

THE ROBOTS ARE COMING

Robotic materials handling technology is changing the way we move products in the plant and the distribution center.

By Bob Trebilcock, Executive Editor





THE BIG PICTURE:

Where business meets materials handling



Back at ProMat 2007, small crowds gathered around the booths of Kiva Systems, Seegrid and RMT Robotics even though all three had relatively inconspicuous booths. The crowds gathered because each supplier was demonstrating something new: small mobile units that ran around the limited floor space.

Although Kiva displayed an integrated picking solution that included portable storage units, most people didn't quite know what to do with these gizmos. They didn't look like traditional robots since they didn't have arms. But they were also smaller than a traditional automated guided vehicles (AGV) and used different guidance systems.

What they did have was pizzazz. The technology they previewed has since become known as mobile robotics: autonomous vehicles that can shuttle materials around a factory or distribution center. Of course, the materials handling industry is replete with cool technologies that never made it from the exhibition hall to the distribution center floor. Since then, however, the Kiva (781-221-4640, www.kivasystems.com) goods-to-person picking solution has found a home in a number of high-profile warehouses, including the Office Depot facility on this month's cover (see page 20). In addition, Seegrid's (877-733-4743, www.seegrid.com) riderless vehicles are being used by a leading grocer to deliver pallets to the shipping dock so that pickers can remain in the aisle doing more valuable tasks. And, RMT's (905-643-9700, www.rmtrobotics.com) technology is being used to deliver small quantities of parts to the line in lean,

just-in-time manufacturing environments.

They're not alone. At the North American materials handling show, NA 2010, last spring, Axiom (514-352-0500, www.axiumsolutions.com) displayed stationary robotic solutions for building mixed SKU pallets while KUKA Systems (586-795-2000, www.kukanao.com) and Westfalia Technologies (717-764-1115, www.westfaliausa.com) demonstrated a completely automated and integrated storage, picking, palletizing and shipping solution for pallet building.

Fast forward to next spring in Chicago and the Robotic Industries Association (RIA, 734-994-6088, www.robotics.org) will co-locate its Automate event with the Material Handling Industry of America (www.mhia.org) at ProMat 2011 (www.promatshow.com).

What's going on here? In part, it's opportunity. The biggest user of robotic technology is the hobbled auto industry. That has led robotic solution providers to look to the distribution center as a new market. "Today, materials handling is the No. 1 application for robots and the one with the most potential for growth," says Jeff Burnstein, president of RIA (see 60 Seconds with, page 58).

This is not a one-way street, however. Systems integrators and conventional automation providers are seeing an opportunity to integrate robotic technology with their solution sets. Why now? "The technology has become more reliable and the cost of implementing a robot is in line with the cost of hiring an associate in a distribution environment, especially in a multi-shift operation," says Bryan Jensen, vice president of St. Onge Co. (717-505-8016,



www.stonge.com). “That was not the case before.”

Consider some of the offerings coming to market from conventional automation companies:

- Swisslog’s (757-820-3616, www.swisslog.com/na10) AutoStore system for goods-to-person piece picking uses an overhead robot, rather than a mini-load automated storage and retrieval system (AS/RS), to deliver totes to an order selector.

- Dematic (877-725-7500, www.dematic.com/na) is partnering with Kollmorgen, (540-467-3086, www.pick-n-go.com), whose technology converts a traditional lift truck into a laser-guided AGV, to create a new order fulfillment system that incorporates voice recognition and driverless trucks for case picking.

- Intelligrated (877-315-3400, www.intelligrated.com) is offering robotic arm retrofits for its family of Alvey in-line case palletizers.

- JBT Corporation (215-822-4600, www.jbt-agv.com) is developing an AGV mounted with a robotic arm that can retrieve parts from storage and place them on an assembly line.

- If you consider an AGV a mobile robot – and AGV makers are members of RIA–Toyota Materials Handling (800-226-0009, www.toyotaforklift.com) and SI Systems (610-252-7321, www.sipa-systems.com) have added small industrial AGVs to their product lines.

This robot roundup raises several questions for end users: Is it all hype? Where do robots fit today? How are robots being applied? What’s next?

