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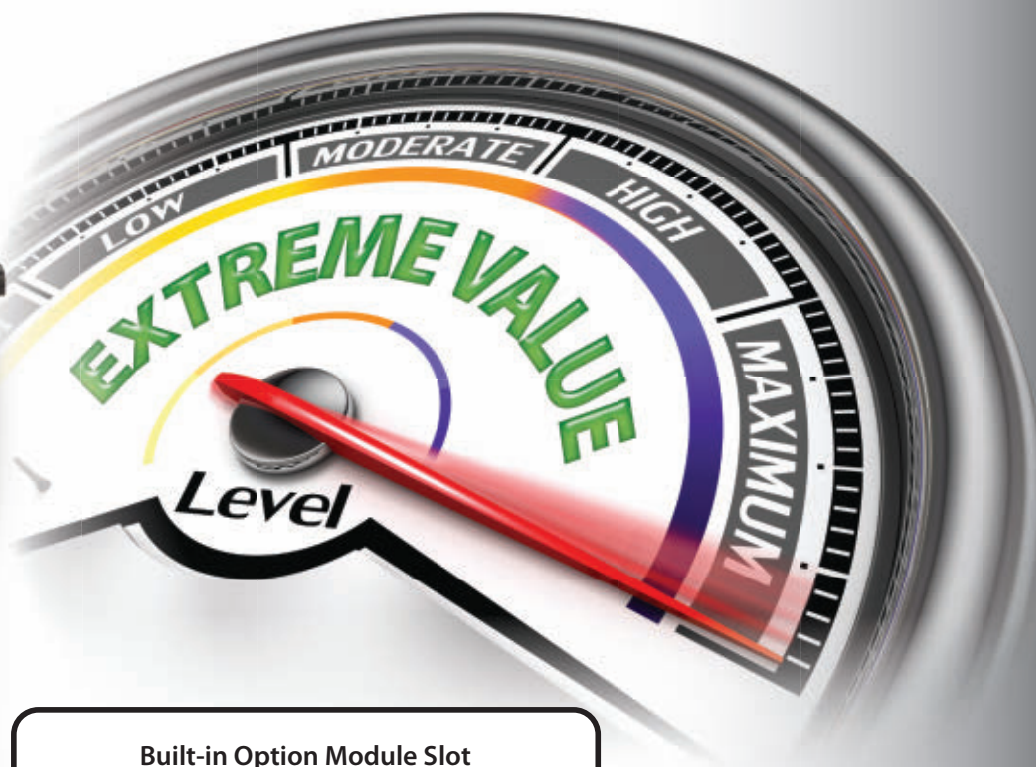
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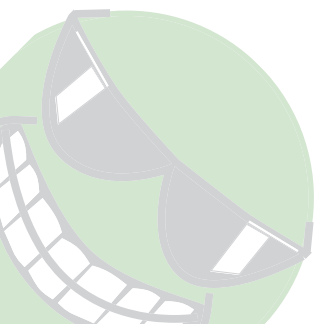
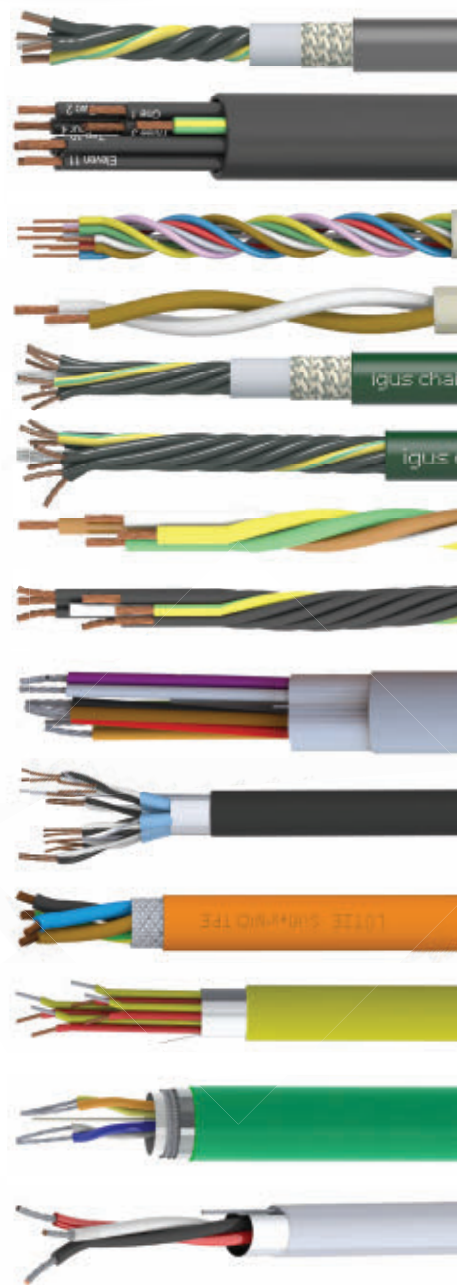
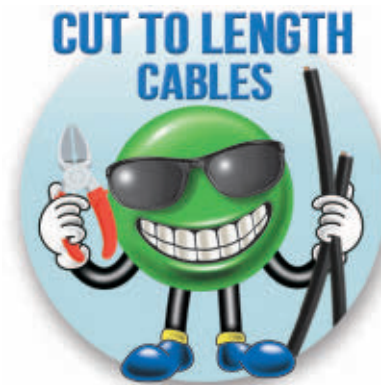
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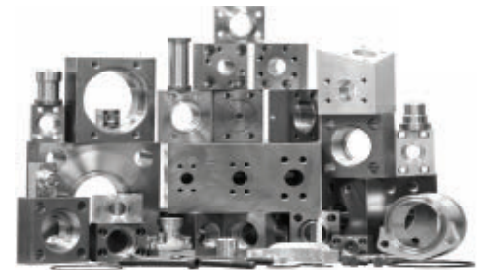
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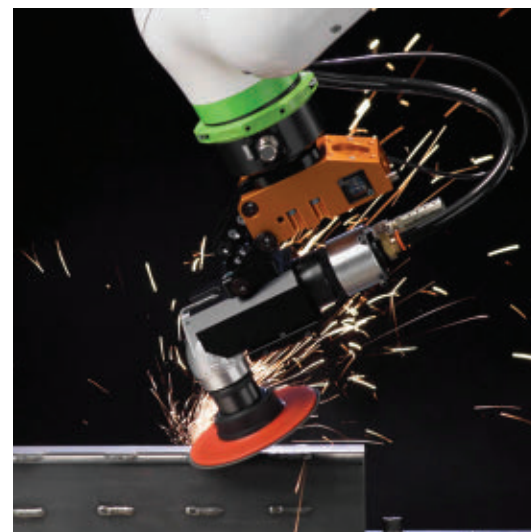


