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10 Robots That Can Speed Up Your Supply Chain

ROBOTS GET BUSY WITHIN WAREHOUSE, LOGISTICS OPERATIONS

Whether it's moving small or large objects around the warehouse, or picking items out of bins with higher accuracy and speed, robots within a supply-chain or logistics operation can help automate delivery processes.

By Phil Britt

In order to meet ever-more-critical efficiency and fast delivery requirements, companies along the supply chain are turning to robots to handle the tasks of materials movement, picking, logistics and other supply chain elements.

Recent venture capital funding announcements for several companies in the supply-chain and warehousing robotics market indicate strong growth potential. Research firm Tractica forecasts that worldwide supply-chain robot unit shipments will increase from 40,000 in 2016 to 620,000 units annually by 2020. The company also estimates global revenue for the sector, which reached $1.9 billion in 2016, will reach a market value of $22.4 billion by the end of 2021.

"The warehousing and logistics robot market is experiencing strong growth, with many prominent companies showing greater confidence in new robotics technologies that could yield a return on investment in less time than it took a few years ago," said research analyst Manoj Sahi in the report. "The next five years will be a period of significant innovation in the space, bringing significant opportunities for established industry players and startups alike."

TUG, BY AETHON

Aethon's TUG robots can be configured as a fixed, secure cart that includes doors and drawers, secured by PIN code and biometric authentication; or as a base platform that can carry other racks, carts or bins.

Unlike older automated guided vehicles (AGVs), which require electronic tracks, TUGs and other automated mobile robots (AMRs) don't need beacons, staging depots or specific infrastructure to be added to a facility. A built-in map and array of onboard sensors help the robots navigate.

TUGs can connect to an existing Wi-Fi or 900 MHz network to communicate with elevators, automatic doors and fire alarms. It also uses Wi-Fi to provide constant contact with the Aethon cloud command center, which monitors TUGs around the clock. The company said its command center is in constant communication with 500 robots installed in more than 140 locations worldwide.



Photo Credit: Aethon

Aethon TUG robot

For example, in Bosch plants, Aethon's TUG Fleet Manager interfaces with the company's existing Manufacturing Execution System software to manage production processes and inventory movement. The Bosch iHub interface sends jobs to the appropriate automation system (for example, automated forklifts, conveyance and AGVs) and communicates job completion. The iHub system also communicates with Aethon's TUG Fleet Manager.

TUG robots are also used in hospitals and hospitality environments. In medical facilities, the robots deliver medications, laboratory specimens and other sensitive materials. At the Sheraton San Gabriel hotel in Los Angeles, TUG robots deliver luggage and room service throughout the facility.

KIVA ROBOTS, BY AMAZON ROBOTICS

Amazon was by no means the first company to deploy robots in the supply chain, but when the company acquired Kiva in 2012 to aid with the company's mushrooming e-commerce business, the rest of the supply chain industry took notice, with new companies and new venture capital entering the market. Now every announcement of a new Amazon fulfillment center touts the deployment of the robots as well as the human jobs being added.



Photo Credit: Amazon Robotics

Amazon's Kiva robots helped spur the growth of mobile robotics within warehouses and fulfillment centers.

Amazon Robotics automates fulfillment center operations using several robotic technology methods, including:

- Autonomous mobile robots;
- Sophisticated control software;
- Language perception;
- Power management;
- Computer vision;
- Depth sensing;
- Machine learning;
- Object recognition;
- Semantic understanding of commands.

On its website, Amazon Robotics said it plans to "continuously explore new opportunities to extend its product lines into new areas" to offer new customer experiences.

The company said robotic systems in each new fulfillment center enables the company to meet its two-day delivery promise to Amazon Prime members. In many cases, deliveries can be made within a day, and in some cases, in less than a day. According to Deloitte, the robots have helped cut shipping cycle times by as much as 80%, compared with human handling systems.

OTTO, BY CLEARPATH ROBOTICS

The self-driving vehicles (SDVs) from Otto Motors, a division of Clearpath Robotics, use laser-based perception and artificial intelligence to navigate through warehouses and manufacturing plants. The systems combine the benefits of manual labor, conveyors, and AGVs, said Ryan Wicklum, manager of supply chain for Clearpath and Otto Motors.

The Otto 100 and Otto 1500 both feature all-metal construction and an integrated lift for automated loading and unloading. The vehicles are designed for durability in several environments, and have become a flagship product for industries spanning healthcare, automotive and small-cell manufacturing, Wicklum said.

The Otto SDVs rely on connectivity with industrial application programming interfaces (APIs) for quicker decisions that Wicklum said saves users time and money. “With facilities using robotics, data is the new currency.”

In March, the company released the Otto industrial API, to help companies have a fully connected and optimized smart factory. The industrial API simplifies the process of connecting equipment and programmable logic controllers (PLCs) to Otto SDVs.