Do the robot

So, is it all hype? After talking to nearly a dozen systems integrators, analysts and robotics companies, it seems we are at an early adoption stage, but something is going on, in part because robotic technology is not new.

“Conventional robotic applications have been around for decades, especially in manufacturing,” says Markus Schmidt, senior vice president

at Swisslog. “What’s changing is the development of mobile robotic solutions that bring scalability and ease of use to markets that weren’t properly served before, like distribution.”

From an operational standpoint, all those years on the assembly line have paid off: Robots are no longer science projects; they are proven and reliable.



The increasing demand to build mixed case pallets is one of the key drivers for stationary robotic materials handling.

From a technological standpoint, the software driving robots has become more sophisticated, allowing end users to solve more complicated distribution problems and achieve real fill rates. “Software allows us to use two robots to achieve throughput of 2,000 cases an hour,” says Frank Carzoli, director of business development for Axiom. “And, the software allows us to build the pallet in a specific sequence for an aisle, optimize the positioning of every box to maintain stability while making sure we don’t put a case of bottled water on top of a carton of eggs.”

Those breakthroughs were mirrored by the development of more sophisticated warehouse control systems to integrate robotics with conventional materials handling for complete solutions. “The robotics industry has had

the ability to randomly stack cases for about 10 years,” says Mike Cicco, director of material handling engineering for FANUC Robotics (248-377-7000, www.fanucrobotics.com). “Now, the materials handling industry has figured out how to automate the depalletizing and sequencing of cartons to the robot.”

Technological developments coincided with changes in the marketplace that have driven the need for new solutions.

One key driver is the need for flexible and intelligent materials handling, says Steve Banker, service director at the ARC Advisory Group (781-471-1100, www.arcweb.com). “A highly automated warehouse drives down your unit handling cost in a way that can’t be done in a manual warehouse,” says Banker. “The risk is that your order profile is going to change and the automation is no longer appropriate.”

Banker thinks of robotics as intelligent and flexible materials handling that fills a middle ground between the conventional manual DC and automation solutions like conveyor, sortation and AS/RS that are bolted to the floor.

“The throughput with robotics is not as high as a custom warehouse,” says Banker. “But neither is the investment. You’re looking at a two-year payback compared to a five-year payback for conventional automation.” Meanwhile, if your order profile changes in a robotic-driven warehouse, you can easily change your layout or add another robot to meet increased demand. “It’s a much less risky investment,” says Banker.

Indeed flexibility has been the key theme from Kiva, whose mobile robots deliver product on portable storage shelves to an order selector. “Not even the rack is bolted down,” says Mitch Rosenberg, vice president of marketing. “If you need to move



Mobile robots like this fork-equipped unit are able to handle non-value-added processes, like delivering pallets from a pick module to the receiving dock.

your operations, you can load the system onto a truck and move it over a weekend without disrupting operations. That's a major advantage of this kind of flexibility."

Driver No. 2 is the explosion in the number of SKUs, according to Bill Torrens, director of sales and marketing for RMT Robotics. "When a facility goes from handling 200 SKUs to 400 SKUs or more, you need a lot more space to store and palletize the product manually," says Torrens. Robotics can readily adapt to an order fulfillment environment that is complex and dynamic, where every order is different.

Driver No. 3 is the ability to integrate robots with materials handling. In the not so distant past, a company bought a robot and then figured out what to do with it. Today, the robot, software and end effectors, and the broader materials handling solution is more likely to come as an integrated package.

The solution Westfalia and KUKA Systems displayed at NA 2010 is an

example of this trend: Westfalia's warehouse management system (WMS) manages the receipt and putaway of product into an AS/RS or mini-load system. Meanwhile, KUKA's software determines the sequence the cases need to arrive at the pallet and then builds the load according to predetermined rules. Once the pallet is built, Westfalia manages the delivery of that pallet to a stretchwrapper and a staging lane for shipment. "What you're really talking about is an automated order fulfillment system that happens to use robotics," says Dan Labell, Westfalia's president. "Not a robotic solution."

Driver No. 4 is the availability of labor in an aging workforce that is more prone to an ergonomic injury. "If you have 50 people bending and lifting to palletize, you've got 50 opportunities for an injury," says Brian Keiger, technology sales leader for KUKA Systems.

