

White Paper

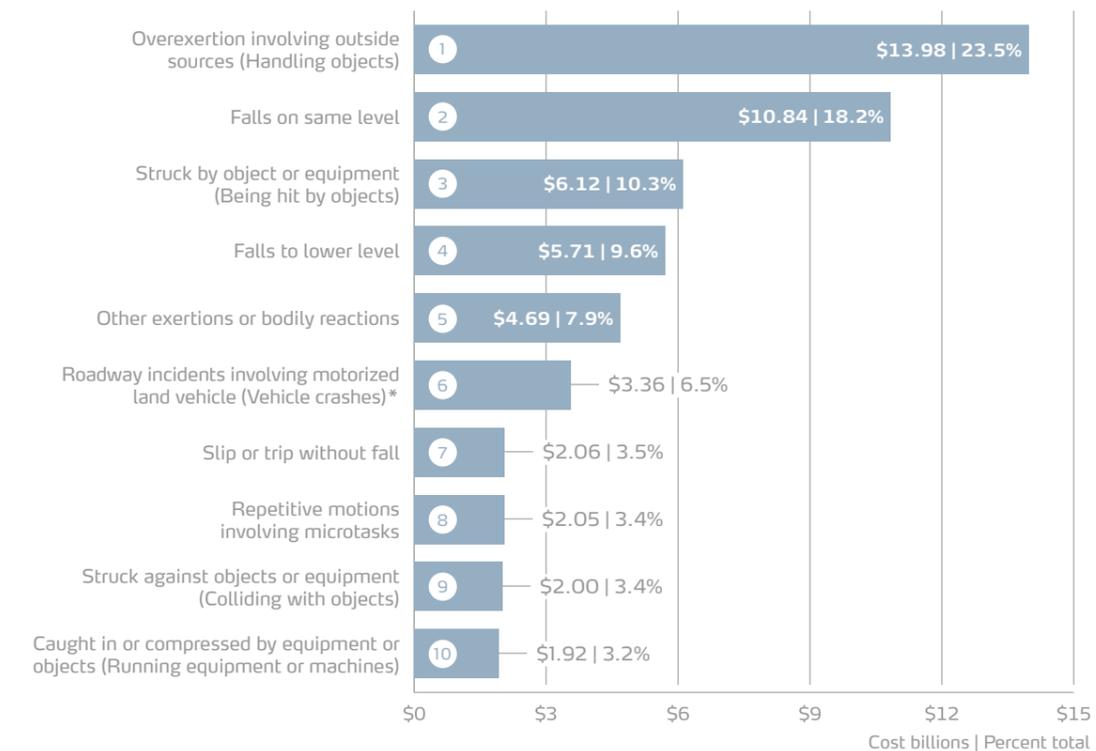
Position your Order Pickers for Success



Introduction

When it comes to warehouse and distribution employees, more organizations are deploying ergonomically designed automation systems. These ergonomic solutions help workers complete picking and order fulfillment tasks while simultaneously eliminating the risk of injury. In addition to enhancing safety, these systems can boost productivity and reduce a variety of costs – positioning both workers and companies for operational success.

This white paper reviews the costs of injuries associated with overexertion and explores three ways automated storage systems improve worker ergonomics and productivity.



Total cost of the most disabling workplace injuries: \$59.59 billion
Cost of top 10 disabling workplace injuries \$52.93 billion

*Typically involving a car or truck

Common ergonomic injuries and their costs

Serious, non-fatal workplace injuries cost U.S. businesses nearly \$59 billion in non-fatal worker compensation injury claims last year, according to a Workplace Safety Index study compiled by insurer Liberty Mutual's Research Institute.¹ Within the Index's top 10 ranking of the most frequent causes of those injuries, two of the top five are associated with the physical exertion most frequently seen in retrieval of stored items.

- 1 **Overexertion**
 "Injuries related to lifting, pushing, pulling, holding, carrying or throwing, cost businesses \$13.8 billion in direct costs and accounted for nearly one quarter of the overall national burden."²
- 5 **Exertion/reaction**
 injuries resulting from tasks such as "bending, reaching, twisting climbing, crawling, kneeling, sitting, standing, walking or running were responsible for 7.9% of the overall injury burden, costing U.S. businesses \$4.69 billion."³

Workers' compensation insurance covers the direct costs of occupational injury and illness, such as medical costs and wage replacement (indemnity). How much might an ergonomic injury cost?

