse analysis can help you identify what you want to get out of a warehouse operating system.



Features comparison

The advantages of a WOS compared to a traditional WMS are outlined in the table to the right.

	WOS	WMS
"Thin" system	x	
Less expensive to purchase	x	
Less expensive per license	x	
Promotes quicker completion on picking routes	x	
IT staff required		x
Expensive hardware investment required		x
Greater complexity to use and maintain		x
Decreased training time	x	
Software recorded maximized storage	x	
Lower cost per package shipped	x	
Easy to maintain and upgrade	x	
Suitable for small to medium-sized businesses	x	
Pick to lights		x
Pick to iPad	x	
Hands free picking	x	

A typical WMS can cost over a million dollars to buy, with more cost incurred in training and management. Most WMS products require staff to maintain and troubleshoot the system, and they require an expensive IT hardware investment.

In contrast, **a Warehouse Operating System** is often cloud-based, with an affordable startup cost, and a per user subscription that **can be as low as \$100/month**. Cost often plays a big role in deciding between software systems, but you should also factor in the ease of using what you buy.



Future Proof Warehouse Design Series

Consider the differences between the two following picking routes

One route using a WMS, and the other using a WOS. The WMS worker is hefting a large RF gun and a clipboard with printed out pick sheets. The WOS worker has a finger-mounted scanner and a cart with a tablet attached to it. The WMS worker uses visual prompts such as signs or lights to locate pick faces and fill the order on the paper pick sheet. The WOS worker follows the guided direction from the mounted tablet or mobile device to find the location of the SKUs in the order. The WMS worker, with a filled cart, returns to a pack station to box and label the order. The items on the WMS pick sheet are inputted manually into the inventory system. The WOS worker, however, has already scanned and automatically entered the inventory along the way. He then returns to a packing station to box the order, and a label has already been printed for shipping.

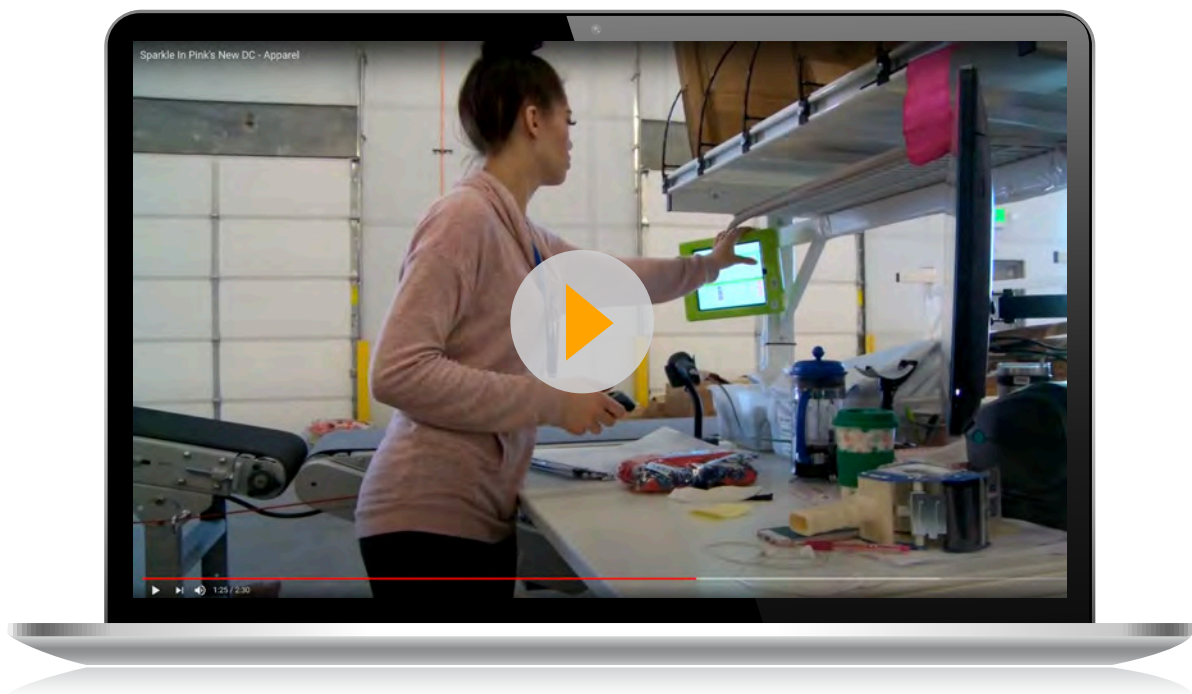
Sparkle in Pink (SIP)

Consider the story of Sparkle in Pink (SIP), a small but emerging online kids clothing business. Extreme growth boomed even as orders were being shipped out of the owner's garage (the business did not have a retail store). As the number of SKUs exceeded 100, the garage (and several outbuildings on the property) became an enormous bottleneck that limited growth. The owner considered a third-party logistics group (3PL) as her business grew, but also analyzed the option to build their own warehouse.

After working with professional warehouse engineers to analyze their warehouse, SIP decided to build a much smaller warehouse than they originally thought they'd need. Installing customized racking designed specifically for their operation, and deploying a fully integrated WOS gave them the comprehensive solution they were looking for. Running on modern cloud-based software, the WOS delivered picking and shipping operations that were both affordable and flexible, giving the business greater control over their fulfillment. With a WOS directed storage, picking, packing, and label printing, **they were moving more SKUs than ever before, and in less time.** Fulfilling on their own became a lower cost and a better strategic solution. Ultimately, they added more asset value to their company in both the short term and the long term.

3PL

Third-party logistics (3PL) is an organization's use of third-party businesses to outsource elements of its distribution, warehousing, and fulfillment services.



Watch the case study online [HERE](#)

A Deeper Look at Warehouse Operating Systems

A WOS utilizes modern technology in a simpler system to facilitate inventory management, as opposed to a WMS that can often be costly and complex. The use of mobile devices, simple scanners, and mobile apps is both more efficient and less expensive.

Warehouse operating system advantages include:

- + Training a new employee in a fraction of the time (usually under 30 minutes) it takes to train someone on a WMS.
- + Dramatically decreasing picking and packing time (sometimes cut by half!), even in warehouses that are already very efficient.
- + Lowering the cost per package shipped from the warehouse.
- + Competing globally at lower overall cost.
- + Eliminating mis-picks.
- + Having directed picking routes and always knowing exactly where your product is.
- + Getting rid of paper pick sheets.
- + Providing more data to help you identify inefficient or problematic areas in your operation.



Dense Inventory Management & Hot Sellers

Apps within a WOS system identify existing storage locations that can be better optimized to store more SKUs. This maximizes usage of warehouse space, and allows quicker routes for pickers and replenishers. Dense inventory management allows hot selling items (as identified by the app) to be placed at the start of picking routes for quicker order fulfillments.

Dense storage can be thought of as “chaotic inventory,” where incoming products are placed randomly on available shelving space within the warehouse with no regard for itemized locations. Since SKUs can be stored anywhere, tablet-directed picking guides pickers right to the SKU when it is requested.



**DOUBLE THE AMOUNT
OF ORDERS**



**HALF AS MANY
WORKERS**



Beauty Industry Group (BIG)

Beauty Industry Group (BIG), one of the leading distributors in hair extension products, had an issue with their inventory management process, and their shipping platform in particular. They would use an open window on their shipping computer to print a label. It would take roughly 15 seconds for a single label to print. With several orders piling up, that was a long 15 seconds. It became clear that label printing was their main constraint. Picked orders couldn't ship out quick enough and were constantly being backed up.

The business tried to improve the process by having computers at each packing station. After a picker would retrieve all of their picked items, they would go to the packing station and print a shipping label. Unfortunately, however, this process was slow and disconnected. With a WOS, a picking cart also acts as a packing station to provide versatility. The order would be marked as complete and a label would then print even before the picker gets to the packing station.

After adding a WOS that pre-calculated and pre-printed labels, BIG was able to eliminate their bottleneck problems and ship out double the amount of orders than before, using half as many workers.



Quick & Easy Training

Deployed as an app, a WOS provides a familiar platform that makes training quick and easy; it ensures that new hires and temp-workers quickly get up-to-speed and contribute right away. (A WOS training takes a fraction of the time it does on a WMS). Quickly change the user license counts to meet high demands and grant unique permissions or scan requirements per employee. Every action is tracked and logged into a history log, which allows for greater research and accountability.

Typically, new installation training on a WOS can be completed within two to four weeks.



CASE STUDY

Zyia Active

Zyia Active, an active lifestyle and clothing brand, was in a good place as far as sales volume. Their challenge was picking speed and shipping times. They added workers several times a year in an attempt to get an acceptable picking-to-shipping time, and they even doubled their workforce over an 18-month time period. To no avail; Zyia did not manage their inventory any better with the additional investment in more employees.

Zyia decided to try a WOS. After completing a brief installation, they spent one day training on the new system. On the first full day of using the software, and with half the number of workers, they shipped 6,300 orders with 30 people, which is more than they'd ever done before in one day. Previously, they had anywhere between 50 to 60 people on the warehouse floor at a time. With quick training on a WOS system, and using half the amount of workers, they were able to nearly double their daily shipments. That's quite the turnaround, especially with only one day of training with a new system.

**6,300 ORDERS
WITH 30 PEOPLE**

**NEARLY DOUBLED
THEIR DAILY
SHIPMENTS**

WOS Data

WOS data provides valuable insights into how you manage inventory, which can help you plan for future needs. It can identify the most valuable spaces in a warehouse (and any wasted space). It can identify inventory that hasn't sold in a certain length of time, and flag it to be moved out of high-traffic picking paths. Based on business growth and levels of products shipped, square footage needed can be determined for current levels, and for five- or 10-year's estimated growth. Often, businesses are losing money by simply not analyzing data and implementing modest changes.

As a whole, a Warehouse Operating System can be a great asset to your business in facilitating your inventory management. At a typically modest price, they provide you with the data, speed, accuracy, simplicity, and versatility that you need to be successful.



20 percent of the SKU's can be 80 percent of the business. That means a warehouse can be sitting on a lot of non-moving SKUs. Identify these non-moving items and relocate them out of high-priority picking routes to increase your warehouse's efficiency.



Forklifts

A Guide to Buying, Renting, and
Maintaining New and Used Forklifts



Forklifts

Forklifts are a critical part in determining the overall layout of a warehouse. That's because good warehouse design takes aisle width and vertical racking height into consideration (more on racking later). These factors play a large role in deciding which types of forklifts will function best in that space. There isn't a one-size-fits-all forklift solution.

