

Otis Technology GOES with LEAN materials handling

Mobile robots, an AS/RS and supply chain software transformed this manufacturer's processes.

By Bob Trebilcock, Executive Editor

Conventional wisdom holds that robotics and automated materials handling systems are for the industry's big guns, not for the little guys.

In the case of Otis Technology, conventional wisdom is wrong. A manufacturer of firearms cleaning systems in upstate New York, Otis Technology has installed three mobile robots (ADAM Robots, www.adamrobot.com) in a manufacturing and distribution facility that measures just 80,000 square feet.

The company began to install automation in 2008 with two primary purposes in mind. The first, and most important, was to enable Otis Technology's implementation of lean manufacturing processes. The second was to further a philosophy that employees matter.

"In the history of the company, we have never laid off an employee," says Mike York, director of operations. "To stay competitive, we are looking at automation to free up our employees for value-added tasks and to increase our throughput, not to reduce our workforce. We are proud to be American-made, American-owned and American-employed."

But its automated materials handling wasn't limited to mobile robots. Otis Technology has also installed a warehouse management system (WMS) and enterprise resource planning (ERP) system, automated data



Mobile robots deliver totes to and from assembly stations at Otis Technologies' facility in New York.



**Left to right: Doreen Garrett president and CEO;
Larry Williams, president of operations;
Denise Miller, president of sales and marketing**



collection, a wireless voice over Internet protocol (VoIP) communications system, and a two-aisle automated storage and retrieval system (AS/RS). One aisle features 512 pallet positions for unit load storage while the other aisle includes 3,240 positions for mini-load storage.

Since going live, the results have been impressive:

- On-time deliveries increased from 85% to 99.92%.
- Otis Technology has saved \$2 million in inventory.
- York estimates the mobile robots are saving the company 94.2 hours a day in time employees used to spend walking back and forth in the operation. That's roughly 1 hour per day per employee.

Going back to a philosophy that employees are integral to the company's success, some of that savings has been reinvested into employee training

in lean techniques that will yield more improvements in the future.

Growing a business

Otis Technology is unique in a number of ways beyond being a small company committed to lean and automation.

For one, the 26-year-old company is female-owned and operated. Doreen Garrett, founder and CEO, was just 16 when a bullet jammed in her rifle after she tripped over a stick in the woods during a hunt with family members in rural New York. After walking 2 miles back to their hunting camp, she cleared her gun with a weight and some string she found in her grandfather's kit. The experience gave her the idea for a field kit to clean a gun's muzzle.

After getting tossed from the first gun show where she showed off her prototype because she was under 18, Garrett went back to the show wear-

ing makeup and high heels and came away with orders from the military. Her father helped her establish the company, since she was not only a kid but a young woman in a male-dominated industry. Today, Garrett's siblings are also involved in the business.

Early orders were produced at the family's kitchen table and then a horse barn. In 1996, the company moved into its current offices, and in 2004 it broke ground on the manufacturing plant where the product is assembled. In 2006, the company added an on-site day care center to help employees.

While Otis Technology does not release sales information, it is now the largest employer in its part of the county. Still, it has maintained a family-owned culture with a commitment to the local economy. "Our area needs jobs," says York, "and we think we have an important role to play in our area."



Although Otis has less than 100 employees in its manufacturing operations, the company has adopted automation to enable lean manufacturing processes and control its manufacturing costs.

Otis Technology is unique in another respect: While many manufacturers outsource some or all of their production processes, Otis Technology remains a vertically integrated company, with some 31 work centers on the floor. “We produce 90% of what we kit,” says York. “As a result, we have multiple work centers going into work-in-process, followed by work-in-process going to other work centers.”

Getting lean

The seeds leading to lean manufacturing were planted in 2008, when the company added 22,000 square feet for the unit and mini-load AS/RS. Prior to that, raw materials, work-in-process and finished goods were stored on the floor in the manufacturing area, in traditional warehouse racking or in an off-site ware-

house. It was not only inefficient, it was costly. “We had no room to expand,” says York. “And every time we moved materials, we were paying a fee to a 3PL.”

Conveyor was in place to transport product throughout the facility. That, however, created challenges when it came to changing processes. “If we wanted to change something, you had to go around a conveyor because you couldn’t go through it,” says York. “We started asking if there wasn’t a way to move material more efficiently.”

In 2009, a group of Otis Technology’s manufacturing operations employees attended a White Belt class in lean manufacturing. During those sessions, the team examined the non-value-added steps and wastes in their processes, including the amount of time associates spent walking to get materials. That led to discussions about

changing the layout of the plant to set up processes closer to one another to improve the flow through the facility. “We realized that wasn’t possible given the configuration of our facility,” says York. And, adding more conveyor wasn’t economically feasible.

While these discussions were happening, an Otis Technology executive discovered a system on the Web for mobile robots that could transport totes, containers and other items. What caught his attention was the laser-based guidance system used to direct the mobile robots. “Most robotic systems or automatic guided vehicles run on a rail or require you to put something on the floor,” says York. “We did not want to do that. With this system, no markers are required on the floor. We decided that would suit our facility.”

