

Managing Mobile Robot ROI

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Peerless Research's annual warehouse and DC equipment survey reports that interest is rising in both robotics and worker training.

EDITOR'S NOTE

As mobile robots arrive at factories, warehouses, and other facilities such as hospitals, the challenge shifts from the initial deployment to managing growing fleets. How can you guarantee that you're getting an ongoing return on your investment?



In this Special Focus Issue, we look at some of the hardware options, software tools, and emerging best practices for getting the most out of automated guided vehicles (AGVs), autonomous mobile robots (AMRs), and other self-driving vehicles such as fork trucks.

Robotics 24/7 shares insights into how AMRs are benefitting warehouse operations, and how the robotics-as-a-service (RaaS) business model can help you.

We also share some observations from MODEX 2022. How are mobile robots diversifying for different functions?

In addition, hardware and software companies are teaming up with finance firms and integrators.

We hope this Special Focus Issue addresses at least some of the burning questions around scaling mobile robot fleets, but don't hesitate to drop us a line if you want to learn more!

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Flooring is Critical

for Successful AMR and AGV
Mobile Robot Performance



The market for autonomous mobile robots (AMRs) and automatic guided vehicles (AGVs) is expected to reach \$13.2 Billion by 2026, according to Research and Markets. With ongoing labor retention challenges, higher wages, and the significant increase in e-commerce demand, robotic solutions can deliver higher throughput and greater operational efficiency.

Simultaneously, fulfillment operations are adding more elevated work platforms and mezzanines to increase capacity. When AGVs and AMRs are to be used on upper levels, the right flooring is critical to ensure they function as intended.

Scott McGill, Director of Sales at Cornerstone Specialty Wood Products (resindek.com) shares several key considerations when specifying automated flooring:

Q: How can a floor impact a robot's operation?

McGill: To maximize efficiency, AMRs and AGVs must move quickly and consistently to maintain workflow. The surface of the floor must not impede the robot's movement. If the floor is worn or has uneven surface it can disrupt the function-

ing of laser-based navigation. Concrete tends to crack and spall overtime; this can lead to wear and tear on the robot wheels and hardware. If the floor is not level the robot could roll away from its target point, requiring downtime and manual intervention to get it back to its proper position.

Q: What flooring attributes are most important in a robotic application?

McGill: There are five things to look for.

1. Capacity. Has the floor, its steel decking, and elevated structure been engineered to handle both the robots and their loads?

2. Coefficient of Friction. Has the floor been tested for Coefficient of Friction and surface roughness? Will the robot operate on the floor as intended.

3. Flat, Level Surface. The swales, dips, and valleys common in concrete flooring can cause a robot to roll away from its intended path.

4. Reflectivity. Shiny finishes reflect more light than dull ones. Robots navigating via lasers that aim down to read waypoints on the floor can be confused

by a shiny finish.

5. Wear Resistance. Robotic traffic is highly repetitive, so the floor's wear resistance is incredibly important to its longevity.

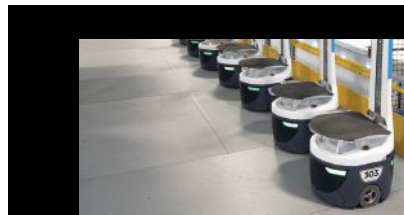
Q: What other flooring alternatives to concrete are there?

McGill: Our ResinDek® floor panels specified with either TriGard® or MetaGard® finishes have been extensively tested with robotics for coefficient of friction, surface roughness, wear resistance, and light reflectivity.

In the last decade, we have provided a variety of ResinDek flooring products to numerous AGV and AMR manufacturers for their testing labs. As a result, millions of square feet of ResinDek panels are in service worldwide with robotic traffic in distribution centers, warehouses, and retail environments.

Q: Any other robotic flooring recommendations?

McGill: Before selecting a floor, involve the robotic supplier to ensure that any testing and evaluation happen early on. The floor should not be considered a commodity, but instead be chosen based on the automation's requirements.



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Warehouses Expect Returns on Investments from Mobile Robots



Fetch Robotics' CartConnect100 AMR. Source: Fetch Robotics

Warehouses are finding AMRs to be the solution to many of their demand woes.

BY CESAREO CONTRERAS

Bob Wallace, distribution center manager at Top Notch Distributors Inc.'s warehouse in Mansfield, Mass., was excited when he heard the company was going to be installing 6 River Systems' mobile robots at his facility.

He is always open to trying new technologies, and Top Notch had already installed 6 River Systems' Chucks at other distribution centers throughout the U.S.

"I like technology and change," he told *Robotics 24/7* during a recent site visit to the facility. "I remember when there was no computers, and we used paper, but I've been

through a lot of changes, and they all turned out to be extremely good. I always look at them with an open mind."

Autonomous mobile robots, or AMRs, are used in the warehouse industry for put-away, picking, replenishment, and sorting. They are designed to work alongside humans to make their jobs more efficient.

They are part of a rising trend in warehouse-industry automation. Companies are turning to robots to help them keep up with rising e-commerce demands and labor shortages, and to extend the life of their facilities.

AMR sales on the rise

Interact Analysis recently reported that more than 100,000 mobile robots were deployed globally last year, which it said is the first time that milestone has been met.

“The current labor shortage, coupled with strong e-commerce growth, has accelerated manufacturing and logistics companies’ plans to automate,” wrote Ash Sharma, managing director at Interact Analysis and the author of the report. “This has caused sales in mobile robots to spiral, with nearly 70% more vehicles shipped than the year before and a 36% increase in revenues, which rose to nearly \$3 billion.”

AMRs are smart because they take advantage of technologies such as sensors, cameras, artificial intelligence, machine learning, and more to understand, adapt, and move around their environments.



Top Notch increases volume with Chuck

Since January, the door hardware company has been using eight Chucks at its Mansfield facility.

Top Notch is already seeing the benefits of the robots it bought. “We’ve added volume to the point that this is the second biggest volume site for us,” said Patrick Houlihan, director of operations at Top Notch. “But we have not added people. We have been able to use technology to keep up with our growth.”

Warehouse picker Joey Montville has worked for Top Notch the past 26 years. In the few months he has been using the company’s AMRs, he has gone from completing about 400 lines a day to about 700. It depends on how many items the facility receives each day, according to Wallace. Even during

days when the company receives fewer orders, workers are completing more lines with the AMRs than before.

Montville is also doing less manual labor. The 6 River Systems Chucks have helped cut down on the amount of walking he needs to do in a day and have overall made his job easier. The robots’ touchscreens help confirm the type of items and quantities that need picking more easily than their older systems, he said.

“They are much more effective because the other way we used to pick was with papers,” said Montville. Chucks can also carry payloads of up to 200 lb., much more than the average worker.

AMRs easier to deploy and scale

Research firm IDTechEx found that there are several factors for the AMR rise, including their easy deployment and scalability, their relatively low onboarding costs, return on investment, and their benefits over fixed automation, such as conveyor



Top Notch worker Lynda Nguyen puts labels on the one of the company’s Chucks.
Source: Cesareo Contreras



systems and automated storage shuttles.

Since May 2021, Waytek has been using three AMRs from Fetch Robotics, now part of Zebra Technologies, at its 100,000-sq.-ft. facility in Chanhassen, Minn.

Founded in 1970, Waytek is an electrical components distributor of wire, fasteners, connectors, battery management, and other products used in specialty vehicles and mobile equipment.

In 2020, the company realized the conveyor system it had been using since 2007 wouldn't be able to keep up with demand in the future, according to Mike Larson, co-owner and chief operating officer at Waytek.

"We had a fixed capacity of our existing conveyor system," Larson told *Robotics 24/7*. "At that point, we were having a good number of days where we would be shipping 800 plus orders. So, we really had to take a hard look and say, 'How are we going to both sort out our orders as well as convey the goods around the facility?'"

To solve the issue, the company took a two-pronged approach, he said. It invested in three AMRs and put up two put walls to help them sort their orders.

The put walls allowed the company to replace the sortation feature it used in its conveyor system. The AMRs helped replace what the conveyor system did, which was bring the goods from pickers to the shipping area for sortation, he said.

The AMRs are being used for three specific workflows, according to Fetch Robotics. (See video above.)

Every 15 to 20 minutes, the AMRs take the goods from the pick stations and bring them to the put walls. Secondly, the AMRs are used to transport goods from the receiving and replenishment area to two of the facility's pick stations. Thirdly, they are used for trash and debris removal.

Since removing the conveyor system, Larson said the company has been able to regain 10,000 sq. ft of racking space to store goods. Larson also estimated that Waytek will now be able to stay

in the facility for an additional five years.

"Where our conveyor could only allow us to handle up to 800 orders a day, now with AMRs, we can add additional routes and pickup times," Larson said in the video. "We'll be able to handle well over a thousand orders a day. Once we get to a point where we need to add more orders than that, we could easily add another AMR. We don't need to remap the entire facility."

E-commerce boom continues

Stefan Nusser, Fetch Robotics' chief product officer, said the rise in e-commerce orders during the early days of the pandemic has helped accelerate AMR demand.

"When the pandemic started, there was this spike in e-commerce activity," Nusser said. "People were locked up at home. They were doing e-commerce orders. Everyone who was involved in running a warehouse had a sudden spike of activity. And that hasn't changed to this day—even though the world has reopened. My impression is that people who used to shop in stores that got locked in got used to ordering online."

With volumes going up, so does the need for efficient operations. Combined with tight local labor markets, companies say they need fast solutions yesterday.

"Most customers I talk to today are scrambling," Nusser said. "I'm not talking to people who are sitting there with a spreadsheet and spending

weeks and months building an investment case about what they are going to do next year or the year after.”

“I’m talking to customers who are very visibly worried, saying, ‘Look, I’m working at my limits. My team is working at its limits. It’s April, and I know in October, my volume is going to start spiking again. I need something between April and October that’s going to

on your order profile, the layout of your warehouse, but that is the metric our customers care about the most – how many orders or how many units can I pick in an hour, or a given timeframe.”

AMRs are being designed to work within companies’ warehouse management systems, he said. Within those systems, the robots are assigned specific tasks alongside humans.

but often when we do a site audit, we do identify some areas where the coverage is slow or the signal is weak. Therefore, 5G is really an enabler to have higher throughput, better connection. It has huge potential later on to do cloud-based solutions.”

To help expand interoperability between AMR vendors, the company, along with Vecna Robotics, 6 River Systems, Waypoint Robotics, Locus Robotics, Seegrid, MiR, AutoGuide Mobile Robots, Third Wave Automation, A3, and Open Robotics, is part of MassRobotics’ AMR Interoperability Working Group.

“Going two or three years back, an installation of two or three AMRs was really the standard,” Nicolay said. “You saw a lot of customers started with small fleets just to test the technology.

“But these days, you have installations of multiple robots—20, 30, and beyond— and not only from one vendor, but from multiple vendors for different applications, different use cases,” he added. “There really is a demand for a single internal logistics system.”

The company has an ROI Calculator on its website to help customers determine how its mobile robots may help companies save money, increase productivity, and save resources.

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.



Fetch automates goods-to-person workflows. Source: Fetch Robotics

help me.’ That’s a very difficult conversation,” he added.

AMRs offer a solution because they are flexible, can adapt to existing workflows and facilities, and can be deployed quickly, he said.

On average, a self-contained deployment of the company’s AMRs only takes about three days, he said. Nusser said warehouses often measure success by the efficiency of their human pickers.

“This is measured by units per hour or lines per hour,” he said. “The actual values are hard to compare because it depends

“The collaboration between the robot and the worker is changing,” he said. “It is almost like the robot is guiding the worker about what work needs to be done.”

Expanding interoperability

Jan Nicolay, global account director of logistics at Mobile Industrial Robots (MiR), said the company has been able to take advantage of 5G technology to expand the coverage area of its AMRs. No longer will customers need to rely solely on Wi-Fi to get their robots to operate properly.

“All the sites we are going into do, of course, have Wi-Fi,



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How to Manage Your Autonomous Mobile Robot Return on Investment

Once mobile robots are deployed, one challenge is to monitor and maintain their productivity according to expectations, say robotics experts.

BY PHIL BRITT

As more operators of warehouses and other facilities adopt automation, it's essential that they closely monitor their robot fleets to ensure they get the most value out of them.

The first step is to determine an initial expected return on investment (ROI) prior to the introduction of autonomous mobile robots (AMRs) into the environment. Users must then keep close tabs on performance to ensure that calculation isn't deteriorating over time, and to know

what changes to make if the ROI figure starts decreasing.

"A lot of companies are embracing robots because of labor shortages – anything from distribution centers for e-commerce to logistics and manufacturing," said Florian Pestoni, CEO of InOrbit Inc., which provides a cloud-based robot operations platform. "They're all feeling the need to keep up with demand."

"Sometimes, there's something even more fundamental than ROI, but of course

MANAGING MOBILE ROBOT ROI

you want that investment to have a positive return,” he added. “What we’ve seen is, after the initial deployment, you still have a lot of work to do. You still have to fine-tune the operation; you have to refine it over time.”

Set benchmarks for robot fleets

A mobile robot user needs to establish capacity, productivity and other benchmarks before a deployment begins, said Matthew Cherewka, director of business development and strategy at AMR and orchestration software provider Vecna Robotics.

