

Robots in the Warehouse

Editor's note: This article could not have been written without the help of several people who were generous with their time in educating us. Jim Apple Jr has for many years been our primary coach in matters involving materials handling, and he provided advice throughout the process of developing this writing. Arthur Barrett of Barrett Distribution shared with us his ideas about decisions in acquiring robotic equipment. George Lord of ODW Logistics, an alumnus of ABB Automation, introduced us to Ali Raja, a manager based at ABB Logistics hub in the U.K. Kevin Reader at Knapp Logistics Automation described his company's development of robotic solutions. Tim Smith of Element Public Relations provided information about Fetch Robotics. Finally, Bruce Welty played a dual role in educating us. First, he is chief executive of Quiet Logistics, a logistic service provider. Second, he is CEO of a robot manufacturer, Locus Robotics. KBA

The interest in robotics continues to grow, and the reasons are obvious. First, the prospect of a \$15 minimum wage motivates warehouse operators to seek any investment that will reduce cost and improve productivity of human labor. In this area, Europeans are ahead of us, since many countries not only have high wages, but also difficulty in releasing workers who are no longer needed. Furthermore, people in Europe are well aware of an aging workforce and its ergonomic challenges.

Therefore, any investment that saves human labor usually has a fast return. Second, the cost of robotics has fallen dramatically, and today there are even high school hobby groups constructing robots.

We sought information from several robotics manufacturers, as well as two warehousing firms that are users. It goes without saying that this newsletter does not promote or endorse any particular brand or vendor. Our goal is to illustrate a few options. We do not pretend to have exposed every robotic supplier, but we believe the group described here provides a reasonable representation of activity in this industry.

Why have robots?

Most of the business applications for robotics today are found in high-volume manufacturing, such as welding machines used in the assembly of automobiles. As robotic systems were developed for manufacturing, they have been used primarily for tasks which can be done faster, better or more safely by a machine. Many of the robotic

systems employed in manufacturing have no application to a warehousing environment.

In warehouse materials handling, the robot has two primary advantages.

- ① Acting as an automatic guided vehicle (AGV) the robot can reduce travel. In most warehouses, order selection requires the greatest amount of labor, and travel is the most costly element in order selection. Because of this fact, the cost is reduced by moving product to the order picker instead of moving the picker to the product.
- ② Compared to options such as carousels, palletizers, conveyors and sorters, the robot is extremely flexible. The robot can move from one aisle to another, it can handle a wide variety of warehousing tasks, and it can even be transferred to other warehouse buildings or sold to another user. In contrast, conveying systems are usually customized and not easily modified or sold.

A pioneer and its influence

Until it was bought by Amazon in 2012, Kiva Systems attracted more attention than any other American robotics producer for warehousing applications. The company changed its name to Amazon Robotics LLC, and the product is no longer offered for sale. Other materials handling manufacturers recognized a gap in the marketplace and moved to create new products that perform in a similar manner. In fact, some of these look like Kiva machines with a different color scheme.

The Kiva system was designed to bring the parts to the picker. The robot moves underneath a mobile shelf, lifting the load and carrying it to where the order picker is standing. Once the needed products are removed from the unit load, the robot returns it to a storage location. This machine has no capability to handle material in high bay storage racks, and therefore most warehouses using such systems have no storage more than 8 or 10 feet high. This represents a significant waste of space in a contemporary building that is designed for 40 foot stacking.

What the users want

Bruce Welty is CEO of Quiet Logistics, a logistic service provider that has been a technology specialist. In 2009, the company announced its new partnership with Kiva to develop robotic solutions for order fulfillment. When the Amazon merger changed the game at Kiva,

Welty started Locus Robotics. Unlike the Kiva machines, the Locus robot is relatively light. It is not designed to bring a unit load to a picker, but rather to make the picker more efficient by allowing the worker to remain within a limited zone and use the robot to move product between the pick zone and a shipping or receiving area. Piece handling is still done by humans, because humans are currently more efficient, more accurate, and more reliable than a manipulator arm and grasping system combination. Locus Robotics places heavy emphasis on its software, designed to make the order selectors task relatively simple and to discover picking errors if they are made. Because the system was designed by a logistic service provider rather than technical specialists, the system meets the specific needs of a typical warehouse operator. In effect, Quiet Logistics will replace Kiva with a new robotic system which it owns.