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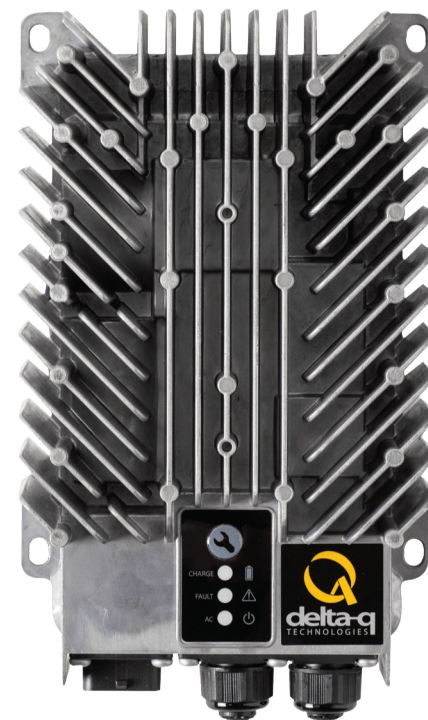
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Grid Connect, Inc.

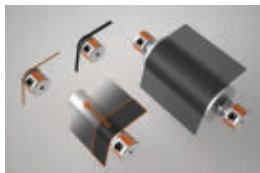


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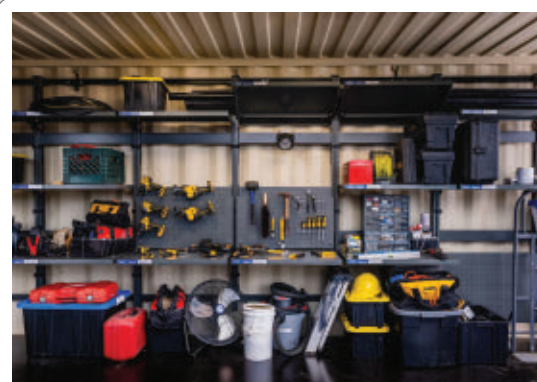


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The State of

US LOGISTICS

2023

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THE STATE OF US LOGISTICS 2023

Is It Time to Hit the Reset Button?

