Robotics247

SPECIAL FOCUS ISSUE
MARCH 2022

Collaborative Robots Bring Productivity

PEERLESS
CONTENT CREATION

CONTENTS

EDITOR'S NOTE

Collaborative robots are a rapidly growing segment of industrial automation, thanks to their ease of use, which promises to democratize robots for small and midsize manufacturers. However, they have had to overcome limitations in payload, precision, and programming.

Cobot arms and collaborative mobile robots are designed to operate safely around people, and they offer flexibility for customization and varied applications. But first, users and integrators must evaluate the latest sensors, software, and end effectors.

In this Special Focus Issue, we look at how cobots are changing how tasks such as machine tending, packaging, and welding are done. From manufacturing to e-commerce, we examine how different industries are using cobots and AI to boost productivity.

As demand for piece-picking automation continues to rise, innovations in perception and manipulation are leading to more cobots in factories, warehouses, and even restaurants. We hope you find this issue informative!

Eugene Demaitre, Editorial Director
Comments? E-mail me at
edemaitre@peerlessmedia.com

EXECUTIVE CONTACTS

Group Publisher/International Sales
Tom Cooney
tcooney@peerlessmedia.com
973-214-6798

President and CEO, Peerless Media
Brian Ceraolo
bceraolo@peerlessmedia.com
508-663-1553

Editorial Director
Eugene Demaitre
edemaitre@peerlessmedia.com
508-380-5457

Associate Editor
Cesareo Contreras
ccontreras@peerlessmedia.com
508-663-1558

SALES

Western Regional Manager
Len Pettek
lpettek@peerlessmedia.com
805-493-8297 office
805-231-9582 Mobile

Midwest/Eastern Regional Manager
Michael Worley
mworley@peerlessmedia.com
508-663-1561

CLIENT SERVICES

Director of Client Services
Mary Ann Scannell
mascannell@peerlessmedia.com
508-663-1560

Director of Marketing
Karen Bligh
kbligh@peerlessmedia.com
508-663-1550

Director Content Management
George Kokoris
gkokoris@peerlessmedia.com
508-663-1555

Director Online Technology
John Brillon
jbrillon@peerlessmedia.com

Webcast Project Manager
Steve Paul
spaul@peerlessmedia.com
617-281-7125

Production Director
Kelly Jones
kjones@peerlessmedia.com
508-663-1554

Office Manager
Laurel Peddie
lpeedie@peerlessmedia.com
508-663-1559

Robotics247

Peerless MEDIA, LLC

PEERLESS CONTENT CREATION

KÖRBER

AMRs address the challenges in today's warehouse

If labor shortages or elevated demand are negatively impacting your warehouse fulfillment, then you're likely thinking about Autonomous Mobile Robots (AMRs). With so many AMR choices available, it can be hard to understand which ones present the best fit for your organization's unique situation. You therefore need a partner with a holistic approach and significant experience in both software and automation. That partner is Körber.

"We would not be able to keep up with volume, without the addition of the robots."

Theron Neese
Chief Supply Chain Officer

ESN EXPECT GROWTH

Read the case study →

"This was one of the first technologies that I've seen come into a building where the team was excited from the get-go, and it just hasn't stopped."

Chris Christiansen
Outbound Manager

evo

Read the case study →

Let's connect!
Book a meeting.

Cobots

Flex Their Muscle in Manufacturing and Education

Collaborative robots are becoming a bigger part of the manufacturing pie, helping workers and educators.

BY CESAREO CONTRERAS

As the manufacturing workforce gets older, the complexity of tasks on assembly lines increases, and the labor shortage continues, more and more companies are turning to collaborative robots, or cobots, to help fill in the gap.

Cobots can work alongside humans and are easier for the end user to control. Their relatively small size and safety sensors allow them to fit in more places, and they can be easily programmed to complete repetitive tasks. Ideally, they free up time for human workers to tackle other more complicated problems and allow facilities to operate more efficiently.

Automaker relies on human-machine collaboration

Stellantis, an auto manufacturer that was formed after the merger of Fiat Chrysler Automobiles and PSA Group, is taking advantage of 11 collaborative robots in one of its electric car factories in Italy. From applying waterproof liners on vehicle doors to the mounting of hoods, the robots have become a major part of the process.

The cobots were created by Odense, Denmark-based Universal Robots A/S, the market leader in the

space with a 44% to 47% market share. Stellantis has been using UR cobots since 2017, according to Universal Robots.

"For us, UR technology is a guarantee of a particularly advanced man-machine interface perfectly matched with the group's quality requirements in terms of both production processes and products," said Ennio Meccia, head of manufacturing chief engineers at Stellantis in a case study by Universal Robots.

The cobot market is estimated to reach $1.71 billion by the end of 2022 and have a valuation of $8.65 billion by 2029, according to a recent study by Future Market Insights. Cobot applications are expanding into painting, quality testing, material handling, and more.

Other manufacturers connect with cobots

One of the biggest applications of collaborative arms, as of late, has been arc welding, said Joe Campbell, senior manager of strategic marketing and application development at Universal Robots. Arc welding involves connecting pieces of metal electrically and is often used by metal fabricators.

"In our world, it's three times bigger than it was a couple of years ago," he told *Robotics 24/7*. "It's actually a little over 6% of our total volume. That's new, and it's continuing to grow every month."

Universal Robots recently reported a record annual revenue of over $311 million, up 41% from 2020 and 23% from 2019.

While Universal Robots may be leading the charge in collaborative robot production, other robotics manufacturers are following suit, including some of the big players in the industrial automation space.

Cobots are increasingly becoming a bigger part of the manufacturing pie, according to Joe Chudy, general manager at ABB Robotics. The Zurich, Switzerland-based robotics vendor has four models of cobots, including the dual-arm YuMi, the single-arm YuMi, the GoFa CRB 15000, and the SWIFTI CRB 1100.

ABB's GoFa and SWIFTI, which were released in February 2021, offer higher payloads than both versions of the YuMi, with payloads of 5 kg (11 lb.) and 4 kg (8 lb.), respectively.

"The demand for collaborative robots is estimated to grow at a CAGR [compound annual growth rate] of 17% between 2020 and 2025, while the value of global cobot sales is expected to increase from an estimated

Cobots such as the single-arm YuMi are designed to be easy to program. Source: ABB

$700 million in 2019 to about $1.4 billion by 2025," Chudy told *Robotics 24/7*.

ABB's cobots are used in small and midsize assembly, polishing, welding, machine tending, packaging and kitting, inspection, and laboratory automation, according to Chudy. He claimed that no programming expertise or specialized training is needed to use the cobots.

Cobots enable research and education

ARC Robotics, a certified supplier of FANUC robots in the Czech Republic, outfitted the University of West Bohemia's mechanical engineering department with a robotics workspace using a six-axis FANUC CR-7iA/L cobot. The company also installed a camera and gripper.

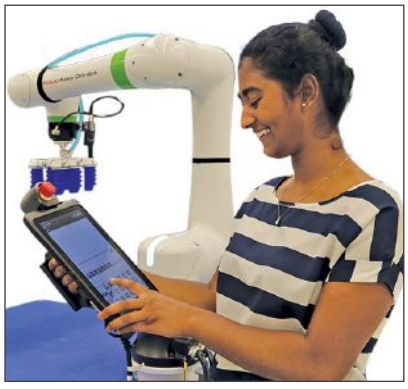
Japan-based FANUC Robots, widely considered one of the top industrial robot manufacturers in the world, has two lines of cobots, the Collaborative Robot FANUC CR series and the CRX Collaborative Robot Series.

Noteworthy applications of FANUC's cobot robots include worker training and research into more uses for cobots in production.

In August, AUBO Intelligent Science and Technology Co. created an open research publishing platform dedicated to the study of collaborative robots aptly named "Cobot."

The Beijing-based company created the platform in partnership with Taylor & Francis' group F1000 open research platform.

"The publishing platform provides a research communication outlet of innovative technologies for technicians, researchers, scholars, and experts who are working in the field of collaborative robots," said AUBO and F1000 in a statement.



The FANUC CRX-10iA can be used for applications including machine loading, inspection, and packing. Source: FANUC

Francis Huang, division director of AUBO Robotics, said the company launched the platform because it felt an obligation to provide a place for cobot research, given its prominence in the cobot space in China. The company also sees the platform as an opportunity to better reach the Western market.

"In a leading position among the industry, [we thought] there was something more we could do for this industry because many people still don't have a very clear concept about collaborative robots versus industrial robots," Huang told *Robotics 24/7*. "There are a lot of things cobots can do that people don't know about."

AUBO and F1000 said topics of research will include "scientific and technical research topics in intelligent robots, artificial intelligence, human-machine collaboration, human-machine integration, machine vision, intelligent sensing, smart materials, and more."

Over the past 18 months, Universal Robots has also expanded its teaching efforts into 89 training centers around the world, Campbell said. The company has also created a teaching curriculum that is being used in more than 40 schools in North America, including universities, vocational schools, high schools and middle schools.

Cobot providers look to expand reach

Some of the biggest challenges ahead include increasing the amount of weight collaborative robots can move and their range, said Campbell. He mentioned that the company recently increased the payload of its No. 1 model, the UR10e, to 12.5 kg (27.5 lb.), a 25% increase.

"It's difficult with a collaborative robot because there are speed and force limitations that you have to watch to make a cobot safe," he said.

But Campbell said cobots will keep growing, expanding, and disrupting the manufacturing industry.