Arthur Barrett is CEO of Barrett Distribution Centers, a logistic service provider with operations in six communities ranging from Boston to California. Barrett is currently shopping for a new robotic solution. The prime goal is to control picking labor, and one way to do this is to cut the cost of travel. The robot is more flexible and simpler than a conveyor system. Barrett recognizes the ability to deploy a robot in one aisle, then move it to another aisle or another building. The machine can be configured to handle the product of one client, and then quickly change to serve the needs of another client. Barrett expects the robotics program to be particularly valuable to handle seasonal surges when extra labor is required. The software interface to existing WMS systems is of prime importance. Barrett is also looking for simplicity with a system which makes the order picker's job virtually foolproof. The robots will be used only for picking of A and B items. Slow movers and overstock will be stored in the high bay racks, and the faster movers will be kept close to the floor. Barrett expects a payback of less than two years.

Multinational providers

We were briefed by experts at ABB Automation, and Knapp Logistics Automation, both based in Europe with substantial experience in warehouse automation.

ABB has an application center in the United Kingdom. As they develop product, the guiding question is "how can we do it better with a robot?" They also consider what percentage of the product line in a warehouse can be handled better with the robot, as opposed to that part that should be handled as it is now. They recognize a difference between an automatic guided vehicle (AGV) and a robot, and one system selects goods that are brought to the shipping dock on an AGV and then picked with the robot. A reasonable goal is 400 to 500 picks per hour, and an expected payback is one to two years. Some of the robotic machines are designed to create mixed pallets for delivery to retailers. Some will interact with a carousel. In the U.S.A., a significant sales volume is to the top five systems integrators who work in warehousing. They also market their products directly to some of the larger retailers, such as Walmart or Target.

Knapp Logistics Automation Inc is based in Austria with a US office near Atlanta. Their newest robotic ma-

chine is Ylog, and it is designed to operate as a shuttle moving within rack systems that are up to 90 feet high. The system may be coordinated with automatic storage and retrieval (AS/RS) systems. Knapp may be the most experienced provider of robotics in warehousing. As an example, they estimate that Kiva produced about 10,000 robots, and Knapp has produced more than 18,000. They emphasize software capabilities, and 25% of their workforce is directly engaged in software development, including warehouse management systems (WMS) and warehouse control systems (WCS). 7% of their revenue is committed to research and development. They emphasize the challenges of implementation and suggest that a year is needed to complete the process. They usually estimate a payback of 3 to 5 years.

Two American manufacturers

Fetch Robotics is a Silicon Valley startup. Currently the company has some pilot operations. It has two types of robot. The Fetch machine includes an arm that will pick up product from a storage location. Most sales are the Freight robot which is designed to follow a human order selector and move accumulated products from the picking area to shipping dock. Payback on the Freight robot is usually less than a year.

Locus Robotics is the manufacturer developed by Quiet Logistics to replace Kiva. Unlike Kiva, its robots are not designed to carry the relatively heavy load of a full mobile shelf. Instead, they move between order picker zones and shipping/receiving docks. Humans continue to handle the manual selection of items in the picking zones, but the robot eliminates much of the travel between pick areas and docks. Furthermore, features of the robot are designed to make the order pickers' job easy and relatively foolproof. Great emphasis is placed on the software rather than the hardware, and the implementation of a system which works more effectively than competitive options. A one to two-year payback is expected.

Summary

At this stage of development, the most common use of a robot is as an autonomous automatic guided vehicle. While users recognize the ability of robots to do more than reduce travel, the fastest payback comes from moving product to or from the picker. A few robots are designed to interact with older "product to pickers" solutions such as carousels AS/RS and conventional AGVs. Some of the robotic solutions save time but waste warehouse space. It seems obvious that all of the conditions that have created an interest in robotics will cause equipment manufacturers to improve their products and reduce the payback time. For logistic service providers and wholesale distributors, the buying decision is likely to be based on flexibility, simplicity, and a fast payback. It is important to remember that a robot is a machine with a fixed capacity. When activity peaks, more capacity will be required. But, the robot doesn't mind working two or three shifts without a coffee break!