Finally, automation, including robotics, may be a strategy to competing with low-wage countries. "Some look at robot-

ics as taking away someone's job," says Keiger. "Then there are those who realize that those jobs are going anyway if you don't do something." KUKA is working on a robotics solution for one American manufacturer that is looking at automation as a way to reduce their costs and keep their production in the United States.

Where robots fit today

In the past, justifying the cost of a robot wasn't easy, especially in the distribution center, because the cost of warehouse labor was so much lower than the cost of labor in a factory. "An order selector just doesn't cost as much as an assembly line worker," says Jensen of St. Onge. For that reason, some of the earliest applications for robotics in distribution were in pharmaceutical warehouses doing e-fulfillment. There, a robot was less expensive than a pharmacist earning a six-figure salary. But as the software has gotten better and the cost of processing technology has come



down, the cost of a robot is more in line with the cost of a distribution center worker.

For those reasons, robotics in the DC is primarily attacking labor intensive processes that also involve a level of complexity. "If you have very few SKUs or if you're shipping full pallets, you don't need robotics," says Kiva's Rosenberg. "If you have complex order fulfillment requirements, if your order profiles and SKUs change often, and if you expect your business or demand for a product to grow over time, robotics can meet those requirements."

As with any form of automation, the savings are most attractive in multi-shift environments.

The ROI, however, can come from other factors. A robot is repeatable, accurate and reliable. That reduces errors and product damage. Those are important to dot.com companies shipping directly to consumers as well as suppliers that might face fines from big box retailers if their orders are inaccurate. "If you ship something wrong to a big box retailer, it's going to cost you a fortune," says Axiom's Carzoli.

But automating labor-intensive activities isn't the only way to justify robotics. The higher productivity and throughput rates that result from automation may allow a company to change its logistics network. "You may find your savings from robotics beyond the DC," says Labell. Indeed, Office Depot is using Kiva as a strategy to consolidate four warehouses into one.

In manufacturing, mobile robotics has emerged as an enabler of lean manufacturing strategies. "Manufacturers have put a lot of money into automating their manufacturing cells," says RMT's Torrens. "But they still have a lot of lift trucks shuttling parts to the line." To reduce traffic, it's not uncommon to have an operator drop off a pallet with a hundred units even though only 20 are required. When the 20 are consumed, the pallet is returned to the warehouse. That's an extra step and it requires more



Small units like this mobile robot assist lean manufacturing by delivering smaller quantities of parts to the line on a more frequent basis.

real estate for storage at the line.

"A small mobile robot can make more frequent deliveries in smaller quantities," says Torrens. "Instead of replacing a lift truck, they create a virtual conveyor within the building."

Much like your car's GPS system, the robots have a map of the facility in their processors and decide autonomously how to get from point A to point B. If the vehicle encounters an obstacle or a traffic jam, like a GPS, it can recalcu-

Suppliers of robotic materials handling solutions

There are dozens of robotics companies in the market. Below is a list of the companies that were contacted for this story and are offering robotic materials handling solutions separately or as part of an integrated materials handling solution.

ABB, 248-391-9000, www.abb.com/robotics

Axiom Technologies, 514-352-0500, www.axiomsolutions.com

Dematic, 877-725-7500, www.dematic.com/na

FANUC Robotics, 248-377-7000, www.fanucrobotics.com

HK Systems, 262-860-7000, www.hksystems.com

Intelligrated, 877-315-3400, www.intelligrated.com

JBT Corporation, 215-822-4600, www.jbtc-agv.com

Kiva Systems, 781-221-4640, www.kivasystems.com

Kollmorgen, 540-467-3086, www.pick-n-go.com

KUKA Systems, 586-795-2000, www.kukanao.com

RMT Robotics, 905-643-9700, www.rmtrobotics.com

Seegrid, 877-733-4743, www.seegrid.com

SI Systems, 610-252-7321, www.sipasystems.com

Swisslog, 757-820-3616, www.swisslog.com/na10

Toyota Materials Handling, 800-226-0009, www.toyotaforklift.com

Universal Robotics, 615-366-7281, www.universalrobotics.com

Westfalia Technologies, 717-764-1115, www.westfaliausa.com

Yaskawa Motoman Robotics, 937-847-6200, www.motoman.com



late and figure out another route to get to where it needs to go.