"We have many partners who deliver total systems for $85,000," he said. "That's about a third of a cost of a traditional system." ■

Cesareo Contreras *is associate editor at* Robotics 24/7. *Prior to working at Peerless Media, he was an award-winning reporter at the Metrowest Daily News and Milford Daily News in Massachusetts.*

6 RIVER SYSTEMS

LEADING THE WAY TO FASTER FULFILLMENT

"The real win here is how quickly we got everything up and running. We went from design to development to deployment in less than 3 months, and in time for the holiday peak."

SCOTT OLDENDICK,
Director, Distribution Operations

crocs™

FLEXIBLE, SCALABLE FULFILLMENT SOLUTIONS FOR TODAY'S WAREHOUSE CHALLENGES.

Increase your efficiency today.

6

Learn more | **6river.com**

Collaborative Robots

Raise the Bar for Productivity

Source: OnRobot

By bringing humans and machines closer together, cobots can play to the strengths of each while improving quality and throughput.

BY TOM KEVAN

Collaborative robots, or cobots, fundamentally change the nature of production by creating new synergies between humans and machines. By playing to the strengths of people and automation, multiple industries can improve productivity and product quality while reducing operating costs.

Equipped with sensors for safe collaboration and accurate manipulation, ways of learning new tasks without programming expertise, and a variety of end-of-arm tooling, cobots can bring flexibility to shops of all sizes.

Cobots promise to boost productivity

Collaborative robots can perform the dull, dirty, and dangerous tasks once performed by humans. "This provides a double benefit," said Joe Campbell, senior manager of applications development at cobot leader Universal Robots A/S. "Cobots take care of tasks humans are unavailable or unable to perform efficiently and safely,

providing a powerful tool for companies struggling in the face of the ongoing manufacturing and warehousing labor crisis."

"They also free humans to work on higher-order tasks, ensuring that companies get the best from both their human and automation resources," he said. "This improves ergonomics and morale for human workers, reducing workplace strain and injury."

In addition, this automation technology can achieve higher levels of repeatability and accuracy than humans performing the same tasks. In some cases, this precision can be measured at micron levels. This level of precision also translates to a reduction of raw material waste.

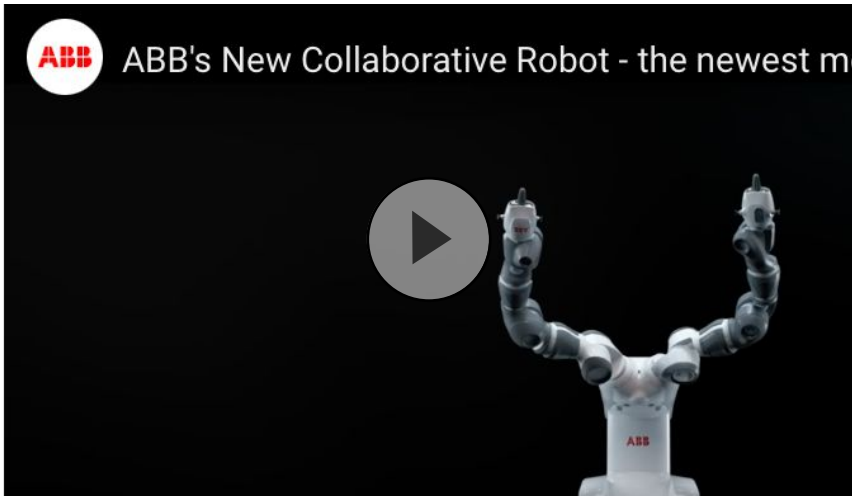
"Cobots are more consistent than human workers at performing certain tasks, are flexible enough to be deployed in a wide range of applications, and are easily transported and deployed," said Campbell. "These qualities provide cobot users with additional productivity boosts."

Furthermore, cobots can operate 24/7, shortening cycle times and supporting just-in-time manufacturing.

Automation helps users adapt to market demands

Another way cobots can help increase productivity is by providing companies with the agility required to quickly adapt to changing market demands.

For example, today's manufacturers must be able to meet the growing demand for customization and shorter, more varied production runs.



At the same time, warehouse and logistics companies must cultivate infrastructures flexible enough to handle the explosive growth of online purchases and the accompanying supply chain demands.

Fortunately, cobots have the functionality and flexibility required to meet these market demands.

"Collaborative automation is ideally suited to high-mix, low-volume production runs due to its combination of usability and flexibility," said Kristian Hulgard, general manager for the Americas at end-effector provider OnRobot A/S. "Making adjustments to an application, such as adjusting the settings on a gripper or camera, is straightforward, even for those with no automation experience."

"With the right end-of-arm tooling and software, a cobot can be deployed on any number of applications, from sanding to assembly to material handling and inspection," he said. "This allows companies to respond quickly to changing requirements. Furthermore, user-friendly software interfaces have replaced the overly complex interfaces associated with traditional automation."

Collaborative robots start in manufacturing

Tomenson Machine Works Inc. is an example of a manufacturer working with collaborative robots. The Chicago-based company looked for a machine-tending system to tend its pin stamper, a very repetitive process in the production of precision hydraulic manifolds.

One of the chief challenges was that the pin stamper had to be able to handle hundreds of different part sizes. Therefore, Tomenson needed a cobot with an adaptive gripper capable of handling a wide range of units.

The system's collaborative capability was also a critical element in the selection process because the unit had to be able to safely function in a tight working environment. In the end, Tomenson selected Universal Robot's UR5 arm equipped with OnRobot's RG6 gripper.

According to Tomenson, the greatest benefit of using the system was a 40% reduction in misloads, a failing resulting from engraving in the wrong direction or on the wrong side of the part.

Profit margins also improved as Tomenson took on more high-volume, small-part jobs because it had confidence in the cobot's ability to perform the task consistently and more accurately than a human. The automation also reduced engineering hours and allowed the company to reallocate workers to focus on bigger parts, with complex processes and longer cycles that require more attention.

DCL Logistics chose the UR10e for its pick-and-pack process, reducing its labor costs by 50%. Source: Universal Robots

Cobots find use in fulfillment and logistics

Another application demonstrating cobot capabilities can be seen at DCL Logistics, a full-service, third-party provider of fulfillment and logistics services. The Fremont, Calif.-based company has several years of hands-on experience with cobots that bear out the promise of increased productivity and efficiency.

"Our cobots are robotic arms that pick products from a storage shelf and place the products into a box," said Brian Tu, chief revenue officer at DCL Logistics. "This is the interim step between when an order is placed in our system and when the box of products is packaged to ship to the customer."

In addition, the modular nature of the system allowed the company to integrate the cobot into the existing workflow, obviating the need for large-scale system changes. Since it first deployed cobots, DCL has seen major improvements in its operations.

"Cobots have allowed us to increase the number of orders we process more accurately and more quickly," Tu said. "Since our fall 2019 launch, we have seen a 200% increase in throughput on our fulfillment lines, a 60% decrease in direct labor, and 100% order accuracy. We have also developed the ability to run 24/7."

Cobots are not without challenges

Industry experts agree that the key to broader robot adoption lies in making the systems as easy and safe to deploy and use as possible. In practice, this means users should be able to program and install their cobots straight out of the box, without specialized training.

Even though cobot developers are investing much time and effort in this area, there is still room for improvement.

"Cobots were a good fit because they provided us with a modular solution to integrate into our system and workflow," said Tu. "This, however, put the onus on us to program, install, and connect the cobots ourselves. This was a relatively slow process because there was a steep learning curve."

"It took approximately 12 months of R&D to get the cobot production-ready," he added. "We also had to train our staff to work alongside the cobots, run them, and troubleshoot and optimize them. This remains true as we deploy more cobots in more of our facilities."

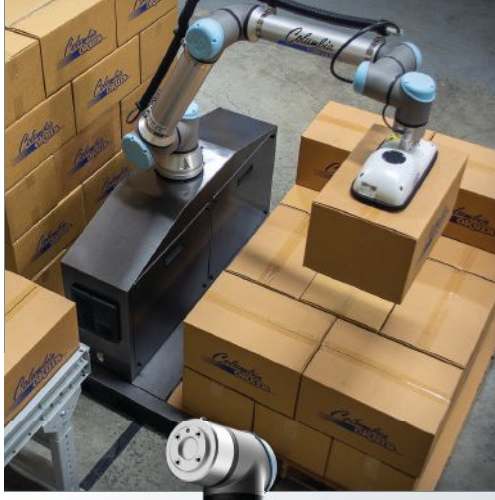
In addition to these deployment challenges, end users should be aware of the inherent limitations of cobot technology.