We predict that a growing number of warehouse operators will implement one of the robotic solutions in the near future.

KEN'S COMMENTS



Understanding E-Learning

As a growing number of logistics service providers recognize the continuing need for training, e-learning is one of the options. It is simply instruction that is delivered electronically. E-learning takes three forms. Synchronous instruction is delivered live, with simultaneous participation by student and instructor. When the instructor and student are separated by both location and time, the instruction is called asynchronous. The instruction materials are pre-recorded. Blended learning includes the two options just mentioned, plus traditional classroom and on-the-job training.

Webinars are one example of synchronous instruction.

In considering the options, it is essential to realize that learning occurs regardless of how instruction is delivered. No one can stop a motivated person from learning, and some do it just by observation. In contrast, no instructional method will force an unmotivated person to learn. Therefore, motivation is clearly the most important element of teaching and learning.



Great expectations

That is a widely recognized title for a Charles Dickens novel, but it is also a reason for high management turn-

over. The problem is particularly acute with younger workers. Sometimes the problem is over-emphasis on technical skills. The new hires excel in data driven projects. The same people may fall short in the skills involved in managing people. There are very few jobs that don't require good communication and teamwork. As the new hires progress, their capacity as leaders becomes more important than their technical prowess. Expectations are managed by continually reminding newer employees that soft skills are of critical importance. Feedback is an essential part of the process of developing those skills. Yet the feedback should not be one way. Negative feedback is not a personal attack, nor is positive feedback an indication that a pay increase is around the corner. When employees know where they stand, and know what to expect, their great expectations turn into ones that are more realistic.



The succession planning imperative

Everyone knows that succession planning is important and yet it is frequently neglected. If you own the company and are its chief executive, it is your option to plan for succession or ignore it. On the other hand, if your rank is any lower than the top of the pyramid, lack of succession planning could influence your career. A friend was a mid-level executive at a specialty retail chain, still in the hands of its founder. He remarked "if anything happens to the founder, I hope I learn about it before the market does."

Have you asked your vendors about their succession plans? Particularly in the case of critical suppliers, their failure to plan for succession could represent a threat to your company. There is no reason why a buyer cannot ask vendors to describe their management succession plans.

WAREHOUSING TIPS

The automation strategy

The romance with robots can be dangerous. Instead of looking at automation as a way to cut costs, consider ways in which it would give your warehousing organization a competitive advantage. Automation involves agility. How can the system be changed as volumes increase or the dimensions of the job are altered? Don't buy features that you don't really need. Consider all the things that can go wrong from power failure to equipment breakdown.

To paraphrase author Simon Sinek, "start with why". What is the compelling reason to install automation?



Piecework pay for staffing service workers

The practice is not common, but a few staffing services have offered this for years. Instead of paying the staffing employees by the hour, they are paid for each unit handled. The process is not simple, nor is it risk-free. If the

piece rate is too low, a hard worker will not make a decent amount of money. If the rate is too high, the cost may be rejected as noncompetitive. To get a rate that is fair to all concerned, considerable time study should be involved. The advantages are obvious. The warehouse supervisor needs not track productivity for temporary workers. A hard-working temporary worker may set a great example for the full-time people. If you have not considered the option of piecework, it is never too late to do so.



Can freight brokerage be Uberized?

This was the title of the panel organized recently by TQL, the nation's second-largest freight broker. "Uber-type" services that were referenced include Gobytruck.com, uShip.com and Truckstop.com. Some of these sources offer apps for both drivers and shippers. It is conceivable that a number of small brokers will fail if Uber-type companies continue to grow. There are approximately 14,000 freight brokers in the US today. See a related article in our digest page: *The Appy Trucker*.

The Appy trucker

The Economist, March 5, 2016, pg. 60.