Putting robots to work

How are end users putting robots to work? That may be one of the more interesting developments. While there are a number of companies developing materials handling solutions for robotics, the problems they are tackling are as varied as the processes in a distribution center and factory.

For example: In a traditional pick-to-pallet operation, an order selector transports a pallet from a pick zone to a staging area at the dock. That transportation time is a necessary evil that adds no value to the order. Using a Segrid mobile robot, the order selector picks to a pallet on the vehicle. Once the picks are complete in that zone, the vehicle automatically travels to the next picking zone or the dock, while the order selector stays in the pick zone and picks to another pallet on the next vehicle. To find its way, the unit is guided by a vision system that compares the features of a facility with a map of the facility in its processor.

Kollmorgen's Pick-n-Go laser guidance and vehicle control systems can be retrofitted to a company's fleet of lift trucks, transforming an existing fleet into driverless laser-guided pallet trucks. In its partnership with Kollmorgen, Dematic is using the technology as a core component of an integrated, voice-directed picking solution. Laser-guided vehicles deliver a new pallet directly to a picker, who is then directed by voice picking technology to pick to a pallet. Once the picks in that area are completed, the truck automatically delivers the completed pallet to shipping while another laser-guided truck delivers a fresh pallet to the picker.

Mobile robots have captured much of the spotlight since ProMat 2007, in part because they are perceived to be so different from what has traditionally been on the market. But there are a number of innovative solutions using stationary robotics:

RMT, for instance, also makes an overhead gantry robot that automatically picks from large floor storage areas and delivers the product in the exact sequence needed to build a pallet for a store or a route delivery truck.

Axiom has developed solutions for layer picking and mixed case picking using one and two robots from ABB (248-391-9000, www.abb.com/robotics). Axiom has also developed a robot for piece picking. Currently in use at a 3PL, the robot picks individ-

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—Mike Cicco
director of material
handling engineering
FANUC

ual cartons of cigarettes to a shipping container. The completed cases could then travel to another robotic station to be palletized. While other companies have developed robotic solutions to build mixed SKU pallets, Axiom's solutions are built on a compact 8-foot by 20-foot skid that can be easily shipped and tied into an existing production line at a facility.

FANUC Robotics has developed a completely automated robotic line for a food manufacturer that picks the product after it has been manufactured and frozen and places it in a flow wrapper. Once the product is wrapped and shrink wrapped, a second robot puts two of the products in a shelf-ready box. Those boxes travel by conveyor to another station where a robot places six boxes of product into a shipping case. From there, the case travels to a palletizing station, where a robot places the cartons on a pallet.

What's next

Each of the solutions identified above are already being used. At the same time, new solutions are being developed. "We expect to see robots with two arms and stationary robots on mobile vehicles in the future," says the RIA's Burnstein. "Those will open up new opportunities for robotics."

For example, Universal Robotics, (615-366-7281, www.universalrobotics.com) a Nashville-based solution provider, is developing solutions using two-armed robots from Yaskawa Motoman Robotics (937-847-6200, www.motoman.com). One currently in development is designed to depalletize mixed size loads at the receiving dock, says David Peters, Universal's CEO, especially loads that may have shifted in transit or damaged product.

The robot uses a vision system and special sensors built into the end effectors to identify and pick a carton from a pallet to a container in a crossdocking operation. "Because the robot has two arms, it can do a closure on the carton and apply force from both sides like a human would," says Peters. Moreover, the solution is designed to fit in a footprint no larger than would be required by a person. "The idea is that we can drop this into an existing work cell without any modifications to your processes," says Peters. The goal: Deliver an 18-month ROI.

JBT is piloting an AGV that is equipped with a stationary robotic arm. The arm is used to pick production components from a storage area and then to load them onto a production machine in the assembly area. The vehicle is in the factory acceptance stage now, says Mark Longacre, JBT's marketing manager.

What all of these solutions illustrate is that robotics is clearly here today. "We're still in the early adopter stage," says FANUC's Cicco, "but we have the possibility for this thing to explode." □