The average cost per medically consulted injury can be **\$42,000 per employee** (on average). This figure includes estimates of wages lost, medical expenses, administrative expenses and employer costs, but exclude property damage costs except to motor vehicles.⁴

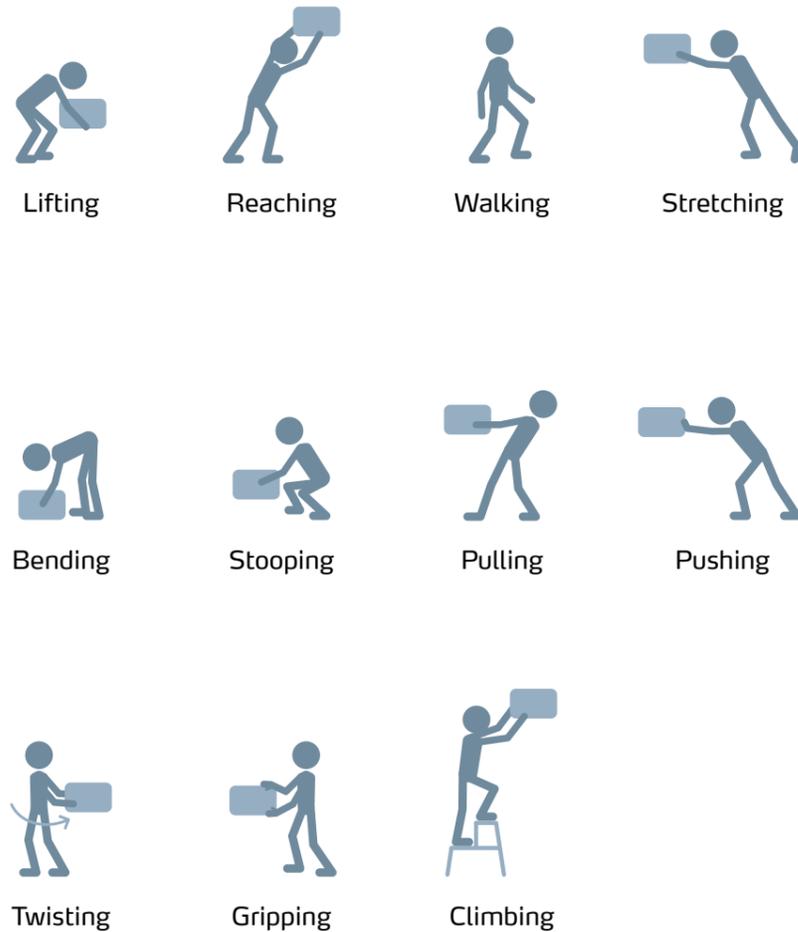
Employers, however, also experience significant indirect costs associated with a worker injured on the job – from **two to 10 times**⁵ higher than direct costs. That's because there are so many hidden or unanticipated expenses resulting from an employee injury. According to Occupational Safety and Health Administration (OSHA), possible indirect costs can include (but aren't limited to):

- Any wages paid to injured workers for absences not covered by workers' compensation;
- The wage costs related to time lost through work stoppage;
- Administrative time spent by supervisors following injuries;
- Employee training and replacement costs;
- Lost productivity related to new employee learning curves and accommodation of injured employees; and
- Replacement costs of damaged material, machinery and property.⁶

Clearly, the costs of an ergonomic injury can add up.

Regulations and recommendations

Although OSHA has not established a maximum limit on how much weight a person may lift or carry,⁷ it does offer recommendations for the prevention of musculoskeletal disorders – including muscle strains and lower back injuries. The agency also notes, the Bureau of Labor Statistics (BLS) found warehousing to be one of four industries with the highest rate of musculoskeletal disorders related to lifting heavy items, bending, reaching overhead, or pushing and pulling heavy loads.⁸



Taking the establishment of guidelines a step further, the National Institute of Occupational Safety and Health (NIOSH) has developed a mathematical calculation to evaluate risk factors for manual material handling tasks, such as lifting and lowering. According to NIOSH, the maximum recommended load weight that a healthy worker can lift under ideal conditions is 51 pounds. When six other variables are multiplied into the equation (horizontal location of the load; vertical location of the load; distance the load is moved; degree of twisting required; frequency and length of lifting activity; and the worker's grip on the load), that maximum weight decreases.⁹

Companies that are well versed in these ergonomic issues often have dedicated Health, Safety and the Environment (HSE) teams to ensure workers are safe on the job. They have already established safe handling practices, such as blocking warehouse aisles when forklifts are retrieving or placing items stored at heights and using spotters to warn pedestrians and other workers in the area of activity overhead. Others have begun lowering the maximum load weight they will allow an employee to lift unassisted to 35 pounds – a full 16 pounds less than the NIOSH recommendations – as an aggressive measure to further prevent musculoskeletal disorders.