The second word of the title refers to computer applications. While the author describes the highly fragmented trucking industry in America as “a juicy target, right for disruption,” the conclusion is that computer applications have begun to create significant changes in transportation. Freight brokerage is described as “a creaky system” and several applications could disrupt this business. Four application sources that are identified are Cargomatic, Convoy, Kontainers, and Transfix. The websites for these are worth further inspection.



Culture is not the Culprit

By J. Lorsch & E McTague, *Harvard Business Review*, April 2016, pg. 98.

The conventional wisdom, reinforced by many good writings about corporate culture, is that the best way to get an organization out of trouble is to fix the culture. This is supposed to be going on at General Motors and at the Department of Veterans Affairs in the federal government. This article suggests that the priorities are backwards. Culture is neither the cause nor the cure. Culture is not something that you can fix. Instead, cultural change is what you get after you have put in new processes or structures. The authors reinforce this view by interviewing four executives who created major changes within their companies. The four examples are Doug Baker at Ecolab, Richard Anderson at Delta Airlines, Alan Mullally at Ford, and Dan Vasella at Novartis.



Technology: Turning truck drivers into smarter players

By Mark Solomon, *DC Velocity*, March 2016, pg. 15.

The author argues that the apparent shortage of commercial truck drivers may be a case of well-informed drivers choosing the loads they want and ignoring those they don't want. For example, a trip into Florida may be unprofitable if it is impossible to find a backhaul moving north, because that state has very little manufacturing. He predicts that the embrace of technology will end the old days of drivers hitting and then leaving the road.



Getting focused

By Mitch MacDonald, *DC Velocity*, March 2016, pg. 88.

The theme of this editorial is the growth of robotics. His magazine has reported that “businesses are buying robots for warehouse and distribution applications at a faster pace than ever, helping push robot orders and shipments in North America to record levels in 2015.” He observes that robotic technology is now a proven means of boosting productivity.

Making the leap to Uber trucking

By P. Moore, *Logistics Management*, Jan. `16, pg. 22.

Uber has announced that it will now coordinate small package express deliveries in New York City. This places Uber in competition with conventional courier services. Nearly a dozen other companies are experimenting with Uber-style shipping options. This model would allow small entrepreneurs, some with only a minivan or pickup truck, to enter the delivery business. It presents a significant challenge for the conventional freight broker, who is accustomed to dealing with established motor carriers. If Uber-type delivery gives more flexibility to shippers, this might be a good thing.

Silicon Valley firms are looking at the \$700 billion US freight transport market. If they can get just 1% of the \$700 billion, that seems worth a try.



Intermodal transportation: Rise and shine,

By S. Beckwith, *Inbound Logistics*, Mar. 2016, pg. 97.

The author describes the impressive growth of rail intermodal. With nearly \$30 billion in new investment, the rail industry has expanded and added inland intermodal terminals. It also is adding track capacity and raising clearances to allow double stack trains. The ability to ship by both rail and truck is now a priority for many companies seeking new warehouse locations.



Mobility & robotics in the warehouse

By B. McCrea, *Modern Materials Handling*, March 2016, pg. 96.

This article is based on interviews with executives at robotics suppliers Bastian Solutions, Dematic, Intelligated, J BT Corp. and Cimcorp. A turnkey item level picking solution using robotics is far along the path, but not here yet. Some robotic “hands” are capable of grabbing and reaching. Sensor technology has eliminated the need for fixed paths, allowing robotic vehicles more freedom in moving around the warehouse. One innovation is called simultaneous localization and mapping or SLAM. One resource admits that the cost of putting robotic arms on mobile platforms is more than can be justified. The need for lower labor costs is a primary driver in exploration of robotic options.



Railroad operates through shippers eyes

By C. Gillis, *American Shipper*, February 2016, pg. 24.

This interview with the chief marketing officer of Kansas City Southern included some surprising facts. Today's rail rates average four cents revenue per ton mile, or nearly 4 times cheaper than it cost to use rail transport 40 years ago. For those concerned about the growing shortage of truck drivers, one railcar equals three truckloads.