“Each vendor, as part of the solution design phase, should be able to give you an ROI estimate ahead of time, something that you should be aiming toward,” he said. Simulation tools can help with that initial ROI estimate, added Cherewka.

“It’s a balancing act with hard

costs and soft costs,” said Matt Charles, sales director for the U.S. Midwest and Canada at Mobile Industrial Robots ApS (MiR).

MiR offers an ROI calculator designed to help prospects and customers determine what hard costs of an installation would be. These include the tasks a company is looking to automate. For example, this could be a task typically performed by a human and a forklift, or the movement of a cart along a defined distance a given number of times per day.

“Typically, we’re seeing an ROI of 12 to 18 months,” said Charles. As a company’s fleet grows, the positive returns come more quickly, he noted. “There’s not as much incremental work for a second robot, a third, etc.”

“It can be challenging for companies to calculate their burden rate,” Charles acknowledged. “If they’re not familiar enough with

our technology, it can be difficult to understand how many robots they’re going to need, and what that cost is going to be. That’s a big part of budgeting, whether you are going to need one robot or 10. That’s where we come in with our ROI calculator.”

Beyond its initial online ROI calculator, MiR also offers more advanced calculators that go much deeper, calculating distance to be traveled, how fast the robot can travel, the number of trips per hour, and other granular details.

MiR will also bring a robot to a facility to run it through the proposed task to help confirm the ROI calculation.

The soft costs are much more difficult to calculate because they include factors that are hard to quantify such as the cost of labor. Using an hourly wage (plus any benefits) doesn’t work for most because workers may be unavailable, regardless of the pay rate.

Other soft costs include the cost of human resources to interview and hire workers and manage their compensation.

RaaS and robot ROI

The ROI calculations are more accurate today as companies move to robotics-as-a-service (RaaS). This model allows users to consider mobile robot expenses as ongoing operating expenses rather than capital expenses to be amortized over time, according to Cherewka.

Another advantage of today’s mobile robots is that they are connected devices that can provide their operating status and other

The screenshot displays the MiR online ROI calculator interface. At the top, the MiR logo and navigation links are visible. The main content area is divided into three numbered steps: 1. Robots, 2. Plant input, and 3. ROI Result. Step 1, 'Robots', is currently active and shows a grid of six robot models with their respective payloads: MiR100 (100 kg), MiR250 (250 kg), MiR500 (500 kg), MiR600 (600 kg), MiR1000 (1000 kg), and MiR1350 (1350 kg). Each model is accompanied by a small image of the robot. The interface also includes a 'Select currency' dropdown menu set to 'USD' and a 'Support Portal' link in the top right corner.

MiR offers an online ROI calculator for its AMRs. Source: Mobile Industrial Robots



key data in real time, he said. This is also key to monitoring and maintaining service levels.

“It gives you greater visibility into how your operations are working in terms of flows or providing heat maps,” Cherewka said. “We take that data, and we can remotely control the robots. So when they get into an error state, we can solve the problem remotely instead of having a [more costly] physical interaction.”

Integrator JMP Solutions focuses on a slightly different calculation—overall equipment efficiency (OEE). It uses proprietary technology to measure how an asset is performing against performance benchmarks, said Andy Batter, director of operations at JMP. “We’ve tweaked OEE for mobile assets,” he said.

JMP’s system is built on the Ignition industry-standard software, which allows third-party module development. It can also conduct OEE calculations for a fleet of mobile robots, even if

they come from different suppliers, Batter said.

Biggest mistakes include ‘analysis paralysis’

One of the biggest mistakes that mobile robot users make in trying to determine and manage the ROI of their fleets is “analysis paralysis,” observed InOrbit’s Pestoni.

He recommended that businesses examine their investments with customers and partners from all angles before moving forward. Another mistake is failing to change processes to take advantage of mobile robot capabilities, Pestoni said.

“It’s like a rotary phone and a smartphone,” he said. “You can do much more with a smartphone.”

Watch your KPIs

After the initial deployment, the three key performance indicators (KPIs) to closely monitor are robot utilization and the robot state or status. This includes the percentage of time a robot is in each state and its history, such

as if it’s regularly running into obstructions or people are crossing its path, said MiR’s Charles.

“Ideally, you’re in the executing stage a majority of the time,” he explained. “If you are seeing the robot is sitting idle 5% of the time, you probably have too many robots, so you may want to start adding additional applications for it.”

Battler recommended monitoring similar metrics, such as the ratio of availability compared with production time. Another metric is the ratio of actual speed compared to “sticker” speed and quality, as well as how many “missions” were successfully completed compared with the total number of missions.

JMP’s proprietary software makes those calculations in real time, producing reports to show if the numbers are improving or declining, with sufficient detail for the user to drill down to determine what’s causing any KPI changes. Another KPI Cherewka recommended monitoring is the percentage of tasks that the mobile robot completes on time.

Managing mobile robot fleets may seem complicated, but suppliers and third-party software providers are making all this data more available for sound decision making.

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.

6 Robotics Experts Reflect on MODEX 2022

MODEX exhibitors and attendees agreed that automation took center stage and that they'd like more networking opportunities.

BY EUGENE DEMAITRE



OPEX demonstrated its Infinity automated storage system at MODEX 2022. Credit: Eugene Demailre

This spring's MODEX 2022 trade show featured

numerous demonstrations of materials handling technology, a return to face-to-face events with more than 37,000 attendees, and a growing number of robotics exhibitors. While global supply chain challenges, labor shortages, and pandemic-accelerated e-commerce have all increased adoption of supply chain automation, what can suppliers, integrators, and, most importantly, operators expect? What should end users demand?

Robotics 24/7 has already shared numerous announcements around MODEX and initial robotics trends and observations. Here are more from some exhibitors, speakers, and attendees from the Atlanta event. We spoke with the following industry experts:

Gerard Andrews

Senior Product Marketing Manager, Robotics, NVIDIA Corp.

Jeff Burnstein

President of the Association for Advancing Automation (A3)

Kelly Kamlager

Senior Director of Marketing, RIOS Intelligent Machines Inc.

Aaron Prather

Senior Technical Advisor, FedEx Express

A.K. Schultz

Co-founder and CEO, SVT Robotics Inc.

Matt Wade

Head of Marketing, BlueBotics SA

What was the most interesting robotics offering you saw at MODEX 2022?



Gerard Andrews, NVIDIA

Andrews: We have a saying that “Everything that moves will be autonomous.” So for me, it was really interesting to witness this vision taking hold with the levels of autonomy displayed in robots that do mobile manipulation.

From impressive autonomous forklifts to Boston Dynamics’ Stretch, it is amazing to see that these robots are now deployed in production. It is obvious that mobile manipulation presents a very hard set of problems to solve.

But with all of the advancements in GPU-enabled edge AI and computing, vendors are coming up with some truly innovative and safe new robots.

Kamlager: Ours, of course! The full-stack technology approach RIOS offers enables customers to go to a single provider for AI-powered robotics with robots-as-a-service [RaaS].

It seems like AGV [automated guided vehicle] providers have figured out a way to scale successfully in this market. From every dimension, they have figured it out.



Aaron Prather, FedEx Express

Prather: Besides Boston Dynamics finally showing off Stretch, I think that Locus, Vecna, and Plus One were big winners. All three of them showed solutions that are

ready—or soon will be—to go.

Locus showed the diversity of its fleet after its acquisition of Waypoint. Vecna showed its expansion into pallet handling. Plus One showed depalletizing and integration into other vendors like Tompkins and Locus.

Schultz: To see so many people engaged and so many tech companies connecting in one venue, especially after everything we’ve gone through with COVID and supply chain disruptions, it was quite remarkable.

The OPEX Infinity solution was impressive. No surprise—OPEX traditionally has a high standard for its technology. With Infinity, the company has done a great job of solving high-density racking while maintaining tremendous throughput.

Berkshire Grey’s Spectrum Gripper, a picking arm with a single suction end, is solving for enormous assortment and size of materials. This flexibility will enable warehouses to lower operational costs.

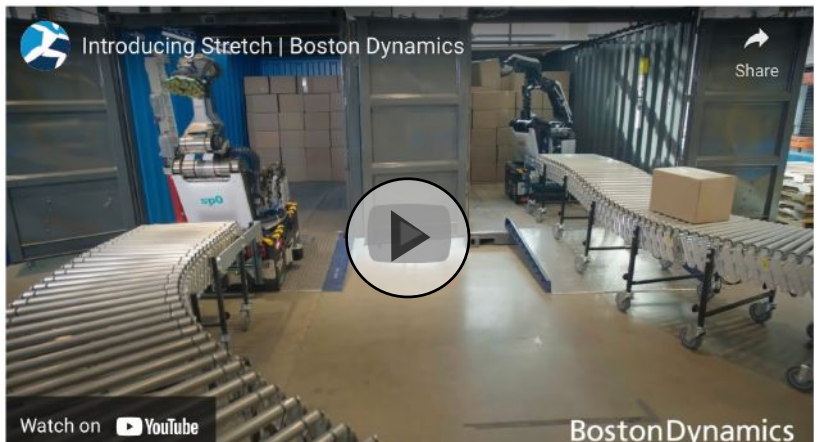


Matt Wade, BlueBotics

Wade: It was interesting to see more automated vehicle suppliers showing examples of fleet operation and interoperability—two themes that end users are demanding more and more.

For instance, you had Jungheinrich with an automated forklift and tow tractor tugger working together, OTTO Motors with a unit-load AGV running alongside its new forked AGV, and Bastian Solutions really impressing us with its AutoStore, mobile robot, and conveyor setup.

And on our own stand, our multi-brand fleet demo also drove lots of visitor questions.



Were there any new trends that you observed this year?

Andrews: I think that there is a recognition that a modern automated warehouse environment is likely to contain different robots from different manufacturers to execute different tasks. And I was able to get a sense of that by observing the numerous multi-vendor demos that were scattered around the show. I would expect that the trend of forming partnerships to deliver more complete solutions will accelerate.

This is an exciting development for NVIDIA, as we are already enabling companies to build digital twins of their facilities and to simulate the performance and operation of their heterogeneous fleets of robots. Our tool, NVIDIA Omniverse, allows the facility owners to optimize warehouse operations before deploying their robots in the real world.

Burnstein: There's a lot more automation than ever before—robotics, autonomous forklifts, smart sensors, mobile robots, etc.



Kelly Kamlager, RIOS

Kamlager: This year's trends included the proliferation of AGVs, demand for mixed palletizing and parcel sortation, and more partnerships between large systems integrators and AI-powered robotics startups.

We also saw that palletizing is becoming widespread, and an increasing number of customers are seeking solutions for high-mix, low-volume, and rapid change of SKUs.

Many startups continue to pursue the holy grail of pick and place/pack of the broadest number of SKUs. Customers are still dissatis-

fied with the technological limitations for pick-and-pack applications, particularly in e-commerce.

Prather: MODEX definitely killed the "Trade shows are dead" crowd. The size of the crowds are not there yet, but the people attending them are buying. Talking to most vendors, they really liked the higher number of buyers versus a high number of attendees.

However, I think this caught some vendors flat-footed. There were a lot of vendors that had a booth to just have a booth. They were not showing anything new really, but at least they were there.



A.K. Schultz, SVT Robotics

With people buying, I would rather have a booth than not have one when my competitors are there.

Schultz: What I witnessed for trends was more holistic. Five years ago, you could count the number of automation and robotics companies on two hands. This year, I saw hundreds of companies, and the majority were production-ready.

I often hear "Robotics are coming." I think it's fair to say, "Robotics are here."

Some of the explosion in this industry is likely due to the commitment of the venture capital



community to invest in these technologies. But I also think that underlying technology—computing technology, AI, etc.—have converged to make it easier to build something that really works well. These technologies were bleeding-edge but are now more commonly accessible.

Wade: Since the market demand for automation is growing strongly—due to hiring challenges, the need to improve resilience, and so on—there seemed to be more AGV and AMR suppliers than ever before at MODEX 2022. We saw several companies from Asia making what we think was their first appearance.



Jeff Burnstein, A3

What would you like to see more of at this show or others?

Andrews: I really enjoyed attending a show where the attendees were so laser-focused on exploring solutions for their real business challenges. So if I could change one thing, I would have liked more networking opportunities off the show floor to connect with these business leaders.

Burnstein: I'd like to see more machine vision, AI, and a broader range of robotic applications for every industry. That's what we plan to showcase at Automate 2022, along with new applications for small, midsize, and large companies in warehousing and distribution, automotive, electronics, aerospace, metalworking, consumer goods, and more.

Kamlager: More relatable automation solutions and lots of customers.

Prather: I would like to see some layout to the show that makes sense. The robot arm vendors were scattered around the show. There was some concen-

tration of mobile robots in one hall, but they were also a bit scattered.

At Automate, there was a whole aisle of just arm vendors, and other companies were placed next to others in their space. Vendors may not like being right next to their competitors, but for a buyer, it makes my life so much easier.



Schultz: How about SVT Robotics in every booth! Kidding aside—because our goal is connectivity, we'd really like to see more companies take advantage of our platform to solve for integration.