By David Sparkman



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Facing ongoing turmoil in the freight transportation industry, the entire logistics sector is undergoing nothing less than “The Great Reset,” say the authors of the 34th annual State of Logistics Report, published by the Council of Supply Chain Management Professionals.

“To a large degree, the period studied by this year’s report—the calendar year of 2022 and the early months of 2023—has been about getting back ‘in sync,’” which was the theme of last year’s SOL report. Much of that period has seen roiling disruption of the transportation sector, including a plunge in the freight rates of different modes and a spate of bankruptcies in the trucking industry.

“Concessions that were given during the pandemic are getting clawed back,” observes Marc Althen, president of Penske Logistics, which sponsors the report for CSCMP and supports the research that is conducted each year by experts who work for the A.T. Kearney consulting firm.

Other events also have contributed to the supply chain turmoil, ranging from rampant inflation, labor disruption and banking weaknesses, to political controversy and technological advances. The extent of this disruption can be seen in the most notable measurement created by the State of Logistics (SOL) researchers over the decades since the report began as a way to assess the success of trucking deregulation—the percentage of the economy that is devoted to expenditures on logistics.

The higher that expenditure, the worse the sector is performing; it’s as simple as that. The most recent measurements don’t look good. In 2022, business logistics costs, also known as USBLC, was at \$ 2.316 trillion or 9.1% of nominal GDP—the highest percentage in the report’s 34 years—and grew 19.6% year-over-year (see **Figure 1** on p. 8).

“The demand-supply balance shifted much more dramatically this year when compared to last year,” explained Sean Monahan, A.T. Kearney partner and the report’s co-author. “In 2015 it was a dark story if you were a carrier. There was a lot of excess capacity in the marketplace. We saw that starting to turn around in 2016 and continued to accelerate into 2017.”

The Kearney researchers said the theme for last year and this one so far “has more fundamentally been about the resetting of relationships, assumptions and practices for a world transforming. A central feature of this transformation is a shift among logistics executives from strictly transactional perspectives to a more strategic and holistic sense of their function’s role.”

Their opinion is that the explosive growth of e-commerce and direct-to-consumer sales during the COVID-19 lockdowns have meant that order fulfillment has become increasingly complex, fragmented and vulnerable, and the more recent deceleration of that growth has provided a welcome breather.

“The deceleration in e-commerce growth should give shippers and carriers some room to build strategic plans until other causes of complexity arise,” they believe. “Inventories are ample, and the quirky demand spikes of the quarantine era have leveled off for now.”

The changes wrought by new demands created by the pandemic also changed how Americans view the supply chain, which before had been almost entirely out of sight and out of mind—and that includes many corporate executives who previously took supply chain management for granted in many cases because it had been working so smoothly. (That, of course, excludes executives like Amazon’s Jeff Bezos, who recognized that the supply chain could be a competitive advantage).

“That development is the major shift in the role of logistics itself across the entire economy,” the researchers observe. “Before the pandemic, logistics was still largely considered a side function. Now, however, it’s widely seen as a core determinant of service and revenue outcomes, and a strategic differentiator.”

Transportation Faces Reckoning

The segment of the logistics chain suffering the most is transportation service providers, and especially hard hit are truckers. In addition to the decline in rates, the industry continues to feel the effects of an ongoing truck driver shortage.

But the researchers expect the days of uncertainty, over-capacity and rock-bottom rates inevitably will come to an end. “It will be interesting to see if the market returns to pre-pandemic tendencies or if the pandemic left a lasting impact on shell-shocked shippers,” they say. “If, on the other hand, the hard lessons of the pandemic seem to be sticking, it’s likelier that shippers would maintain their preference for high service and dedicated capacity arrangements.”

In regard to the truck driver shortage, the researchers say it’s not entirely clear whether the true problem is actually a shortage of qualified drivers, driver turnover, or suboptimized planning. They perceive indications that rate shifts and the move away from a spot market that had afforded some drivers a measure of freedom as owner-operators during the pandemic are forcing many drivers back to the large carriers—or out of the market completely.