The question was whether the system could deliver enough return to justify the investment. Doing the math, they calculated a savings of more than an hour

per day per employee in travel time that would now be available for value-added processes or future growth. That was sufficient to justify the investment.

Going live with robotics

Mobile robotics was also an ideal technology for Otis Technology's new lean manufacturing strategy. In the old strategy, all of the materials for a day's production were stored in a work center. Associates would retrieve the material they needed as they needed it. Keeping track of inventory in that system was difficult and it led to a lot of work. One solution was to allocate no more than one hour's worth of production materials to a work center at any given time. Changeovers were easier, but that approach still required a lot of walking.

As the team did the value-stream mapping associated with lean, all that walking emerged as a significant waste. That's where the mobile robots came into play. The machines operate like small automatic guided vehicles, shuttling containers and totes rather than pallets through the facility. That would eliminate the walking. What's more, they could be easily reprogrammed if products, processes or a layout changed.

After performing due diligence, Otis Technology executives ordered three mobile robots. The implementation and training took about a week.

The primary function of the robots is to deliver kanban totes and containers from the AS/RS to work centers in the manufacturing area. In that capacity, when an item runs out in a work center, an associate on the line presses a call button for a mobile robot. When the robot arrives, the empty container, any waste cardboard and a kanban card are placed on one of the robots. The robot automatically delivers these back to the AS/RS system.

There, an associate scans a bar code on a kanban card. That signals the AS/RS to retrieve and deliver the replenishment items. Meanwhile, the robot gets an opportunity charge. Once the product is delivered to the operator, it's

loaded onto the mobile robot and delivered to a workstation.

In addition, the robots are also used to deliver work-in-process from work centers to the AS/RS for temporary storage; to deliver finished goods from the packing area to the AS/RS for temporary storage; or from the line or the AS/RS to the shipping area.

Employees have adapted well to working with robots. "When we come up with a new idea, we go through a change management process," York says. "We explain the benefits, explain how we're going to use it and we repeat that several times. There's a level of employee trust so that we don't have pushback."

The biggest accommodation has been to add audio to the robots so that

employees hear them coming. "The audio system plays music, and we allow the employees to request what we play so long as it's appropriate," York says.

Along with improved inventory accuracy and productivity, York says the most visible change may simply be that the facility is orderly. "If you look around, you'll notice that there's no inventory sitting in the aisles and only the supervisors are walking," he says. "Our employees are all involved in value-added services."

Down the road, he adds, if products or processes change, there is an infrastructure in place to adapt. "All I'll have to do is add another robot," he says. "I have flexibility that I didn't have before." □



Pallets and totes are stored in an AS/RS (center). Product is then packed in kanban totes and delivered just-in-time to the assembly line (top).

Mobile robots bring flexibility to the line

At Otis Technology, the laser-guided vehicles shaved over an hour of walk time per employee.

At Otis Technology's Lyons Falls facility, mobile robots, automated storage and warehouse management (WMS) come together to enable lean manufacturing and distribution.

Receiving: Raw materials and parts are received (1) and staged briefly while an associate verifies the count and scans bar codes to enter the newly received inventory into Otis' WMS. Once the receipt has been counted and verified, a stock movement is created in the WMS and the inventory is ready for putaway.

Putaway: Product can be putaway in several locations.

If an item is hot, it'll be placed on one of the mobile robots and automatically directed to one of the work centers in the manufacturing area (2).

Items going into storage will be placed on a pallet for putaway in the unit-load automatic storage and retrieval system (AS/RS) (3) or into a blue bin if the product will be stored in the mini-load AS/RS (4). Either way, the product is delivered to an induction area. There, it will be automatically laser scanned

Otis Technology Lyons Falls, N.Y.