Before we started SVT Robotics, the problem wasn't the tech—it was that companies couldn't implement tech in a reasonable time span or financial cost required to justify the investment. This integration problem has stymied the entire industry. It would be great to see SVT Robotics continue to be part of the ongoing solution.

Wade: We would find more closely-themed networking opportunities helpful, as at such a busy show, it can be challenging to get interested parties together. Plus, our team agreed, the more free foot massages, the better!

Eugene Demaitre is editorial director of Robotics 24/7. Prior to joining Peerless Media, he was a senior editor at other robotics publications.

10 Materials Handling Robotics Takeaways from MODEX 2022

MODEX 2022 showcased numerous supply chain applications involving robotics.

BY EUGENE DEMAITRE

After a few years of mostly virtual or smaller events because of COVID-19, both exhibitors and attendees were relieved to reunite in person for MODEX 2022 in Atlanta in March.

Robotics also had a strong presence at the biennial materials handling trade show, growing from about 10% five or six years ago to nearly 60% this year, according to several industry observers. From autonomous mobile robots (AMRs) and self-driving lift trucks to robot arms and automated storage and retrieval systems (ASRS), there were systems aplenty for supply chain applications.

The average booth size was also larger, with relatively few 10x10-ft. exhibits but plenty of demonstrations of multiple systems working in harmony for goods-to-person, pick-and-place, and palletizing tasks. They were spread out across Halls B and C in a lower level of the Georgia World Congress Center, in between providers of more conventional technologies such as conveyors.

Presentations at MODEX covered topics such as how to get started with automation, how to manage fleets of AMRs, and improved robot-

ics capabilities enabled by machine vision and artificial intelligence. Several vendors said their software could interface with or even take over functions from warehouse management systems (WMS) and warehouse execution systems (WES), but the opportunity to see the latest hardware was the big attraction.

Many discussions around the show focused on the need to compensate for widespread labor shortages and global supply chain problems, the acceleration of e-commerce demand during the pandemic, and last but not least, the opportunity for greater visibility into operations.

Most importantly, delegations from corporations including Amazon, CVS, General Electric, Target, and more were at MODEX, scouting out the latest tools, comparing notes, and looking to make deals on the show floor or at many dinners around Atlanta. In fact, some robotics vendors told me that they have already booked orders through next year.

This was *Robotics 24/7's* first year at this event. After more than 50 appointments, here are some robotics takeaways from MODEX 2022 (see next page).

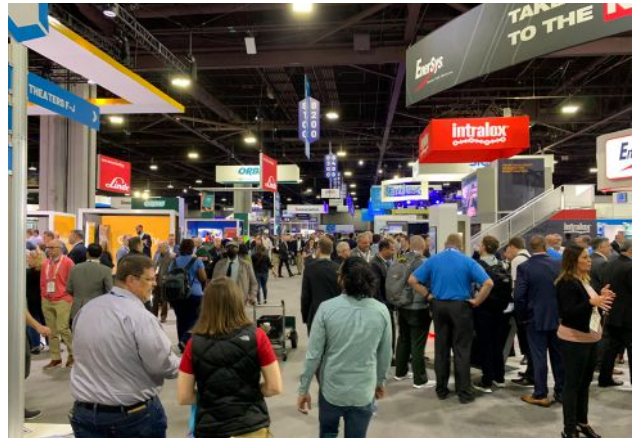


HAI Robotics demonstrated its HAIPICK system among the robots at MODEX 2022. Credit: Eugene Demaitre

1 Crowds come back to MODEX

“Over 37,047 visitors connected with over 857 exhibitors across 405,000 sq. ft. of exhibit space,” said the Materials Handling Institute (MHI), which organizes MODEX. “This was the largest MODEX event to date for MHI, with 20% more visitors than the last pre-pandemic show—MODEX 2018.”

After lines to get in on Monday, March 28, Tuesday had the most people on the show floor. Whether attendees were greeting old friends or co-workers were meeting their teams for the first time after months of teleconference calls, the mood was upbeat.



Credit: Eugene Demaitre

2 Technologies improve — incrementally

If you were looking for drone deliveries, humanoid robots, or fully autonomous tractor-trailers, this was not the right show (see CES). MODEX mainly focused on the warehouse or distribution center.

However, compared with three or more years ago, AMRs are definitely more capable, and the understanding of warehouse processes and the software to manage robots, goods, and staffers has gotten more sophisticated.

As my colleague Bob Trebilcock noted, “sustaining innovation,” or the combination of technologies to improve performance, still counts as innovation.

One of the more impressive advances at MODEX 2022 was FANUC’s heavy-duty CRX-25iA robot arm (see image), which is one of the largest cobots I’ve seen.



Credit: Eugene Demaitre

3 Spring fever hits, as companies pair off

Robotics 24/7 was inundated with press releases about corporate partnerships leading into MODEX 2022. Many of these reflect efforts to broaden product portfolios, gain access to adjacent markets, and deepen engineering teams.

Examples included Murata Machinery and AGVE Group collaborating on automated guided vehicles (AGVs), Vecna Robotics and Big Joe’s autonomous pallet jack, and GXO Logistics working with Locus Robotics, among other suppliers.

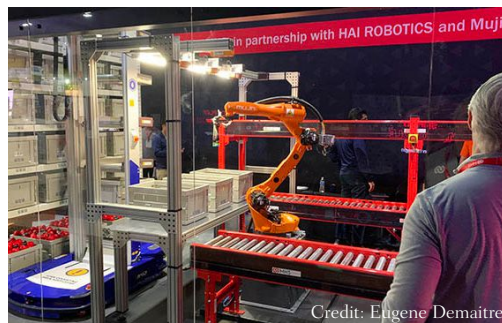
In addition, Honeywell demonstrated robot arms with OTTO Motors’ AMRs,

Oceanering chose BlueBotics’ navigation tech for its robots, while Berkshire Grey and Swisslog showed how AI can aid order fulfillment.

Still more partnerships included Addverb’s AMRs with Numina Group’s distribution software, as well as Caja Robotics and Ranpak’s packaging system. Plus One Robotics and Tompkins Robotics

jointly offered systems for sortation.

Material Handling Systems (MHS) had one of the coolest displays, with black walls and red lights, plus a mixed-case palletizing demonstration with Mujin and HAI Robotics, as seen in this photo.



Credit: Eugene Demaitre

4 Robots reach new heights

Mobile robot providers have released larger models over the past few years to address the need for moving pallets and manufacturing parts. At this year's MODEX, robots got taller to address high-bay warehouse storage.

Examples include Geek+'s RoboShuttle, HAI Robotics' HAIPICK, and Raymond's Automated Transtacker.

Vecna Robotics displayed the Omni autonomous reach truck (shown). "The concept is to maximize storage density and reach 8 to 32 ft. and double-deep storage," said Daniel Theobald (left), founder and chief innovation officer of Vecna Robotics, as well as co-founder of MassRobotics.

"Along with our Pivotal software and new pallet jack with Big Joe, we want to take our experience



Credit: Eugene Demaitre

with autonomy to increase autonomy," added Craig Malloy (right), new CEO of Vecna. "Out of the \$300 billion to \$400 billion market for moving pallets, only 1% is autonomous today."

5 Alternatives to automated storage abound

From mobile robots to taller lift trucks, several exhibitors positioned their products as alternatives to ASRS. For instance, Conveyco said its Go-Fer Bot offers greater flexibility at a lower price.

Among the products that Geek+ showed at MODEX was its Sky-Storage & Ground Pick system, which uses X-series "four-way" shuttle robots that take advantage of vertical space.

"With our PopPick station for totes, it's an evolution of goods-to-person automation, without the infrastructure of ASRS," Randy



Randolph, vice president of channels and partnerships at Geek+, told *Robotics 24/7*.



Credit: Eugene Demaitre

6 But don't count out ASRS just yet

For density, automated storage systems are still hard to beat, with AutoStore and OPEX having two of the bigger demonstrations at this year's MODEX. AutoStore recently introduced its BinLift 2.0 product to the North American market.

One challenge of ASRSes is maintaining throughput when something gets stuck or a robot shuttle malfunctions. OPEX addressed this issue in its Infinity system, which it said is more configurable than other goods-to-person systems. "Our third-generation OPEX Infinity is more modular, scalable, and flexible, and totes latch together to decouple presentation from the racks," said Alex Stevens, president of OPEX Warehouse Automation.

7 Mobile robot vendors grow their fleets

AMRs may not yet be commoditized, but there were plenty of options for MODEX attendees.

Industrial automation company ABB showed its ASTI line, which it acquired last year. Zebra, which acquired Fetch Robotics, demonstrated its integrated hardware and software.

While Mobile Industrial Robots (MiR) was absent, albeit in a few partner booths such as that of ROEQ, autonomous forklift provider VisionNav Robotics and AMR and AGV battery supplier Flux Power were present.

Seegrid unveiled its Palion Lift AMR (shown), which is now available for pre-orders. “It has more intelligence for navigation, thanks to sensor fusion of cameras with 2D and 3D lidar,” said Jeff Chris-



Credit: Eugene Demaitre

tensen, vice president of product at the Pittsburgh-based company. “Our real-time adaptive stack provides full volumetric vision for point-to-point navigation.”



Credit: Eugene Demaitre

8 Mobile manipulation picks its way forward

Mobile robots are all over the place, but there were relatively few piece-picking systems at MODEX, aside from palletizing robots that relied on suction rather than grippers.

Collaborative robot leader Universal Robots demoed its item-handling system with Mujin, which also demonstrated an industrial robot arm from FANUC for fast depalletizing.

RightHand Robotics was an exception, discussing recent deals with integrators Element Logic and Vanderlande.

IAM Robotics and Fetch Robotics (now Zebra) have shifted in focus from mobile manipulation to AMRs, at least for now. Dexterity showed how two robots can handle parcel picking.

One of the more promising systems drawing attention at MODEX was Boston Dynamics’ new Stretch robot for unloading trucks.

9 AI offers to make automation more approachable

Software and AI are becoming as essential to supply chains as AMRs and WMS.

RIOS noted that the robotics-as-a-service (RaaS) model can help warehouses get started with increasing productivity and augmenting scarce labor.

Softeon touted its range of software and services for warehouse management, while Rajant explained

how its wireless mesh makes communications more reliable.

SVT Robotics claimed that its SOFTBOT platform can ease integrations and deployments of robots and other technologies.

Speaking of integration, Körber Supply Chain Vice President John Santagate (far right) took to the stage to discuss how his firm worked with ISN to successfully deploy LocusBots in its operations.



Credit: Eugene Demaitre

10 Interoperability efforts continue

Last but not least, growing numbers of robots of all kinds in warehouses demand ways of managing them, regardless of manufacturer.

“FedEx wants to use lots of robots, where we don’t have to worry about them communicating,” said Aaron Prather (above, right), senior technical advisor at FedEx Express, on another panel hosted by Locus Robotics.

“There’s going to be heterogeneous fleets, and the MassRobotics interoperability standard isn’t about any one company having control; it’s looking at shared resources,” noted Jason Walker (center), founder of Waypoint Robotics and now vice president at Locus.

Work is continuing on the MassRobotics standard, which was first demonstrated at A3’s AMR and Logistics Conference last year, said Walker and Theobald. Multiple industry and government parties



Credit: Eugene Demaitre

are interested, and more companies are welcome to join the effort, they added.

Eugene Demaitre is editorial director of Robotics 24/7. Prior to joining Peerless Media, he was a senior editor at other robotics publications.

Mobile Industrial Robots Partners with River Capital Finance to Help Warehouses Adopt Automation

*MiR offers mobile robots and software with partners worldwide.
Credit: Mobile Industrial Robots*



River Capital Finance is offering leasing options in the U.S. to help businesses meet increasing demand with automation.

BY ROBOTICS 24/7 STAFF

Among the barriers to entry for automation is the challenge of financing. River Capital Finance recently said it has partnered with Mobile Industrial Robots ApS to offer custom, flexible financing options to companies that want to add robots to their warehouse operations.

“With the current labor shortages and rising inflation, the

need for warehouse automation is more crucial than ever,” said Mike Jones, senior vice president at River Capital Finance. “We’re excited to be able to offer financing solutions to Mobile Industrial Robot’s customers so they can easily integrate automated solutions into their warehouses.”

Cleveland-based River Capital said it makes hardware more accessible through fast, conve-

nient leasing options. The firm said it offers numerous payment plans, term-end options, and equipment-return policies for cutting-edge technologies.

River Capital Finance has been providing leasing for warehouse equipment for more than 30 years. It specializes in radio frequency identification (RFID), automatic identification and data capture (AIDC), warehouse au-



tomation, mobile computing, and point-of-sale (POS) equipment.

Partners aim to ease initial investment in robots

Orders for robots in the U.S. increased by 28% in 2021 to an all-time high of almost 40,000 units, reported the Association for Advancing Automation (A3). With the COVID-19 pandemic and a renewed focus on manufacturing in the U.S., business of all sizes across industries are interested in automation, noted the companies.

“Automation is a game-changer for manufacturers and in warehouse operations, and businesses need to optimize their workflows to maintain a competitive edge,” said Rasmus Smet Jensen, group marketing director at Mobile Industrial Robots.

“The initial investment can be hard for small-to-medium-sized business to afford, so River Capital Finance’s leasing solutions are a great way for those companies to afford automation and get

mobile robots running at a low monthly cost,” he said.