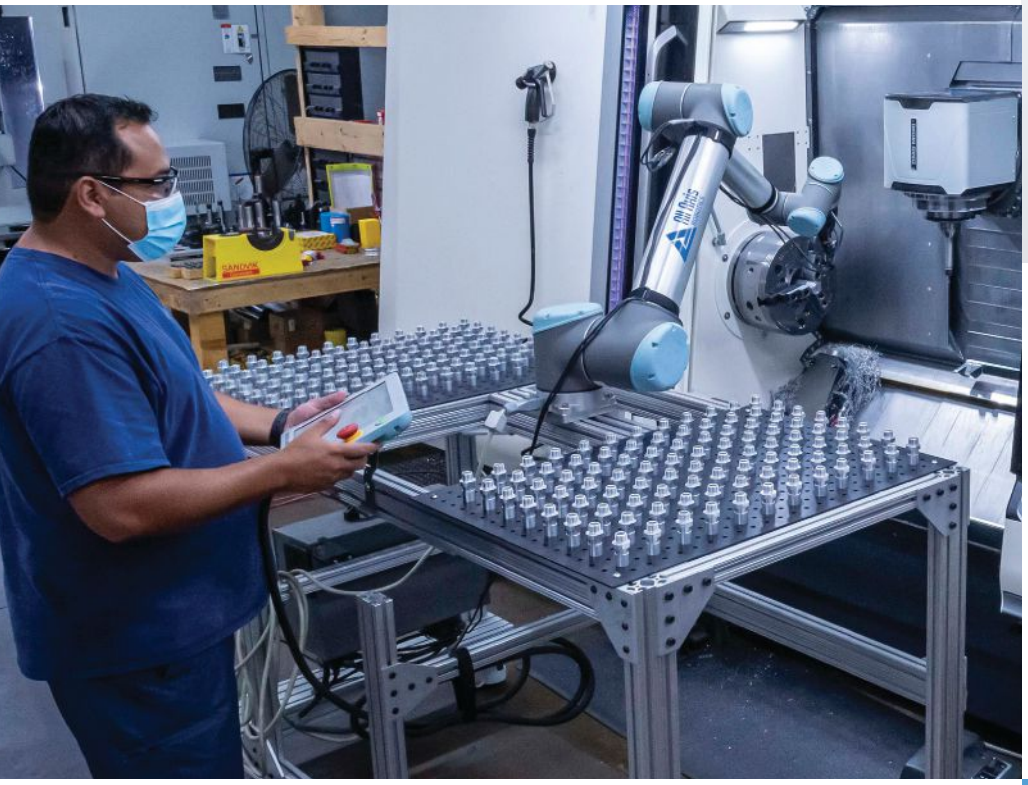
"By the nature of their design, cobots often operate slower than full industrial robots, so throughput should always be considered when placing a cobot into service," said Dean Elkins, segment leader for handling at Yaskawa Motoman. "Additionally, limited payload designs will always see cobots placed in tasks that call for less lift capacity."

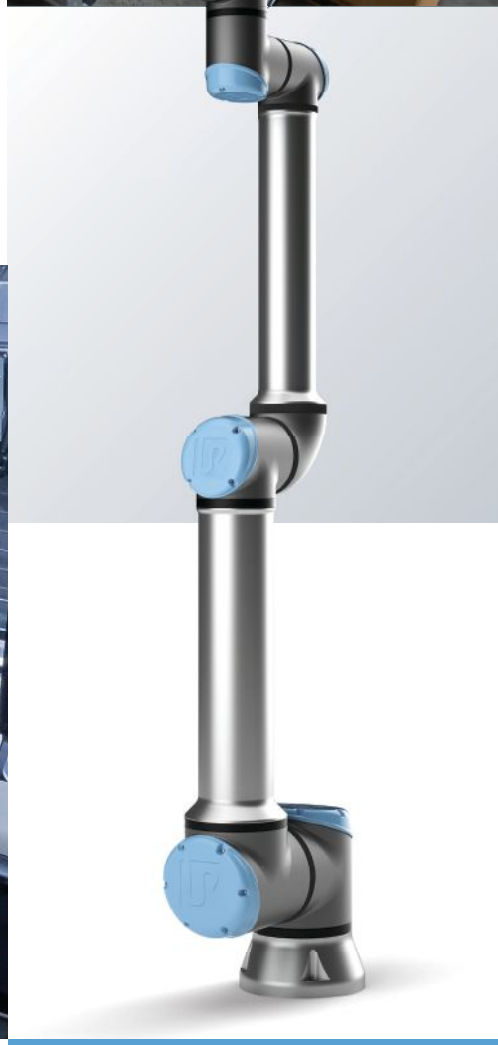
Such limitations are valid concerns, but cobots still offer value and ease of use. "It's important to note that the challenges involved in deploying cobots are orders of magnitude smaller than the challenges involved with traditional industrial automation," said Campbell. ■

Tom Kevan *is a freelance writer/editor specializing in engineering and communications technology.*

It’s time to boost productivity.
It’s time for Cobot automation.







Facing the ongoing shortage of highly skilled labor, smart manufacturers are turning to collaborative robots. Cobots by Universal Robots can handle most dull, dirty, and dangerous jobs. Freeing your skilled workers for more creative and critical work. Boosting efficiency, productivity, and profitability.

Learn more at **Universal-Robots.com**

UNIVERSAL ROBOTS

www.universal-robots.com

Universal Robots CEO Discusses Cobot Leader's Outlook for 2022

Kim Povlsen, who became president and CEO of Universal Robots last year, shares his perspective on growing collaborative robotics applications.

BY EUGENE DEMAITRE

One of the fastest growing areas of robotics is collaborative robots or cobots, which have sensors enabling them to work alongside people and are designed to be easier to program and use for a variety of tasks. Universal Robots A/S is the global market leader in cobots, and it has developed an ecosystem of accessory providers, systems integrators, and training programs to support its robot arms. Kim Povlsen, who became president and CEO of the Odense, Denmark-based company last year, has seen cobot technology mature.

Robotics 24/7 spoke with Povlsen about his background, how Universal Robots has weathered the COVID-19 pandemic, and the company's plans for innovations in 2022.

You came to Universal Robots from Schneider Electric—how familiar were you with robotics before becoming CEO?

Povlsen: I grew up in Odense and went to the University of Southern Denmark, where the whole cobot thing started. I'm a robotics engineer and studied at the same place as UR's three co-founders.

There wasn't that much of a robotics community when I was studying, but a lot of our professors were helping to launch startups.

When I was done with my studies, I went to Schneider Electric, where I worked for 13 to 14 years doing very different things. I moved from engineering

to the "dark side" of business. I got to run the software business and strategy at an internal startup. I moved more and more into management roles.

I lived in France and the U.S. but was always keeping an eye on Odense. I'm passionate about robotics.

Early last year, there was an opportunity when [then-President] Jürgen von Hollen decided to leave. I was in contact with Teradyne [the owner of Universal Robots and other robot companies], and it was a good match.

80+ sites around the world

The pandemic has dominated the news of the past two years—how has it affected an international business like Universal Robots?

Povlsen: Borders closed during COVID, but I'm proud to say that we successfully adapted and had a good year. The adaptation to digital was a lot of work, but it worked out really well.

We moved to Microsoft Teams, and more importantly, we engaged with our customers and support teams and showed them the cool things we do in automation. There's a desire to understand how it would look in their environments.

UR also had to move quickly to show customers cool innovations as we did at events. To that end, we now have [more than] 80 sites around the world that do training with our partners. We invited customers in, and fortunately, they rated it very highly.

The sites for training vary by country. Sometimes, Universal Robots opens its own UR Academy facility; other times, we partner. The countries that are open are still very busy—there's still a catch-up effect.

How much does UR use simulation tools in education or setup?

Povlsen: We had to develop online trainings that were very sophisticated. We had the technology in-house, and with simulations, we could do training online and see how something would look in reality.

We also have significant traction with the online version, which features full physics. With an acquisition, Universal Robots has software for making advanced robots even smarter. The simulation capabilities needed for real-time path planning can also be used for training.

Speaking of setup, how important is UR's network?

Povlsen: I want to give credit to our partners and distributors. They can do online prototyping, which is like a proof of concept in person, and they could 3D-print an object to show a customer how things would work.

With more than 300 UR+ partners, there's a multiplication of our engineering workforce.

UR has received endorsements for its products and curriculum from the Ohio Department of Education and the Advanced Robotics for Manufacturing (ARM) Institute. Source: Universal Robots

For the future, we're taking online as an additional opportunity and turning it into a hybrid experience. Even if you're present at an event, we'll still have a virtual one. Our customers can get an omnichannel experience.

Products and applications

How has the demand evolved for Universal Robots' products?

Povlsen: Compared with a couple of years ago, when it was just automotive manufacturing, cobots are being used in a variety of solutions. SMEs [small and midsize enterprises] have really been getting into the game of automation. A few applications rise to the top.

One vertical that's really moving fast is robotic welding. A few years ago, a shop wouldn't consider a cobot, but it's now our fastest-growing vertical because of the versatility of our robots.

Some partners are really being innovative, and smart OEMs are developing standardized solutions and then helping customers with the last 10% of whatever they need to do. With open APIs [application programming interfaces], it's easy to do something specific, like a welding deployment program in the U.S. or Europe.

Another cobot application that's really getting traction is screwdriving. It sounds simple, but you have to be very precise. Customers set certain expectations.

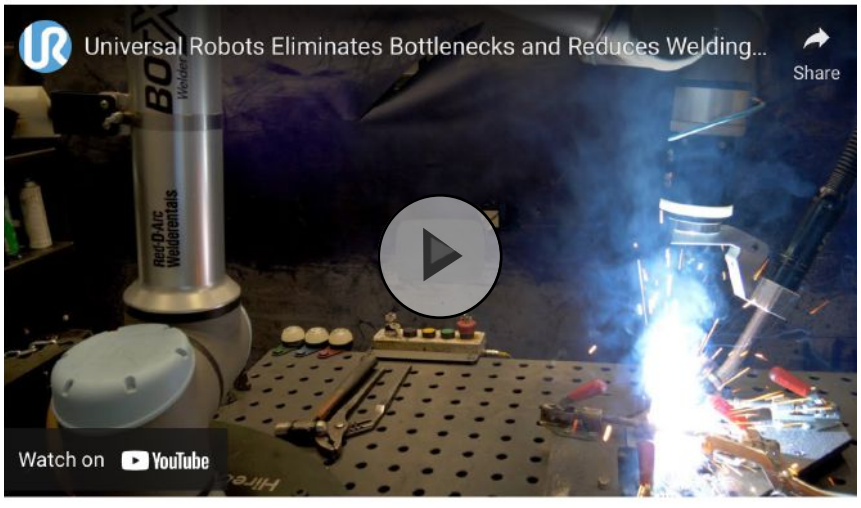
What has the reception been to the e-Series cobots, which are designed to be more precise than their predecessors?

