

Warehouse Insights

Maximizing Warehouse Space



High-density storage

Facilities using shelving to manage inventory often find themselves squeezed for space. Before you tear down walls to expand or sign a lease for an additional facility, be sure you're maximizing the warehouse space you currently have. A reorganization of your current warehouse might not be the answer to your long-term space problem, but you might be able to recover enough space to delay your expansion or relocation decision.

By design, shelving has three main space limitations:

1. **Wasted storage capacity**
2. **Wasted aisle space**
3. **Wasted ceiling height**

Unless you move or expand the size of your current warehouse, space isn't going to increase (it may even be decreasing). High-density storage can be used to recover up to 85% of the floor space currently occupied by shelving and drawers by eliminating the aisle spacing and utilizing the full ceiling height of your facility.

Are you not familiar with high-density storage systems?

Thousands of organizations throughout the world have used high-density storage – such as Vertical Lift Modules (VLM), Vertical Carousel Modules (VCM) or Cube Storage Automation Systems – to increase storage capacity and avoid costly brick and mortar expansions or relocations.

Let's get some of your questions answered:

- How can you find space in your current facility?
- Exactly how much shelving or drawers can you replace with automation?
- What's the monetary value of that space savings?



[Discover automated order picking by Kardex Remstar](#)

[See how Cube Storage Automation works](#)

Limitation #1 Wasted capacity in low-density shelving

The first place to look to recover valuable storage space is within the shelving itself. Most shelving is set up for a standard 20, 40 or 60 cm vertical spacing when it's installed and years later is storing products far too small for the space. If your shelving is spaced 30 cm apart and storing a 15 cm tall product – that wasted vertical space adds up.

Also, each shelf should store products of similar height. If all products on a shelf are 10 cm tall and there is one 25 cm product, the whole shelf needs to accommodate the 25 cm product. Lastly, check behind stored products. Often, the items get pulled to the front of the shelving for easy access, leaving wasted space at the back.

You'll be surprised how much space you can recover by simply re-slotting a few items and adding a few more shelves. It's a labor-intensive task and depending on the condition of your warehouse can be dirty – but well worth it in the end.



Solution #1 Increase capacity with high-density storage

ASRS provide high-density storage on trays and shelves, or within a cubic grid system. For example, within a VLM trays are stored on 25 mm centers – meaning if you have a 125 mm high product in a tray, the VLM stores it in a 150 mm space – utilizing every cubic meter of space. When your product mix changes, so does the tray spacing. Each time a tray is returned into the machine the height of the products on the tray is scanned and the storage location is dynamically adjusted to use the least amount of space. A 125 mm product requiring a 150 mm storage space automatically adjusts to a 200 mm product requiring a 225 mm storage space – no lost capacity.

Similarly, carriers within a VCM can be fitted with shelves and drawers to provide the exact storage heights your product mix requires. When compared to wasted capacity within manual shelving, these automated systems recover a tremendous amount of capacity.

 [Check out the Buyer's Guide – Vertical Storage Solutions](#)

The Cube Storage Automation System AutoStore™ enables high-density storage in the smallest possible space. Items are stored in bins that are neatly stacked next to and on top of each other inside an aluminum cubic grid system. Robots are presenting these bins at workstations which can be installed on any side of the grid, in a tunnel, or above / below the grid on a different floor level.



Limitation #2 Wasted aisle space

Once you've squeezed every square centimeter of space out of your shelving and you're still looking for more – it's time to take notice of your aisle space. Workers travel up and down aisles to access products stored on shelving. These aisles need to be a minimum of 1 m wide to accommodate workers and simple handcarts.

If you need to access products with a pallet truck, the aisle space increases from 1.25 to 1.5 m wide. If a product needs to be accessed with a forklift, it's far greater as you need to accommodate the length of the forklift plus an additional 30 cm of maneuvering space. A standard forklift can require 3.5 m aisles – you can get this aisle space down to around 1.25 m with a narrow aisle order picker.

In most shelving systems, aisle space accounts for over half of the warehouse space used. Eliminating wasted aisle space alone can double your warehouse capacity.



Solution #2 Eliminate wasted aisle space with high-density storage

Vertical storage systems are fully enclosed units accessed by an operator from one pick window or access point. An access area of 1 to 1.5 m in front of the unit is recommended. This reduces multiple aisles required in shelving to one single aisle for access to all stored products.

The Cube Storage Automation System AutoStore works completely without aisles and racking, reducing space consumption by 75% compared to traditional storage.

Consolidating all the aisle space found in a typical shelving system into one access point recovers a considerable amount of floor space. This recovered floor space gives you room to expand operations internally, avoiding a costly facility move or expansion (not to mention eliminates the time workers spend walking and searching through shelving as all stored products are now delivered directly to the worker).



Limitation #3 Wasted ceiling height

The average ceiling height for manufacturing facilities and distribution centers range from 7 to 15 m. Older buildings (pre 1970's) tend to be closer to the 7 m mark, while more recently constructed buildings are closer to 15 m tall. Standard industrial shelving is typically up to 3 m in height. Filling a 7 m tall warehouse with 3 m tall shelving leaves quite a bit of wasted space.