SIZE: 80,000 square feet, including

manufacturing and distribution

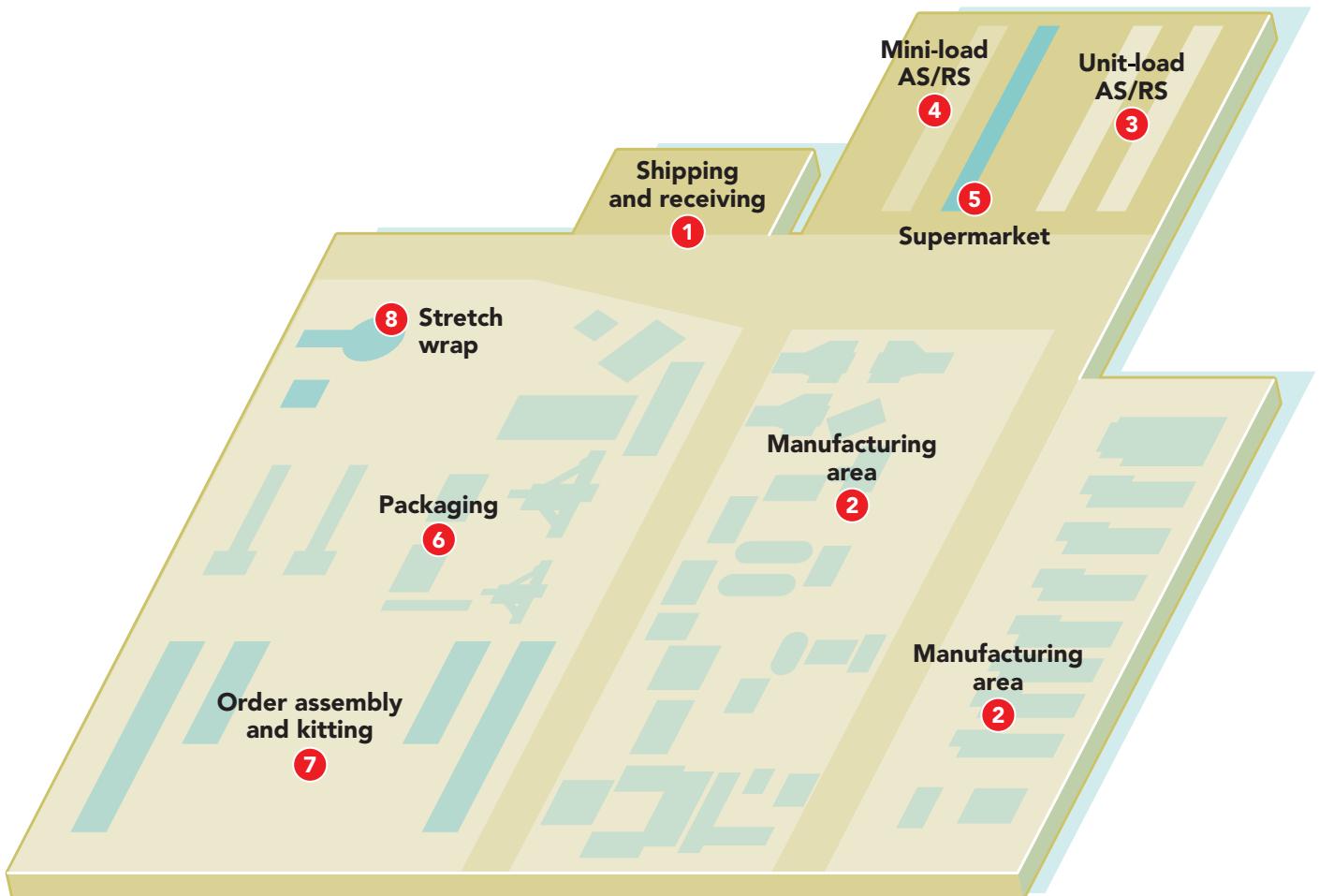
PRODUCTS: Firearm cleaning systems and accessories

SKUs: 3,354

SHIFTS: 1 shift/5 days

EMPLOYEES IN OPERATIONS: 90

and associated with a specific storage location in one of the two automated storage units. That product is now available to promise in the system.



System suppliers

Mobile robots: ADAM Robots, www.adamrobot.com

AS/RS: Daifuku, www.daifuku.com

Warehouse management system: Accellos, www.accellos.com

ERP: Sage, www.sageproerp.com/products

Lift trucks: Linde Material Handling, www.lmh-na.com

Bar code scanning: Motorola Solutions,
www.motorolasolutions.com

Stretch/shrink wrap equipment: Belco Packaging Systems,
www.belcopackaging.com

Picking: When associates receive a work order, they scan a bar code on a work card. That signal tells the AS/RS (4) to retrieve materials from storage and deliver them to a fulfillment area known as a supermarket (5). There, an associate scans the items to a bin. Each robot will typically carry four bins. Once the order has been pulled, the mobile robot is ready to make a delivery to one or more work centers in the manufacturing area (2) if it will be mak-

ing multiple stops.

Once the robot arrives at a work center, it parks and beeps. The robot tells the associate which load is for that workstation. Once the load has been removed, the associate loads any empty containers at the workstation, and presses a button that the receiving is complete. The robot then continues to its next task.

Typically, an associate has two bins at a workstation. When the first bin is empty, the worker presses a call button for the next delivery. Likewise, once a full bin in assembly of finished product has been completed, that product will be routed to the next workstation on the assembly line or to the supermarket if it will go into temporary storage.

Product ready for shipment to the military is sent to a packaging area (6) at the end of the order assembly and kitting area (7), where it is bagged, boxed, palletized and stretchwrapped (8) and then staged in the shipping area (1).

All other finished goods will be delivered to a packaging area where they are kitted in plastic molded pieces and heat sealed. After that, they are delivered back to the AS/RS for storage until they are ready for shipment.

Picking orders for shipment: Customer orders are created in the WMS. When an associate scans a pick ticket, bins and pallets are pulled from the AS/RS and delivered to the supermarket area. There, the associate picks the quantity required for the order and scans the items to a bin location for that order on a cart. Once the order is completed, a mobile robot delivers the cart to a packaging area where the items are packaged for parcel shipments or palletized and stretch wrapped for LTL shipments. The orders are now ready for delivery. □