The OTTO 1500 uses laser-based perception and AI to navigate through warehouses and manufacturing plants.



Photo Credit: OTTO Motors

The company's SDVs are deployed at various operations. For example, at GE Healthcare's 280,000-square-foot facility in Milwaukee, the Otto robots have taken over moving equipment between repair cells, shipping and other areas.

John Deere & Co. is uses the Otto SDVs at its Horicon, Wis., plant, while Toyota Motor uses the vehicles to shuttle tires from a holding area to the assembly line at its Mississippi facility.

HMISHELF AND ROLLERTOP, BY FETCH ROBOTICS

The company's original Freight500 and Fright1500 mobile robots have been joined by two newer models, HMIShelf and RollerTop, providing more capabilities in moving materials around warehouses and other facilities. The robots help logistics firms work around the clock in existing facilities, something not always possible with human workers and locations facing big labor shortages. The robots can move a wide range of materials, from parts to pallets in warehouses, factories and distribution centers.

The HMIShelf robots include autonomous transport for packages, bins, and totes, with customizable shelving sizes to adapt to different package sizes. The robots come with integrated touchscreen interfaces, and dynamic obstacle avoidance technology to move around humans and fast-moving forklifts, the company said.

The HMIShelf robots from Fetch include autonomous transport with customized shelving size options.



Photo Credit: Fetch Robotics

The RollerTop model provides automated conveyor-to-conveyor transport, able to extend and adapt existing conveyance systems. They can autonomously pilot to a conveyor end to either receive or deposit material, Fetch said.

Fetch's FetchCore cloud software lets customers deploy new robots in a few hours, while also collecting data from the robot systems. At RK Logistics, robots were up and running in a matter of days, and now handle one-third to one-half of the materials handling for the facility.

SWIFT, BY IAM ROBOTICS

The Swift mobile picking robot incorporates 3D vision technology to select items from racks, shelves, or bins. It can work alone at smaller facilities, or as a fleet for larger operations. The robot uses a hot-swappable battery capable of supporting 10 or more hours of continuous operation, giving each robot the ability to pick across three shifts with virtually no interruption, the company said.

The "brains" of the Swift robot is the SwiftLink software interface, which integrates with existing warehouse management systems. SwiftLink lets users issue commands for setup and picking, monitor robot status, track productivity and receive 24/7 mobile notifications. SwiftLink also provides regular performance analytics, enabling users to monitor and tweak the system for better efficiency.



Photo Credit: IAM Robotics

The Swift mobile picking robots uses 3D vision technology to pick items from racks, shelves, or bins.

One of the first installations of Swift was in January 2017 at the Rochester Drug Cooperative (RDC). The robot works on a third shift, performing picking duties for RDC's over-the-counter eCommerce order fulfillment process. RDC said it plans to increase utilization of the first robot and add additional units to automate more picking zones in its operation, though no date for adding to the Swift fleet has been announced.

LOCUSBOTS, BY LOCUS ROBOTICS

Working collaboratively alongside warehouse staff, LocusBots help locate and transport pick items so human workers don't have to push carts or carry bins. The company said the LocusBots also can eliminate the need for a worker to move from place to place with their picked products. Instead, workers can take items from a warehouse shelf, scan it, place it in a container, then program the LocusBot to deliver the container or send it to another destination for additional pickup.

DHL Supply Chain selected the LocusBots in a pilot program designed to improve efficiencies for its customers.

LocusBots can work collaboratively with human workers.



Photo Credit: Locus Robotics

"DHL Supply Chain's initial implementation of this pilot program within the life sciences sector will inform the potential for broader deployment across different parts of our business," said Adrian Kumar, vice president of solutions design at DHL Supply Chain North America. "This is a natural evolution of our robotics program."

The deployment of the LocusBots enabled DHL Supply Chain to double its productivity, Kumar added. "When we can provide our customers with more efficient and effective operations, we all win. We are eager to further develop our relationship as our commitment to continuous improvement is solid."

Locus Robotics recently partnered with Supply Chain Services LLC, an integrator of supply chain and warehouse technologies. The partnership makes Locus Robotics' units solution available to Supply Chain Services' network of some 2,000 warehouses and distribution centers.

VGVS, BY SEEGRID

Whereas many warehouse and logistics robots are designed to move individual items or small bins of materials, Seegrid specializes in pallet trucks and tuggers that move pallets and other objects typically moved by human-operated forklifts, said Jeff Christensen, Seegrid's vice president of product. The company calls their units Vision Guided Vehicles, or VGVs.

"Our navigation system is probabilistic, which is more robust for environmental change," Christensen said. "When we train a vehicle on a route, it takes all 10 images, forms a giant point cloud from ceiling to floor in 360 degrees, and uses all that data to define this point in space. The VGV is not looking at individual points, but statistically to have confidence. It's true adaptive navigation. You have to be prepared for contingencies."