River Capital is offering mobile robots through a version of the robotics-as-a-service (RaaS) model.

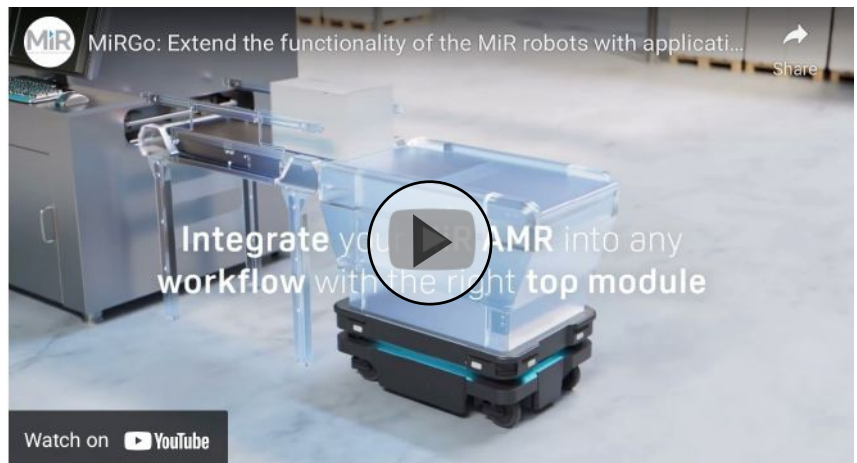
“We’ve been doubling down on robotics, as the warehouse industry started to see significant changes,” added Jones. “We’re proud to be at the forefront of this new industry and are looking forward to helping companies achieve the efficiency they need to be successful.”

About Mobile Industrial Robots

Mobile Industrial Robots (MiR) said it develops and manufactures collaborative and secure autonomous mobile robots (AMRs). The Odense, Denmark-based company claimed that they can quickly, easily, and cost-effectively manage internal logistics, freeing employees to carry out more value-added activities.

MiR said that hundreds of midsize companies, major international enterprises, logistics centers and hospitals all over the world have installed its robots. The company has a global network of distributors in more than 60 countries. It has regional offices in New York, San Diego, Singapore, Frankfurt, Barcelona, Tokyo, Seoul, and Shanghai.

MiR said has grown quickly since it was established in 2013, and its turnover has increased significantly every year. The company was established by experts from the Danish robotics industry, and Teradyne acquired it in 2018.



MODEX 2022

Welcomes Back Attendees, as Materials Handling Robotics Cautiously Advances



Robots stole the show at the biennial trade event, but they raised as many questions as they answered.

BY BOB TREBILCOCK

OK, I was a skeptic. Boy, was I wrong! I arrived in Atlanta in March 2022 with memories of MODEX 2020 dancing in my head. As anyone who was there remembers, attendance was sparse on the busiest of days. Having attended one event this past January with light traffic, and reading accounts of other events that have struggled to get people in the door, I didn't know what to expect.

Well, MODEX 2022 was perhaps the best trade event I've attended in many years. The mood was exuberant, the crowds were there from

Monday afternoon through the end of the day on Tuesday, and Wednesday wasn't half bad.

I don't know the exact number of exhibitors, but the show approached ProMat levels for sheer scale. And there was a lot to see. Hats off to the staff and leadership at MHI for pulling off a tremendous event at a time when there's still a lot of uncertainty in the air.

Exhibitors display incremental innovation

So, what was my biggest takeaway from Atlanta? There's nothing new under the sun. Well, that's not exactly true – and it's not meant as a criticism. On the new front, I saw a conveyance system powered by magnets at Beckhoff Automation that I'm still trying to wrap my head around. It's called the XPlaner, and it's easier to watch a video than for me to explain what it does (see above, right).

That said, a lot of what was on display was what Jim Rice, a professor at MIT, calls "sustaining innovation." This type of innovation represents "the combining and application of a mix of inventions, existing processes, and technologies in a new way to create improvements in cost, quality, cash, and/or service."

A great example of this recommended to me by several fellow MODEX attendees was the new goods-to-person system from OPEX, which decouples robots from its high-density storage medium. Goods-to-person isn't new for the industry or OPEX, but the new product is a sustaining innovation based on what the company has already done.

Industry consolidation continues

One notable deal around the show was the acquisition of SDI Systems by Element Logic, a Norwegian firm that is the largest integrator of AutoStore. SDI will serve as Element Logic's base to enter the North and South American markets.

Examples of partnerships to gain access to new markets included Murata Machinery and AGVE Group, Muratec and Cimcorp, and Addverb Technologies and Numina Group.

And, while not really a consolidation, I remain



impressed by the amount of private equity funds that continue to be invested in our space.

Robotics reaches a tipping point

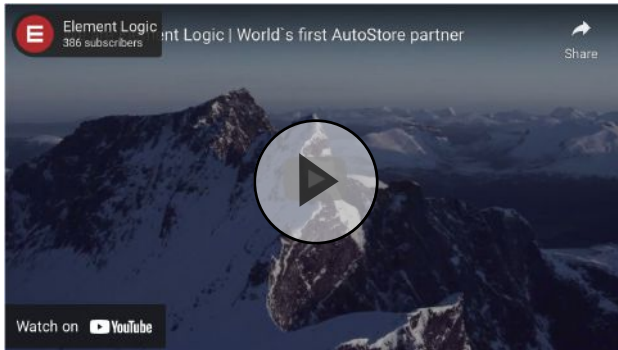
Back in 2015, I invited Tom Galluzzo, the co-founder of IAM Robotics, to write an article for *Supply Chain Management Review* [Editor's Note: a sibling site to *Robotics 24/7*] on why roboticists like him were jumping into the materials handling space. The resulting article was titled "Robotics at the Tipping Point."

The tipping point that Tom was referring to was the entrance of robotics into warehousing and logistics operations when up to that point, robotics was primarily limited to manufacturing. And, with a few piece-picking exceptions, materials handling robots were autonomous mobile robots (AMRs) being used as point solutions, like in robot-to-person fulfillment processes.

That was a huge leap forward, and seven years later, most companies haven't yet made that leap. But I think we're at another tipping point that's being defined in several ways, all of which were on display at MODEX.

Fleets grow from homogenous to heterogenous

Last year, I published an article co-authored by Shekar Natarajan, chief supply chain officer of American Eagle Outfitters, and Parimal Kopardekar, director of the NASA Aeronautics Research Institute (NARI). They made a distinction between what it takes to introduce new technologies into homogenous and heterogenous systems.



They cited the example of adding a new type of aircraft to the national airspace. That’s not a big deal if the new aircraft is a jet, because it will fly at the same speed as the other jets. But, what happens if you try to introduce slow-moving drones or blimps into the same airspace as the jets? Now, everyone has to adjust to whatever is the slowest moving aircraft in the airspace.

Or, as Natarajan and Kopardekar pointed out, in India, it doesn’t matter if you’re driving a high-powered sports car on a congested street. You can only move as fast as the cows that share the road.

I’ll be honest: At the time, the point they were trying to make was over my head. However, if you walked around MODEX, you saw that robotics is moving from point solutions to integrated solutions, sometimes with more than one type of robot. I believe the new tipping point is heterogeneous robot fleets in the warehouse. It’s something that Gartner analyst Dwight Klappich has been predicting.

Here’s what that means: The current wave of AMRs began with Kiva, which was segregated from the rest of the warehouse for reasons of safety. It was homogenous. After Amazon bought Kiva, we saw a whole new set of robot-to-goods solutions from companies like Locus Robotics, 6 River Systems, and Fetch Robotics. However, like Kiva, they were homogenous solutions. They did one thing and did it well, but they were “islands of automation.”

At this year’s MODEX, we saw vendors such as Addverb Technologies, Geek+, or Mujin showing off their robot portfolios. Or, we saw vendors like RightHand Robotics, HAI Robotics, or Tompkins Robotics demonstrating how all of their different robot types could work together.

For instance, RightHand showed its robot picking not only from a tote to a tote, but also to a tote on someone else’s AMR and onto a Tompkins T-Sort. HAI Robotics demonstrated how its robot could be part of what Klappich describes as a heterogeneous setup.

Robot proliferation leads to management questions

The shift from homogenous robot fleets to heterogeneous environments raises several questions:

1. Who within the organization is going to own the robots, especially if you have an environment where multiple robotic technologies are sharing space with people and other forms of automation? Klappich asks whether it’s time for a chief robotics officer (CRO).
2. Can a robotics company do it alone? There are robotics companies with broad portfolios, but more vendors announced partnerships than funding around this MODEX.
3. How important are systems integrators? As we move from point solutions to more end-to-end solutions, someone is going to have to integrate the robots. I don’t think that’s going to be the robotics manufacturer. Partnerships between robotics providers and integrators are likely.
4. What software system is going to make this happen? Is it a warehouse management system (WMS), a warehouse control system (WCS), a warehouse execution system (WES), a robotics operating system like ROS, or an emerging layer of software like what SVT Robotics has brought to the market? Will it be from the likes of Apple, Google, or Microsoft? I’m betting on the new layer of software, and I think it’s essential to moving robotics forward in our space.

Those are some of the questions I want to see explored at this year’s NextGen Supply Chain Conference in Chicago.

Bob Trebilcock, editorial director, has covered materials handling, technology, logistics and supply chain topics for nearly 30 years.

Honeywell Collaborates with OTTO Motors to Improve Facility Safety, Productivity



OTTO Motors automates materials handling for manufacturing and logistics operations. Credit: OTTO Motors

Honeywell demonstrated OTTO Motors' autonomous mobile robots alongside its own supply chain automation at MODEX 2022.

BY ROBOTICS 24/7 STAFF

Labor shortages and the COVID-19 pandemic have posed serious challenges for warehouses and distribution centers. Honeywell International Inc. announced a strategic collaboration with OTTO Motors

to provide automation throughout North America for help with labor-intensive tasks, such as moving carts, pallets, or totes.

Honeywell said the partnership enables its customers to increase efficiency, reduce errors,

and improve safety by deploying OTTO Motors' autonomous mobile robots (AMRs) in their facilities.

"Supply chains continue to be stressed by staffing shortages and consumer demands driv-

ing expectations of speedy and accurate fulfillment,” said Keith Fisher, president of Honeywell Intelligrated. “Tackling the more dynamic, unstructured environments of today’s distribution centers calls for more sophisticated robots, and OTTO’s AMRs have been proven to be deployed and adapted quickly to changing market conditions or peak buying seasons.”

Charlotte, N.C.-based Honeywell is a Fortune 100 technology company that serves the aerospace, building management, manufacturing, and supply chain industries. Honeywell Safety and Productivity Solutions (SPS) provides hardware, software, and connected systems to improve productivity, workplace safety, and asset performance to customers worldwide.

Mason, Ohio-based Honeywell Intelligrated provides materials handling automation and software.

Industry recognizes automation's benefits

A 2020 Honeywell study found that more than half of companies are more willing to invest in automation because of the pandemic and its lasting effects. Respondents said they see increased speed of tasks, productivity, and employee utilization as the top three potential benefits from automation.

Robot sales in North America had the strongest year ever in 2021, as more industries look to

increase productivity and alleviate ongoing labor shortages, according to the Association for Advancing Automation (A3).

Not only are existing users of automation expanding applications in their facilities, but many first-time users are also increasingly turning to robotics to stay competitive, said A3.

While AMRs handle repetitive and often time-consuming tasks, increasingly scarce labor resources can be shifted to higher-value jobs, noted Honeywell. This alone delivers multiple benefits such as boosting worker satisfaction, reducing injuries, and lowering turnover rates, it claimed.

Mobile robots offer flexibility

Honeywell said that AMRs from OTTO Motors can automate the movement of carts used to transport picked orders or returns. They can travel over any floor surface smooth enough to handle a traditional cart pushed by a worker.

Instead of spending more than half the day walking, workers can simply park carts in designated pickup locations throughout the facility and call robots to retrieve them, said Honeywell. The robots also offer a flexible way to transport pallets typically accomplished primarily with forklifts and conveyor systems.

OTTO Motors said its AMRs are easy to install and smart enough to interact safely with human co-workers and other vehicles, find a different route if

their original paths are blocked, and respond to rapid changes in orders—all without human intervention. The company's AMRs can work with Honeywell automation including its Smart Flexible Depalletizer and autonomous storage and retrieval system (ASRS).

“OTTO Motors provides autonomous material handling inside manufacturing facilities and warehouses and is the technology behind some of the largest deployments of AMRs in North America,” said Matt Rendall, co-founder and CEO of OTTO Motors. “Our relationship with Honeywell shows we partner with the very best integrators and tech leaders to provide business with industry expertise to automate a wide range of workflows in their facilities.”

Kitchener, Ontario-based OTTO Motors is a unit of Clearpath Robotics Inc.

Honeywell and OTTO give MODEX demos

Honeywell said its collaboration with OTTO Motors gives its customers a complete suite of fixed and mobile robotics solutions, backed by expert systems integration, developers, and reliable 24/7 technical support.

Honeywell started demonstrating its Smart Flexible Depalletizer working with OTTO AMRs at MODEX 2022 in Atlanta. They illustrated the benefits of integrating robots into the warehouse, it said.

