New storage and picking technologies are stealing the limelight, but horizontal and vertical carousels and VLMs still have a place in the tool kit.

By Bob Trebilcock, Executive Editor
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When it comes to automated storage and picking technologies, “no single size fits all requirements,” says Dan Boone, quality manager for Plasser American Corp., a manufacturer of maintenance equipment for the railroad industry. “We’re using the best tool for the job.”

Boone was referring to his selection of vertical lift modules (VLMs) and a pick-to-light order fulfillment solution to manage $16 million worth of service parts in a Chesapeake, Va., manufacturing and distribution facility (see below). New automated storage technologies like shuttles were likely on every distribution center manager’s wish list during the holiday season. Yet, when it comes to space and cost per storage unit, carousels still have a lot to offer in the right application.

“When with the right product line, order profile and application, carousels should be considered as part of the solution in a blended system,” says Don Derewecki, a senior consultant with St. Onge Company.

Historically, the right application has been maintenance parts to support a production line; spare and service parts distribution; kitting; and put-to-light or pick-to-light order fulfillment in some retail applications. For instance, carousels have been effectively used to consolidate picking of slow-moving parts. Because they can be enclosed, carousels are a good choice in high-security applications. They can also be independently climate controlled for product that is sensitive to temperatures or humidity. Most importantly, they’re not a one-size-fits-all solution, but a component of a broader system.

Let’s make the case for carousels.

**Steady versus sexy:** Carousels aren’t sexy, but they are steady. “Carousel technology has been perfected over decades,” says Ed Romaine, chief marketing officer for Integrated Systems Design. “They are relatively easy to maintain, and they now have the best of today’s controls.” What’s more, they work well in distribution environments where space and productivity are at a premium. “A horizontal carousel will take up 70% less floor space than conventional storage for the same amount of inventory,” says Romaine. “If you’re picking slow- to medium-movers, the sweet spot is 250 to 550 lines per hour.” That can be increased if you stack units or add multiple picking pods.
Keep it simple: Order fulfillment has become much more complex. However, applications where a simple, high-density, space-saving automated storage technology fits the bill still exist. “We do not see carousels in fast-moving e-commerce applications,” says Tim Archer, a sales training manager for Kardex Remstar. “However, carousels deliver an attractive cubic-foot-to-square-inch ratio, and it’s a simple storage method.” Hospitals, for instance, are adopting horizontal and vertical carousels in their central storage areas, where the value of the inventory is high and space is limited.

Balancing productivity gains against the cost of those gains: “In a typical Pareto distribution of slow-, medium- and fast-moving SKUs, you can often get the best bang for your buck with a horizontal carousel,” says Tom Coyne, CEO of System Logistics. “There may be a little more walking compared to a mini-load or shuttle system, but carousels eliminate the walking associated with a conveyor-based picking system.” On the other hand, a carousel doesn’t require a conveyor to deliver a tote to a workstation, which can reduce the cost of the solution. Why haven’t carousels gotten more love lately? Coyne attributes to the introduction of competing technologies, like shuttles, just as the carousel industry went through a shakeup. “As the new technologies are maturing, some customers are evaluating carousels versus shuttles and mini-loads,” Coyne says. “We could see a comeback of carousel technology.”

They can be highly automated: For end users looking for high degree of automation, horizontal carousels can be stacked on top of one another and equipped with extractors that automatically remove totes or cases and deliver them to a takeaway conveyor, much like crane-based technology. “There are cost/throughput issues to consider,” says Coyne. “An automated carousel system can provide better throughput than a mini-load. However, mini-loads are better at sequencing the delivery of product.”

Still drawbacks: Carousels aren’t right for every application. Fast-moving SKUs are better suited to a shuttle or a pick-to-light mezzanine. What’s more, it’s not efficient to pick and replenish at the same time—something that can be readily done with conventional picking, a mini-load or a shuttle. But, as Derewecki says, if you do the analysis, “you should look at all the viable alternatives and in many cases, carousels are a viable alternative.”

Making the most of all the tools in the toolbox

Two years ago, Plasser American Corp. faced a challenge at its Chesapeake, Va., plant: Business was good. A manufacturer of high-end machines that maintain, straighten and strengthen existing railroads and transit systems, Plasser needed more space for production and finished goods warehousing. “Our choice was to build a new production building or tighten up storage in the warehouse,” says Dan Boone, quality manager. “Production wanted to consume some of our service parts storage space rather than build.”

One of the areas targeted for space reduction was a 35,000-square-foot stock room that held more than $16 million in spare parts. Roughly two-thirds of the 18,000 stock keeping units (SKUs) were stored in a two-story mezzanine with 19,000 square feet of bin shelving that occupied 4,875 square feet of floor space. Seals, small parts and electronics were stored on the upper level and bushings, bearings, valves and machined parts on the lower level.