Having a partnership with a respected and trustworthy forklift dealer is a valuable asset. Dealers are a good source for advice, parts, service, and support, as forklifts will need ongoing maintenance checks over the years. Forklift purchases can affect the business for a decade or longer.

A correctly designed warehouse will benefit the life and operation of forklifts, and will facilitate how you manage your inventory. Forklifts that are in constant and smooth operation are more productive and experience less wear. Forklifts that are idle, in inconsistent use, or subject to damage during use will need to be repaired and replaced more often.



**HAVING A
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A VALUABLE ASSET.**

New vs. Used

Used forklifts are popular, and they definitely have their place, but they may require more maintenance. With warehouse uptime being the single most vital consideration for the entire operation, used forklifts should be used sparingly.

A typical used forklift should be around half the price of a new forklift that has roughly the same features. Lower cost, used forklifts can carry serious baggage, and may cause financial losses down the road. A responsible dealer will acquire used forklifts from trustworthy and reliable sources, and perform maintenance to bring them up to standard—just like a good, used car dealer. Ask the dealer about their sources and maintenance/refresh checklist.

Used, electric forklifts can come with questionable batteries. Plan for the cost and usage of spare batteries. A used forklift battery should test to 80% life or better. Note that a degrading battery can signal a domino effect on the forklift's other components, causing more aging and wear. As of 2020, new batteries can cost anywhere from \$6K to \$10K.

When purchasing a used forklift, get a complete condition report and usage report to determine what repairs and maintenance are required to make it usable. Negotiate for the best warranty possible.



A metric when considering a used forklift is your projected usage. Two hours a day of usage is a good upper limit for a used forklift. If you plan to use one for more than two hours a day, consider a new forklift.



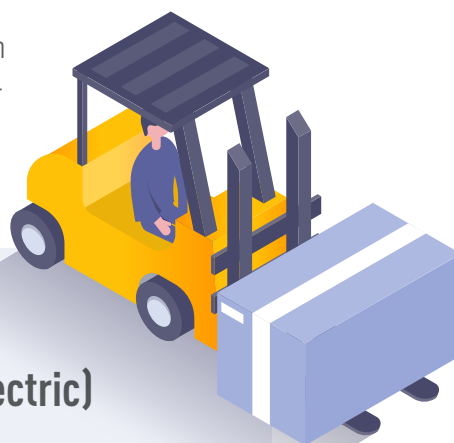
Electric forklifts vs IC (Internal Combustion) forklifts

IC forklifts have been around for a long time. There is an extensive knowledge-base of experienced operators, parts, know-how, and support for IC forklifts. Due to some significant changes in battery technology, however, expect electric forklifts to begin to dominate the market. With technological advances, electric forklift prices will eventually become less expensive.

Below are three general rules of thumb for traditional forklift batteries (conditions may vary):

- + Expect eight hours of use on a fresh charge
- + Expect eight hours to charge them fully from discharge
- + Expect to wait eight hours to cool after charging

As a result of the charging and cooling time, extra batteries are required to keep an electric forklift in continuous operation. Therefore, your duty cycle expectations for the forklift need to be considered when choosing electric.



Features Comparison (5,000lbs IC vs. 5,000lbs Electric)

*Note, these are estimates

	IC	ELECTRIC
Operation Cost Per Day (10 Hours) - \$1.75		X
Operation Cost Per Day (10 Hours) - \$30.00	X	
Quarterly Preventive Maintenance Cost - \$65.00		X
Quarterly Preventive Maintenance Cost - \$125.00	X	
Zero Emissions While in operation		X
Very Low Emissions While in Operation	X	
Estimated Purchase Price - \$29,000-\$37,000		X
Estimated Purchase Price - \$23,000-\$28,000	X	



Selecting a Forklift

As mentioned previously, the design of a warehouse heavily impacts the types of forklifts that should be used in that space. That design includes several factors that need to be considered when selecting a forklift for a warehouse:

- + Aisle width
- + Rack height
- + Door dimensions
- + Tunnel dimensions
- + Pallet weight
- + Pallet size
- + Throughput
- + Number of SKUs
- + New or existing warehouse

Again, don't hesitate to contact a good forklift dealer and/or trusted warehousing experts to help you evaluate which forklifts will work best with your warehouse design and inventory management processes. The following gives a brief overview of the various types of forklifts and where they function best.



Type of Forklifts by Aisle Width



6' forklift aisle - Turret Truck

A turret truck is an operator-up, very-narrow-aisle (VNA), custom built truck that is specifically designed to handle pallets in tight spaces. It's easily identifiable due to its articulating forks that rotate 180°. Most turret trucks can reach up to 40 feet high. If a turret truck goes down, the warehouse can grind to a halt. Even with a quick turnaround service time of less than a day, the losses on efficiency can add up quickly. A second turret truck on hand is like an insurance policy against lost production.



7'-9' forklift aisle - Flexi Truck

Flexi trucks are similar to turret trucks in that the forks rotate, but a flexi is capable of picking both sides of the aisle from either direction. The Flexi can also be used for other purposes around the warehouse.



9'-6" forklift aisle - Reach Truck

A reach truck is a narrow-aisle stacking truck that is designed for 'reaching' extreme heights. These trucks offer the maximum lift height with exceptional maneuverability. Traditionally, reach trucks are found in indoor environments. Traditional reach trucks cannot unload trucks and are dedicated to the aisles.



10'-6" forklift aisle - 3-Wheel Stand Up and Sit Down

3-wheel stand up and sit down forklifts offer great maneuverability as they can easily turn around tight corners. Although they are primarily used for loading and unloading docks/trailers, they can be used for stocking and transporting pallets.



12'-15' forklift aisle - LP and Electric Cushion Trucks

Cushion trucks are made for smooth surface applications, like warehouses and loading docks. Due to the smooth design of the tires, these trucks don't do well in outdoor or uneven surfaces. These are the most typical forklifts you find in most warehouses. Cushion tire trucks have a smaller chassis than Pneumatic trucks, that's why they are more suited for warehouses.



12'-higher forklift aisle - LP and Electric Pneumatic Trucks

Pneumatic forklifts are similar to cushion trucks in design, but are more suitable for work conditions outside or on uneven surfaces due to their chassis size and their bigger tire size. These are more popular on job sites and lumber yards.



Stock Picker

A stock picker, or order picker, is similar to a forklift but different enough for an explanation. It is defined as a piece of equipment designed to lift a person to a desired location on a pick-face or pallet rack. The picker is designed for picking from a pallet or pick-face, and will not move or put away pallets. Stock pickers are popular in eCommerce industries where pickers are fulfilling individual orders rather than full pallets.

Forklift Manufacturers

A best practice in building and maintaining a forklift fleet is to find a manufacturer that fits your needs. Prices, parts, contacts, service, new forklift purchases, and used forklift purchases are all more manageable and effective when dealing with one company and one brand. Building relationships with dealers also pays off in good-will benefits. There are many great brands out there, but here are two at the top of the list.



Hyundai

Hyundai is one of the largest manufacturers in the world. They continually work to perfect their craft in creating a strong forklift brand. You can expect to see the same engineering and innovation in their forklifts as they put in their automobiles. There are a lot of parts, supplies, and expertise built around this brand. Hyundai releases new forklift models every four to six years. Hyundai will also engineer models to custom requests, where most other manufacturers will not.



UniCarriers (formerly Nissan/TCM)

Manufactured primarily in Illinois, UniCarriers has been manufacturing forklifts for over 40 years. UniCarriers is a good choice for experience, and has a strong base of used and new parts, and accessories. They have one of the best warranty programs in the industry.

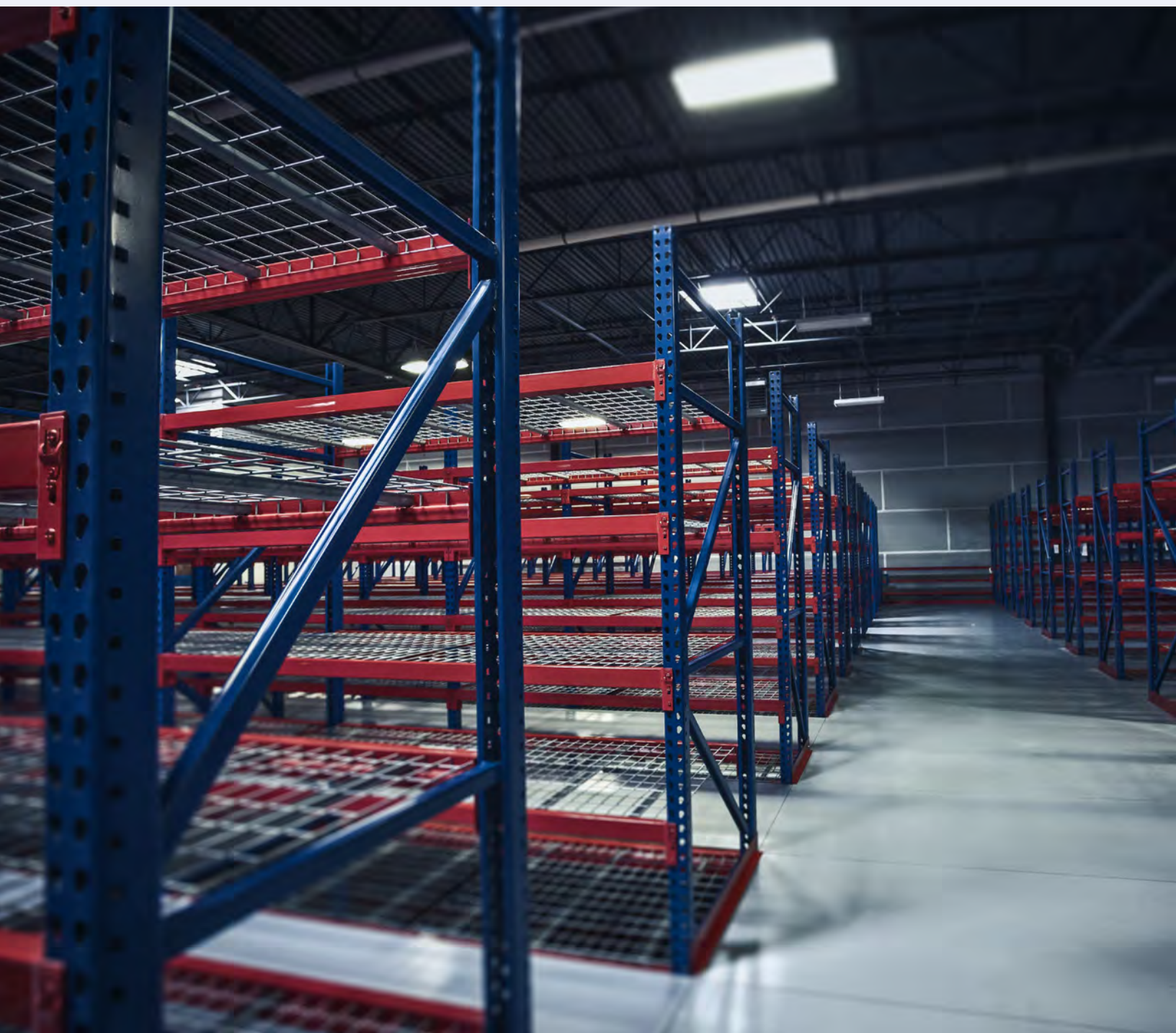
Forklift Operation Training

A sales and service organization should be able to perform forklift operation training to warehouse employees. There may be state and local requirements for forklift safety training. OSHA certification may be required. Since there are different manufacturers, and different products, most training is specialized.