CJ Logistics Integrates Autonomous Systems With SVT Robotics



CJ Logistics is using a cloud-based platform to integrate multiple technologies, from AMRs and lift trucks to smart glasses and WMS. Credit: CJ Logistics

CJ Logistics needed to improve its processes with mobile robots, autonomous lift trucks, and other systems, and it turned to a cloud-based platform to tie them together.

BY BOB TREBILCOCK

“Integration” is considered a dirty word by many in industry. Sure, there are more software and automation tools than ever, but getting them to play nicely with one another can still be a major challenge. CJ Logistics wanted to add robots and other technologies to a 1.1 million-sq.-ft. facility in Dallas, but it needed to address integration with the help of SVT Robotics.

“This was a strategic initiative for our company,” said Laura Adams, vice president of tech-

nology, engineering systems, and solutions (TES) at CJ Logistics. “In this particular building, we wanted to deploy several technologies that CJ Logistics is using on a global basis. But no single provider could provide it all, so we needed a partner that had industry knowledge, had experience building integration points, and could integrate with our system.”

With a heritage extending back 90 years, CJ Logistics was formed from the 2013 merger of

CJ Korea Express, Korea’s largest logistics firm, with CJ GLS. The Seoul, South Korea-based third-party logistics provider (3PL) has a portfolio spanning temperature-controlled warehousing, multimodal transportation, e-commerce order fulfillment, and last-mile delivery.

CJ Logistics has operated in the U.S. for nearly 50 years and acquired Des Plaines, Ill.-based DSC Logistics in 2018. Today, CJ Logistics operates in 155 cities across 40 countries, with 80



CJ Logistics is using a cloud-based platform to integrate multiple technologies, from AMRs and lift trucks to smart glasses and WMS. Credit: Fetch Robotics

locations in North America. It has a significant presence in regulated industries, such as food and beverage, healthcare, and consumer packaged goods (CPG).

The company distributes food and CPG products at the pallet and case level to retail, club stores, and specialty stores on a regional basis. Its Dallas facility is dedicated to one customer.

CJ Logistics needed to bridge islands

The challenge of integrating disparate technologies often leads to “islands of automation,” whether intentional or not. What’s more, integration is often time-consuming and expensive, requiring a significant amount of custom coding. That can result in improved but suboptimal operations that never realize their full potential across all processes.

Not only did CJ Logistics need to integrate autonomous mobile robots (AMRs), automated lift trucks, electronic pallet trucks, and voice and vision

technologies, but it also wanted them to communicate with its warehouse management system (WMS) from Blue Yonder.

The solution was cloud-based integration from SVT Robotics. The Norfolk, Va.-based supply chain startup brings integration points from various hardware and software providers into its platform. It then enables a customer like CJ Logistics to integrate the

systems it needs to create its processes.

Once a solution set is validated and deployed, it’s a permanent part of the 3PL provider’s toolbox and can be applied to other facilities and for other customers.

3PLs strive to lead with innovation

The project at the Dallas facility reflects two trends driving the 3PL industry today. The first is a quest for innovation as a competitive differentiator, and the second is the requirement to continually deliver value to customers.

Those requirements have always existed, but labor shortages, the COVID-19 pandemic, and the rising costs of energy and materials have contributed to a shifting business environment.

“We have always been focused on creating customer value through the total cost of the system, transforming business processes, improving service, and driving growth and change,” said



Without an integration platform for managing multiple technologies, warehouses can suffer from islands of automation. Source: Getty Images

Kevin Coleman, co-CEO of CJ Logistics America. “Today, our customers are asking us how we can challenge the status quo to deal with the changes in consumer demand patterns.”

Part of that shift is a change in focus from handling at the lowest unit cost within a facility to a focus on the cost of the total end-to-end process. In that scenario, an increase in handling costs inside the four walls of a facility might result in a lower total end-to-end cost.

“Now, with COVID, we’re experiencing capacity constraints,” Adams said. “All of that means that the solution we provide today needs to be flexible enough to adapt to what we might have to do in the future.”

In addition to changing consumer demand, CJ Logistics is facing increasing customer complexity because of mergers and acquisitions, plus SKU proliferation. (The Dallas facility handles about 4,000.) The logistics industry is implementing automation at higher levels than even in the recent past.

“The technology space is evolving fast,” said Coleman. “In the past, the solutions were not portable or flexible, and today they are.”

“On top of that, the pandemic is forcing all of us to look for ways to eliminate touches in the supply chain to create a safer work environment and to make up for the fact that there just aren’t enough people to get orders out the door without automation,” he added. “The conversations now are that we have to do something different to service our customers.”

Dallas distribution center built for efficiency

CJ Logistics opened its Dallas distribution center as a green-field facility late in 2019. The project involving SVT Robotics got under way early the following year, before the pandemic. Adams described it as “a strategic initiative” on behalf of a customer that wanted to see an increase in throughput.

At the time, the Dallas labor market was tight but manageable, so the 3PL didn’t focus initially on how to make up for a lack of labor. Instead, “the question was, ‘What can we do differently to generate labor efficiencies the right way and reduce travel distances?’” Adams recalled. “There wasn’t a specific timeline to complete the project. Rather, we wanted to make sure we had a cost-effective solution.”

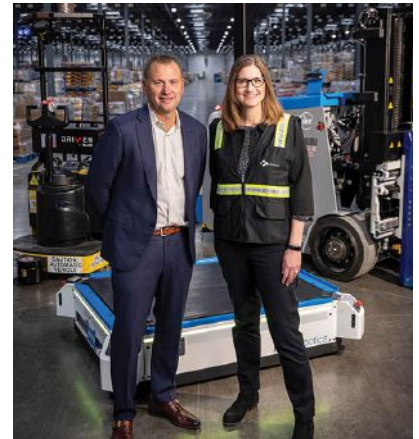
The goal was to introduce automation to reduce the human element in non-value-added processes, such as pallet movement, and reduce the touches and travel time required for value-added processes such as case picking. The distribution center handles 38 million to 40 million cases annually.

The tool kit for achieving those goals would come from the technologies CJ Logistics was already deploying on a global basis, including AMRs from Fetch Robotics, autonomous forklifts (AFLs) from JBT, and electronic pallet trucks (EPTs) from Hyster-Yale. The company also used voice- and light-directed picking, which was later augmented by vision-directed picking technology from Ox Technology.

An automation road map

CJ Logistics expected AMRs to reduce the amount of walking required of associates in case picking. They could remain in a zone while the robots traveled from pick location to pick location.

AFLs would pick up pallets in receiving and then automatically put them away in storage locations. The automated lift trucks would also pick and deliver pallets to outbound staging. Ultimately, the AFLs would also be used for automated trailer loading and unloading.



Credit: Eugene Dematre

Kevin Coleman, co-CEO of CJ Logistics America, and Laura Adams, VP of TES at CJ Logistics.

In addition, CJ Logistics planned to use EPTs for non-value-added pallet movement. The EPTs are essentially autonomous pallet jacks that can move four pallets at time. Since they can only lift a pallet 6 in. (2.3 cm) off the floor, they are only used for transport. An example of a task might be moving a pallet from one business unit to another where it’s combined with other pallets for an order.

Voice and put-to-light were initially used interchangeably to direct case picking. Even-

tually, CJ Logistics went to a multi-modal solution that combines vision-directed picking with voice that's used to capture lot information, which can be more easily inputted by voice.

"Once we developed a roadmap for what we wanted to do, we realized we had to find a solution to integrate these new technologies with our WMS," Adams said.

But the goal wasn't just to integrate with Blue Yonder. CJ Logistics wanted a platform that was WMS-agnostic so that it could add or remove technologies as requirements change or roll it out to other facilities with similar requirements.

"We needed to connect to Blue Yonder today, but our ultimate vision is to develop a robotics hub that can integrate with whatever WMS our customer wants us to use," said Coleman. "For instance, a manufacturing company may want to use EWM [Extended Warehouse Management] from SAP. Being flexible is key to our strategy."

Late in 2020, Blue Yonder introduced CJ Logistics to SVT Robotics.

There's a platform for that

SVT Robotics was founded by two former Swisslog executives who had experienced firsthand the frustration of trying to integrate disparate technologies from a number of different vendors when they worked on an automation project in a new automotive assembly plant.

Left to systems integrators and solution providers, integration took months, required tremendous amounts of new coding, and

Is Vision the Next Picking Technology?

The concept of vision-directed technology using some type of smart glass has been floating around warehouse operations for a number of years. The first application was likely in maintenance and repair operations (MRO), enabling technicians to share what they were looking at with a more senior technician or supervisor, or even to overlay an image of what a part should look like on top of the part they were going to repair.

That was followed, albeit slowly, by expansion of the technology into picking operations. Vision technologies were on display at ProMat in 2017, and *Modern Materials Handling* (a sibling site to *Robotics 24/7*) featured a pilot vision-guided, pick-to-cart process at a DHL facility in March 2018.

According to Laura Adams, vice president of technology, engineering, systems, and solutions at CJ Logistics, vision-guided picking might be ready to move out of the emerging technology category.

CJ Logistics implemented the technology as part of a multimodal case-picking system at its new facility in Dallas. CJ Logistics is combining vision with voice in a process where associates receive location, SKU and quantity information on a vision headset from Ox Technology, and then use voice to capture lot information.

"The technology has come a long way," said Adams. "In the right application, we find it better than voice."

Rolling out any new technology can be challenging, and taking on something as different as vision layers on another level of complexity. Adams said the process at CJ Logistics began with a selection of a few associates who were willing to experiment with the technology and then to work on the process.

For instance, some vision systems overlay a virtual image on a physical image by incorporating virtual colored squares that identify a put location on a cart or a mobile robot. After completing the pick, the associate stares at the cart or AMR and sees a virtual representation of where the pick should be stored.

"We made the decision that it was more complex from a user experience," said Adams. The employees who have used the technology have embraced it.

"They like the concept that we're trying to augment what they do," she said. "With younger workers, the more technology we can provide, the better. It's been a positive."

still didn't yield optimal results. The executives found inspiration in the electric grid. Regardless of what's involved in making a computer, monitor, and keyboard

work, from a power standpoint, when they're plugged into electrical sockets, they all work.

Why couldn't the same concept work for integration on

a plug-and-play, cloud-based platform? Done right, it would allow for the rapid deployment or reconfiguration when requirements change, without custom coding. SVT Robotics called its platform “Softbot.”

“On behalf of the market, we prebuild Softbot connectors to leading technologies across the industry, including automatic guided vehicles [AGVs], AMRs, conveyors, sorters, WMS and e-commerce shipping platforms, to name a few,” said T.J. Fanning, vice president of growth at SVT Robotics. “By prebuilding the connectors, we can integrate multiple robotic and automation systems, build solution sets, validate them, and then have them in CJ Logistics’ toolbox so they can be redeployed to other customers.”

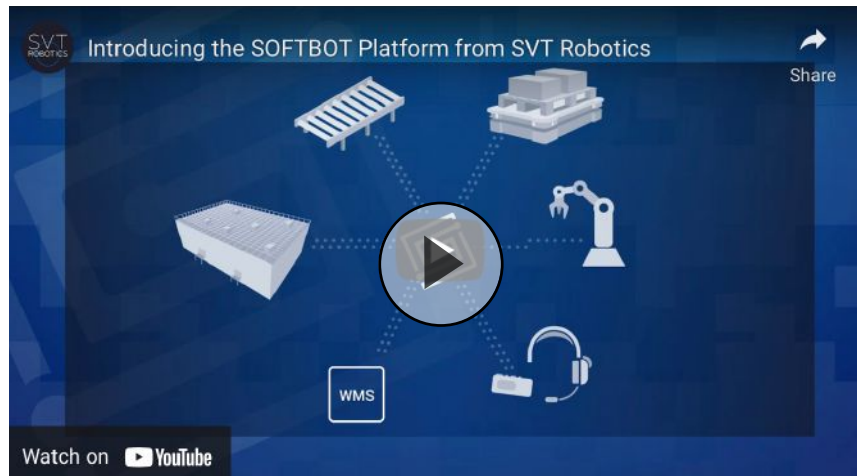
Softbot handles orchestration

SVT’s platform also handles orchestration decisions so that, for instance, a task for pallet movement on the dock can be assigned to an EPT rather than an AFL if it just involves travel without putaway.

In another example, lot capture was not a requirement for every product, so using the platform, CJ Logistics could determine which zones needed it to be available.

According to Fanning and Adams, the software stack was installed and ready for deployment once the hardware was procured and delivered to the facility. Then, each of the individual solutions was enabled. For example, CJ Logistics rolled out AMRs from Fetch for case picking.

Then over about six weeks,



the company rolled out smart-glass vision technology, voice, and finally put-to-light. It rolled out the other hardware, including EPTs and AFLs, as it arrived.

SVT Robotics meets changing requirements

One way in which CJ Logistics pivoted during its deployment of robotics was a new requirement to capture lot information. The 3PL worked with SVT Robotics to create a new multi-modal case picking process.

An associate receives information about the pick location, SKU, and quantity through smart glasses and then confirms the lot information with voice. Thanks to the pre-built connectors, it was relatively simple to integrate the technologies for that process.