The report urges carriers to explore ways of enhancing the utilization of their workforce. Based on Kearney studies, on average, over-the-road carriers use about half of drivers’ available hours, and of that number, 10% to 25% is unproductive movement. The authors contend that carriers should deploy routing optimization solutions to reduce unproductive driver time. “Efficient implementation could nearly double the labor capacity through improved planning of driver time and reduce empty miles through optimization,” they argue.

In addition, they say carriers will need to look beyond strictly monetary compensation to determine what other

levers they can use—such as consistency in pay and workload—that might correspond more closely with the priorities actually influencing drivers’ decisions to take or leave a position with any specific company.

When it comes to the nation’s freight railroads, while things may look good on the surface to investors, the researchers did not mince words when it came to criticizing rail management’s obsession with cutting costs at the expense of service and business growth.

In 2022, Class I railroads saw operating income increase by 8% year-over-year, and total revenue by 14%—but these gains were largely attributable to price increases. But while rate hikes boosted railroads’ income and revenue, rising costs undermined operating ratios. Aggregate carload volume for Class I carriers was static in most categories.

The sector also suffered from service-related issues, including increased terminal dwell, ongoing congestion, network speeds that still lagged pre-pandemic velocity levels, and some high-profile derailments. “Looking ahead at the sector’s future, it’s hard to avoid a stark conclusion: rail should be doing better,” the authors state. “Its up-and-down outcomes of recent years are difficult to square with what would seem to be its significant structural advantages.”

Without mentioning it by name, the researchers underline the damage that has been done by the industry’s adoption of the Precision Scheduled Railroading operations model and its obsession with cost cutting and maintaining low operating ratios above all else.

“It’s a mindset that tends to emphasize short-term financial results, while frowning upon the strategic risk taking that might generate longer-term prosperity (including non-core growth investment). It prioritizes here-and-now efficiency at the expense of lasting resilience, and competition among rail companies over the kind of mutually beneficial collaboration that could advance the entire sector against its modal rivals.”

Adhering slavishly to a management philosophy of doing-more-with-less is not an adequate prescription for healing the sector, the researchers assert. “What is necessary is a far more growth-oriented approach, an intention to ‘do-more-with-more.’ At the very least, that means reestablishing sustained volume growth. But in order to achieve this, companies will need to get more comfortable with making fundamental changes to the way they do business. Incremental fixes won’t do.”

Growth will require sustained and consistent service levels, and a level of capacity sufficient to absorb new volumes, they contend. Top management needs to dedicate investments allowing railroads to both compete for a greater portion of freight, and to expand that market over time. This includes investments in technologies to enhance visibility, improve decision-making, and facilitate interconnection with other modes.

To build a more prosperous future, it is of vital importance for railroads to reverse their present adversarial relationship with their customers, the report’s authors argue. “At this moment, then, railroads and shippers have a converging



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Figure 1
The USBLC increased 19.6% YoY between 2021 and 2022

Overview of 2023 USBLC figures (\$ billion)	2022	2021	2020	YoY 2022/2021	YoY 2022/2020	5-year CAGR
Transportation costs						
Full truckload	403.8	380.4	313.6	6.2%	28.8%	7.9%
Less-than-truckload	96.3	90.6	74.8	6.4%	28.8%	6.9%
Private or dedicated	395.8	373.5	304.5	6.0%	30.0%	8.0%
Motor carriers	896.0	844.5	692.9	6.1%	29.3%	7.8%
Parcel	217.3	207.5	181.0	4.7%	20.1%	13.7%
Carload	64.7	55.0	48.3	17.6%	33.9%	2.3%
Intermodal	34.5	29.4	26.2	17.6%	31.7%	10.5%
Rail	99.2	84.4	74.5	17.6%	33.1%	4.8%
Air freight (includes domestic, import, export, cargo, and express)	66.8	65.7	40.2	1.7%	66.3%	-2.9%
Water (includes domestic, import, and export)	36.4	30.7	25.7	18.4%	41.8%	1.4%
Pipeline	75.7	63.2	56.3	19.8%	34.4%	10.2%
Subtotal	1,391.4	1,296.0	1,070.5	7.4%	30.0%	7.6%
Inventory carrying costs						
Storage	218.5	185.1	154.1	18.1%	41.8%	9.5%
Financial cost (WACC x total business inventory)	313.0	164.5	123.3	90.2%	153.9%	15.4%
Other (obsolescence, shrinkage, insurance, handling, others)	227.8	149.8	118.9	52.0%	91.6%	12.7%
Subtotal	759.3	499.4	396.2	52.0%	91.6%	12.7%
Other costs						
Carriers' support activities	93.8	78.6	62.4	19.3%	50.3%	10.0%
Shippers' administrative costs	72.3	63.1	57.6	14.6%	25.5%	7.5%
Subtotal	166.1	141.6	120.0	17.3%	38.4%	8.9%
Total US business logistics costs	2,316.7	1,937.0	1,586.8	19.6%	46.0%	9.2%