Photo Credit: Seegrid

Seegrid's VGVs are designed for autonomous tugging and heavier loads.



Photo Credit: Tompkins Robotics

The t-Sort system from Tompkins Robotics has a modular design to let companies create customized picking and sorting processes.

Each VGV has five pairs of cameras to provide a 3D grid view of its environment so it can react quickly to any changes, whether it's permanent, such as new shelving; or temporary, such as a forklift or human moving in the planned path.

More than 50 of Seegrid's robots have been deployed at the Whirlpool Corp.'s 2.4-million-square-foot plant in Clyde, Ohio, automatically delivering parts every 20 to 30 minutes to some 24 drop-off locations on the assembly and sub-assembly lines.

While the Whirlpool operation is the most extensive deployment of the Seegrid robots to date, the units are also used for parts-to-line, put away, long hauls, end-of-line, staging/sortation, replenishment, kitting/picking, trash removal, and cross docking/virtual locations for various customers.

T-SORT, BY TOMPKINS ROBOTICS

Tompkins describes its t-Sort sorting system, developed in conjunction with Z Labs, as "a tilt-sorter with no rail." The system's modular design lets companies add individual robots, chutes and induction stations as additional modules without interrupting normal operations. Such a design also enables users to add and eliminate elements as needed, so companies can scale up or back to meet seasonal needs.

The t-Sort is 15 inches wide and can handle items ranging from small containers and small individual items to liquid containers.

Compared to a traditional tilt tray system, the t-Sort system requires 50 to 70% less capital, with the final cost dependent on design, scale and volume. Tompkins has yet to name any users of the t-Sort system, but did announce

two partnerships – RightHand Robotics and its RightPick robotic piece-picking systems; and SI Systems and its Robotic A-Frame dispensing technologies for optimized order flow.

TSVISION3D, BY TM ROBOTICS AND TOSHIBA MACHINE

The company's six-axis picking robots use stereo cameras, PC software, and LED lighting to provide accurate 3D measurements, accurate positioning, and high speed for automated bin picking, said Doug Dalgliesh, business development manager for TM Robotics, a partner with Toshiba Machine.

The company offers three different models of the robot, enabling companies to choose the one that best fits their needs for reach and payload. The TSVision3D system includes features such as model registration without requiring CAD data, simple calibration, function for collision avoidance with boxes, and more, the company said.

The optional TSAssist robot programming assist tool can assist in several work phases, from planning automation facilities to installation and improvements. The software also includes features for interference check, path display and accurate simulations.

RT4500, BY VECNA ROBOTICS

The RT4500 is the workhorse of its robotic tugger line, able to handle loads of up to 4,500 kg. The company also has a pair of robotic lifters (RL3600, for weights up to 3,600 kg; and the RL350, for weights up to 350 kg), and two conveyors (RC500, for payloads up to 500 kg, and RC20, for payloads up to 20kg).



Photo Credit: Vecna Robotics

Vecna tuggers include the RT4500 and other models for lower weight capabilities.

The company recently introduced Industrial Internet of Things (IIoT) montoring for all its robots, helping them automatically handle the transport of pallets to an intermediate storage buffer. The system also handles the flow of empty pallets to production lines. Data captured by the AGVs can now be used for predictive analytics, maintenance, safety, and best-practice lean manufacturing processes, the company said.

FedEx started with a single Vecna robot at its 63,000-square-foot Kernersville, N.C., distribution facility in 2011, expanded to three later that year, and then to five a year later. The robots are designed primarily for moving heavy, bulky items at the Fed Ex facility, such as tires, large boxes and even coffins. The initial pilot program has provided enough benefits that in March, FedEx announced a plan to expand its deployment of Vecna RT4500 robots to 20.

ADDITIONAL ROBOTS IN THE MOBILE ROBOTS SPACE:

- **"Chuck", by 6 River Systems:** Massachusetts-based 6 River Systems recently announced a $25 investment by Menlo Ventures for its Chuck robots, which collaborate with human workers to help them complete orders more efficiently in a warehouse and logistics operation.
- **Piece-picking robot by RightHand Robotics:** In addition to the partnership with Tompkins mentioned earlier, the company recently claimed a world record in piece-picking at the MODEX supply-chain event. The company also partnered with Vecna Robotics on an e-commerce order fulfillment project.
- **Materials-handling robots from Next Shift Robotics:** The company uses self-lighting and smart navigation technology on its mobile robots, along with the ability to "load and unload order-totes unassisted." The company recently announced a new robotics system for use within e-commerce distributions centers and cellular manufacturing.



Photo Credit: 6 River Systems

'Chuck' by 6 River Systems