There are many great forklift options out there, but ensure that you get the right ones based on the design of your warehouse. It's worth consulting with warehouse professionals or a trusted forklift dealer to understand which forklift will operate best in your warehouse. Having the right forklift plays a major role in effectively managing your inventory.

Pallet Racking

What to Consider When Searching for the Right Racking Solution



Pallet Racking

Some people may not consider pallet racking to be an important factor in inventory management or warehouse design, but it is.

Pallet racking design starts with the amount of product you're going to store in the warehouse. (For example, you may want to use 5,000 pallets in a 90,000 square foot warehouse). From there, calculations on aisle width, height, column distances, and load bearing concrete are made to optimize the design and racking choice. You will always benefit from talking to professional warehousing engineers to determine what design and rack options will work best for your operation and help you optimize your inventory management abilities.

Racking Design

You certainly could buy racking from Home Depot, but you want a more educated and planned purchase. Every installation of pallet racking is unique, and should be carefully thought out. The following describes 10 high-level engineering considerations you should factor into finding the best racking solution for your business:

- 1 Perform a seismic study based on the likely configuration. You want to ensure you have the right racking if you are in earthquake-prone areas. (This requires specialized engineering and a report by zip code).
- 2 Determine an elevation; how tall will the rack be? (Is there room for expanding vertically as the business grows?)
- 3 Determine slab thickness; is it adequate? (Like a dock, a concrete slab should be rated for the job. It can wear out).
- 4 Decide on the number of racking levels to install; do I have enough storage space?
- 5 Decide on the width of the racking.
- 6 Determine building columns and building column spacings.
- 7 Determine size of steel to utilize.
- 8 Determine the gauge of steel.
- 9 Determine the size and weight requirement for each beam.
- 10 Calculate the number of anchors needed for each upright.

Usually, the above engineering exceeds the experience and skill-set of a typical warehouse operator, which makes selecting your own racking solution a risky proposition. The requirements of each installation are unique, so you will appreciate and benefit from talking with a professional warehouse design engineer before making a racking decision.

Unsafe Racking Can Cause Injury and Have Long-lasting Consequences

Nothing is more important than employee safety, so racks need to hold thousands of pounds and be engineered to prevent injury. There are pallet racking failures that lead to deaths every year, so it shouldn't be taken lightly, especially in older warehouses or in a new acquisition. Racking can take a beating in the day-to-day warehouse environment, so checking it regularly for damage will help ensure it's in safe and functional condition.

Here is an object lesson in racking safety. A business was at a decision-point. Their racking was at the fifteen-year useful-life expiration time and needed to be replaced. (Similar to the timing belt of an automobile lasting 100,000 miles). A decision was required, but the company didn't know if or when to invest in new racking.

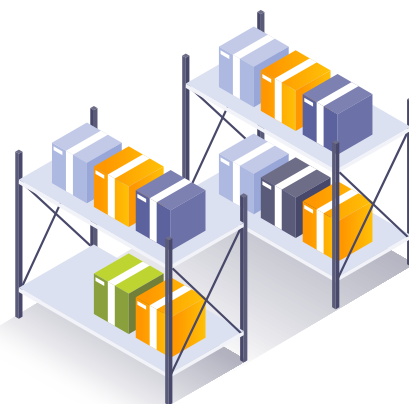
A sales rep from a warehouse design business pointed out stress fractures in the racking, meaning it would only be a matter of time before a collapse. A strong recommendation was made to replace the racking. However, in order to get a little more time on the existing racking, the business passed on replacing the racking to a later date.

Not long after, a failure of the racking injured and permanently crippled a worker. The worker needed care for the rest of his life. The story of the injury was in the news and reflected poorly on the business. The federal government got involved as well.

There can be a frightening and real human cost that outweighs the simple material cost of replacing a rack solution. Again, employee safety is a top priority.



A business representative should inspect shipments of pallet racking before installation, to be sure you received the correct racking for your order. Especially inspect the steel gauge of the delivery matches the steel gauge that was ordered.





Thatcher Chemical Group

In the early morning of March 18, 2020, a 5.7 magnitude earthquake came roaring through the Salt Lake Valley in Utah. Thatcher Chemical Group, one of the largest manufacturers of chemicals and mineral acids, was right in its path. With barrels full of corrosive liquids sitting 25 feet high up on racking, Senior Process Engineer, Tim Lawton, wondered if he was going to enter a HAZMAT war zone at work that day. To his astonishment, their facilities hardly saw a scratch! The only thing that fell from any of the racking in their warehouse was an empty 55-gallon drum.

Four years prior, Thatcher Chemical Group needed new racking, so they worked with professional warehouse engineers to discuss racking options that would do well during an earthquake. Narrower and much taller pallet racking was suggested. Not only would it allow them to store inventory in a tighter space, but also store heavier items on top shelves while staying well within safety guidelines, even in an earthquake.

"If you would've seen the racking that was in here before, all of our inventory would be all over the floor if we didn't make the necessary upgrades," exclaimed Lawton. It was a much needed facelift to an already tired-looking racking solution.

"When we got the new plans, there were some questions about how much it was going to cost. But we knew we would be well prepared to weather a potential storm. After what happened on March 18th, all of us felt reassured we made the right decision." – Mason Carroll, Warehouse Manager at Thatcher

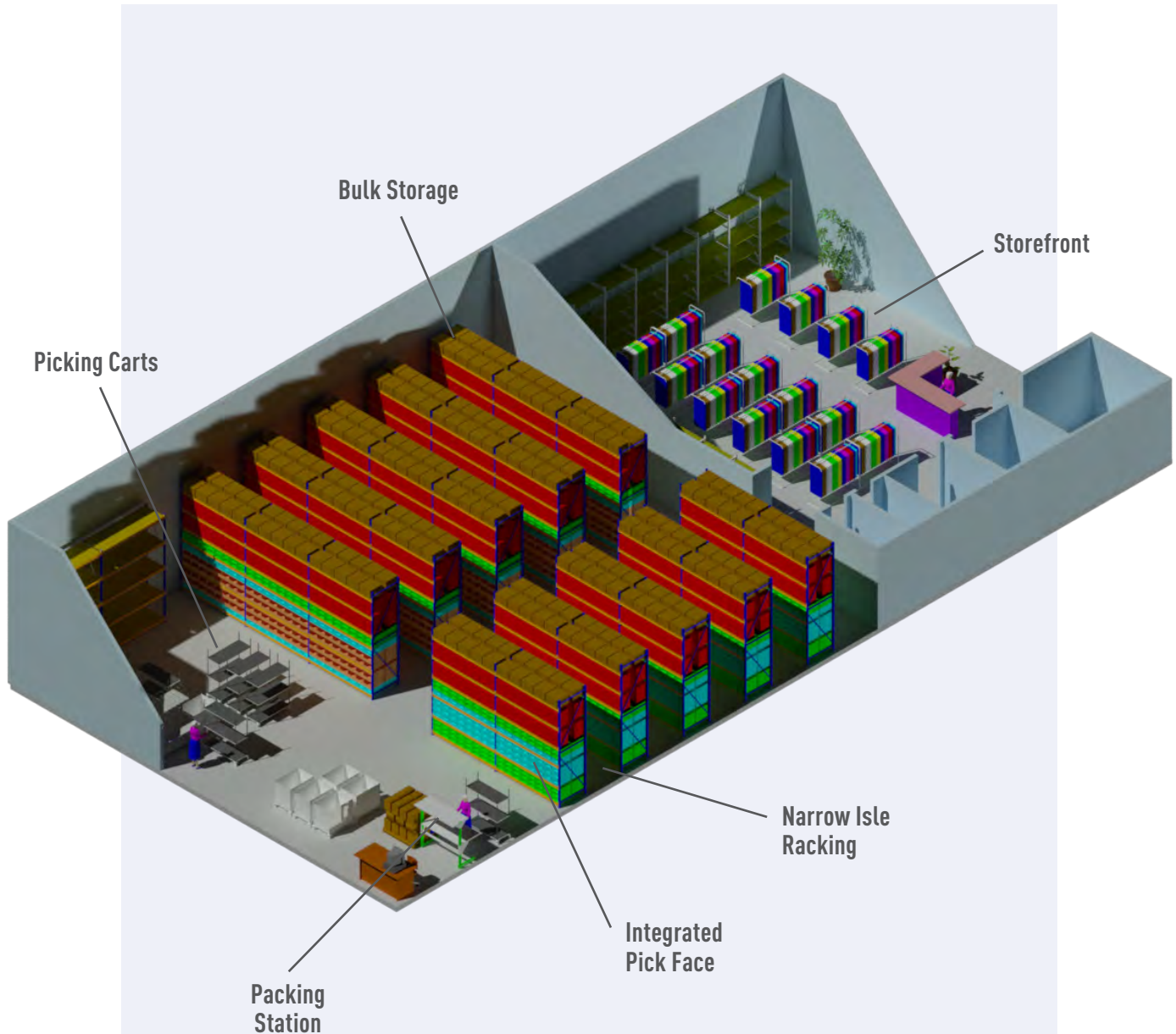
For Thatcher, a more expensive solution in the short run saved them millions of dollars in potentially lost inventory. Doing it right the first time can make a big difference when a catastrophe strikes.