NIOSH and OSHA recommend that workers use powered equipment – such as automated storage and retrieval systems (ASRS)¹⁰ and cranes outfitted with an electric hoist¹¹ – as an alternative to lifting loads manually.



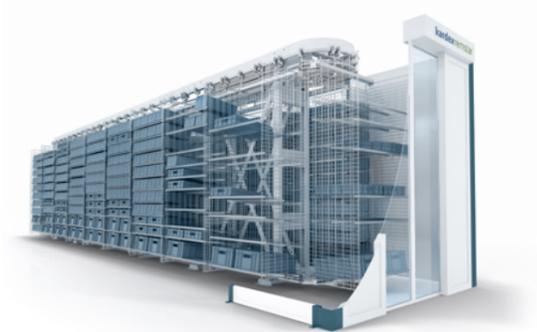
Solution: ASRS minimize exertion

Automated technologies maximize storage density, and provide workers more distance from one another by eliminating pickers walking up and down aisles and searching for stored items – an activity that can waste as much as 60% of their productive time.⁵ Automation keeps workers safe within their assigned workstation, less fatigued and more productive. Installing one of these systems can cut labor requirements by as much as 66%, enabling current employees to be reassigned to more value-added work while easing hiring pressures and labor expenses.

Horizontal Carousel Module (HCM)

Consisting of bins mounted on an oval track that rotate horizontally to deliver stored items to an operator. These automated storage and retrieval systems save up to 60% of floor space when compared to standard shelving and rack.

[Learn more about HCMs.](#)



Vertical Carousel Module (VCM)

Comprised of a series of shelves that rotate around a track – similar to a Ferris wheel – these automated storage and retrieval systems quickly deliver stored items to an ergonomically positioned work counter at the operator's command. When compared to static shelving and rack, they save up to 75% of floor space.

[Learn more about VCMs.](#)



Vertical Lift Module (VLM)

An enclosed automated storage and retrieval system that incorporates two columns of trays with a central inserter/extractor that automatically locates and retrieves stored trays from both columns, then presents them to the operator at a waist-high pick window. These systems save up to 85% of floor space compared to static shelving and rack.

[Learn more about VLMs.](#)

Vertical Buffer Module (VBM)

In the middle of a multi-segment shelving system is an aisle, where a moveable mast with a telescopic gripper operates. The control unit sets the gripper in motion picking a bin and transporting it to a picking station.

[Learn more about VBMs.](#)





Minimize fatigue, improve accuracy

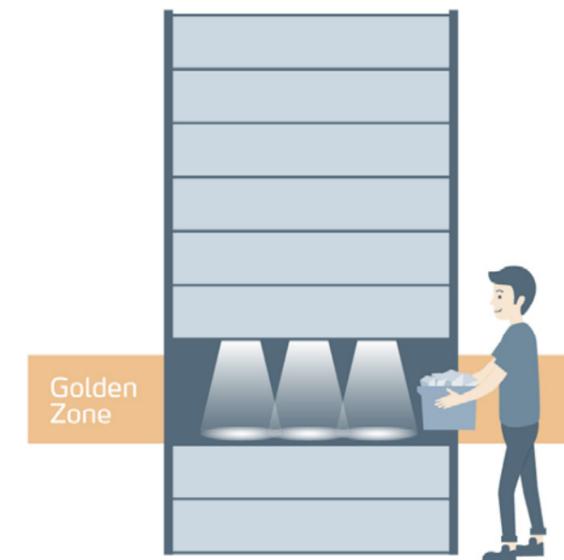
Automated storage and retrieval systems eliminate unproductive and physically tiring travel and search time by delivering required items directly to the operator on command. Workers in conventional warehouses spend as much as 60% of their time walking to product,¹² searching for it on a shelf and climbing on a ladder to reach items stored high or kneeling to access items stored low. With an ASRS, a worker no longer has to spend as much time on travel or retrieval of items. Not only does limiting an operator to just a few steps to complete picking tasks dramatically reduce fatigue, it also boosts picking rates by as much as 600%.