Povlsen: As we've seen across any tech sector, when products provide new features, they take some time to catch on. A platform product like ours can take a while to find applications.

However, we can attribute our favorable financial results from recent quarters to all our UR+ products, as software, grippers, dispensers, and more become increasingly sophisticated.

Cobots have shifted from pick-and-place operations and machine tending to also being process tools.

With the e-Series precision and torque, plus partner software for welding and screwdriving, our partners are driving a lot of innovation with us.



Cobot awareness grows

Given the market potential, do SMEs have a greater awareness of the potential benefits of using cobots?

Povlsen: Yes, absolutely. We do our market analysis, and we know that there are tens of millions of tasks that people could do for more value-added work than the "3 Ds" [dull, dirty, and dangerous]. We're still just scratching the surface of what robotics can do.

The automation wave was happending even before pandemic. As business slowed down, it opened people's eyes to the need to automate. Labor shortages around the world are caused by a number of things—a lot of people are retiring, young people have different career choices, and a lot of people who did these jobs before have simply

decided that they don't want to go back.

Small and big production firms are really struggling for workforce, accelerating the desire for automation quite a bit. Cobots are a good choice for SMEs that need to retrofit their operations for automation because it's not a huge project and is manageable.

When we get up in the morning, we think about how to remove friction for SMEs in any part of their automation journey. We spend a lot of time thinking about what we can do about that.

Scaling up and 2022 plans

How does Universal Robots plan to stay on top in the cobot market?

PovIsen: As Universal Robots gets to a larger size, we're keeping the spirit of a startup. We can pivot fast, with no fear of change.

We're investing more in innovation and in our ecosystem of partners that create components and software for customers. We've been spending a lot of time trying to understand customer challenges, from design to deployment and after. If part of a process changes, we're looking for how to make that smoother.

We've learned that the customer is not looking for a cobot; it's looking for an application that solves a challenge. We're embracing that perspective and making technology available for any given problem. For some SMEs new to automation, those customers are still challenged by picking a gripper. We're looking at how to make their choices easier.

UR is taking great strides in North America, following up with customers to ensure that their deployments were smooth, that they got what they expected. We understand the automation journey takes a leap of faith, so we want to make sure they're satisfied and that we're there to help make it work.

With a holistic view, I'm obsessed with the idea of removing friction from the customer experience. Automating should be a breeze once you decide you need it.

What are you looking forward to this year?

PovIsen: In 2022, we've got some cool new things coming out that people haven't seen before. We're making additional improvements to Universal Robots' manufacturing facility, so we can build three times as many robots in the same space.

Hopefully, the world will reopen. I'd like to travel, and I can't wait to meet the company's teams.

We have very big growth ambitions. We have a lot of open positions and are adding a lot of people. It's challenging to find talent, but we're doing OK. This is an interesting industry, and it's fun to get into robotics. ■

Eugene Demaitre is editorial director of Robotics 24/7. He has participated in numerous robotics-related webinars, podcasts, and events worldwide.

3 Machine Learning Use Cases That Transformed E-Commerce

These examples show how AI and machine learning are enabling robots to serve the ever-growing needs of online retailers.

BY ALEX HUSAR, ONILAB

Artificial intelligence, robotics, and related technologies have found a place in online retail. In fact, e-commerce providers such as Amazon.com, Asos, and Zalando have found AI and deep learning departments essential.

Why do they invest in machine learning (ML)? It can helps them better understand their clients, customize offers for particular buyers, and automate manual tasks.

Machine learning allows online stores to be upgraded with smart on-site search, personalized ads, and intelligent chatbots. That's why you should integrate it into your website, the Magento "headless commerce" architecture or a headless platform on another content management system (CMS), or even in brick-and-mortar store.

Here are three ways to use machine learning and robotics to assist e-commerce.

1 ML enables vision-guided picking

Vision systems and robotics have come together for industrial applications. Regular robots that aren't equipped with an advanced perception system require certain conditions. For example, the work environment must be fixed, and the robot should always proceed to a predetermined position.

How can a robot move to where it's needed? Picking systems require high-precision sensing to locate objects to manipulate.

Today, vision-guided robots (VGR) are rising in popularity. They include the following capabilities:

- Recognizing an object with cameras or other sensors
- Determining the item's shape and position in space
- Picking and transferring the item to a target point with robotics hardware

A seemingly simple task requires complex AI and ML technologies. VGRs are commonly used to locate objects on a conveyor belt. How does this help e-commerce companies? Most vision-guided picking occurs in warehouses.

For example, the RightPick system from RightHand Robotics uses AI to autonomously handle thousands of SKUs from totes, bins, boxes, and cases. The hardware consists of an intelligent gripper, a high-performance industrial PC, and a robot arm.

Advanced automation systems can help online stores keep up with product flow and ensure customer satisfaction. For example, Paltac Corp., a major wholesaler of consumer packaged goods in Japan, has streamlined its picking processes with the help of RightHand Robotics.

2 AI manages mobile robot fleets

As manufacturers and supply chains adopt automation, they need to control and manage their growing fleets of autonomous mobile robots (AMRs). Fleet management systems (FMS) from the robot vendors or third-party software providers can help.

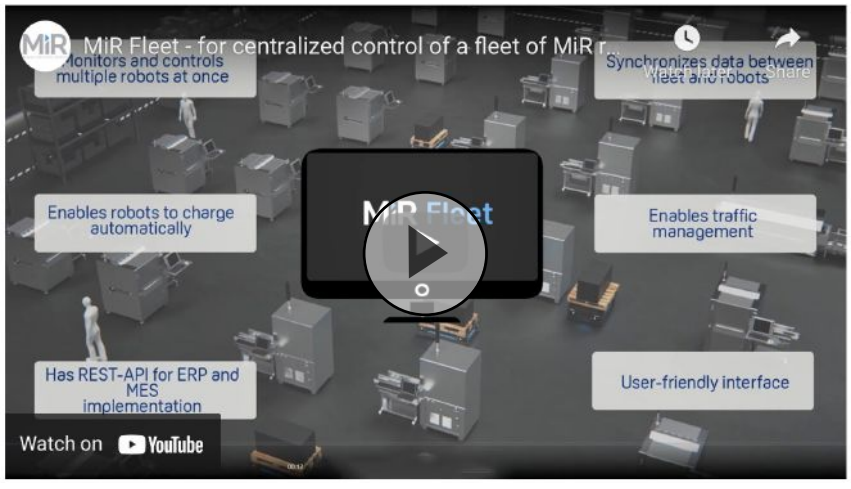
An FMS allows users or operators to centrally supervise numerous mobile robots from multiple devices via standard communication protocols. They can use devices incuding laptops, tablets, or smartphones to access the robots from anywhere, not just the shop floor.

What benefits can an FMS provide? First, it helps avoid bottlenecks and downtime, ensuring 24/7 AMR operation throughout a facility.

For instance, Mobile Industrial Robots' MiR Fleet software offers an intuitive Web interface for programming and monitoring. How does it work?

1. MiR Fleet assigns priorities to several robots and coordinates their actions.
2. The software allocates the tasks among the mobile robots to complete the job in the least amount of time.
3. It also guarantees that the mobile robots move to a charging station and charge up between tasks, reducing downtime.
4. The smart system allows users to have multiple levels of access.

MiR Fleet is equipped with cameras to control robot traffic patterns. Coupled with advanced learning algorithms, the system analyzes anonymized data to de-



termine the objects in the area, such as people, forklifts, or other mobile equipment.

MiR's AMRs receive this information from the cameras, which improves their awareness of their surroundings and allows them to change their behavior even before entering an area. Thus, the robots use AI and ML to avoid high-traffic areas, such as where goods are regularly transported and transferred by fork truck or where large groups of workers are present.

MiR robots are already at work at Toyota, Ford, and other companies in over 60 countries.

3 AI enables robots to collaborate with human workers

How can e-commerce businesses handle the ever-growing number of orders? Recruitment and retention of workers for repetitive tasks has become more difficult during the COVID-19 pandemic.

As online shopping doesn't show any sign of slowing down, more merchants are applying robots to order picking. At the same time, people are still needed for upstream and downstream processes. That's where collaborative robots, or cobots, come into play.

Collaborative robot arms and AMRs are different from industrial robots because they include sensors and programming to avoid dangerous interactions with humans. They are also potentially easier to operate, reducing the need for technical experts in production. Cobots include the following features, depending on the application:

Safety-monitored stop: Such safety systems disable a robot when a human enters the work envelope, or the robot's operating area. This is designed for applications that require little interaction between the robot and personnel.

Speed and separation monitoring: Such robots use more powerful vision systems than safety-monitored stop to slow down operations when a person approaches and stop when a worker is too close to the robot.

Power and force limiting: These cobots are designed with rounded corners and several collision sensors. They have force limits to avoid injury.

Hand guiding: In this case, an operator can control the robot's motion directly rather than using a teach pendant. If the robot is in automated mode, it responds only to the operator's direct control input. It allows the robot to reduce the operator's repetitive-stress injury risk.