Efficiency in Racking

Data analytics can help identify and catalog the optimal level of racking (and other equipment) needed. Properly engineered warehouses can operate effectively with fewer racks.

Note that tightly condensing a warehouse can cause congestion in aisles and decrease picking efficiency. There is a happy medium of efficiency and consolidation. (Efficiency can be measured by picking time, re-slotting time, and overall warehouse flow.)

A business can improve efficiency in their inventory management, keep control, lower costs, and increase customer happiness when its warehouse is properly designed and operated.



Time in Short Supply

Deseret Book, one of the largest distributors and retailers of religious books and art, was faced with an inventory management issue. Employees spent too much time in the picking process, taking four to five business days to fulfill customer orders. That is fatally long when same day picking and two-day shipping is the norm.

With old racking, long pick paths, and inefficient warehouse design, Deseret Book's overall inventory management processes needed to change in order to fulfill orders quickly. Three areas needed resolution:

- 1 Storage space. Deseret Book was out of space and needed a better storage solution.
- 2 Picking Speed. Deseret Book needed to find a way to make more products easily accessible for pickers.
- 3 ^{Pallet Racking} Employee safety. With long pick routes and lanes, machines were crossing paths with pickers which led to a hazardous environment.

Deseret Book needed a complete warehouse overhaul. Based on several in-depth logistical studies, every detail was considered, down to box size, box color, pick paths and shelving.

The business maximized their warehouse space through vertical expansion. This was accomplished with a second story mezzanine and an integrated conveyor system.

The solution dramatically reduced the time needed to fulfill orders, doubled their storage space, shortened their pick paths and improved employee safety. Deseret Book filled **20 percent more orders with 20 percent fewer labor hours**. They overcame their main challenge, greatly improved their inventory management abilities, and ultimately cut costs in many other areas.

Watch the case study online [HERE](#)





How to Spot Illegal Work

Racking design should be carefully planned as listed above. Rush-jobs or incomplete planning will result in inadequate and possibly dangerous installations. A racking vendor or installer that skips on the planning may even be performing the work illegally. A business that skips on planning may experience a rack failure that can cause weeks, if not months, of warehouse down time. Don't take the risk, it's not worth it in the long run!

A good vendor will participate in the sales and the planning when creating a racking quote. They should also be able to help you get a racking permit.

Racking Permit

Any racking exceeding 5' 9" in height has to be permitted because the government wants to keep companies and their employees safe at work. Warehouses without proper racking permits can be very dangerous. Avoid a shutdown and obtain a warehouse permit. Ensure that every job and installation is done with safety in mind.

A contractor's license is required to obtain a racking permit (most cities require it). You can also ask a warehousing engineer to help you obtain one. Follow these six steps to obtain a racking permit:

Step #1

Create layout drawings

A drawing of your warehouse layout is the basis for racking design. The drawing should depict:

- + Location of racking
- + Height of racking
- + Aisle width
- + Connections, bolts, and manufacturer's specifications
- + Amount of weight to store

The planned type, weight capacity, and dimensions of commodities stored determines the size of beams, the width of the pallet bays, and how many rows of racking a building can fit. Knowing the answers to these questions and putting it all in a layout design drawing will make obtaining a racking permit much easier.

Step #2

Get seismic calculations from an engineer

Once the layout drawings are complete, it's time to consult a racking engineering expert. The expert will come to the warehouse facility and gather the necessary information to perform seismic calculations.

Every zip code in the US has a seismic rating, which directly affects how much weight racking can handle when considering seismic forces. This code will help determine the types of racking that will work best in the warehouse. Seismic rating is available on the [FEMA website](#). The expert will factor in that rating when identifying your warehouse's racking needs.

Step #3

Determine the building's fire suppression

The fire suppression information on a building helps to better prepare the warehouse, and will protect the company and employees from extensive harm and damage.

Any racking over 12 feet tall requires additional fire suppression in the building. Early Suppression Fast Response (ESFR) systems are commonly required for high pile storage. However, all systems depend on what material is being stored. If the material is very flammable, it may require additional in-rack fire suppression.

Step #4

Take the warehouse specs to the city building department

To pull a racking permit and take the gathered information to the city:

- + Contractor's license
- + Seismic calculations
- + Warehouse layout drawings
- + Fire suppression information
- + Racking height
- + Inventory to be stored

Step #5

Pull and pay for the permit that day

Be fully prepared with the racking information, and make sure it is complete. Check with the city before applying to confirm their requirements, including permit cost. Be prepared to pay for the permit during the visit.

After pulling and paying for the permit with the city, there are a limited number of days to close the permit with the city. Be sure to finish the project in the time allotted on the permit. Permits that are opened but never completed may be subject to penalties and fees.

Step #6

Have a third-party anchor inspection

When the project is done and the permit is closed, a third-party anchor inspection will take place. Cities usually require a third-party (someone not affiliated with the racking company or the city) to inspect all of the anchors for the racks and make sure they are all installed correctly.

After this third-party inspection, the city will either sign off on the project or request changes. If modifications are required, make them quickly and then ask the city to review them.

A certificate of occupancy is granted once the project is approved and accepted. Any additions or updates desired will require a permit. Keep records with the city up to date.

Ortho Development

Ortho Development Corporation is an orthopedic device design and manufacturing company that develops implants and surgical instruments for knee and hip replacement, trauma fracture repair, and spine treatment.

Ortho had an enviable growth rate, and they wanted to have the warehouse capacity to sustain the growth. They had two existing warehouses and had to make a decision; expand the existing buildings or build a new one. Safety was also a factor that needed to be addressed; pickers climbing ladders while carrying items was clearly unsafe and inefficient.

Ortho chose to expand their existing capacity rather than building a new warehouse. They consulted warehouse engineers and decided to build up, removing old racking and installing a new system (with an overhead crane). The new racks were 22 feet high, and brand new Big Joe order pickers were acquired to match the new racking capacity.

The Big Joe order pickers, known as Joeys, were quick and safe for picking on any level of the racking. The Joeys could access the racks from front or back while operating smoothly and quietly, and could run the entire day on one charge.

Their warehouse designer incorporated narrow aisle lift/pickers technology. The new design and technology consolidated rack space, and offered quick and flexible pick routes. With the use of a Warehouse Operating System, the newly opened space could be densely packed while still effectively managing inventory. The new design did much more with existing space and created greater efficiencies for the business.

Thus, the need for a new warehouse was satisfied by improving the layout and increasing the efficiency of the existing space.

Watch the case study online [HERE](#)



Narrow Aisle Wire Guidance

Aisle width depends entirely on the kind of forklifts and other equipment being used in the warehouse. Very Narrow Aisle Systems can be as narrow as five feet wide, and are at increased risk for accidents. Wire guidance systems help protect racks, and especially help protect narrow aisles, which typically take on more damage.

A wire guidance system is an electromechanical system that controls forklift steering by tracking a guidewire that has been secured in the warehouse floor. This prevents veer-offs and helps prevent damage to pallet racking. (Note that operator error can still cause damage and accidents on a wire guided system. Post protectors are still recommended).

Racking is a vital area of your warehouse that can be optimized for efficiency. Where you place your racks, how far apart you place them, and their height all factor into how you manage your inventory. Talk with a racking specialist or engineer to better understand how racking impacts the overall efficiency of your warehouse.



Pay For Protection

Once the correct size racking is determined, and permits are pulled, the racking will be installed. Consider rack protection and guardrail protection products. Workers or products can damage a rack; and even simple damage can cost thousands to repair. Post protectors can run \$25 to \$30. It is better to have to replace post protectors than an entire rack.

Periodic formal inspections may be required, depending on the warehouse zip code. Inspections should be thorough, and inspections can require some time. Damage will almost certainly be found. As regulations tighten around pallet racking, being able to inspect and fix damage (or replace) will be more important in the future. It is a best practice to be able to deal with inspections. This is another reason to have a long-term relationship with your racking vendor: they can expedite the repair process, so you can minimize your downtime.

Docks, Doors, and Levelers

Dock Efficiencies Lead to Overall Profitability



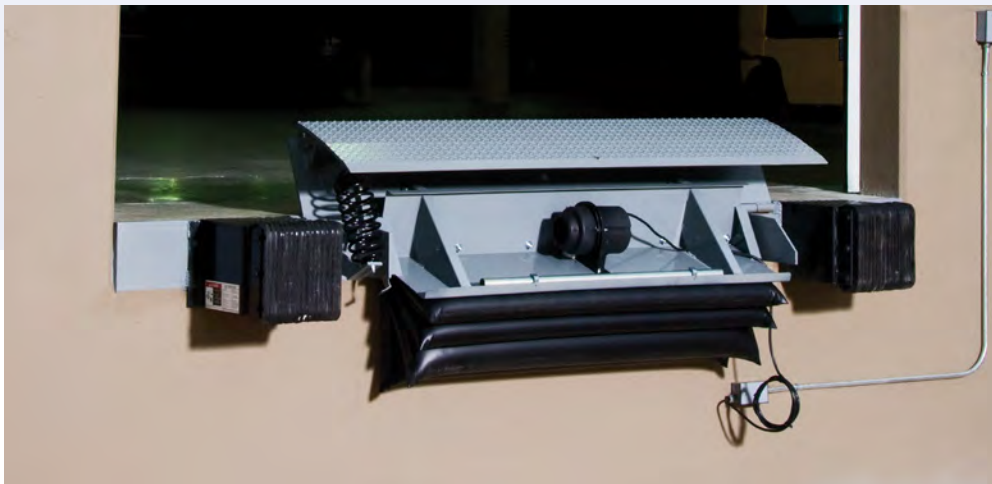
Docks, Doors, and Levelers

Efficient docks lead to quicker, safer, and smoother loading. Quicker loading and unloading all contribute to your overall efficiency and profitability of your company. Width, weight, and size of loads must be accounted for in dock capacity and door size. The proper door and leveler are vital in meeting these needs. Drivers also respond better when the leveler aids them in loading and unloading. Pallets are accessed at the best angle at the end of the truck and during passage. Less product damage occurs as well, and time is more efficiently spent.

No wasted motion, no waiting, and no damage are worthwhile benefits from using the right leveler in the correct way.