The platform also allowed CJ Logistics to manage how tasks were rolled out to its operators and to switch back and forth between existing and new processes during the changeover as required.

“If we wanted to use part of the week for training and then concentrate on throughput with

the existing processes the rest of the week, we could change which process we were using through the platform,” Adams explained.

While SVT Robotics engineers were on-site at first, within two to three months, they no longer had to be present for all three shifts per day.

CJ Logistics expands tool kit

CJ Logistics has been working with the new technologies and integration platform for about a year. The most important benefit is that it expands the tool kit, said Adams and Coleman. This enables CJ Logistics to quickly adjust to its customers’ changing requirements with new technologies as they emerge.

“There is no one solution that will fit every customer and every facility,” Adams said. “Once we have a connector on the platform, we can bring together the best components for each customer profile.”

Bob Trebilcock, editorial director, has covered materials handling, technology, logistics and supply chain topics for nearly 30 years.

Warehouse and Distribution Center Managers Ready to Invest in Automation, Finds Survey

Peerless Research's annual warehouse and DC equipment survey reports that interest is rising in both robotics and worker training.

BY ROBERTO MICHEL

A new survey by Peerless Research Group reported that interest in automation is increasing among warehouse and distribution center operators. The "Annual Warehouse and Distribution Center Equipment Survey" found that usage and budgets for materials handling systems, including mobile robots, have increased.

Peerless Research, which is owned by Peerless Media LLC along with *Robotics 24/7*, asked readers about their spending plans for warehouse automation, materials handling equipment, and related software.

The findings suggested that operators are interested in more than a crude swap of human labor for robots. Respondents also said that they expect to spend more on labor and that they are more interested in training.

Despite ongoing supply chain problems and the COVID-19 pandemic, e-commerce growth has continued, forcing distribution centers (DCs) to scramble. This has led to both more spending on both workforce



Credit: Eugene Demaitre

Demand for automation in warehouses and distribution centers continues to climb.

development and automation. This two-pronged approach is enabling retailers to keep up with fulfillment volumes.

"It's the new landscape," said Norm Saenz, managing director and partner at St. Onge, a supply chain engineering and consulting company and Peerless' research partner for this project. "I think leaders in operations see the writing on the wall. They realize that there needs to be more automation in their facilities to support throughput requirements and offset the lack of enough workforce to carry out processes manually, so we're seeing more automation."

This year's survey, conducted in December 2021 by Peerless Research Group, drew responses from managers and executives

involved in materials handling system decisions in multiple verticals. Compared with last year, the survey found less hesitancy about investments, reaching a level on par with the 2020 survey, which was conducted before the COVID-19 pandemic hit North America.

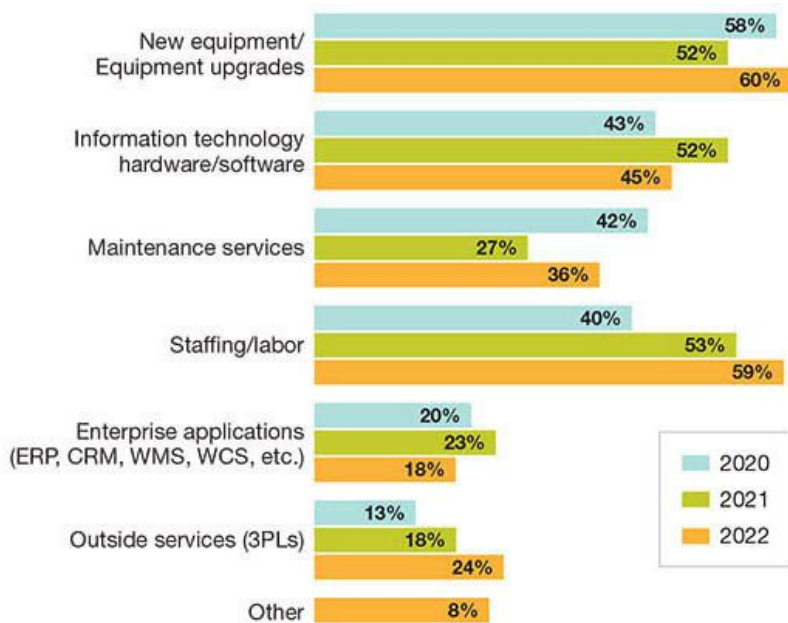
Not only did this year's survey show less hesitancy, it also learned that budgets are rising fairly dramatically. The average anticipated spending on materials handling systems and related technology for 2022 came in at \$459,316, well above last year's average anticipated spend of \$306,990.

Hesitancy dissipates

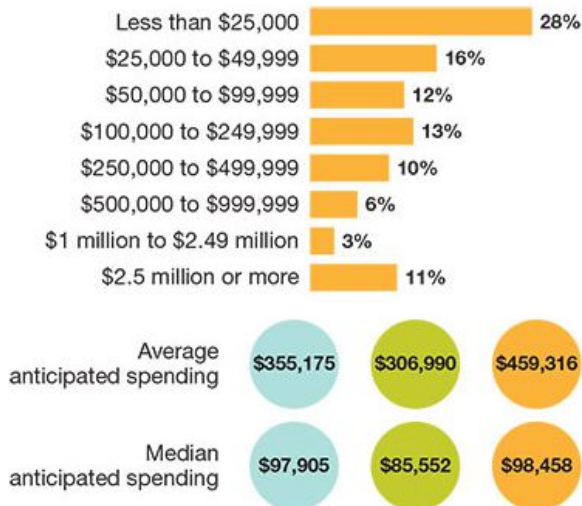
Each year, the survey asks how the present state of the economy is affecting spending on material handling systems and related

MANAGER SURVEY

In which areas will you be investing over the next 12 months?



Over the next 12 months, approximately how much do you expect to spend in total on materials handling equipment and information systems?



technologies. Compared to last year's findings, there is less hesitancy. In particular, those saying that they're "holding off" on purchasing decisions dropped from 19% last year to 16% this year.

"The trend is toward more optimism and use of automation," said Donald Derewecki, a senior consultant at St. Onge, who along

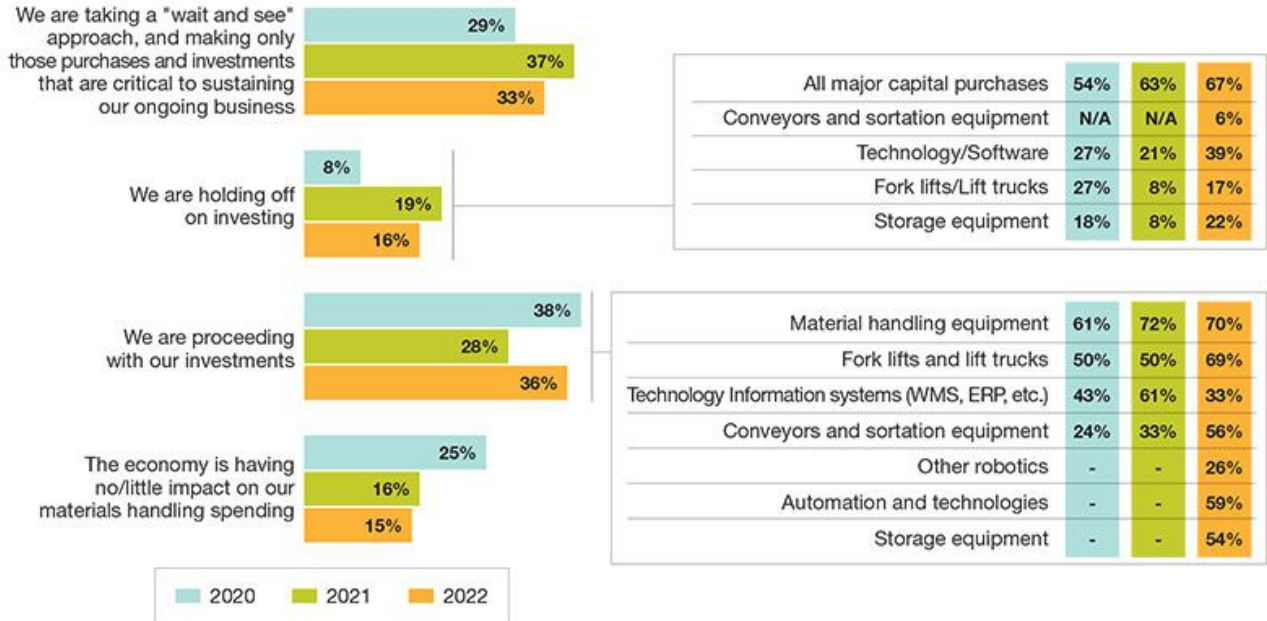
2022 respondent demographics

Peerless Research Group's e-mail survey questionnaire was sent to readers of *Logistics Management* and *Modern Materials Handling* in December 2021, yielding 114 qualified respondents. The respondents were from sites whose primary activity is corporate headquarters (32%), warehouse/distribution (26%), manufacturing (25%), and warehousing supporting manufacturing (13%).

The median annual revenue of responding companies was \$52 million, while the average was \$184.8 million, compared with an average of \$188.9 million last year and a median of \$50 million. Qualified respondents—managers and personnel involved in the purchase decision process for materials handling systems—held influence over an average of 108,330 sq. ft. (10,064 sq. m) of DC or facility space.

MANAGER SURVEY

How is the present state of the economy affecting your spending on materials handling equipment, technologies, and services?

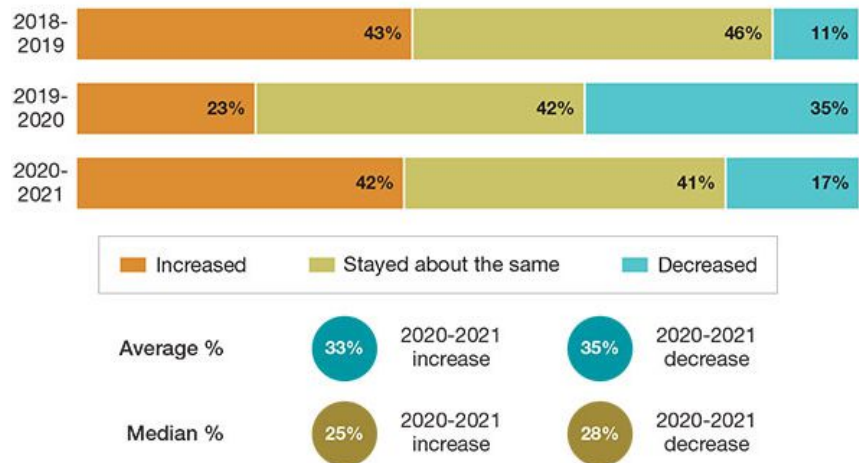


with Saenz reviewed the survey findings. “The survey shows that a cross-section of companies of different sizes realize that they have to keep up with automation and information technology to stay competitive. Maybe the smaller companies don’t want to be bleeding-edge, but more of them realize they need to keep up with the mainstream.”

Conversely, this year 36% said they are proceeding with investments, up from 28% last year. Those taking a “wait and see” approach also declined, from 37% last year, to 33% this year.

When asked which broad categories they’re proceeding to invest in, the categories of growing interest versus last year were lift trucks (named by 69% this year, up from 50%) and convey-

How did your company’s spending on materials handling systems in 2021 compare with 2020? And by what percentage?

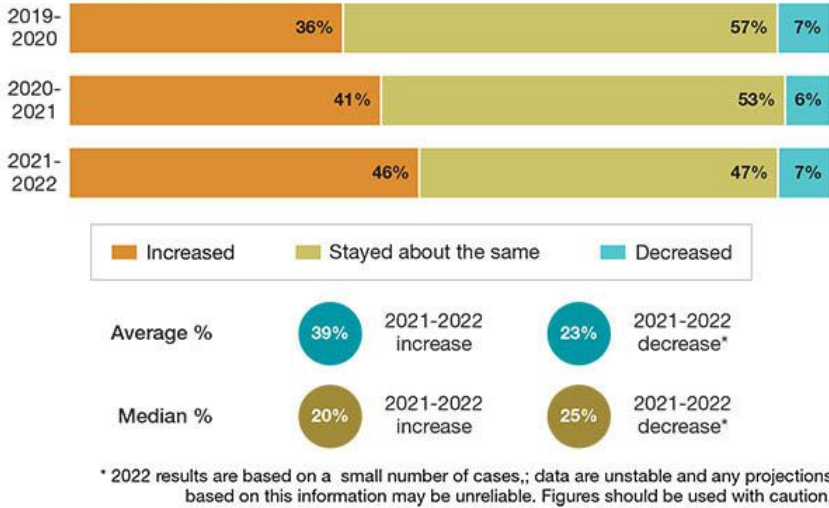


ors and sortation (named by 56%, up from 33%).