Unlike other autonomous systems, cobots and collaborative AMRs are designed for constant work alongside human workers. One example is DHL, which keeps pace with e-commerce demands by using collaborative picking technology from Locus Robotics.

The global logistics provider uses more than 500 assisted picking robots in its warehouses in the U.S., Europe, and the U.K., and it plans to increase that number this year.

AI, ML, and robotics are already helping the e-commerce industry meet customer expectations for rapid and accurate order fulfillment. Vision-guided picking, fleet-management systems, and collaborative robot arms and AMRs have matured and are helping businesses be competitive.

This is only the tip of the iceberg, and we'll see how online retailers realize these technologies' full potential. ■

Alex Husar *is chief technology officer at Onilab, with more than eight years of experience in developing progressive Web apps, Magento migration, and Salesforce development. Husar's expertise includes both full-stack development skills and the ability to provide guidance to an entire project team.*

AI Becoming an Essential Feature for Picking Robots

Honeywell, Mujin, and RightHand Robotics have applied machine learning to make picking more precise and efficient.

BY PHIL BRITT

From path planning to object recognition, artificial intelligence is essential to improving robotic piece picking, particularly in manufacturing and e-commerce.

"The number of AI applications and providers using AI in robotic picking solutions continues to increase," said Thomas Evans, chief technology officer at Honeywell Robotics. "In the past year, we've seen an increase in the demand for automation, particularly around robots that use machine learning [ML] and artificial intelligence."

"Quantifying the impact and improvements can most easily be estimated by the efficiencies and increased scope of robotics in autonomous pick-and-place tasks," he added. "The improvements most readily tied to increasing the number of products and SKU variations a robot system can visualize and handle in warehouse and DC [distribution center] operations."

In addition, Thomas explained, "improvements are made when AI solutions are exposed to more operational data and the developers can efficiently repurpose that

data back into the AI and ML models."

The following systems demonstrate recent innovations for picking robots using AI:

Honeywell SmartFlex Depalletizer

Pittsburgh-based Honeywell Robotics has a strong focus on machine learning innovation and implementation, according to Evans. "This isn't just in the perspective to enhance robot performance and increase operational efficiencies, but also how we continue to quickly integrate automation solutions while on a customer site," he said.

"Having a strong understanding to generalize ML and AI models for multiple applications as the starting point for customer deployments and quickly refine the system to meet operational requirement is where we have focused our AI development," Evans noted. "It is an advantage to have a strong understanding of how to deploy AI solutions in order to provide end-to-end automation."

The company has several products that use AI and articulated robot arms to pick and place packages and products. Honeywell's Smart Flexible Depalletizer is an autonomous system that uses machine learning to identify items on a pallet, then reach and pick up individual or multiple packages (the mode can be changed) to place on a conveyor belt.

The latest computer vision technology identifies the exact location of every case on the pallet, while perception software automatically recognizes a wide variety of packaging. This technology allows for seamless handling of a continuous flow of pallets in any sequence without requiring any pre-programming or operator intervention, according to Thomas.

With AI and machine learning, the depalletizer is designed to optimize the movements of the robotic arm for maximum picking speed and efficiency. The control logic senses the weight of each item as the robot lifts it and automatically updates its gripping response to securely transfer each product.

The depalletizer, which was introduced in September, is in pilot at one production facility and is commercially available. "There is a lot of interest from our customer base," according to Thomas.

Some installations could come in early 2022 with even more advanced AI and machine learning capabilities, he said.

Mujin robot doesn't use a neural net

Other companies using AI with picking robots rely heavily on neural networks, but they are very difficult to train, asserted Brandon Coats, director of system innovation at Mujin Inc.

"No matter what you do, it will never be 100% accurate," he said. "So we're going in and using a model-based definition approach."

That approach relies on a combination of sensing the environment and then using it for measurements, path planning, and execution. This enables a picking robot to have a target and a plan to reach the target before execute mode, Coats said. "We never give the robot a target that it can't reach," he explained.

Rather than a neural net, Tokyo-based Mujin's robot relies on a database of items to be picked, enabling the task to be completed without any training.

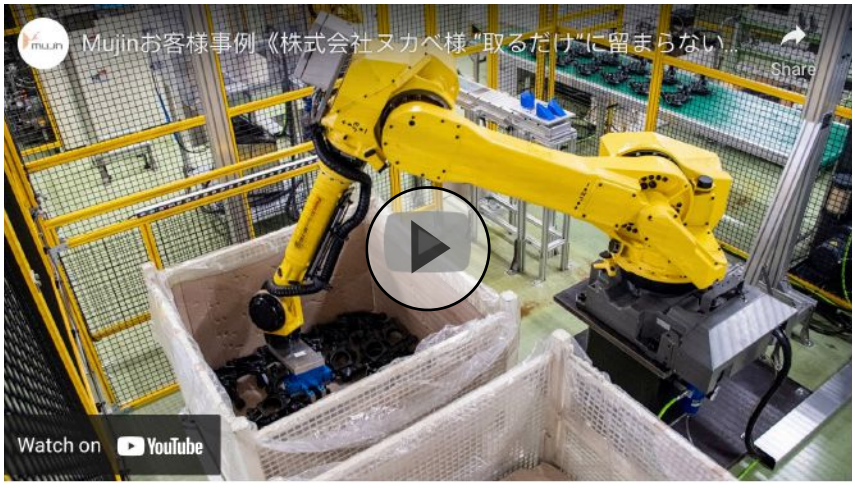
While picking robots have been used in assembly-line operations for years, 3D vision systems have only recently advanced to the point where the robots have the necessary intelligence for warehouse and logistics applications, according to Coats.

A Japan-based company is already using 20 of the robots to perform 100,000 picks daily per unit. The success of the technology there could be the basis for quick adoption around the world, Coats said.

"With everything we're seeing, a lot of Fortune 500 companies are going to want to make their supply chains more redundant and capable," he said. "By this time next year, you're going to see some major names deploying these types of robotic systems."

Coats said he doesn't expect any major changes in the underlying AI technology. Instead, there will be continued evolution and realization of the cost benefits of such systems, he said.

"The same way that we saw



robots getting into automotive manufacturing 20 and 30 years ago, you're going to see the same thing over the next five to 10 years in warehousing and logistics," said Coats.

AI advances benefit robotics users

"When it comes to AI and picking robots, the companies commercializing these systems are benefiting from broader technology trends," said Vince Martinelli, head of product and marketing at RightHand Robotics Inc. "It's now possible to hail a ride in an autonomous vehicle in some cities, for example, and we already take for granted that we can order lunch via a virtual assistant using AI-augmented speech and voice recognition based on natural language processing."

This progress seems to be accelerating, pushing the state of the art in underlying tools, methods, and sensors that are also critical for the machine vision and motion planning systems that are at the heart of autonomous picking systems, Martinelli added.

"Robotic arm costs have come down significantly over time, making the systems more attractive, and pressure on retailers from on-demand e-commerce, labor challenges, and the global pandemic have piqued demand for warehouse automation," he said.

AI software and processors, cloud and data-centric technologies, and autonomous mobile robots (AMRs) are each attracting billions of dollars of investment globally, according to Martinelli.

"When we look at the commercial impact, we see the number of production sites with picking robots increasing since they were introduced by RightHand Robotics in 2017," he added. "These robots are working across retail verticals including general e-commerce, pharma and online drugstores, grocery, and others."

This growing experience base has helped drive technology improvements in the past year, as has the demand for meaningful data from the people who operate fulfillment centers, Martinelli said. As the software has improved, so too has the reliability and performance of AMRs to execute warehouse tasks such as picking and materials handling.