Dock Leveler

Most dock levelers have lips that store in the front when down and rest in the lip keepers. When the pit dock leveler and lip are in the stored position the lip keepers help to keep the leveler flush with the concrete. This prevents it from dropping to the below-dock position when a forklift drives on it. If a door is in the open position and no truck is at the dock, this creates a serious fall hazard. In this instance it is suggested to install a safety barrier (ie. chains or scissor gates that allow the door to be open and prevent falls).



Dock Doors Have Lives as Well

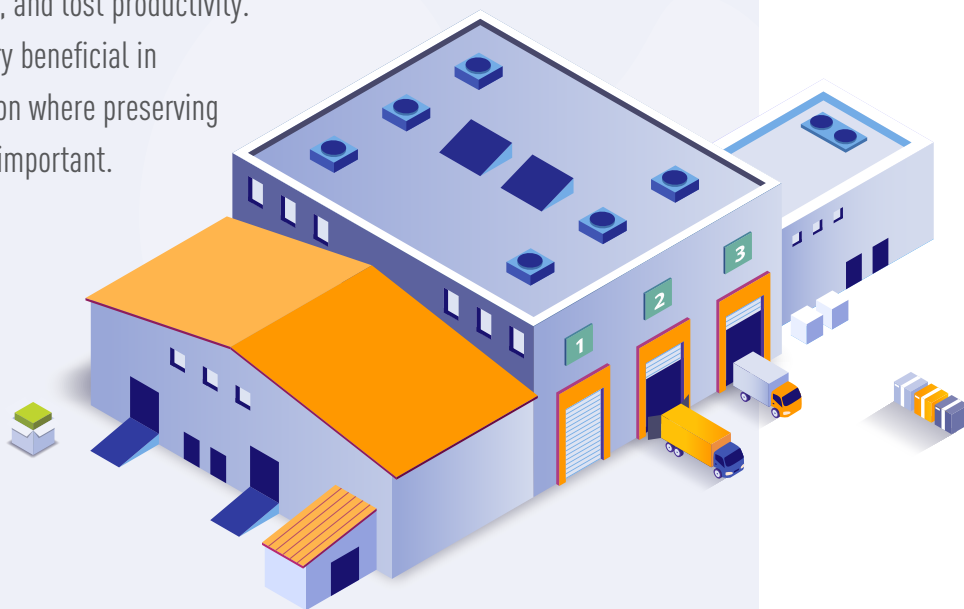
An overhead door can open and close many times, but exactly how many times can it do so before it breaks? That depends on its duty cycle and rating, which changes by door type. Smooth and consistent door opening and closing speed will lead to longer door service. Safety is also a focus for door operation; workers and equipment must be clear when a door closes.

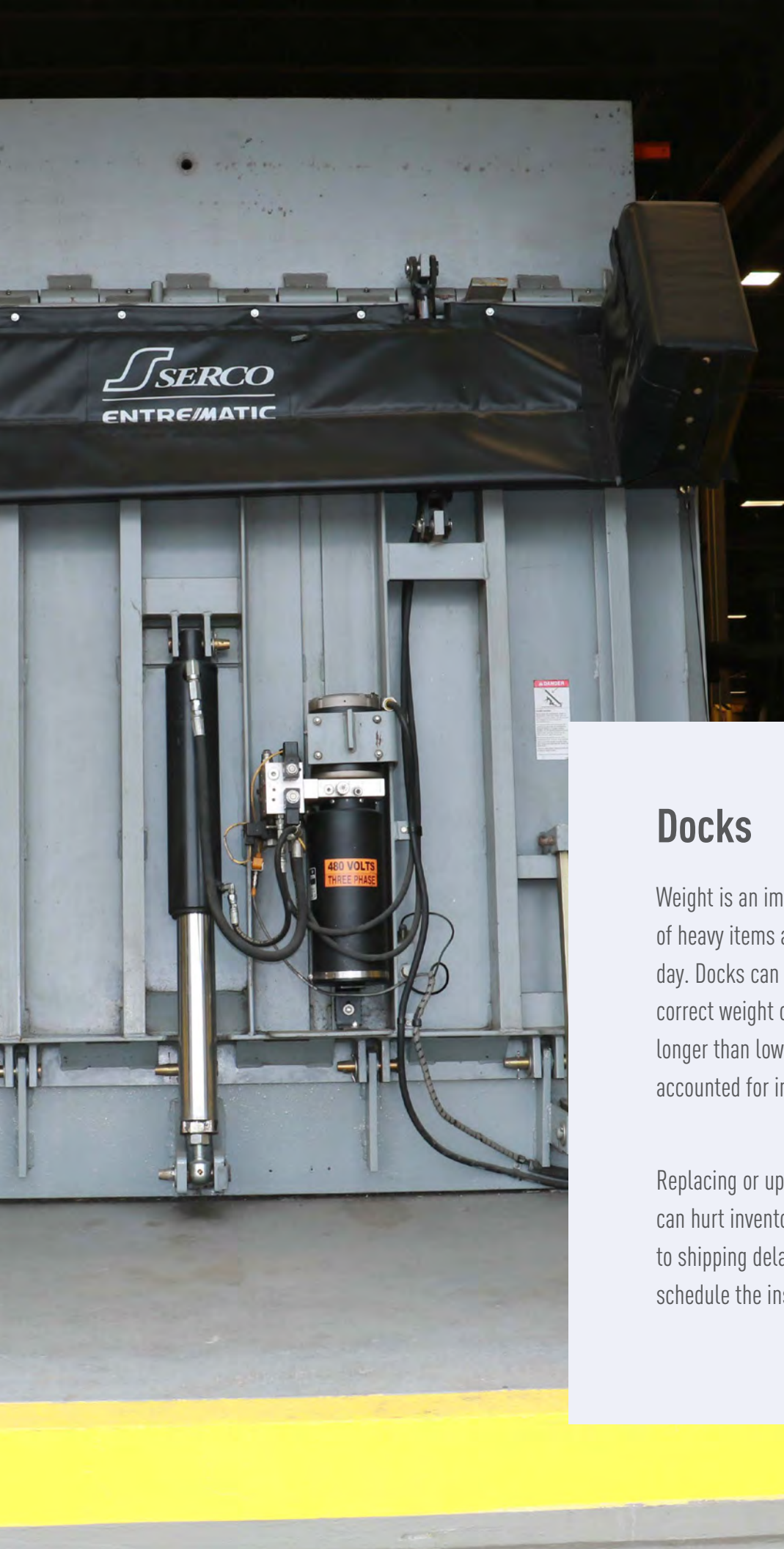
When ordering dock doors, consider these factors to ensure you purchase the best door for your warehouse:

- + Door uses per day
- + R-value (insulation)
- + Door speed (high speed doors only)

The service life of the door will depend on factors such as door uses per day. Estimate the door cycles per day (one time up and one time down is considered a cycle) then select an operator that meets that with some margin for increased opens (include worker passage and equipment passage).

The R-value (insulation) must also be considered in the door's usage. Using an under-rated door will lead to earlier than expected door failure, spoiled goods, and lost productivity. Door speed and R-value are both very beneficial in refrigeration use, or in any application where preserving a temperature or an environment is important.





Docks

Weight is an important calculation for the dock. Loads of heavy items and forklifts roll over it many times a day. Docks can wear out if they are not rated for the correct weight capacity. Higher capacity docks last longer than lower capacity docks, which should be accounted for in your planning.

Replacing or updating docks during working hours can hurt inventory management productivity and lead to shipping delays. So when you have one installed, schedule the installation appropriately.



Interlocked Dock, Door, and Truck Restraint

An interlocked dock, door, and truck restraint add a great measure of safety and efficiency to your inventory management processes and to the warehouse. An interlocked system is one where the dock doors only open when a truck is backed into the dock, which also engages the truck restraint. As a truck driver approaches the dock, a green light will indicate that they can safely back the trailer into the dock. Once the trailer is fully backed into place, the truck restraint can then be engaged. The door can then be opened, allowing the leveler to be raised and placed in the trailer. The light on the outside will turn red, indicating to the driver that they cannot pull away from the dock. When these steps are completed, a light on the inside of the building will turn from red to green, signalling to the forklift driver that everything is safe and secure. The driver cannot pull away from the dock until the procedure is reversed, at which point the exterior light will turn green. (Note that nothing happens automatically. A person inside the warehouse controls these actions from the control panel)

Leveler and Door Maintenance

A malfunctioning dock, leveler, or door can hold up any number of trucks and create bottlenecks in your inventory management workflow. Incorrect loading angles can slow loading averages and increase wear and tear on forklifts. The cost of downtime from a bad door or leveler is usually much greater than the cost of maintenance, so get your dock, door, or leveler serviced when it needs it.

Maintenance must be consistent and performed to spec. Preventative maintenance (regular service) on doors, levelers, and the docks can prevent costly failures and keep you running smoothly.

There are three types of levelers: mechanical (spring assisted), hydraulic, and airbag. Each one of these has moving parts and requires inspection and maintenance. Purchasing a preventative maintenance program from your warehouse equipment supplier is a wise investment to maintain an interruption-free warehouse operation.

