



CAM's Industrial Corner

NEWSWORTHY INFORMATION FOR OUR INVESTORS

August 2016, Volume 7

www.cohenasset.com

Commentary from Cohen Asset Management®

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With industrial facilities becoming increasingly more technologically advanced, the following article explores the possibility of fully automated distribution centers, the existing challenges that have impeded the industry, and the technology that may one day make “dark warehouses” a reality.

Feature Article

It's Lights Out In The Warehouse

By Ben Ames

Warehouse automation has come a long way in recent years, as distribution centers turn to technology in their effort to meet the demands of fast fulfillment. Today it's increasingly common to find warehouses deploying sophisticated automated equipment, such as self-guided forklifts, vision-guided robots, automated storage and retrieval systems (AS/RS), robotic palletizers, and high-speed conveyors, in their daily operations. These systems can deliver speed and accuracy in a complex material handling environment, but some businesses say the best is yet to come. Combine all these ingredients together, they say, and the result could be a fully automated facility that operates without any human labor at all.

Also known as a “dark warehouse” or a “lights-out facility,” this vision promises swift, error-free fulfillment operations, enabled by key technologies such as automated material handling equipment, warehouse execution systems, and automatic identification (auto ID). Candidates for this sort of fully automated operation include cold storage or freezer warehouses, such as those used in the food and beverage or pharmaceutical sectors. There are a couple of reasons for that. For one thing, replacing humans with machines eliminates the need for people to work in adverse conditions like sub-zero temperatures. For another, automation helps reduce

the amount of traffic in and out of the refrigerated chamber, thereby enhancing climate control, said Matt Engle, director of ID products marketing and logistics at Cognex Corp., a company that specializes in machine vision technology and industrial bar-code readers. Excluding workers from the refrigerated room helps prevent humidity from entering the chamber when people enter and exit the area for shift changes and coffee breaks, Engle said. Too much humidity can create frost buildup on goods and equipment, damaging materials and requiring extra maintenance, he explained. Engle adds that the lights-out approach is best suited to “low-variability” operations that process the same sized items all the time. That's because highly tailored material handling systems can be thrown off when confronted by items of a wide variety of dimensions. Processing diverse goods can lead to high failure rates on tasks like aligning parcels on a conveyor or distinguishing between similar stock-keeping units (SKUs). “A lights-out facility is more possible in less-variable parts of logistics, where people are moving a large portion of the same types of objects,” Engle said. Examples of these dark warehouse operations would be a facility that distributes standard-sized packages of processed foods or a soda bottling plant that processes identical 12-packs of cans.





HURDLES INCLUDES COST, FLEXIBILITY

Still, many challenges remain to building an entirely dark facility capable of running without human intervention. "People are talking about the dark warehouse," Engle said. "It's a great goal—if we could achieve that, it would have a massive impact on operations and cost structure—but it's a very challenging quest." For example, in a conventional warehouse, mislabeled packages or torn boxes can be rerouted to a conveyor's "hospital lane," where they are directed to workers who can repair the damage, he said. That type of workaround becomes much harder in a building without people. For that reason, current installations of dark warehouse technology are usually found in corners of larger facilities, where they can run independently but still draw on human help for the occasional error.

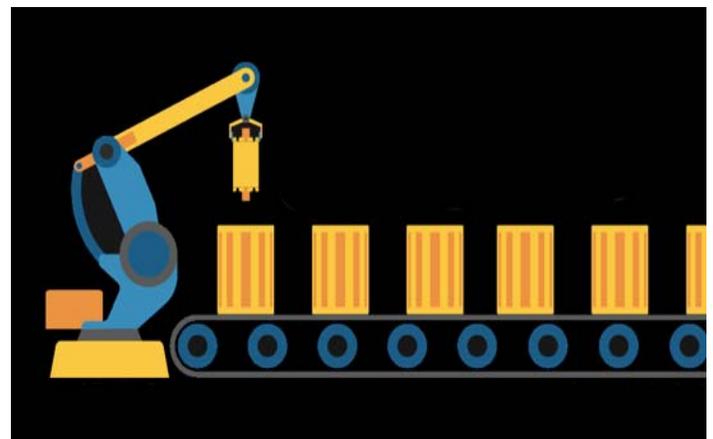
When it comes to the widespread adoption of the dark warehouse approach, however, perhaps the biggest hurdle is cost, as facilities strive to balance the investment in automation with the value of the goods they handle. "You need to ask the question: Is the automation of every activity going to lead to an efficient warehouse?" said John Ashodian, marketing manager for logistics automation at Sick Inc., a company that produces sensors and sensor solutions for industrial automation applications. "You could fully automate with robotics and other equipment, but is that a cost-effective way to automate the supply chain?" Many industries handling high-value goods have achieved precision read-rates for identifying goods. Manufacturing applications in the pharmaceutical, automotive, and electronics industries achieve read-rates at a Six-Sigma level of precision, a strategy of eliminating defects to a high statistical level.