Notes: The 2017-2022 USBLC figures have been retroactively revised to incorporate two changes this year: (1) the revised methodology for parcel market sizing and (2) an S&P Global data refresh. Due to these changes USBLC percentage of GDP has increased. Includes 5.4% inflation for 2021 numbers. USBLC is United States business logistics costs. YoY is year over year. WACC is weighted average cost of capital.
Source: CSCMP's 34th annual State of Logistics Report

interest in both innovation and collaboration. It’s a moment that both sides would do well to seize.”

Managing the Inventory Mess

As companies raced to meet demand for consumer goods during the pandemic, inventories skyrocketed and demand for warehouse space grew enormously. In 2022, however, that demand waned, resulting in overstock. Warehouse vacancy rates fell sharply, to as low as 2.9%—well below pre-pandemic levels, which tended to hover around 6.5%.

These historically low vacancy rates resulted in higher rents, while new construction continued at a healthy rate. However, as available space is increasing, companies are hesitating to occupy it as they try to get rid of excess inventory and make use of their existing space more efficiently, the researchers found.

Net absorption peaked in the second quarter of 2022 but then decreased nearly 20% by the fourth quarter, they point out. As a result, pricing and availability is expected to be more favorable for shippers in 2023.

One factor negatively impacting warehouse owners and third-party logistics (3PL) providers was that overoptimistic retail forecasts driven by earlier pandemic surges in e-commerce resulted in an inventory glut that stretched over several industries, and which companies are still trying mightily to shrink over the course of this year.

Many retail companies adopted aggressive inventory management practices to reduce “days on hand,” the standard measure of how long it takes to sell inventory, they noted. Those measures included discounts and promotions, liquidation sales, repurposing and recycling, and even the outright donation of lingering goods.

Also helping this year is the fact that customers are still buying, particularly through digital channels, in spite of inflation and economic uncertainty, but that could change. “We have seen in recent years just how suddenly consumer appetites can shift, and how vulnerable the warehouse sector has been to such sharp adjustments in demand,” the SOL researchers observe.

Even if consumers keep buying, the continued strength of the retail market and smarter inventory management is not likely to be enough to fill up all of new construction that remains in the current pipeline, they believe. In fact, a very high proportion of warehouse construction now in progress—83%—is speculative in nature.

“Our sense is that the recently constructed square footage and the availability of lease-break options are likely to result in a level of warehousing supply that will outstrip projected demand,” they say. “Under such a scenario, companies will look for alternative ways to make the most of all this excess square footage, or to get out of it entirely.”

They say potential courses of action for warehouse owners include consolidation through square footage reduction; the repurposing of warehouse space for other operations, including manufacturing; and, where feasible, the subletting of space to other companies.

One challenge that continues to bedevil both private and 3PL warehouse operators is the difficulty in finding the workers they need. Labor at warehouses continued to be a scarce resource, as the hourly cost for workers rose steadily throughout 2022. The year concluded with the nationwide average hourly wage of warehouse workers at \$16.16 per hour, with the low range at \$10.26 and high range at \$25.43. This represented a 7% increase from the already inflated 2021 labor rates.

In the case of 3PL warehouse operators who offer a wide

range of logistical support services in addition to warehousing, the future continues to look bright because of a growing need for those services, especially ones that help customers optimize their supply chains by maximizing transportation efficiencies and improving inventory management. The pressure to innovate is on for both customers and service providers.