Docks, Doors & Levelers

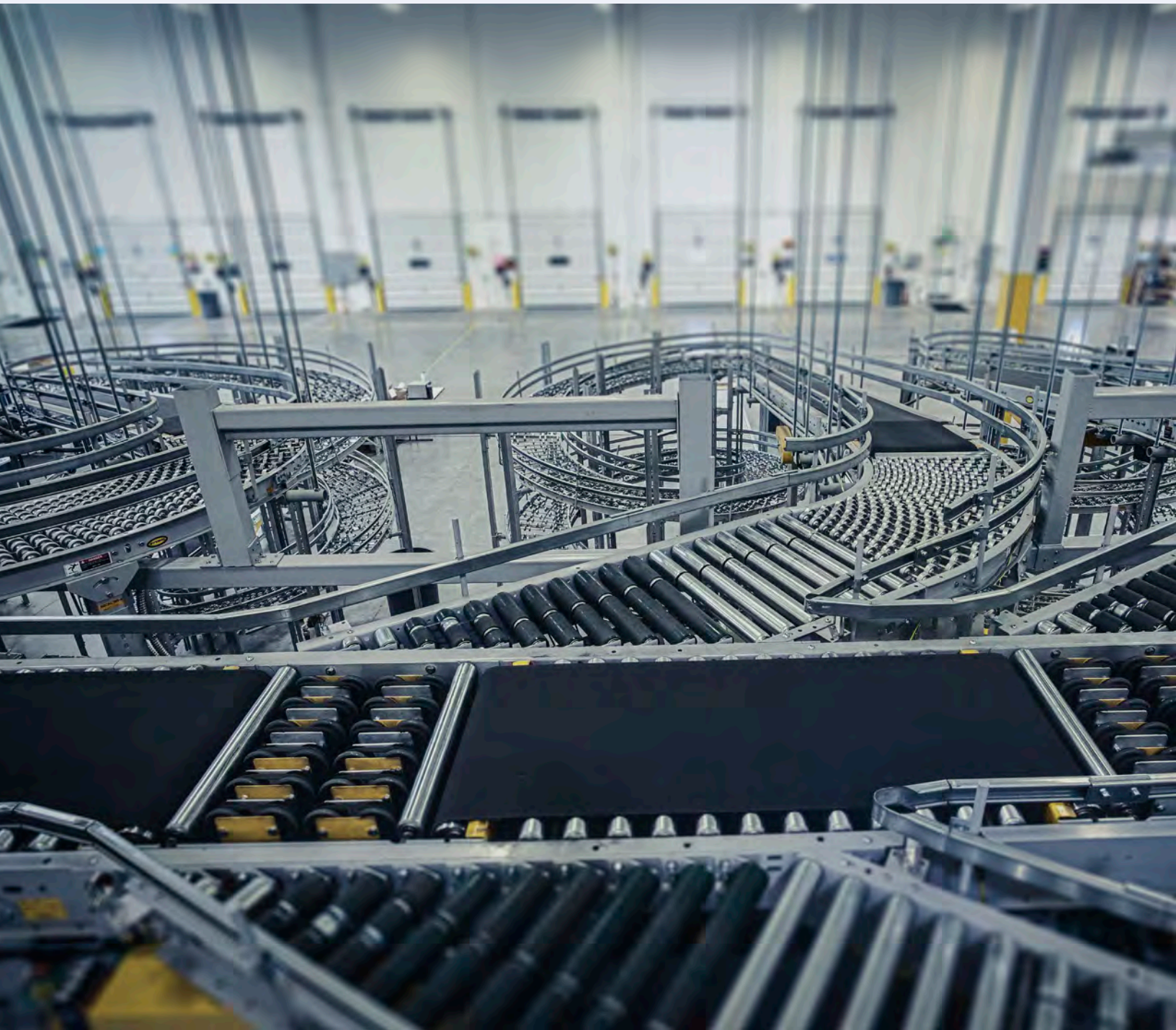
Safety Issues

Dock leveler equipment can have safety and maintenance issues. Proper equipment and training can prevent accidents and increase the life of your dock-related equipment. Skipping in safety areas can have tragic consequences. Always ensure fire-drop doors are functioning properly. They are required to be inspected annually and can slow or prevent fires from spreading into other areas of the facility, thereby reducing damage and saving lives.

Docks, dock levelers, and doors are critical aspects of your warehouse that have a big impact on how efficient you are in managing your inventory. If they aren't functioning properly and are not repaired right away, the lingering, harmful effects can be severe. This may be considered a small area of your operation, but it's often overlooked to the point of causing a bottleneck.

Carts, Conveyors, and Automation

Determining what Solution Brings the Greatest Efficiency



Cart Systems

Picking to a cart is another way a warehouse can increase its inventory management efficiency and make a big impact. Picking and packing speed can be greatly increased when picking to a cart. Because carts are able to move around the warehouse floor, many businesses find them more flexible than conveyors, and more suitable when a business is picking more than 100 SKUs.

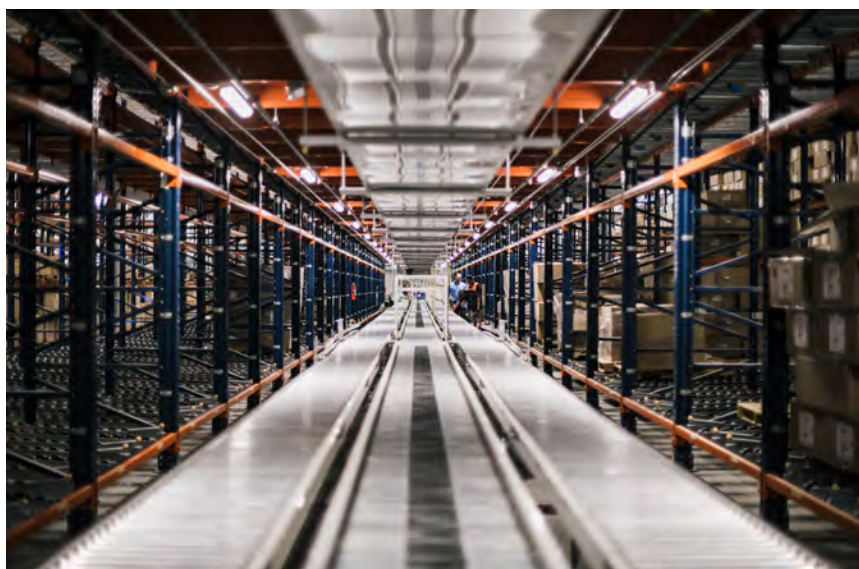
Benefits of cart systems:

- + Picking to carts can reduce electricity costs.
Powered conveyors are not needed, and neither are “picker lights.” (Using a WOS with a tablet or mobile device mounted on the cart directs the picker on their routes. A finger-mounted scanner confirms a correct pick.)
- + A cart’s carrying capabilities can be significant.
A five-shelf cart can move the same amount of inventory as would fit on 20 feet of conveyor!
- + Most conveyor systems are stationary, which can block picking routes. A cart can go anywhere, or be moved out of the way when not in use.
- + One cart is significantly cheaper than 20 feet of conveyor. Carts are also easier to maintain and replace.
- + It’s easy to add more carts in response to increased demand.



Conveyor & Automation Systems

Although carts provide great flexibility and speed to inventory management, there is also great value to conveyors and automated systems when implemented in the right way. This is another reason why consulting with warehouse engineers can be helpful in making these decisions. The many types of conveyor systems (belt conveyors, gravity conveyors, live roller conveyors, portable conveyors, and more) move SKUs to packing areas without human intervention. Since conveyor systems can run all day, it's very important to get a reliable system. Quarterly, or even monthly, inspections and maintenance are vital for conveyor systems.



Backcountry.com

Backcountry.com, one of the largest online specialty retailers of outdoor recreational goods, traditionally fulfilled their orders through Excel spreadsheets. Before the company opened up a distribution center in Salt Lake City, Jeff Carter, Senior Vice President of Global Fulfillment, was tasked with building an open-source warehouse management system (WMS) that would communicate with a fully integrated conveyor system. It was the first major step towards the modern distribution system currently used by the company.

Carter said: "Around the time we started building the WMS, we began on the racking and conveyor system to make sure the two were compatible and complementary. That's a critical piece that a lot of companies miss. If the WMS is not compatible with the material handling system, it can create flow issues, especially on large volume days during peak season."

To address the large amounts of orders going through the system, corrective conveyor and storage automation actions were taken. Instead of making an order go through every zone in the warehouse, it could be automatically taken out of the system and routed to packing.

An original racking and flow system was proposed by an engineering team using vertical lifts instead of diverts; this automated process ensured the routing was from pick to pick, rather than picking and passing through zones. Totes go from each pick, to the next pick, to the next, using a "three-dimensional" process. An order is started in the pick module, and when everything in that order has been picked in a zone, it's taken out of the system and sent to the packing station.

The facility went live without any congestion. Multiple item orders were easier and faster to process because of the three-dimensional direct-to-zone pick design. Overall, orders were being processed and completed 20 percent faster! The new facility also became

20 percent more efficient on a cost-per-order basis.

Carts, Conveyors, & Automation

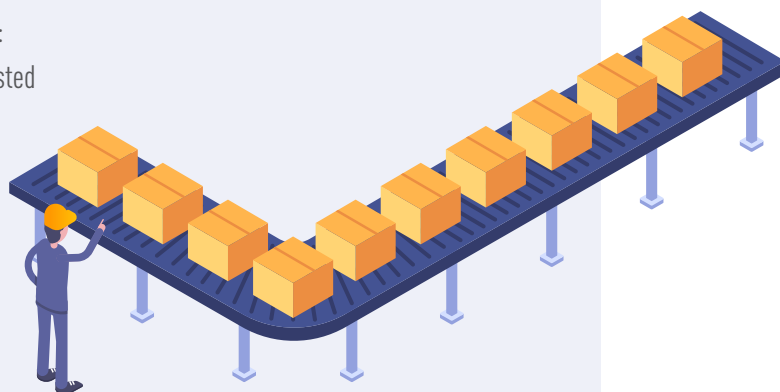


Do I Need a Conveyor System?

The products and the packaging your business is processing determine if there's a need for a conveyor system. Typically, the best use of a conveyor system is picking and shipping homogeneous products. To truly determine if a conveyor system is a good fit for your business, logistical studies with warehouse engineers are suggested.

Here are some signs that you may need a conveyor system:

- + You have picking and/or packing areas that are congested
- + You're struggling to fulfill and ship orders quickly
- + You need to efficiently ship to different carriers
- + You're looking to reduce per-unit costs
- + You're simply running out of space



Storage Automation

An automated storage and retrieval system uses automation to store and retrieve products from defined storage locations. Consider using storage automation when:

- + A high volume of products are moved in and out of storage.
- + Space constraints require a high-storage density.
- + Fragile or hazardous items need to be moved with less worker involvement.