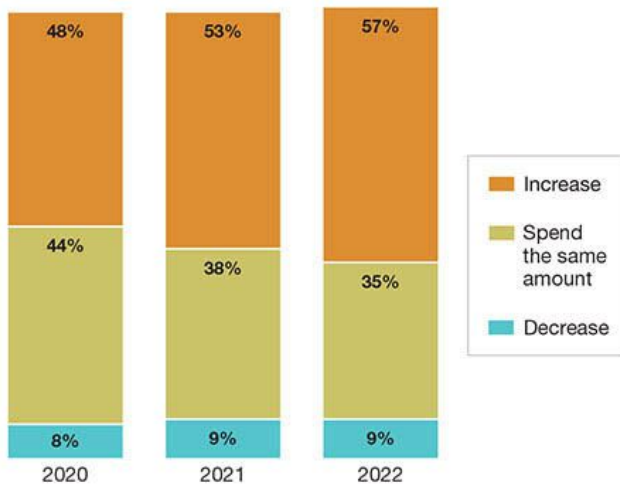
For this year’s survey, we also added “robotics” and “automation and technology” as other areas

companies are proceeding to invest in. We found that 26% want to proceed with robotics, 59% with automation, and 54% with storage solutions.

How do you expect your company's spending on materials handling solutions in 2022 to compare with 2021? And, by what percentage?



Overall, how do you expect your spending on materials handling equipment and related information systems to change in the next two to three years?



When asked how 2021 spending compared to 2020, 42% said it increased, up from 23% on the same question last year. The “stayed about the same” response dropped by just 1%, but only 17% said that their spend level

decreased, down sharply from 35% last year.

Looking at expected spend for 2022 compared to 2021, 46% said their spend level will be up this year, which is 4% higher than the 41% who last year said

their spend level would be up versus the previous year.

The annual survey also asked if spending will increase over the next “two to three” years, and, once again, the findings trended upward. This year, 57% predict increased spending on materials handling systems over the next two to three years, compared to 53% last year.

As mentioned, the average anticipated spend for 2022 (the survey asked for anticipated spend for the next 12 months) reached \$459,316, up from \$306,990 last year. The median 2022 anticipated spend was also up—from \$85,552 last year to \$98,458 this year.

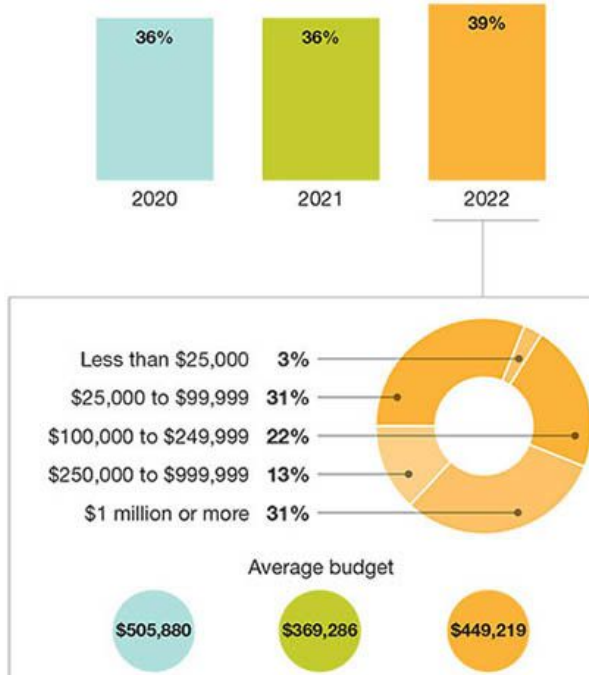
In terms of dollar ranges for anticipated 2022 spending on materials handling, a combined 14% of respondents plan to spend \$1 million or more, though with many smaller companies among respondents, 28% plan to spend less than \$25,000.

When asked in which areas they will be investing over the next 12 months, 60% will spend on new equipment or equipment upgrades, up from 52% last year. In addition, 59% said they plan to invest in labor, up from 53% last year, while 24% said they will invest in outside services, up from 18% the year before.

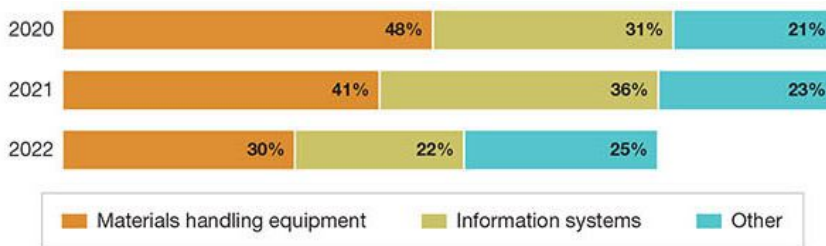
This year, 36% said they will invest in maintenance services, up from 27% last year. Forty-five percent planned to spend on information technology (IT) hardware or software, down from 52% in our 2021 survey. However, other

Do you have a pre-approved annual capital expenditures budget for materials handling solutions?

(Percentages reflect those who said, "Yes.")



And, what percentage of your overall spending during the next 12 months will be on...



findings in the survey reflect a need for software.

Labor spending includes incentives

The higher spending on labor doesn't necessarily mean respondents are looking to add significantly more people, explained Saenz. Some are likely paying

higher wages or incentives to attract and retain the same level of staff, or at least an adequate level of staffing to support their operational volume. They're doing this as they turn to automation to reduce the overall labor requirement, he said.

"Companies are definitely paying higher wages to try and

attract and retain enough people, while also looking at more automation," Saenz said. "Both are part of the strategies we see: spending more on automation to be more efficient and also spending more on labor to ensure they have enough people to staff these more highly automated facilities."

While labor availability concerns have been around a long time, added Derewecki, the problem is only escalating, making it harder for companies to meet significant peaks in demand if they rely on mostly manual processes.

"It's just very difficult for DCs that experience significant spikes in demand, to go out and find 40 or 50 extra people for just a couple of months," Derewecki said. "That is where much of the demand for automation is coming from."

This year's survey also found an increase in pre-approved, annual capital expenditure (CapEx) budgets for materials handling solutions, with 39% reporting they had one, up from 36% the previous year.

The average pre-approved budget climbed from \$369,286 last year to \$449,219 this year. When we asked about ranges, 31% reported a pre-approved budget of \$1 million or more.

Spending breakdown

When asked what percentage of overall spending will be on either materials handling equipment, information systems (IS), or "other," over the next 12 months, this year 30% is for equipment, 22% is on IS, and 25% on "other."

Which systems and equipment are you likely to evaluate or consider during the next 12 months?

Materials handling equipment

Lift trucks and accessories	46%	40%	48%
Racks and shelving	35%	45%	49%
Mobile and wireless	28%	26%	30%
Dock equipment	27%	33%	28%
Bar coding	26%	32%	37%
Packaging including palletizers, pallets and dunnage	25%	25%	40%
Totes, bins and containers	24%	32%	31%
Conveyors including sortation equipment	20%	19%	19%
3PL services	16%	16%	17%
Order picking and fulfillment	16%	19%	17%
RFID solutions/products	14%	19%	25%
Controls	14%	14%	15%
Automated storage including carousels and vertical lift modules	14%	13%	10%
Systems solutions	13%	17%	21%
Hoists, cranes, and monorails	13%	11%	18%
Power transmission including motors and belts	13%	9%	16%
AGVs/AMRs	8%	2%	5%
Mezzanines	6%	13%	13%

Information management systems

Bar coding and automated data capture	32%	43%	40%
Asset management systems	26%	18%	19%
ERP	23%	22%	24%
WMS	21%	24%	24%
WCS (Warehouse control systems)	14%	24%	14%
TMS	13%	18%	15%
WES (Warehouse execution system)	12%	15%	18%
Distributed order management (DOM)	8%	11%	10%
Voice recognition picking	5%	11%	4%
LMS (Labor management systems)	3%	12%	5%
Other supply chain related software	5%	6%	3%



Last year, this breakdown was 41% on equipment, 36% on IS, and 23% on “other.”

When asked to break down which IS niches they will be spending on during the next 12

months, categories on the upswing this year include warehouse execution systems (WES), up 3%, and enterprise resource planning (ERP), up by 2%. The warehouse management system (WMS) cate-

gory held steady at 24%.

In terms of interest in various types of equipment over the next 12 months, the growth categories included lift trucks (8% gain versus last year), radio frequency identification (RFID) systems (up by 6%), and power transmission including motors and belts (up 7%).

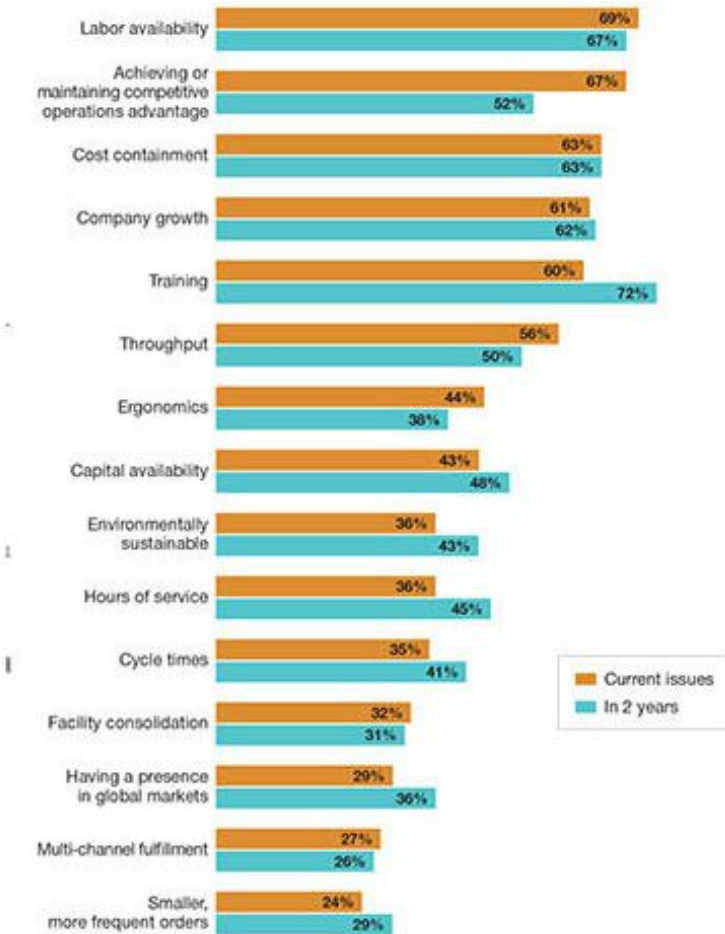
Automated guided vehicles (AGVs) and autonomous mobile robots (AMRs) were up 3%, and more dramatically, packaging investments including palletizers and pallets, were up from 25% last year to 40% this year.

The survey also asked about which new purchases or substantial changes to existing systems fell into one of three broad areas of investment: IT; use of third-party logistics providers (3PLs); and various “system equipment” investments such as automated storage and retrieval systems (ASRS), lift trucks, and conveyors. The big gainer here was systems equipment, up from 24% last year, to 44% this year.

While IT was down 10% versus last year, Derewecki and Saenz observed that “systems solutions” like ASRS typically involve software to run and manage, so some IS spending is wrapped up in these investments.

Another part of the survey that bodes well for software vendors is that many respondents want to automate how they gauge productivity for key factors like cycle times or throughput going forward. This ultimately takes software both to generate the data and to visualize metrics. This

How important are each of these issues today? Two years from now, how important do you expect these issues to be?



question asked if respondents use a manual process for certain metrics, an automated one, or are currently not monitoring the area, as well as if the plan to automate measures in two years.

For example, this year, we found that while just 30% automate measurement of daily throughput, 69% anticipate automating this metric in two years. Similarly, while 27% have an automated means for tracking order cycle times, 54% plan to automate this within two years.

Another is dock-to-stock cycle time, measured in an automated way by 25% today, but 55% anticipate a more automated means of tracking this within two years.

In terms of industry issues rated as “very important” today, compared with what will be very important two years from now, some issues like cost containment and safety drew high percentages today, and remained fairly stable in importance rating two years out.

Others showed a sharper

rise in importance, including training, rated as very important today by 60%, but very important for 72% in two years. Capital availability, cycle times, hours of service, having a global presence, and dealing with smaller, more frequent orders also increased in this two-year look ahead on “very important” practices.

Generally, observed Dereweccki, automation solutions involve training, even if once installed they reduce the overall labor requirement versus manual processes. “Training people on how to use software, and how to maintain and work with any automation they’re putting in, is going to be critical to getting the most from these systems,” he said.

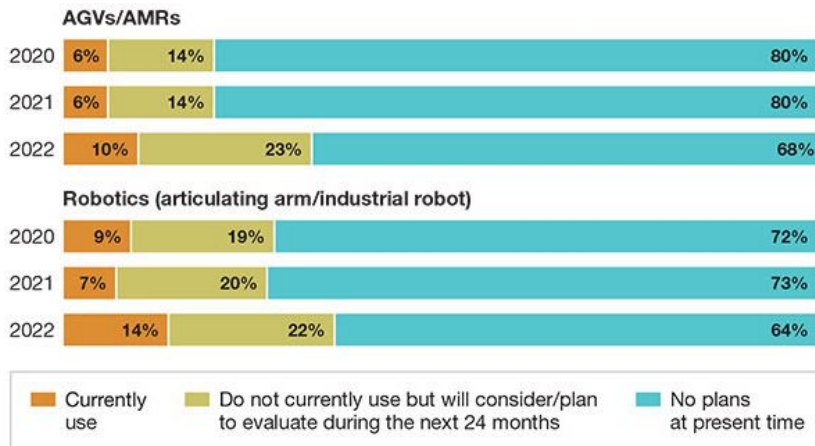
The rise in having pre-approved budgets, as well as projected higher importance on CapEx funding as an issue, may reflect that more organizations are trying to justify materials handling automation expenditures in a more structured, long-term way.