In contrast, this degree of sophistication may be harder to justify in logistics, where workers handle low-value items and operations are held to tight profit margins. A critical step in closing that gap in any lights-out facility is choosing the most reliable auto ID technology from a growing menu of options that includes radiofrequency identification (RFID),

one-dimensional (linear) and two-dimensional (matrix) bar codes, imagebased data capture, and optical character recognition (OCR) for reading printed or handwritten labels. "A dark facility or warehouse is the holy grail right now," Ashodian said. "People are looking to automate certain processes, and auto ID is a crucial part of that vision, to enable track and trace."

BALANCING FLEXIBILITY AND AUTOMATION

Another barrier to the wider adoption of light-out technology is the need for many DCs to remain flexible. Building a fully automated facility to handle a specific type of goods would not make sense for e-commerce fulfillment centers that ship a wide variety of items for online retailers or for third-party logistics companies (3PLs) that serve a constantly changing roster of clients. Instead of committing to build a fully dark facility, these types of operations might instead create zones of automation, adding dark capabilities only for certain material handling tasks. "There are already dark functions within the warehouse, such as AS/RS and systems that move materials from pickup spots to racks," Ashodian said. "Each of those is like a dark facility within a facility."



PATHS TO FUTURE GROWTH

As warehouse operators look to expand these islands of automation into full-scale lights-out facilities, they are focusing on three critical technologies that act as the muscles and the brain of automated DCs:



- **Automated storage and retrieval systems.**

Automated storage and retrieval systems are "lightsout" by design, since their intricate patterns of conveyors, bins, and racks leave no room for a human operator to get inside a functioning machine, Cognex's Engle said. AS/RS installations work best in distribution or manufacturing facilities that handle high volumes of inventory moving in and out of storage. Some of these can even sort, sequence, and buffer goods for tasks such as goodsto-person picking, order fulfillment, and temporary or long-term storage.

- **High-speed sorting equipment.**

Another warehouse tool appropriate for lights-out processes is high-speed sorting equipment. These machines whisk goods and materials to different locations in the facility. Operating independently of human control, these sorters usually need human help only to tend to the placement of objects on the inbound end or to monitor the reject lane and other output locations, Engle said.

- **Warehouse robotics.**

One of the most recent growth areas for dark warehouse operations is robotics. Deployed for decades in manufacturing environments such as automotive production, they have been expanding in recent years into a variety of logistics applications. DCs have relied on stationary robotic palletizers and depalletizers for some time, but recent advances in technology have allowed warehouse robots to become mobile. Guided by wireless instructions from a warehouse management system (WMS) or warehouse execution system (WES) and navigating by laser-based vision systems, these robots can ferry pallets and cases of goods around a bustling warehouse without human intervention.

As supply chain leaders continue to wrestle with these challenges, it's likely that DC operations will move only gradually toward the ultimate ideal of a dark warehouse. By continuing their investment in auto ID, robotics, and warehouse automation gear, they can expand the dark zones that already exist at some sites. Even under pressure to meet rising demands for e-commerce fulfillment and next-day delivery, the hurdles of building the lights-out warehouse of the future still loom large. "There is a lot of change in the wind, such as the Internet of Things and new fulfillment strategies like decentralized structures that get product closer to the customer," Sick's Ashodian said. "But as to building the fully automated, dark facility, we're not there ... yet."



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