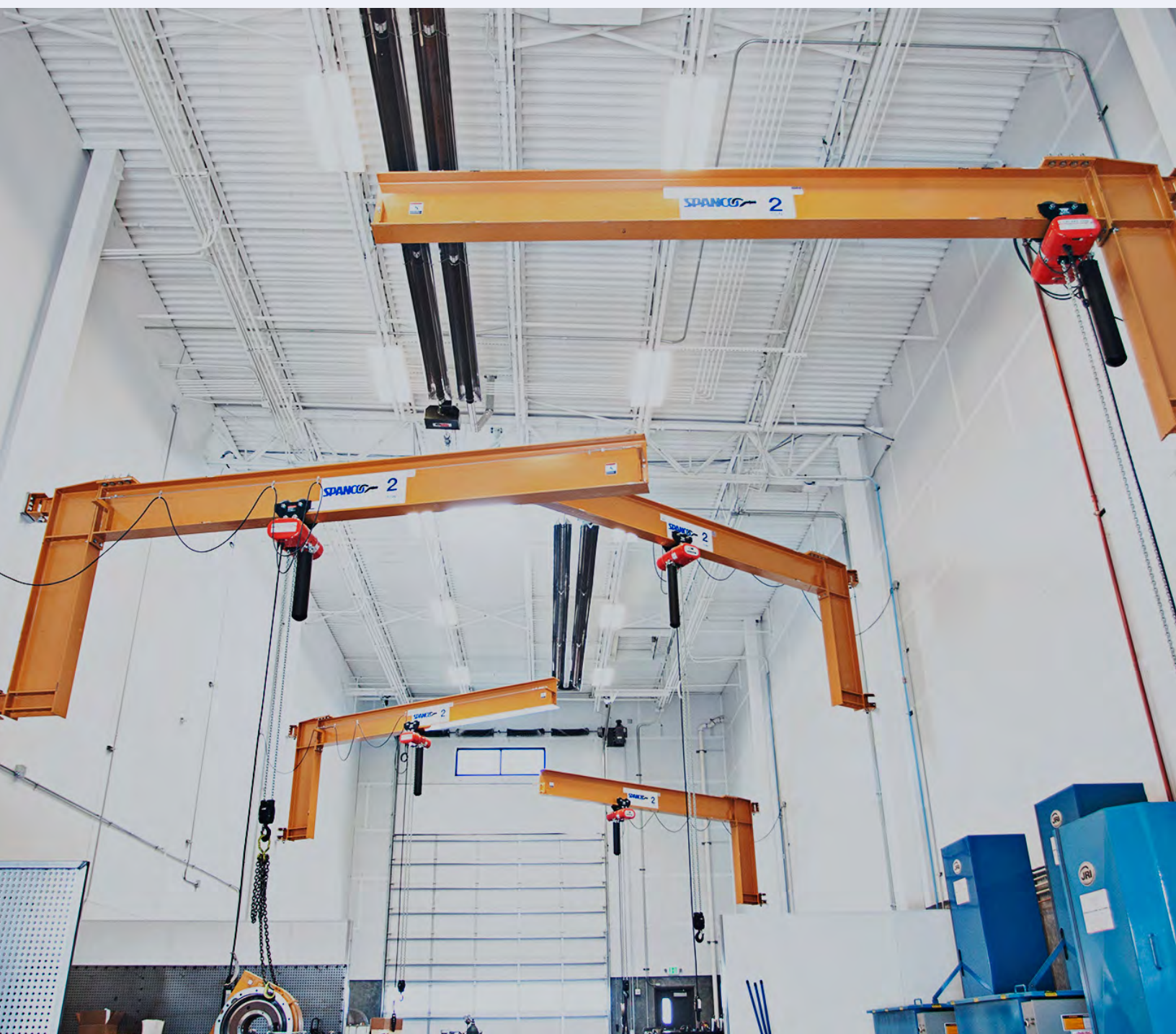
Storage automation can create substantial efficiency savings in handling, storing, and retrieving inventory. Speciality computer-controlled automated storage and retrieval systems are available for the manufacturing, assembly, distribution, and retailing industries.

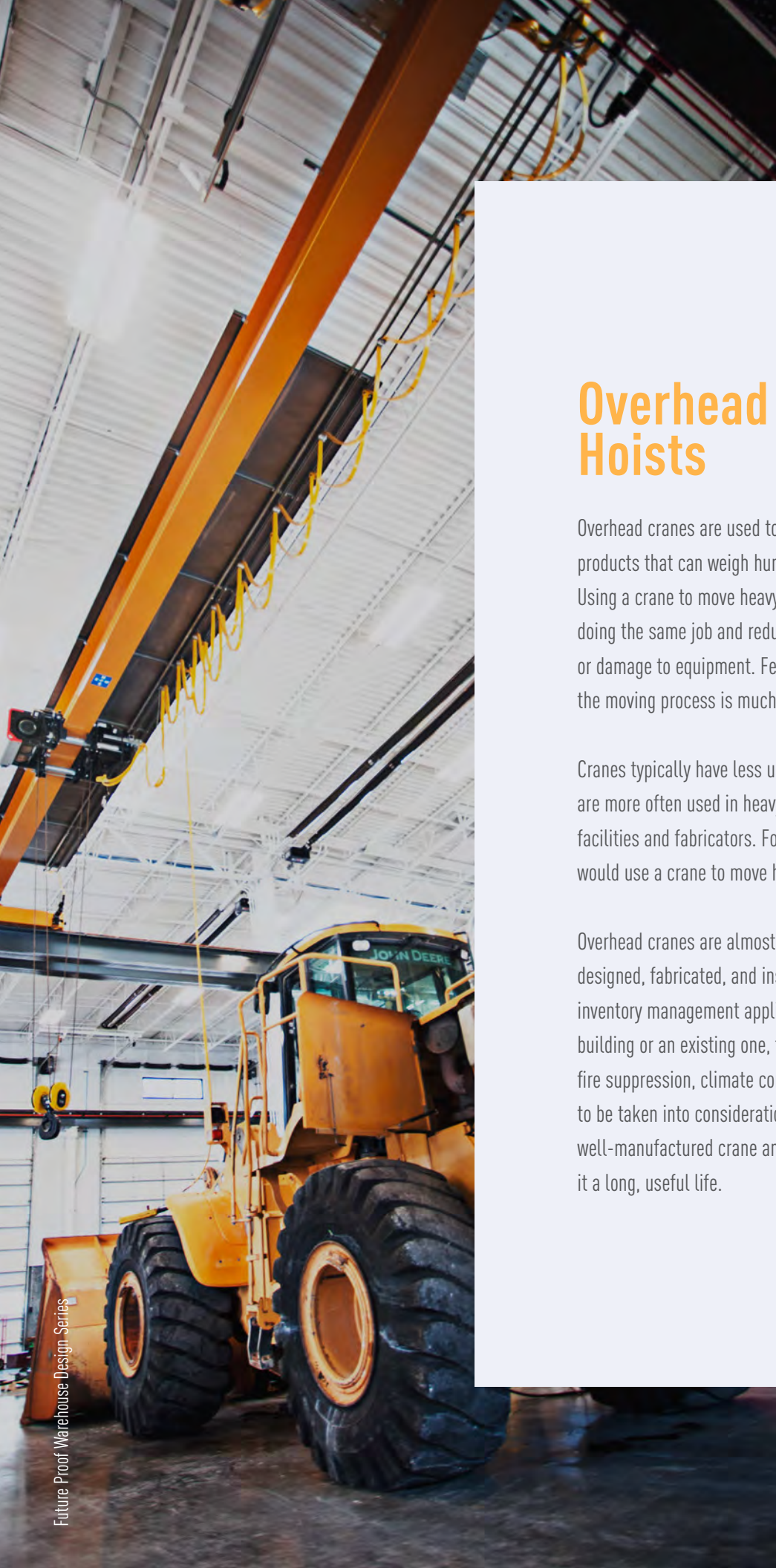
The wide range of storage automation products has helped many industries, such as aerospace, automotive, distribution, electronics, retail, manufacturing, e-commerce, government, healthcare management, metal working, and tooling, just to name a few. These systems are expensive, but the ROI can be very favorable under the right conditions.

Automated and conveyor systems can be a great benefit and optimize efficiency in your inventory management, but only in the right environments. If you are considering these solutions in your warehouse, be sure to talk to an experienced warehouse engineer. A logistical study of your operation is the best way to determine if it's the right fit for your business.

Overhead Cranes & Hoists

A Solution to Take On the Heavy Lifting





Overhead Cranes & Hoists

Overhead cranes are used to safely move large equipment or products that can weigh hundreds or thousands of pounds. Using a crane to move heavy items replaces a forklift from doing the same job and reduces the risk of injury to employees or damage to equipment. Fewer workers need to be involved, so the moving process is much safer.

Cranes typically have less use in a traditional warehouse, and are more often used in heavy-duty workshops, maintenance facilities and fabricators. For example, a granite fabricator would use a crane to move heavy slabs of stone.

Overhead cranes are almost always custom-built, and will be designed, fabricated, and installed for a specific building or inventory management application. Whether operating in a new building or an existing one, the building's systems (plumbing, fire suppression, climate control, electronics, and more) have to be taken into consideration when installing a crane. Using a well-manufactured crane and maintaining it properly will give it a long, useful life.

Crane Inspection and Maintenance

Overhead cranes should be inspected and maintained quarterly. On systems with daily use, a monthly inspection and maintenance routine is the best practice.

- Similar to conveyors and automation, cranes work best in specific work environments for specific inventory management tasks. If you have big or heavy items you need to move around your warehouse, they can help you do so in a safe and efficient way. If you are moving into a new building, consider constructing the warehouse around the crane and its functions. Talking with warehouse engineers will help you get the right crane.

There are typically three kinds of cranes:

-
- UNDER HUNG SINGLE GIRDER CRANE**
- Diagram showing a side view of an Under Hung Single Girder Crane. Dimensions include:
- 20' OF FRONT CLEARANCE IN CRANE RAIL
 - 18' 11" TOP OF RAIL
 - 15' 0" MAX HOOK HEIGHT
 - 15' 0" MAX HOOK TRAVEL
- TOP RIDING SINGLE GIRDER CRANE**
- Diagram showing a side view of a Top Riding Single Girder Crane. Dimensions include:
- 20' OF FRONT CLEARANCE IN CRANE RAIL
 - 18' 11" TOP OF RAIL
 - 15' 0" MAX HOOK HEIGHT
 - 15' 0" MAX HOOK TRAVEL
- TOP RIDING DOUBLE GIRDER CRANE**
- Diagram showing a side view of a Top Riding Double Girder Crane. Dimensions include:
- 20' OF FRONT CLEARANCE IN CRANE RAIL
 - 18' 11" TOP OF RAIL
 - 15' 0" MAX HOOK HEIGHT
 - 15' 0" MAX HOOK TRAVEL

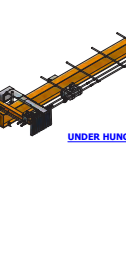


Diagram illustrating a **TOP RIDING SINGLE GIRDER CRANE**. The crane consists of a single orange girder mounted on a black support structure. A trolley is positioned on the girder, and a hoist is attached to it. The crane is shown in a side view, highlighting its compact design.

