

# OPTIMIZING EFFICIENCY IN DEEP STORAGE OF PALLETIZED LOADS

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## INTRODUCTION

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Shuttle-based storage and retrieval systems designed for deep-lane storage of high-volume palletized SKUs deliver an attractive ROI for companies with small, medium and large storage needs. Fully-automated systems, such as PowerStore® from Swisslog, are highly configurable in size and shape, capable of integrating into existing brownfield or greenfield facilities with low ceiling heights to maximize density and efficiency within beverage, packaged foods, cold storage and consumer goods warehouses.

Supply chain executives within the food and beverage, pharmaceutical and consumer products industries are faced with considerable challenges when balancing production runs, inventory volumes and delivery schedules. Warehouse managers are increasingly required to store more products in existing warehouses, to retrieve them faster for growing volumes of just-in-time orders to retail stores, make more efficient productive use of labor, reduce energy consumption and improve cost efficiencies. Inventory is costly. It requires facilities, labor, energy and equipment to manage it. If the manufacturer is warehousing items that require refrigeration or freezer storage – such as food, beverages or pharmaceuticals – costs can be amplified substantially.

“Food manufacturers are being saddled with having to maintain more inventory at the plant, as opposed to the retailer or the distribution center,” said James Sharples, VP of Global Business Acceleration, with Swisslog Logistics, Inc. “This has put considerable pressure on manufacturers to figure out ways to better utilize their warehouse space.”

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Space utilization within production warehouses is at a premium, and they are consistently running out of space. Finished products are frequently stacked on floors and aisles, which contributes to increased fork truck accidents, spillage and damaged products, and lost and expired inventory – particularly troublesome in food and beverage, and pharmaceutical environments. The continuous increase in the cost of land, construction, labor and facilities has put a heightened demand on space utilization within these production warehouses.

Consequently, manufacturers are more closely looking at their storage, and how they can optimally balance their inventory against production and delivery.

# REMOVING THE BARRIERS TO HIGH-DENSITY STORAGE IN BROWNFIELD FACILITIES

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Many production warehouses handling food and beverage, pharmaceutical and consumer products have been limited in automated pallet-handling solutions because of their relatively low ceiling heights.

These factors, along with increased volumes of product throughput, the inclination for longer production runs when feasible, and the addition of new product lines, is forcing an increasing number of manufacturers into utilizing 3PLs or renting outside space to store manufactured products. But this presents a new set of issues. Although most contemporary 3PLs run highly efficient operations, transporting pallets of product to off-site storage incurs rental costs, increased transportation costs, and loss of last-touch product control, which can increase product damage and returns.

But now, this scenario has taken a dramatic turnabout. A growing number of manufacturers are moving their high-volume, palletized SKUs away from stationary rack storage locations, away from floor staging, and to some degree away from remote warehousing sites. Instead, they are embracing highly automated, shuttle-based pallet deep-storage systems, which can provide excellent density and flexibility to fit easily within existing low-ceiling-height brownfield facilities. These systems are accommodating pallets from their conventional racking, floor staging and much of their remote warehousing, while enhancing the value of their current assets.

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## POWERSTORE: THE WORLD'S LEADING PALLET SHUTTLE SYSTEM

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One such system is PowerStore®, from Swisslog Logistics Automation. A mobile robotic, shuttle-based storage and retrieval system designed for deep storage of palletized loads, PowerStore adapts to any warehouse, regardless of size constraints, to retrofit existing space into a fully-automated warehouse solution.

PowerStore enables warehouse operators to optimize for system flexibility, modularity and scalability. Existing warehouse space can accommodate the racking structure required, with no need for new construction or floor slab modification, making this solution very well suited for retrofits into existing buildings.

The system delivers an option in automated pallet storage that is truly unique. By providing a dynamic combination of high density and high throughput, it enables a high-performance, lean warehouse storage solution, designed to maximize capacity in either high-bay or lower-ceiling-height facilities, whether greenfield or brownfield sites. This is ideal for manufacturers and distributors, including those in the cold-storage food and beverage industries,



# POWERSTORE: THE WORLD'S LEADING PALLET SHUTTLE SYSTEM

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whose operations demand flexible high-density storage for high-volume, limited-SKU counts.

PowerStore uses automated storage and retrieval shuttles to transport pallets within the system's aisles and rows, along with lifts and transfer stations to vertically move pallets between aisle levels. Palletized product is stored in highly-dense rows – up to 20 pallets deep of the same SKUs.