RightPick 3 learns without models

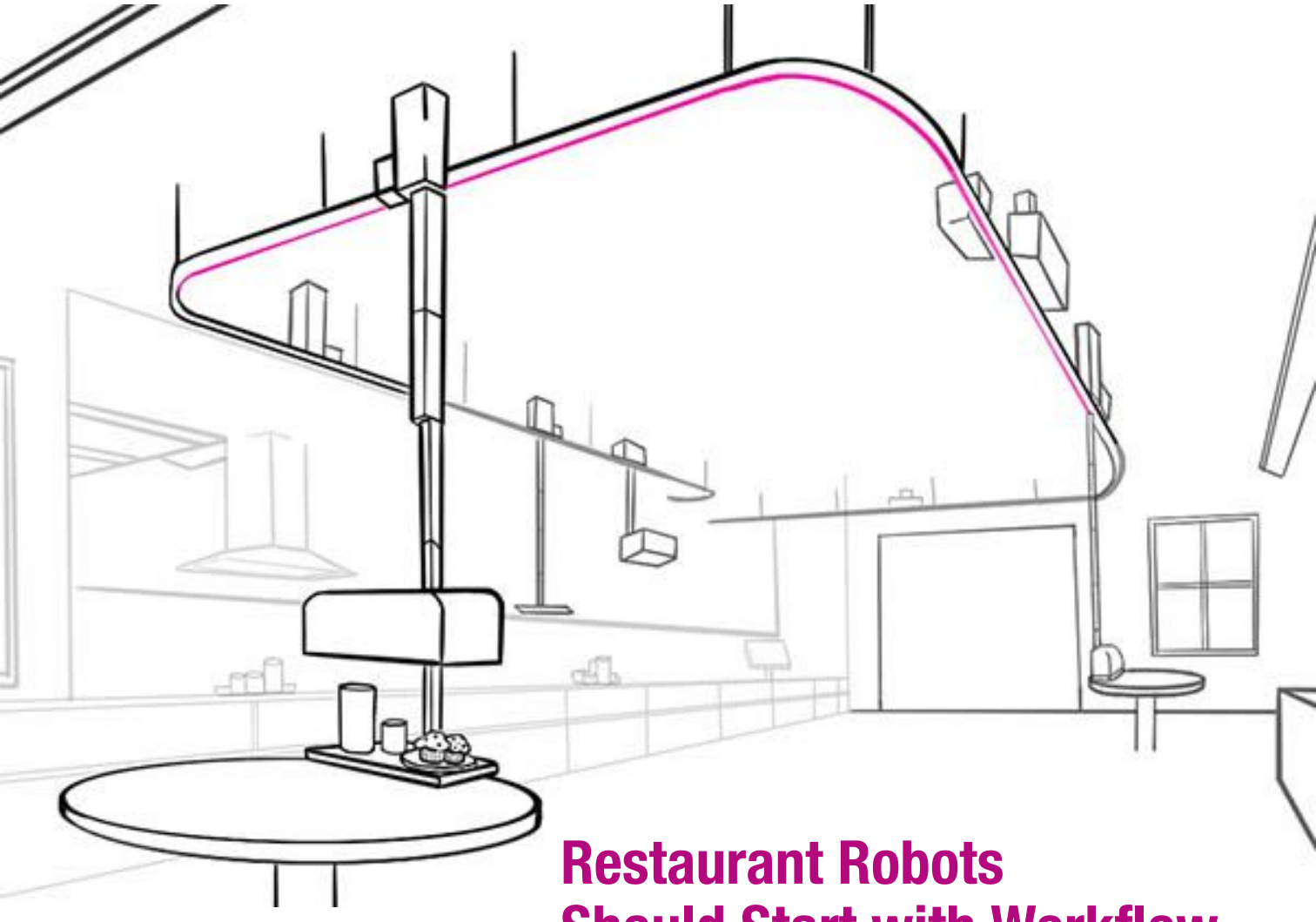
RightHand Robotics incorporated AI into its RightPick 3 system, which comes equipped with all components to integrate with fulfillment systems. It also includes the RightPick MCP application programming interface (API) for easy and safe integration.

The RightPick 3 uses the RightPickAI software, which the company said does not rely on models but instead learns over time.

Apologistics GmbH is one user of RightHand's technology. The company, which claimed to be Europe's most advanced online pharmacy, with 100,000 products, recently opened a 220,200-sq.-ft. (20,438 sq. m) warehouse in the Netherlands.

With a fleet of RightPick-enabled picking robots and an automated storage and retrieval system (ASRS) from AutoStore, Apologistics handles more than 25,000 parcels per day with 20 or fewer employees, according to founder Michael H. Fritsch. ■

Phil Britt *owns S&P Enterprises and is a technology writer who lives in the greater Chicago area. In addition to Robotics 24/7, he has written for financial services and business publications, including magazines, newsletters, conference dailies, and Web sites.*



Restaurant Robots Should Start with Workflow, Says Wings CEO

From labor shortages to the changing consumer behavior, restaurants of all sizes are under pressure to digitize their businesses.

BY EUGENE DEMAITRE

As with other industries, the COVID-19 pandemic has accelerated demand for automation in the restaurant industry. However, small and midsize businesses, or SMBs, have tight profit margins and are understandably reluctant to invest in new, complex technologies even as they struggle with turnover and labor shortages, according to Haitham Al-Beik, CEO of Wings.

Littleton, Mass.-based Letsbutterfly Inc., which does business as Wings, is developing proprietary systems in its HiveRobotics Lab for "autonomous sustainable retail" (ASR). Al-Beik has spoken with several restaurant franchises about the challenges they face and what they want from robotics suppliers. He shared his findings with *Robotics 24/7*:

What are some of the biggest challenges facing small and midsize food-service businesses?

Al-Beik: Across the board, the challenges stem from logistics highly dependent on human labor. Even at capacity, the output is limited — human workers can't compete with 80 digital orders coming through in a single hour. As a result, customers have less of a burden when making an order, but they take it on when they wait to pick up their orders.

Today, with the labor shortage alone, the logistics are overwhelmed, and the customer experience inevitably plummets. Therefore, the biggest challenge is upgrading logistics to support a much more streamlined input and output retail system while retaining the same quality of service.

It's not about replacing labor with robotics but addressing the whole operation and business model. Retailers need to start thinking about their business as a single system or robot, rather than a box with independent and heterogenous robots within it.

How has the COVID-19 pandemic made pain points more acute or created new ones?

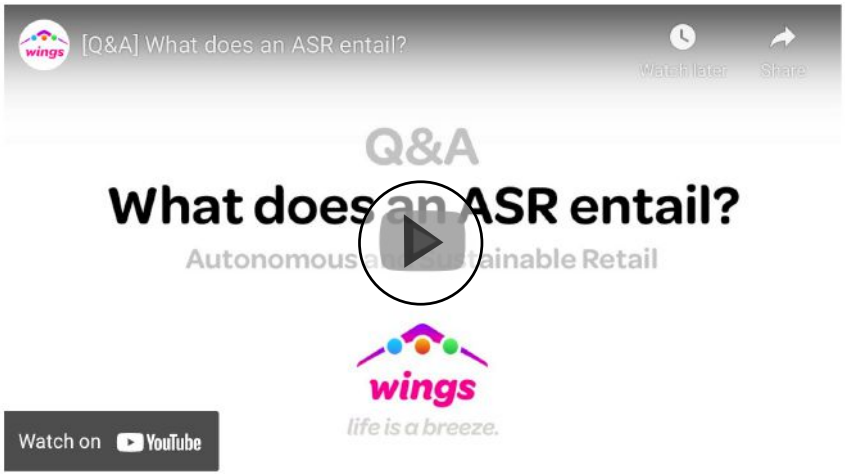
Al-Beik: The pandemic exposed many existing vulnerabilities of the services economy. In addition, it is now more apparent that the retailer has no control over the external logistics—human customers— due to safety and security regulations.

The environmental changes forced retailers' hands to work on increasing customer satisfaction while retaining staffers who continue to be overworked.

The pandemic showed that human labor had already approached peak performance. We will have to automate operations while bringing about more creative work opportunities to break that barrier. The industry needs to transition to an economy where more entrepreneurs and innovations are locally driven.

What are some examples of automation intended to help with internal and external logistics? For example, are we talking about food-preparation robots, server robots, or automated storage and retrieval systems (ASRS)?

Al-Beik: Before we jump into particular automation solutions and pick those with the most impact, we need to understand and plan out an autonomous strategy to be implemented for years to come. Transitioning to a standardized adoption of automation takes time.



For example, the transition to digital orders has only been recent. In contrast, over 40% of restaurants do not have up-to-date websites. The path towards autonomous retail is taken by addressing three aspects of a labor-driven logistics framework: human work, workflow, and human-to-human communication.

Many retailers embarked on automation starting with digital orders that address the cashier and delivery stations and the workflow that connects them. This eliminated the need for staff to write down or input orders.

It also eliminated the human workflow of taking orders from the customer and sending it over to the assembly station. In addition, human communication has been eliminated, since all communication is digitized to modify and adjust orders on demand.

Transitioning to digital orders and communication was a significant first step. It enables the end customer to be more versatile in interacting with the retailer. The

next step is to continue automating the rest of the internal logistics by moving backward, carrying the "end-in-mind" benefits.

The challenge is deciding whether to automate a station, a workflow between stations, or both.

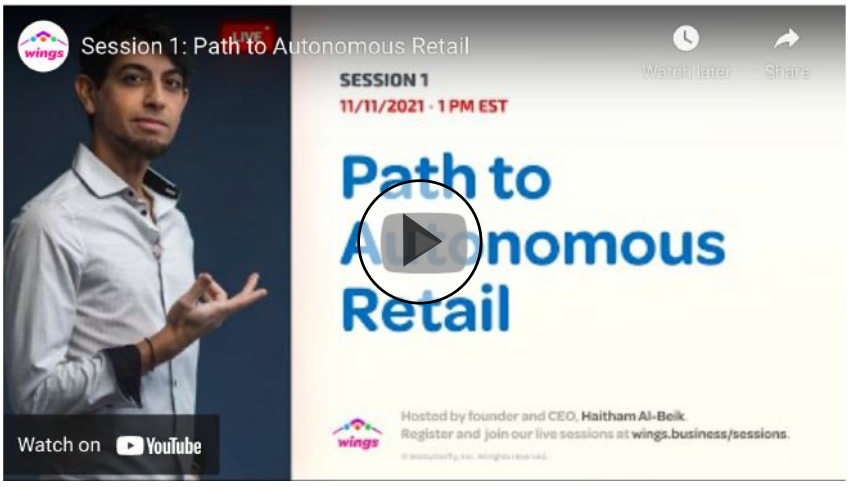
For example, an automated assembly station fulfilling orders at two or four times the speed of a human being will find itself bottlenecked when attempting to transport said orders to a delivery station. Even if the delivery station is automated, it cannot benefit from the assembly stations' speed because the highway becomes the limiting factor.

What can be done about these workflow bottlenecks?

AI-Beik: The overarching guidance is to upgrade workflows to handle the accelerated transfer of work between stations, then upgrade its connected stations accordingly.

While food preparation can be seen as the first step to automate, it does not address how the food prepared will be delivered to customers in a timely fashion and at their intended destination: dine-in, pick-up, or drive-through. Instead, automating workflow between the assembly and the delivery station as a whole would provide the most impact.