The remaining 5,000 SKUs, comprised of the largest and bulkiest parts, were stored in a bulk storage area that took up 18,000 square feet in the stock room. Boone believed they could find a better way to store that material.
“Our warehousing system had been static for a number of years,” he says. “Given the opportunity to upgrade, we wanted to see what other tools were available on the market.”

The solution was to replace the mezzanine bin system with eight vertical lift modules (VLMs) that hold 13,000 of the 18,000 SKUs. Each VLM unit measures just more than 9 feet wide and 10 feet deep. In all, VLM spare parts storage now occupies just 1,440 square feet of floor space—a 70% savings in floor space.

The solution also features a light-directed, goods-to-person order picking area in the center of the units, where parts are delivered directly to the order selector. Since order selectors no longer walk to pick locations, picking labor has been reduced by 20% and order pick accuracy has increased from 98% to 99.7%.

For the remaining open floor space, Boone chose a high-density, mobile shelving system that can handle large, heavy-duty parts. The system includes seven mobile rack carriages: Each carriage is 8 feet wide, 32 feet deep and up to 18 feet tall with the ability to carry 16,000 pounds per upright. The carriage aisles can expand like an accordion to accommodate an order selector or a lift truck and then contract afterward for high-density storage. When completed, the warehouse was able to release approximately 10,000 square feet of floor space to production. “We learned that there are more tools in the toolbox than just shelving and racking,” says Boone.

**Redesigning the space**

In the old configuration, the stock room was split into two sections. Smaller parts were stored in the front section while the back section was reserved for storing larger parts. The second floor of the mezzanine was used for seals, small parts and electronics.

Picking was highly manual. Using a list of printed labels, an order selector walked through the mezzanine to each part location to collect the required parts. Generally, one worker picked one order at a time but larger orders could be picked by two people by simply dividing up the labels. In that case, one worker picked the small parts and another picked the large parts. They combined the parts into one order in shipping.

As part of the process, selectors had to bend down low or reach up high to access parts. If a part was stored on the second level of the mezzanine, they had to carry them down to the first floor to fill an order. “The ergonomics had room for improvement,” says Boone.

To combat high humidity, machined and electronic parts were stored in anti-rust bags or coated with a preservative that had to be cleaned off before the parts could be put into use. That process resulted in additional labor costs.

The new storage solutions addressed each of those concerns. For one, Plasser was able to remove the mezzanine and store all parts on one level.

To address environmental concerns, Boone brought in a local HVAC contractor to install dehumidifiers to control the air within each VLM unit and create positive pressure. When the shutter doors open to deliver a tray to an order selector, clean air blows out of the unit and prevents dirty air from entering.
“We haven’t eliminated all anti-rust bags and preservatives, but we have lessened their use and we’ve extended the life of the materials inside the VLMs,” Boone says.

Finally, the combination of goods-to-person delivery of parts and a software- and light-directed picking process improved the ergonomics and improved accuracy. In the new process, parts are labeled during the receiving process with a bar code that identifies the part and receipt numbers.

When an order is ready for fulfillment, pick labels are delivered to both the VLM area and the bulk area. On average, 60% of the picking activity takes place in the VLM area.

When the VLM operator initiates a pick, the VLMs move to retrieve the parts required for that order. Using a cart, the operator travels from VLM to VLM. At each unit, the operator is directed to the exact location of the part by lights that display the part number and quantity to be picked. Pick labels are attached to each part as it is picked and added to the order. When complete, the order waits at the VLM area for any additional parts from the bulk area before it is picked up by shipping or production.

In addition to the improvement in productivity, inventory accuracy and cycle counting have been improved. At the end of 2012, the VLM inventory variance was just $500, or 0.01% of misplaced inventory. And, cycle counting now takes half the time.

The wow factor

According to Boone, assigning the right operator to the VLM system was a key to its success. “To get the most from these machines,” he says, “you have to have someone who will take ownership of them.”

Rather than choose a veteran who was well-versed in warehousing, Boone chose a young associate who liked technology. “We felt it was easier to teach warehousing concepts to someone who was comfortable with technology than it was to train someone who was comfortable with conventional warehousing how to use the new technology.”

In addition to improved operations, the system is also used as a selling tool. “When customers come in, they see we have a clean, compact storage area using automated technologies, bar coding and pick-to-light,” he says. “There’s a wow factor that gives them the confidence that we can support their service requirements.”

Despite the advantages of automation, Boone believes that conventional storage methodologies have a place in the warehousing tool box. “We have conventional static racking in other parts of our warehouse and production operations,” he says. “No one size fits all requirements. We’re using the best tool for the job.”