Installation

The Final and Crucial Step



Installation

Whether you are updating or building a new warehouse, installation is that vital step that brings every area of the warehouse to life. Some installations can be straight forward, such as simple conveyors, racks, security cages, and other equipment. Others may require a full systems integration team to power a fully automated or conveyor system. Whatever it may be, your installation process is an important part of material handling.

The installation process is based on:

- + Agreements being signed between the business and the warehouse supplier
- + Blueprints being finalized that document the engineering and design
- + Equipment being ordered
- + Project lead and team being assigned
- + Project timeline being confirmed

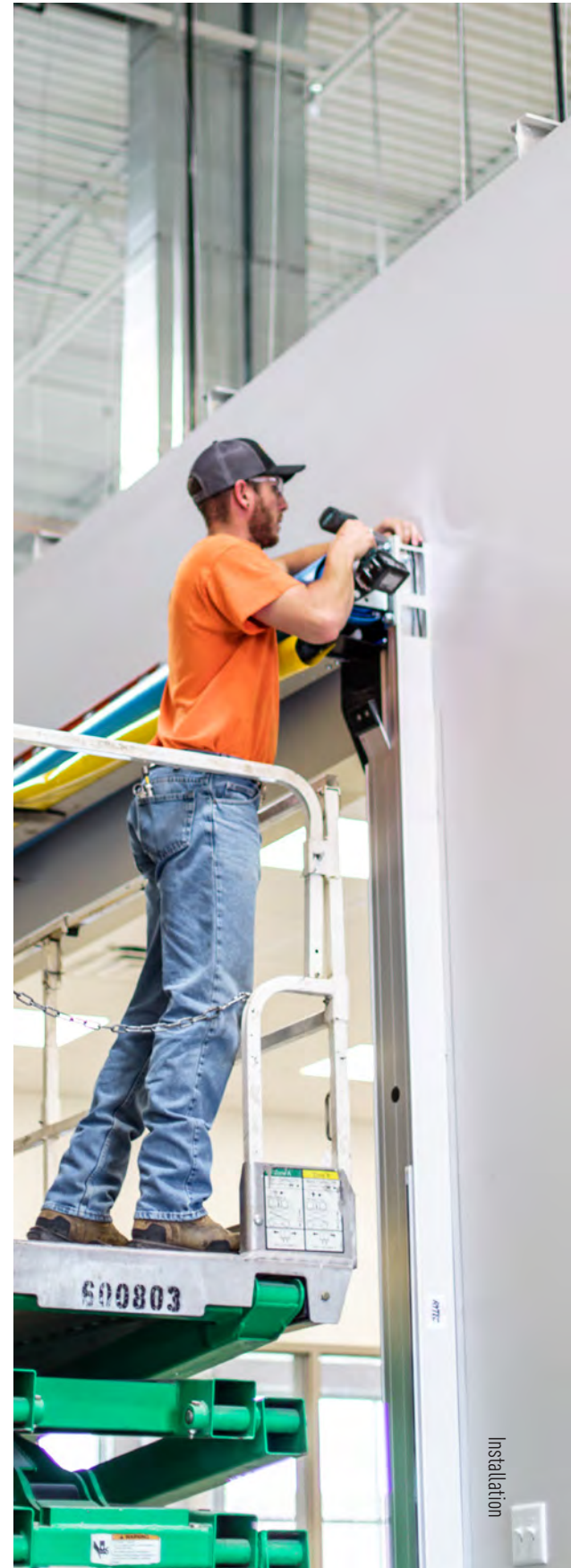
Installed equipment may include:

- + Overhead cranes
- + Racking
- + Conveyors
- + Storage Automation
- + Dock & Door Equipment

The installation team may consist of:

- + Ten or more vehicles
- + Up to 20 installers

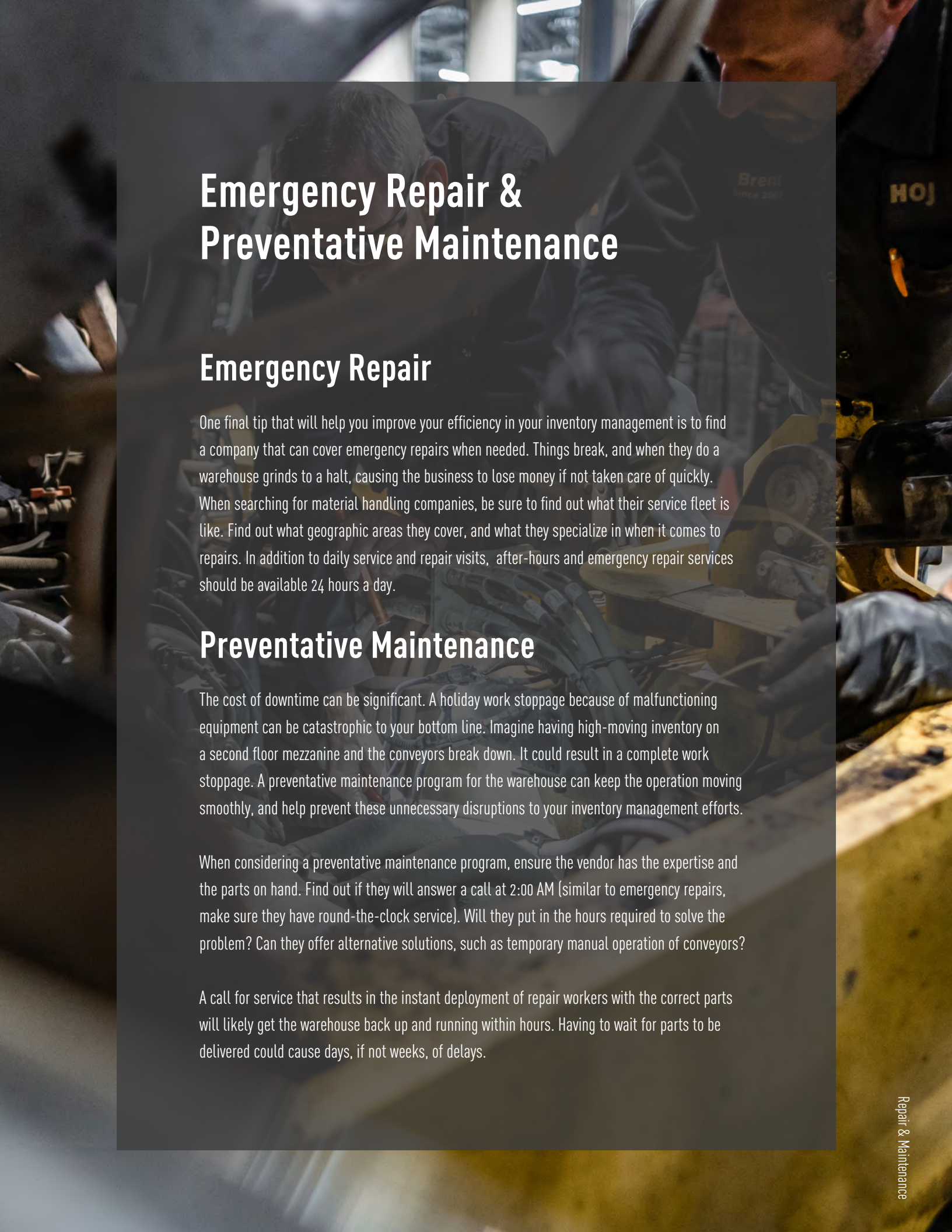
Many material handling suppliers and companies will hire out third-party installation teams to get the job done. This is typical and usually isn't a concern, but it doesn't hurt to inquire about their experience and tenure. Make sure they are well trained in whatever you're installing, whether it be a mezzanine system, pallet racking, wire partition, or an integrated solution of several equipment components.



Emergency Repair & Preventative Maintenance

The Efficiency You Need for Unwanted Downtime





Emergency Repair & Preventative Maintenance

Emergency Repair

One final tip that will help you improve your efficiency in your inventory management is to find a company that can cover emergency repairs when needed. Things break, and when they do a warehouse grinds to a halt, causing the business to lose money if not taken care of quickly. When searching for material handling companies, be sure to find out what their service fleet is like. Find out what geographic areas they cover, and what they specialize in when it comes to repairs. In addition to daily service and repair visits, after-hours and emergency repair services should be available 24 hours a day.

Preventative Maintenance

The cost of downtime can be significant. A holiday work stoppage because of malfunctioning equipment can be catastrophic to your bottom line. Imagine having high-moving inventory on a second floor mezzanine and the conveyors break down. It could result in a complete work stoppage. A preventative maintenance program for the warehouse can keep the operation moving smoothly, and help prevent these unnecessary disruptions to your inventory management efforts.

When considering a preventative maintenance program, ensure the vendor has the expertise and the parts on hand. Find out if they will answer a call at 2:00 AM (similar to emergency repairs, make sure they have round-the-clock service). Will they put in the hours required to solve the problem? Can they offer alternative solutions, such as temporary manual operation of conveyors?

A call for service that results in the instant deployment of repair workers with the correct parts will likely get the warehouse back up and running within hours. Having to wait for parts to be delivered could cause days, if not weeks, of delays.

The ultimate question for you to consider is: “Where do I start?”

When looking closely and investigating these eight areas of your warehouse, start in the ones where you know you can improve now. Implement small wins and efficiency gains here and there. You'll begin to unravel what you need to do to get your inventory management operations in better health.

The difference between an average warehouse (or fulfillment operation), and one that is highly optimized and efficient, is dramatic. It's the difference between profit or loss, growth or stagnation, fast or slow, and accuracy or mistakes. Because warehouses are usually a cost center, (operating in businesses with thin margins), this disparity often makes a measurable difference to the bottom line financial results of the business.

You may realize that your current infrastructure can work with some modifications. Other times, it may make sense to transition to a new facility and start from the ground up. Whatever the case is, seek out professional advice, have a logistical study done and capture the data that will help you make the right decisions. You don't want to find yourself eating extra, unnecessary costs. Making proper modifications to both existing and new warehouse designs takes time, so when you know you have efficiency problems to solve, it's better to act sooner rather than later. Doing it the right way will take your operations to the next level and unlock new potential in your business.



OVER A DOZEN INDUSTRY EXPERTS WITH MORE THAN 150 YEARS OF COMBINED EXPERIENCE CONTRIBUTED TO THIS GUIDE.

It is highly advised to consult professional warehousing engineers
when making some of the changes outlined in this article.

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