Today, a delivery station is an analog shelving unit, atop or behind the counter. It does not address the workflow portion, as a human still manages it. How often have we been experienced an order that's ready to pick up but is not yet on the shelf?



In this scenario, automated storage of orders ready to be picked up and a customer retrieval system would reduce the need for a human to manage the workflow between the assembly and delivery stations. The challenge is to develop such a system that can do the following:

- Increase customer versatility, regardless of space
- Take minimal valuable customer footprint
- Eliminate the need for assemblers to leave their stations
- Reduce work for the assembler and customer

Why aren't these sufficient—is it technological limitations, or a lack of understanding of the use cases?

AI-Beik: The tendency to automate stations first is a knee-jerk reaction to eliminate labor without understanding the use cases. The most friction for retailers is where internal and external logistics connect. A retailer can set up and tune its internal logistics however it wants.

However, external fulfillment is dynamic and time-sensitive. It is challenging to predict, especially considering each customer's unique preferences regarding what, when, and where they want their orders — even without considering their allergies, sensitivities, or accessibility requirements.

Technologies coming to the market need to understand the logistics and customer needs fully — the more it can support a versatile customer experience, the more sustainable it is.

What do restaurant operators and franchisees want or need?

AI-Beik: The short-term needs are to reduce costs and reliance on labor and retain their I/O bandwidth. A model that can fulfill such a need would allow franchisees to scale their businesses and replicate them across many locations.

The long-term need is to offer customers a versatile experience with a more sustainable model than in traditional retail. Moreover, the automation must be modular, scalable, and take as

little space as possible. Such systems would allow franchisees to quickly deploy their products at urban and non-urban locations.

Retail will transition from a management operation to a more administrative operation. At the same time, robotics will minimize people focusing on logistics, so they can do more customer-facing, value-add work.

What types of solutions are better focused on these requirements?

Al-Beik: The next step is to elevate the ordering technologies while addressing the assembly-to-delivery workflow and stations. It's imperative that the solution increases revenue by taking back considerable time that has been wasted from layers of friction.

Wings' systems address this workflow by retaining the customer and kitchen footprint as much as possible while reducing stress on the staff and elevating the customer experience.

What are the differences in designing for so-called ghost kitchens versus regular restaurants?

Al-Beik: The dark or ghost kitchens separated logistics concerns to address changes in customer behavior and how they want their products. In a more urban setting, customers expect more on-the-go, pick-up or delivery by third parties — where dark kitchens excel. Similarly, restaurants will have to do the same by restructuring the kitchen-to-customer delivery systems with a single input channel.

By standardizing and streamlining the input, the mechanisms can now focus on delivery. For example, a drive-through becomes a drive-pickup when only a single input channel is implemented for digital orders. In this case, a restaurant without a dine-in will behave similarly to a dark kitchen.

How quickly are the market and technologies serving it evolving? When can we expect widespread deployments?

Al-Beik: As mentioned earlier, this transition will take time, since cutting-edge technologies will require numerous people to test it day in, day out in the real world. Initially, major brands will drive and adopt such technologies first before SMBs can afford them.

Widespread adoption of automated workflows and customer-facing systems will begin after a year of "being in the wild," as people become more comfortable with it.

Soon after, stations will be automated, offering concurrent operations for a more seamless and streamlined path to augmentation and higher-bandwidth retailers.

While we've talked about SMBs, how much are the big chains pushing advances in food-service automation?

Al-Beik: The big chains will most likely drive the adoption of food automation, as they have the exact same needs as SMBs but on a larger scale. In retrospect, SMBs with the right automation should have the option and ability to scale such a system in a modular way to a big chain as they grow.

Big chains are looking at the immediate short-term impact to reduce cost and labor while retaining the same input and output while considering long-term benefits from an ROI [return on investment] and sustainability.

In addition, many chains are looking into their external delivery services with unmanned ground vehicles (UGVs) and unmanned aerial vehicles (UAVs).

What can restaurateurs expect in the coming year?

Al-Beik: Restaurateurs will see an adoption of next-generation robotics that does not occupy the same space as humans to give customers and staff members more versatility.

Moreover, retailers will focus on a single digital communication channel through their smartphones to best facilitate their customer needs, allowing in-the-moment and just-in-time operations. In this case, the restaurant becomes a pickup station or a dine-in experience where the same type of robotics system is doing the delivery.

We will also see the idea of a waiter or server transitioning to a customers' pocket with display and voice AI solutions. Nonetheless, the restaurant will have a concierge on staff who run operations and be its face to customers. The future will bring more freedom for customers and retailers to be more versatile and scalable. ■

OnRobot Debuts WebLytics Software for Collaborative Robotics Applications

WebLytics brings remote monitoring, device diagnostics, and data analytics capabilities to OnRobot's line of application-focused hardware.

BY ROBOTICS 24/7 STAFF

OnRobot A/S recently announced the launch of its WebLytics software for production monitoring, device diagnostics, and data analytics. The Odense, Denmark-based company said WebLytics is designed to gather data from multiple collaborative robot applications simultaneously and transform it into easy-to-understand, visualized device and application-level intelligence. The goal is to enhance productivity and minimize downtime, it said.

"The launch of WebLytics is an important landmark for OnRobot, our customers, and our global integrator network," said Enrico Krog Iversen, CEO of OnRobot. "WebLytics is the first software solution to provide real-time, application-focused data for collaborative applications across major robot brands."

"As our first software product, WebLytics marks the beginning of OnRobot's journey into robot software and completes our vision of providing a 'one-stop shop' for collaborative applications on both the hardware and software side," he said.

OnRobot's product line includes all-electric vacuum and magnetic end effectors, the bio-inspired Gecko gripping technology, force/torque sensors, "2.5D" vision, robotic screwdrivers, sanding kits, and tool changers. The company said it serves applications such as packaging, quality control, and materials handling, as well as machine tending, assembly, and surface finishing.

WebLytics uses OEE standard

Not only can WebLytics eliminate manual data collection for cobot end users and integrators, but it can also provide actionable insights into how well a collaborative application is performing, claimed OnRobot. The software is also designed to offer live device diagnostics, alerts, and preventive-maintenance measures to minimize costly robot cell downtime, it said.

Integrating the globally recognized Overall Equipment Effectiveness (OEE) industry standard, WebLytics identifies trends in the robot cell, including patterns, peaks, and disturbances in application productivity. OEE measures the percentage of manufacturing time that is truly productive – a score of 100% indicates that the collaborative application is producing only good parts, as fast as possible, and with no downtime.

With these OEE measures, WebLytics can determine whether the manufacturing process is running at optimal speed. It can also monitor and analyze the quality of application cycles, providing key insights for manufacturers of all sizes, said OnRobot.

WebLytics can report on the utilization of a robot arm and OnRobot tools such as grippers, vision cameras, and sensors. The software can measure in real time the number of safety stops initiated and the number of grip cycles performed while an application is running.

When changes are made to a robot cell, such as adjusting the speed of a robot or the settings on a gripper, WebLytics can also automatically report on the effects of those changes on application performance, according to OnRobot.

If anomalies occur in the collaborative application after deployment, WebLytics enables users to analyze the data collected directly from the robots and tools and report on its findings using customizable dashboards.

OnRobot maintains product compatibility

OnRobot said that WebLytics is compatible with all of its own tools, as well as leading collaborative robot and lightweight industrial robot arms. The software is expandable, "futureproofing" it as new robots and tools become available, said the company.

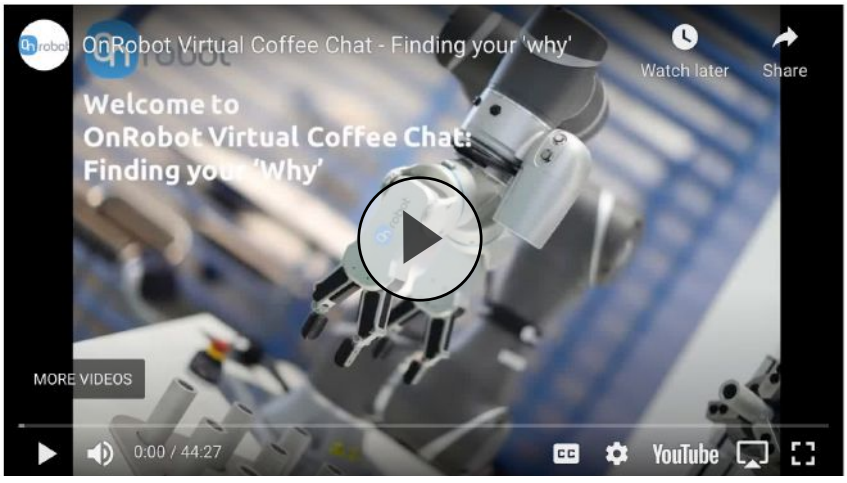
Access to WebLytics is available through a secure, intuitive browser-based user interface that displays OEE measures and user-defined key performance indicators (KPIs). Customizable dashboards can provide an immediate view into real-time and historical application performance, OnRobot said.