Standard pallet racking comes in a wider variety of heights – reaching 12 or 13 m. While this can utilize ceiling height better, it creates a variety of other challenges. Workers now must use forklifts to access products (leading to wider aisle space as discussed above) or employees need to climb ladders to access products slowing productivity and creating an ergonomic headache.



Solution #3 Utilize ceiling height with vertical or cube storage

By delivering goods to the operator, vertical automated storage systems are designed to take full advantage of the entire ceiling height, up to 30 m, to maximize every square meter of space within your facility. High-density vertical storage solutions can be customized to the height of your existing facility, with the average unit height being around 7 m.

In some cases, warehouses with limited ceiling heights have constructed a vertical storage unit outside of the existing building, enclosed it and provided access to the unit through an existing exterior wall. This allows the benefits of the storage height without the restriction of the building ceiling – avoiding leasing an additional facility or a full building expansion.

An alternative is a cube storage system like AutoStore, ideal for facilities with nearly any ceiling height. The bin storage cube can be configured up to a height of 5.4 m, plus a minimum of 1.6 m extra space for the robots to drive on top of the cube. Higher storage heights are possible by building AutoStore systems on mezzanine platforms. It is also possible to install a mezzanine above the AutoStore cube, which offers extra space for the workstations or other manual areas.



Capacity savings by ceiling height

The number of shelving or drawer sections that can be replaced by one vertical storage system is dependent on your ceiling height. The taller your ceiling, the more floor space you can save. For instance, a 4.5 m tall automated vertical storage unit can replace 9-10 m sections of shelving or roughly 19 drawer cabinets. A 12 m tall high-density vertical storage unit can replace 100 sections of shelving or 65 drawer cabinets. In the chart below, locate your facility's ceiling height in the left column to determine how many sections of shelving or drawers one vertical storage unit can replace. Need to replace more? No problem, vertical storage solutions are designed to work together in workstations or pods for maximum productivity.

Recovered wasted rack & shelving space using vertical automation

Celling height	Eliminated shelving sections	Space savings (percentage)	Space savings (m ²)
4.5 m	31-35	76%	29.4 - 30.4 m ²
6 m	45-49	82%	42.8 - 43.8 m ²
7.6 m	59-65	85%	52.8 - 57.2 m ²
9 m	73-80	88%	66.2 - 67.2 m ²
10 m	87-94	89%	76.2 - 80.6 m ²
12 m	to 100	91%	to 86 m ²

Recovered wasted drawer system space using vertical automation

Celling height	Eliminated drawer cabinets	Space savings (percentage)	Space savings (m ²)
4.5 m	19	53%	8.3 m ²
6 m	28	66%	14.6 m ²
7.6 m	36	74%	20.9 m ²
9 m	46	80%	28.8 m ²
10 m	55	83%	36.7 m ²
12 m	65	86%	44.6 m ²

The value of space

In a manufacturing and distribution facility, it costs on average EUR 75/m² annually. While the space itself might not be too costly, everything you need to run and manage operations in that space adds up.

Consider the operational costs of an additional warehouse:



Staffing: Running two facilities requires additional staff (or asking current staff to travel between two locations). Additional staffing will add costs and can impact employee morale. With the majority of the operation happening at one location, it's only natural the "other" location will feel left out or "less-than".



Additional IT: Don't overlook the IT support and infrastructure for a second location including phone systems, internet access and additional employee workstations.



Freight costs: The cost of moving goods between locations will add up quick. Consider the cost of dedicated transport (daily/ weekly) or adhoc transport of goods or equipment that needs to be combined with goods or equipment at the other location to execute a process and complete a task.



Consolidation of operational activities: Internally combining the activities at two locations into one business result can get tricky. Consider how you will report on total operational results and how to manage all inventory spread over two locations.

With the average cost of a high-density vertical storage unit starting around EUR 30,000 – EUR 50,000 it makes sense to learn if an automated solution could eliminate or delay your need for an additional facility. Kardex experts can evaluate your current space-related expenses and share how an ASRS will reduce costs while saving you significant space.

i Learn everything about the cost factors that support the investment into an AutoStore solution

DC Dental: Realizing the value of space



A full-service dental supplier, DC Dental inventories over 20,000 SKUs in their distribution center in Baltimore, MD. When an acquisition increased their SKU capacity by 54% overnight, DC Dental was facing a costly expansion.

Instead, they implemented automated storage and retrieval systems into their existing operations, consolidating roughly 1200 m² of shelving into 325 m², saving 73% floor space. This recovered floor space allowed DC Dental to reduce the overall footprint of the facility from 2800 m² to 1850 m². They resigned their lease, saving nearly \$1 million dollars in rent and utilities over the next 10 years. Combining this space and capacity savings with the 67% labor savings, ROI justification for this project was easy.

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