The aisle carriers, traveling at speeds up to 5 m/s, transport row carriers, with or without a pallet loads on them, between the vertical conveyors and the designated rows. The aisle carriers establish absolute positioning along an aisle rail through laser positioning.

Row carriers, traveling at speeds up to 3 m/s, retrieve pallets from, and deliver to, transfer stations at the vertical conveyors. The row carriers utilize a precision laser for positioning, and wireless Ethernet/IP for communication with the aisle carriers. Row carriers are designed to handle various pallet types – such as CHEP, EURO, Blockpallet, Stringer and AS, with load requirements up to 3,400 pounds.

The vertical conveyors and transfer stations utilize a single-mast design which accommodates fast and effective pallet movements between levels. The vertical conveyors lift and lower pallets at a speed up to 2 m/s.

Aisle and row carriers, working in combination with vertical conveyors and transfer stations, constitute a single module of the PowerStore system, with throughput capability of up to 200 pallets per hour, per module.

A typical PowerStore system consists of multiple modules working in coordination, controlled and monitored by flexible software components designed to solve complex distribution requirements, and seamlessly integrated with the company's ERP or host system.



# BENEFITS OF POWERSTORE

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## Flexibility and Scalability

Seasonal influences, expanding numbers of SKUs, and the rise and fall in the popularity of items, necessitates the need for highly flexible and scalable requirements in an automated storage and retrieval system.

The scalable design of PowerStore allows it to be easily installed and implemented in any existing or greenfield warehouse or distribution center. It is ideal for both high-bay and lower-ceiling height applications, and facilities with unusual configurations, allowing for any number of modules, levels, aisles, rows and pallet locations. Designed for high throughput, PowerStore can easily be extended or contracted as needed to accommodate changes in SKU models and throughput volumes.

PowerStore can be configured to different lane depths to accommodate SKUs of varying batch sizes. Deep-lane and shallow-lane storage can be easily achieved within modules, without any additional equipment, and little or no modification to the system.

In addition, PowerStore offers the flexibility to adapt the lane depth between aisles to support specific application objectives. In some cases, a traditional balanced configuration in which each aisle carrier supports half of the rows within a section will be preferred. However, aisle carriers can also be configured so that one reaches more rows to support large batch sizes, or each aisle carrier

can reach all rows to support redundancy, capacity or inventory management strategies, such as FIFO. The depth of each carrier can be continually adjusted as needs change.

Unique to PowerStore, FIFO is more efficiently accomplished than with other deep-lane systems. Taking advantage of flexible lane depths, aisle carriers can be configured to access all rows within a section and pallets can be easily moved and reconfigured during low-production periods to accomplish FIFO and LIFO requirements.

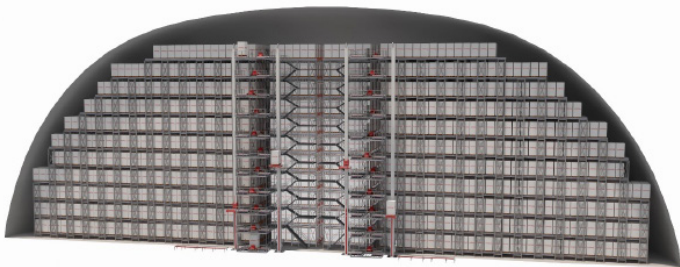
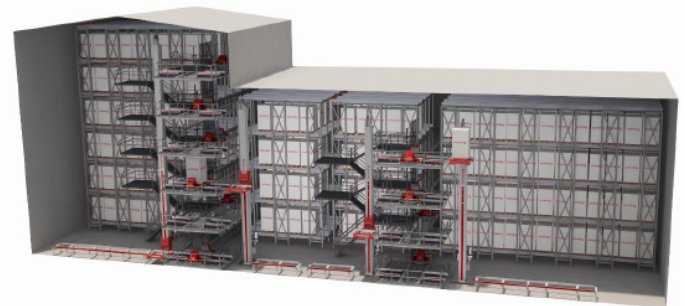
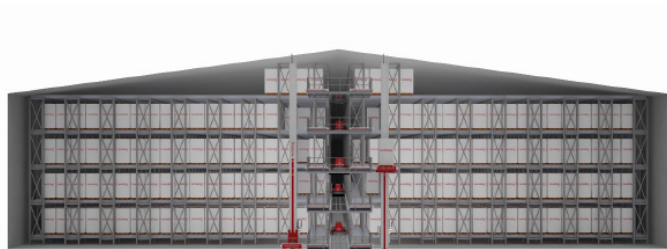
Although ideal for low-bay, brownfield applications, if SKU volumes and throughput requirements are compatible, PowerStore can present an extremely efficient solution for high-bay environments up to 100 feet in height.