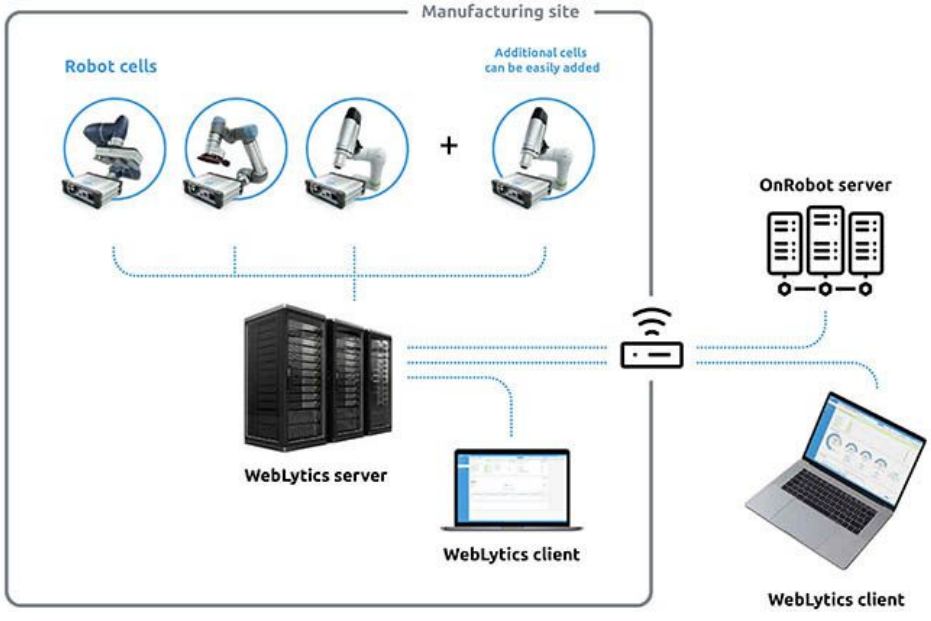
A shop floor can deploy the WebLytics server can be deployed on its local network or added to a virtual network that connects to the robot cell, the company said. Collected data is stored locally on the WebLytics server.

In addition, WebLytics' built-in Web server is always accessible from the shop-floor network or from anywhere in the world via secure HTTPS connection.

WebLytics is not just a powerful tool for end users, said OnRobot. It also creates new revenue opportunities for system integrators by providing the software required to offer data-backed custom service agreements and engineering services for cell optimization.

"WebLytics is the perfect addition to our existing product lines and a natural progression of the OnRobot tradition of making advanced tools and technologies — in this case remote monitoring, device diagnostics and data analytics — affordable and accessible to companies of all sizes," said Iversen.





WebLytics overview. Source: OnRobot

WebLytics designed to ease optimization

Laszlo Papp, product manager and sales engineer at Wamatec Hungary Kft., tested WebLytics with machine tending, pick-and-place, and palletizing applications.

"In this fast-paced world, time is everything," he said. "When cycle time is really important, WebLytics helps you identify the small mistakes that cause time wastage. WebLytics can also save a lot of time for yourself and for your production line by making it easy to schedule all maintenance and product changes."

"My favorite function was the dashboard," added Papp. "I really liked how WebLytics allowed me to monitor all my applications, my cobots/robots, and my end-of-arm-tools using one platform that provides real-time monitoring, data collection, and line charting. WebLytics makes optimizing all applications much easier than before."

WebLytics is available worldwide via subscription. ■

Nimble Robotics Says Its Picking Robots Have Picked More Than 15M Objects

The startup says its AI-enabled robots have picked across 500,000 unique products from several well-known brands.

BY ROBOTICS 24/7 STAFF

Nimble Robotics Inc. recently said that its robots have picked and packed hundreds of thousands of customer orders on a daily basis. The San Francisco-based startup claimed that its robots use artificial intelligence to "pick, pack, and fulfill online orders to enable the fastest, most affordable, and most sustainable on-demand e-commerce fulfillment."

"E-commerce continues to grow rapidly, but the available warehouse labor force is actually declining," said Simon Kalouche, founder and CEO of Nimble Robotics. "These opposing trends are creating historic labor shortages and a growing labor supply void. Our robots are being used to augment the human workforce to help fill that void."

Over the past few years, said Nimble, two challenges have stifled the adoption of pick-and-pack robots: reliability and tech-

Nimble Robotics supports e-commerce order fulfillment. Source: Business Wire

nology integration challenges. E-commerce fulfillment centers hold millions of different products, said the company. Each of those products are different sizes, shapes, weights, textures, stiffnesses, and fragility. Having robots that can reliably handle all of this variability has been considered by many to be impossible, said Nimble.

In addition, integration of technology into warehouse ecosystems is a notoriously painful process, Nimble said. Integration efforts frequently take up to a year, cost hundreds of thousands of dollars, and require thousands of software changes to the warehouse management system (WMS). Nimble said its offering uniquely solves these two challenges.

Nimble touts flexibility, ease of integration

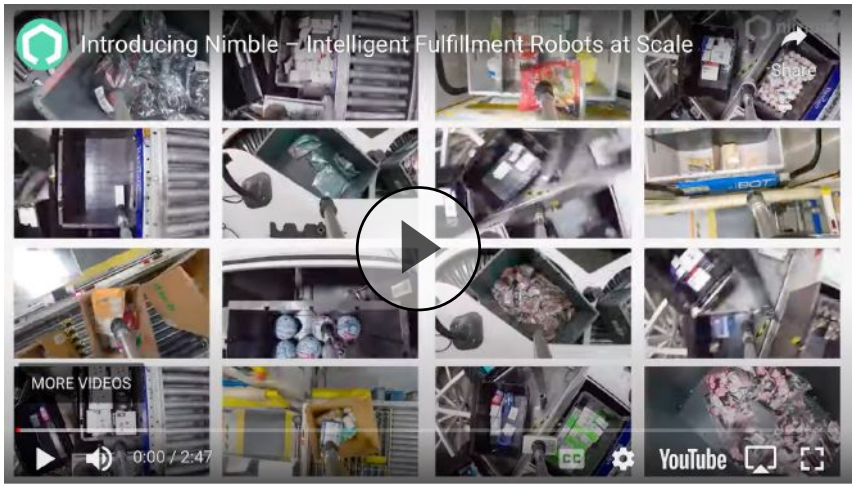
Nimble said it has deployed fleets of robots within warehouse environments across the U.S. this year. It added that it expects existing and new contracts to grow the fleet with over 200 more robots in 2022.

The company said its robots have picked more than 15 million objects across 500,000 unique products, ranging from cosmetics and consumer electronics to apparel, from daily essentials to holiday gift favorites.

"Our robots use a variety of different grippers and supervised autonomy to reliably handle nearly any object or product that fits into a bin," said Kalouche. "Our AI learns what grippers work best on different objects and automatically switches its gripper to properly pick, pack, and handle each object."

"Our technology has been proven to be reliable to 99.9% accuracy in production, but what's often the most impressive and exciting product feature, in the eyes of our customers, is the way in which we seamlessly integrate our robots," he added. "It's very fast and easy. Our AI-based integration requires no changes to the warehouse software whatsoever. It also costs nothing to implement. The AI interprets the already existing human operator interfaces to determine what items to pick and where to pack them."

"A full production integration can all be done in one day using Nimble's AI Integration tool,"



said Kalouche. "When I say, 'One day, $0, zero code changes,' it sounds too good to be true, but our customers will vouch for us. This has been a significant competitive advantage allowing us to quickly scale."

"To my knowledge, we've now deployed the world's largest fleet of e-commerce ASRS [automated storage and retrieval system] picking robots," he stated. "More robots deployed means more proprietary data being collected. Just like with self-driving cars, more data means higher capability and reliability which further drives customer retention and happiness."

Big brands turn to picking robots

Nimble said it is working with many of the world's largest and best-known brands including Best Buy, Victoria's Secret, Puma, NFI/CalCartage, and Weee! It added that its robots are picking in warehouse applications developed by systems integrators such as AutoStore, OPEX, Bastian, Swisslog, TGW, and Kuecker Pulse Integration (KPI).

"We haven't done any marketing and surprisingly we don't have any dedicated sales reps, yet we've deployed a large number of robots," said Kalouche. "I think this is a testament to the high demand for what we're building and to our product and how well it works. We let the robots speak for, and sell, themselves. To date, we have 100% customer retention and 100% repeat customers."

"With logistics and fulfillment experience at Amazon, iHerb and other retail companies, I've worked with a lot of technology teams, and the Nimble team is the most impressive robotics team I've ever worked with," said Jonathan Styles, director of continuous improvement-lean at iHerb. "They are bringing to market bleeding-edge technology and solving extremely hard problems in a market that is struggling to find labor. We have over 20 Nimble robots today and plan to add more as we grow our fulfillment capabilities."

"There are a dozen or so robotics companies that claim to have a robotic picking solution," said Helmut Leibbrandt, senior vice president, supply chain management and logistics – Americas, at Puma. "Nimble is the only one I've seen that has proven, scaled deployments in real warehouses performing real production picking. They developed a solution that integrated seamlessly within our existing physical and WMS/WCS [warehouse control system] structure."

"Nimble partnered with us last year during the COVID outbreak to help us safely fulfill orders in our warehouse," said Gary Bravard, co-founder and chief business officer of Adore Me. "Together, we became the first e-commerce fulfillment center in the world with fully robotic picking. The robots now handle our 25,000+ SKUs and can pick over 30,000 units per day."

Nimble invests in growth

Nimble Robotics said its backers include Accel, DNS Capital, GSR Ventures, and Reinvent Capital. It noted that its board members include AI experts and entrepreneurs Fei-Fei Li and Sebastian Thrun.

Since raising a $50 million investment last March, Nimble has increased its team from 25 to 75 employees and expanded its customer base. The company added that its robots helped to fulfill millions of orders for the 2021 holiday season. ■