Further, a less-fatigued worker is a more accurate one. Tired operators are more likely to make mistakes. In addition to minimizing fatigue caused by exertion, these automated goods-to-person systems can prevent errors when equipped with a variety of supporting technologies. Additions such as light-directed picking systems and monitors that display images of the items to be picked further errors, resulting in up to 99.9% picking accuracy.

Go for the gold(en zone)

Every item stored in an ASRS is delivered to the operator at the optimal ergonomic work height, called the “Golden Zone,” or waist-high. (In the case of a HCM, the addition of a lift table — coupled with proper slotting to ensure the most-frequently-picked items are at waist height — achieves the same ergonomic benefit.) Shelves, trays, totes or bins of products presented in easy reach eliminates bending down to retrieve an item stored low or stretching up to grab an item stored high.

The machines also minimize unnecessary or excessive motions required for retrieval of items from drawers or shelves, such as reaching, stretching, bending, pushing, pulling, or stooping. Likewise, ladders, climbing and forklifts are not needed to place or retrieve items.



Further, VLMs can be equipped with a manual or automatic tray extractor for even easier load handling. With a manual extraction device, the operator can easily glide the tray completely out of the VLM and onto a cart. The tray of items can then be rolled to any destination within the facility, such as a workstation for parts kitting or a work cell that requires tooling stored within the VLM.

Upon its return, the extraction device accepts the tray with minimal operator effort. Ideal for heavier loads (such as dense, heavy parts, tooling, dies, molds and other components used in manufacturing or field service and support operations), the automatic tray extractor mechanically slides the tray out of the machine. This ergonomic assist function prevents a worker from having to reach inside the system to pull the tray or item out.

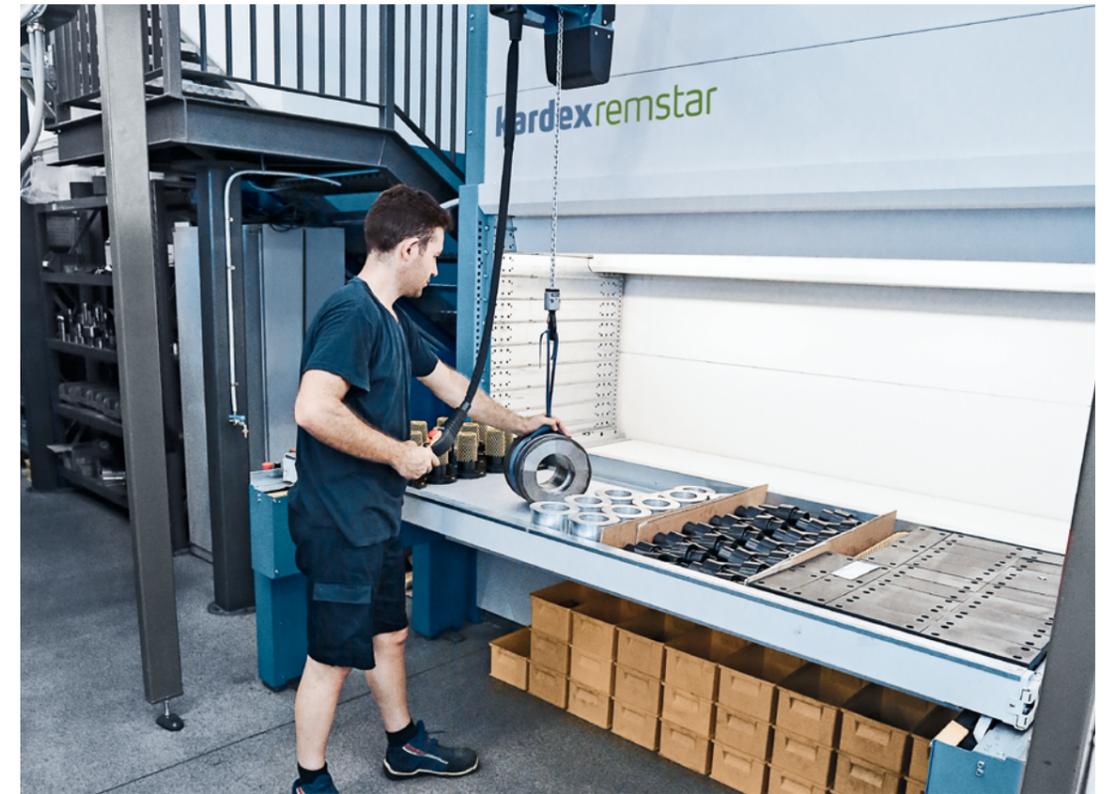


Need a lift? Add a hoist

VLMs can be engineered to hold a range of different load capacities per tray, including 4-foot-wide goods weighing more than 2,200 pounds up to 13-foot-wide items weighing more than 1,700 pounds. Loads that heavy are impossible for an operator to lift. For such situations, a VLM can be equipped with an integrated, overhead crane and electric hoist to provide further ergonomic handling assistance.