As Saenz explained, “the lead time for getting some of these systems approved and installed can be quite long, so you have to think ahead.”

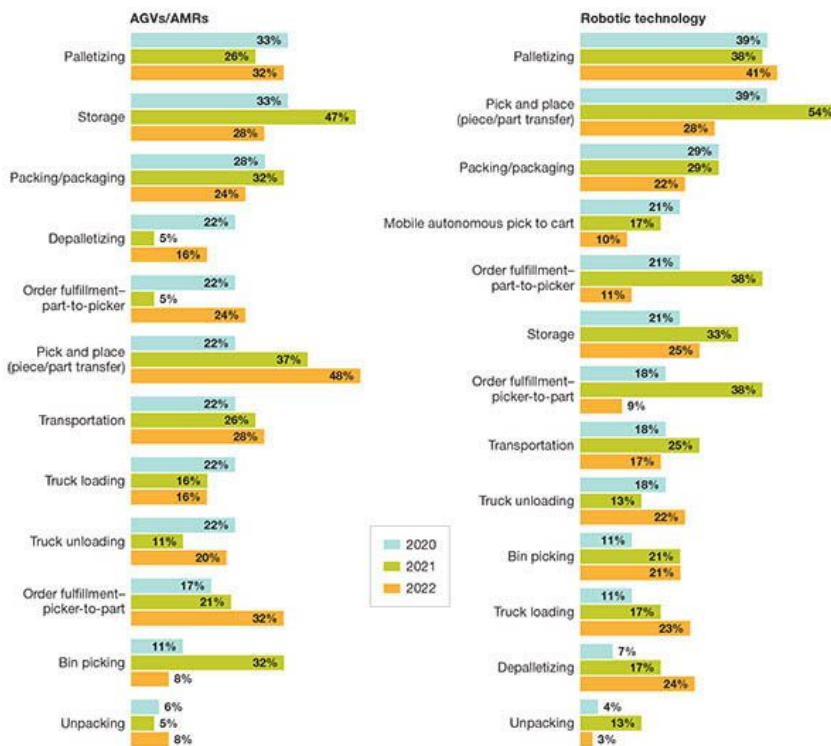
Saenz added that there’s lot of DC network projects going on, consolidating conventional buildings down into fewer, more highly automated buildings.

“These factors are putting pressure on organizations to come up with longer-term capital outlay plans, so that they can get projects approved and actually have new systems in place when and where they need them,” he said.

Does your company currently use or are you considering mobile or industrial robots for materials handling applications?



For which applications are you using different robots?



Robots on the rise

Perhaps of little surprise, interest and use of robotics was up. Not only did 26% of respondents name robotics as a category that they’ll invest in, but they also expressed growing interest in mobile robots.

This year, 10% said that they currently use AMRs or AGVs, and 23% are evaluating them for use within the next 24 months. Last year, that breakdown was 6% who currently use, and 14% evaluating them.

Similarly, interest in industrial robotic solutions with articulating arms for piece picking, palletizing, and other processes is growing. Fourteen percent said that they use industrial robotics of some type, and 22% are evaluating them for use during the next 24 months. Last year, that breakdown was 7% who currently use, and 20% evaluating them.

We further asked which applications mobile and industrial robots will be used for. Growth applications for AMRs and AGVs this year include order fulfillment (both “part to picker” and “picker to part” workflows), transport, as well as transport involved with palletizing and depalletizing.

For other robotic technology, growth applications included truck unloading, truck loading, bin picking, as well as palletizing and depalletizing.

This year’s findings around maintenance of materials handling systems found that internal staffs remain the most

MANAGER SURVEY

common source for carrying out maintenance, well ahead of outsourced maintenance or a combined approach of internal and external resources. For 2022, 67% said that they rely on in-house maintenance, up from 53% in 2021.

However, there was also a 6% rise in respondents who outsource the maintenance function, while 23% use a combined approach, down from 35% in 2021.

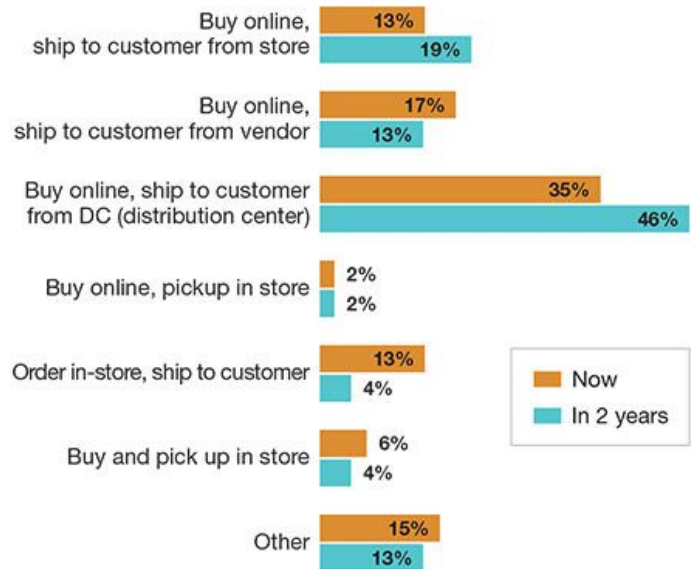
When asked what role automation vendors or third parties play in maintaining automation, upgrades and upkeep visits were the most commonly cited purpose, at 43%, down 3% from the previous year. Most reasons stayed fairly stable, though use of vendors and third parties for maintenance “consulting” was down 10%, though for “data analysis” it was up from 14% last year to 19% this year.

E-commerce prompts capacity increases

The annual survey asked about the most common method of fulfilling online orders today, and which method respondents believe will be most common in two years.

The most common practice today is to “buy-online, ship to customer from a DC,” used by 35% today, and expected to be the most commonly used method by 46% in two years. Similarly, 13% of respondents this year said that “buy online, ship to customer from store,” is today the most common method—but this grows to 19% in two years.

In your operation, which is now most common? Which do you believe will be most common in 2 years?



Some other methods are projected as taking a slight dip in two years, such as “buy-online, ship to customer from vendor,” seen as most common by 17% today, but only by 13% in two years.

The survey also asked if e-commerce “will or is already prompting change in where distribution and manufacturing activities take place.” This year, 57% said e-commerce is prompting more distribution functions in manufacturing, up a full 10% from last year. In addition, 32% said e-commerce was prompting more manufacturing functions in distribution, down from 47% last year.

When asked “where does packaging and fulfillment occur”—with choices including warehouses, factories, fulfillment centers, DCs, retail stores, and outsourced—the most common site remained a warehouse, cited

by 55% this year, up from 47% last year.

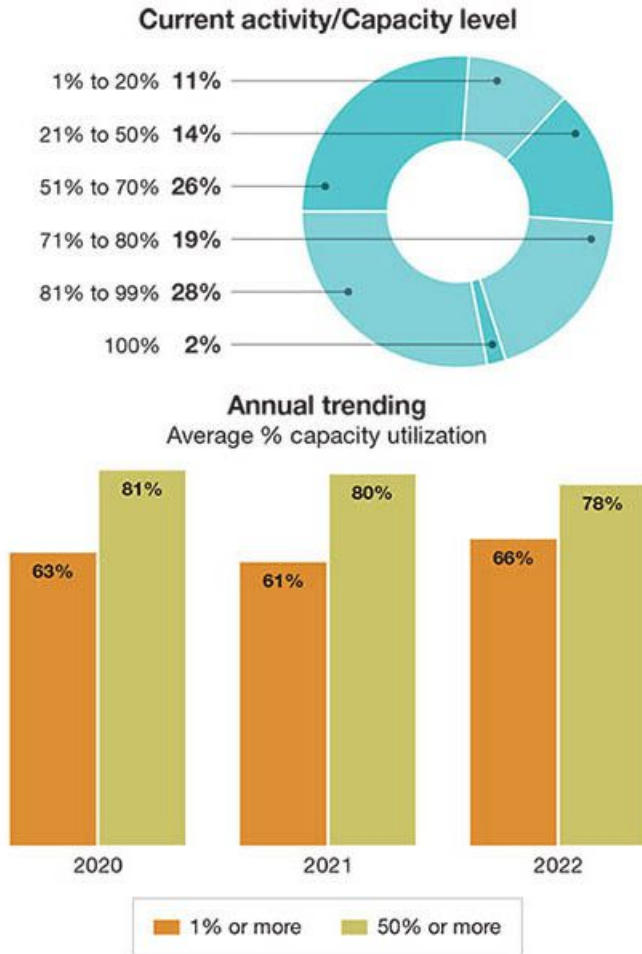
Also, 27% this year indicated that packaging and fulfillment occurs at a fulfillment center, up from 19% last year, while 8% cited stores this year, up from 2% last year, and finally, 53% said packaging occurs in manufacturing, up from 40% last year.

Warehouse space crunch continues

To some extent, the warehouse space crunch can be seen in this year’s survey results. For example, when asked about current activity/capacity level for stand-alone DCs, a combined 31% have a capacity level that exceeds 80%. This showed a significant chunk of respondents likely need more space.

However, for those respondents reporting a capacity level of

What is your current activity level for standalone warehouses/distribution centers?



Among those reporting at least 1% capacity, the average capacity level is 66% (in 2022). Similarly, of those reporting 50% + capacity, the average capacity level is 78%.

50% or more, the average capacity level is 78% this year, down slightly from 80% the year before.

Similarly, for warehouses that support manufacturing, the survey found that a combined 23% currently exceed a capacity level of 80%. Among those reporting 50% or more capacity, the average level reached 80%, down slightly from last year, but still

indicating tight space capacity for these respondents.

Saenz noted that capacity levels can vary widely between different companies, even though it's true that warehouse space has grown tighter this year. International supply chain snarls can affect companies differently, he adds.

"Some companies can't

source the inventory they need, so they have warehouses with a surprising amount of empty space, while other organizations have decided to over buy intentionally to ensure availability for customers, so they are short on space," said Saenz. "It's sort of a mess with inventory, because of the larger supply chain issues."

Survey results paint a bigger picture

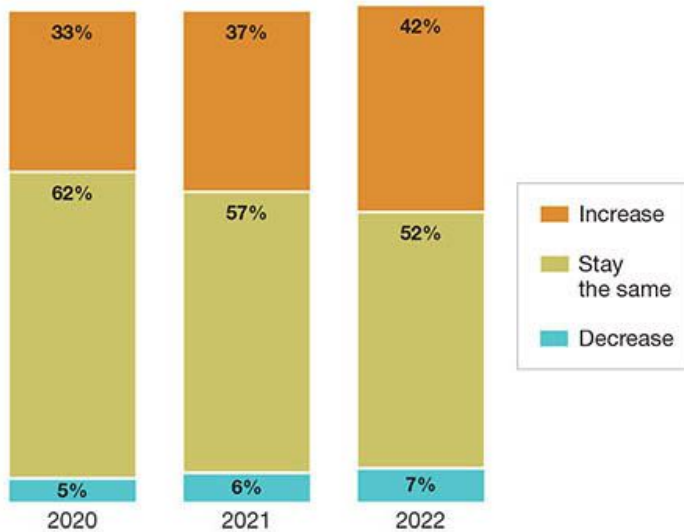
Even though this survey focuses on DC/plant-level systems, some findings reflect the bigger picture. For example, this year, the concerns around labor availability are seen in the growing importance of workload planning as a key practice for managing DC operations.

This year, 46% rated workload planning as important, coming in as the fourth leading practice today; but two years from now, 53% see it as being very important.

Likewise, labor productivity was already rated as important by 54%, but 60% said it will be important two years out. The top practice is "continuous improvement," but this practice is seen as declining in importance two years out.

A similar question on important practices for manufacturers found that just-in-time (JIT) production, rated as a key practice by 25% today, dips slightly to 22% in two years. Outsourcing among manufacturers, rated as important by 25% today, also declined in importance in two years, to 20%.

In the next two years, how do you expect your activity level to change for standalone warehouses/DCs?



Such findings are likely related to today’s international supply chain snarls and may reflect some respondents rethinking their sourcing and production strategies.

On the other hand, respondents said they expect lean manufacturing to grow in importance in the next two years, so there appears to be lasting confidence in pull-based methods, even if

it was a tough year for the JIT approach.

“For some companies, it has turned from ‘just in time,’ to ‘just in case we can’t get it, we’re going to buy more,’” observed Derewecki.

Our questions also found heightened global supply chain concerns. Specifically, logistics increased as a risk factor being analyzed by respondents, from 52% last year, to 65% this year.

In addition, “outsourcing tasks” was being analyzed for risk by 39%, up from 24% last year. A higher percentage said it is also looking at natural disasters as a risk factor this year (up by 5%).

What’s more, this year, 55% said that they have a program for identifying and analyzing risks, up sharply from 39% the year before, and also a bit higher than in 2020, when 52% said they had a plan for identifying risks.

Macro-level supply chain issues aside, one thing that’s clear in multiple findings in the 2022 survey: Respondents are ready to embrace more automation and robotics, and they are budgeting more to make it happen.

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