## High Storage Density

PowerStore has a space configuration that allows for the maximum number of pallet positions to fit into the system, and utilizes both the footprint and the facility height optimally. With flexible lane depth, PowerStore shuttles can access all positions in all rows to maximize system storage density.

## High Throughput

PowerStore operates differently, having one mobile robotic shuttle for each aisle and level in a module, it can perform more pallet store-and-retrieve cycles per hour, thereby delivering a higher throughput.





# BENEFITS OF POWERSTORE

## Redundancy

Central to the performance capability of PowerStore is its ability to access inventory, despite a section of the system being down for maintenance or repairs of shuttle.

With PowerStore, SKUs can be located on different aisles and different aisle levels, and over separate modules, effectively providing three-to-five times more SKU redundancy. This means that when a PowerStore aisle/row carrier is down the impact on SKU accessibility is considerably lessened.

"With PowerStore, if more than one module is built into the system, you would not put all of your SKUs into one module," said James Sharples, VP of Global Business Acceleration, with Swisslog. "You would give yourself the flexibility and spread out your SKUs across the modules to make sure you had access to them. And even spread them out across different levels within a module, which is an added layer of redundancy."

Alternately, enabling aisle carriers to access all rows within a section of the system enables all pallets within the system to be retrieved even if a row or aisle carrier is taken offline for service.



## Vitro Group Leverages PowerStore's Density and Efficiency for New Automated Warehouse

Frozen food producer and distributor, Vitro Group, chose PowerStore for their new automated warehouse in Spain. PowerStore delivers the storage capacity, operational efficiency, flexibility and availability the company needed to optimize its innovative new warehouse for speed and agility of order fulfillment. The modular PowerStore system was designed to meet the company's current demands and future requirements.



# COLD-STORAGE ENVIRONMENTS

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An increasing number of supply chain manufacturers, including food processors, bottlers and distributors, require 24-hour operation at maximum throughput in cold-storage facilities. But many of these warehouses are brownfield sites with low ceiling heights, making them ideal candidates for automated shuttle systems. Without PowerStore, warehouses depend upon the accelerated use of fork lifts maneuvering pallets into low-bay racking and staging for shipping, which is both highly labor intensive and space consuming.

Manual pallet handling in cold-storage warehouses can be particularly difficult. Compared to ambient-temperature facilities, many manually-operated cold-storage warehouses are plagued with a higher incidence of wrong item fulfillment and poor product rotation which increases returns, shipping costs and labor.



Cold-storage warehouses also have heightened facility, equipment and product damage, primarily caused by manually-operated forklifts impacting racks, doors, walls and product cases – significantly higher than that found in warehouses with ambient temperatures. Personnel turnover in cold-storage warehouses is also higher than in ambient-temperature facilities. The extreme temperatures create difficult working conditions for personnel, heightened safety issues, and staff recruitment and retention problems.

PowerStore provides a highly-automated solution to these cold-storage issues and is ideal for low-bay, brownfield sites. PowerStore can perform in various temperature zones including deep-freeze environments. The system has a temperature range from -22 degrees F – 113 degrees F and the shuttles 5 HP motors generate minimal heat, reduce the refrigeration load and cut energy costs.

## ATTRACTIVE SOLUTION

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"The ability to put this system into a brownfield low-ceiling height facility is a critical factor for many end users," said Rupesh Narkar, Sales Director for Swisslog. "This is what the system was originally designed to support."

PowerStore is most frequently utilized when throughput is high, SKU-mix is medium-to-low, and ceiling height restrictions are 30-feet or lower. Its technology is based upon providing two fundamental conditions: a) maximum pallet storage density, with total control of SKUs; and b) throughput balance, so as to store and retrieve pallets without creating bottlenecks in production or shipping.

To this end, PowerStore provides an attractive ROI for companies in the food and beverage, pharmaceutical and consumer products industries with small, medium and large storage requirements.

"What I have been observing over the past year or so is a very welcoming acceptance of the PowerStore solution in the distribution, automotive and pharmaceutical industries," explained Narkar. "The industry is moving toward modular solutions that have an aspect of scalability. And PowerStore offers that."