With a hoist rated for loads more than the 2,200-pound VLM tray limit, an operator using a handheld, wired control pendant can safely and confidently direct the lifting of the load from the tray, then position it as needed. To accommodate different load types, the hoist can be outfitted with a variety of customized below-the-hook attachments, end effectors or specialized tooling. For safety and control, the hoist maneuvers the load to its destination precisely, at a fraction of the rated speed.

The hoist takes the strain of lifting the load off the worker, further reducing fatigue and lowering injury risk. It also handles products gently to minimize damage and waste. Unlike forklifts, which are involved in 20,000 serious injury accidents and 100 deaths annually¹³ and can be costly to own and maintain, the integrated crane and hoist operate only with the VLM. This ensures the device is always readily available when needed to transfer a heavy item into or out of the storage machine, unlike overhead warehouse cranes engineered to maneuver large loads throughout a facility.



Other benefits

Not only do ASRS eliminate the fatigue and errors associated with walk and search time and substantially decrease the risk of worker injury, adding these ergonomic systems positions an operation to significantly reduce absenteeism, insurance premiums and claims for worker's compensation.

Additional benefits include highly dense storage, reducing floor space requirements by as much as 80%; fast access times; computerized inventory control for simplified warehouse management; and interface modules that communicate with other warehouse management systems (WMS) and enterprise resource planning (ERP) systems.

ASRS with integrated lift-assist in action

Kardex Shuttles help Christie lift heavy projector components

Projection technology manufacturer Christie custom-builds systems for cinemas, education, media, government and more. When the company sought to double its inventory of sub-assembled projectors, it switched from a cart-based storage system to two Vertical Lift Module Kardex Shuttles.

The VLMs each hold 100 sub-assembled projectors with room for more. Each VLM occupies only 180 square feet, compared to the 600 square feet occupied by the previous cart system, providing 70% floor space savings. In addition to these benefits, the company has improved both ergonomics and safety — thanks to the VLMs' integrated, ergonomic tray extractor and lift-assist hoist.

With each projector weighing approximately 52 pounds, "the projectors are very heavy and lifting them puts the employee at risk of injury and the projector at risk of damage," explains Philip Hibberd, Senior Manufacturing Engineer at Christie.

When the projectors were stored on carts, employees had to push and pull them around, contributing to fatigue. Once a cart reached its designated production station, hoists were available to transfer the projector — but not all employees utilized the hoists, putting some at risk for back injuries.

Alternately, the new VLMs are equipped with automatic tray extraction and a hoist mounted at the operator access point. The operator processes the order with the click of a button, and the VLM retrieves the tray with the required projector. Once the tray arrives at the opening, it is automatically pushed out onto an extraction table for easy access. A software screen identifies the projector's storage position in the tray.

Because up to five sub-assembled projectors rest closely together on the trays for maximum storage density, workers must use the ergonomic hoist to easily access them. To pick, the operator uses handheld controls to position the hoist over the item, hooks the two together, and again uses the controls to lift the load. With the controls the operator guides the hoist to move and lower the projector onto a transfer cart, where the two are disconnected. After pushing a button to confirm the pick, the tray automatically retracts into the VLM.

In addition to introducing a safer, more ergonomic process by deploying the hoist-supported VLMs, projectors are retrieved 90% faster with half the number of employees previously required.



About Kardex

Kardex is a global industry partner for intralogistics solutions and a leading supplier of automated storage solutions and material handling systems. The Group consists of two entrepreneurially managed divisions, Kardex Remstar and Kardex Mlog.

Kardex Remstar develops, produces, and maintains dynamic storage and retrieval systems and Kardex Mlog offers integrated materials handling systems and automated high-bay warehouses.

The two divisions are partners for their customers over the entire life cycle of a product or solution. This begins with the assessment of customer requirements and continues through planning, realization, and maintenance of customer-specific systems. It ensures a high level of availability combined with low total cost of ownership and operation.

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