The challenge for smaller 3PL warehouse companies will be keeping up with the necessary investments in technology, ranging from warehouse robots to take some of the pressure off having to meet labor requirements, to sophisticated computer systems for analyzing data and better managing the entire supply chain, from sourcing raw materials to delivering shipments to the ultimate customer’s front door.

This more sophisticated and broadly encompassing range of service has been dubbed fourth-party logistics (4PL) and is the space all 3PLs increasingly need to occupy, the researchers explain. This exerts pressure on smaller providers to adopt more sophisticated transportation management systems (TMS) and warehouse management systems (WMS).

4PLs strive to ideally manage all aspects of their client’s supply chains and act as the single interface between the shipper and multiple logistics service providers, the researchers point out. The more advanced ones go even further and help shippers design their supply chain.

“For 3PLs, moving into a 4PL role can be an attractive prospect; it inherently deepens the relationship with the customer,” they stress. “As shippers increase their trust in the 4PL model, they allow providers to manage more of their freight.” ■

Contributing editor **David Sparkman** is founding editor of ACWI Advance (www.acwi.org), the newsletter of the American Chain of Warehouses Inc., as well as a member of the MH&L Editorial Advisory Board.

Achieving Warehouse Productivity Gains Beyond the Forklift

By Michael Wiesenegg

While forklifts are vital for keeping products moving in today's supply chains, they are not the only important pieces of the puzzle when it comes to overall warehouse productivity and efficiency. While companies need to identify opportunities to enhance the efficiency and productivity of their forklift fleets, at the same time, there may be improvement opportunities associated with other warehouse equipment that are equally impactful.

Often, these opportunities are nonconsecutive, meaning they can be addressed in no particular order. Sometimes they are or may seem unique to the equipment itself, but there are times when changes in processes or the warehouse equipment itself can affect how your forklifts perform.

The following are eight steps warehouse managers can take to help enhance warehouse productivity and efficiency beyond the forklift.

1. Benchmark your storage ratio and determine where you can make improvements, to give your forklift operators enough room to maneuver comfortably and efficiently without wasting available space or damaging product, racking or equipment.

Ensure rack aisles are wide enough for the types of forklifts used and the type of product stored. It is also important to ensure the aisles remain free of clutter and debris. Consult with your forklift provider for recommendations on how best to benchmark your storage ratio.

2. Design an efficient warehouse racking layout that meets the needs of your operations. Determining factors can include storage ratio, available floor and vertical space, docking locations, throughput and the type of forklifts used.

Choose your racking based on the type of storage you need (e.g., narrow aisle, high-density, bulk storage). Also, if your warehouse is in an area of potential seismic activity, a code-compliant racking design may affect aisles and overall spacing.

3. Review pick methods and procedures to recover valuable storage space and increase space utilization. Vertical lift modules (VLMs) are enclosed, vertical automated storage and retrieval systems that use trays to store objects and can be a great way to save space and bring products to the operator to increase picks. The trays are automatically retrieved and delivered to a window for picking.

They come in various heights and widths to fit a variety of applications and they are an especially good fit for manufacturing environments.

4. Take steps to protect your racking from costly damage caused by impacts. Damaged racking is not only a potential safety issue, but it may also impede operators from quickly moving loads in and out of racks.

Column protection, such as steel units that wrap around the base of the upright column and are anchored to the concrete with wedge, bolt or screw fasteners, can help alleviate costly



Crown

damage. End-of-aisle protection, such as a heavy guard at the end of the aisle where additional traffic occurs, can isolate and help reduce the effects of impacts on racking structures.

5. Be smart about rack label locations to save operator time and wear and tear. Improper label placement can make them difficult to read and scan and may even result in damage or loss that can bring operations to a halt when the rack location cannot be confirmed.

A common location for the label is on the beam directly under the pallet. This can require the operator of a turret truck, with an entire cab that raises and lowers, to first stop at the label height to scan before moving up to the rack height to access the pallet. In this case, affixing labels to the upright would allow for easier scanning and more productive pallet movements. Since some uprights have punched holes, you may need to use magnetic labels or label holders to ensure they are secure.

6. Prominently display aisle signage to alert operators quickly to potential safety hazards or provide directional assistance. Make sure you put signs in well-lit and visible locations but out of the path of travel.

Periodically inspect signage locations to ensure signs are still present and nothing has been placed in a way that blocks them from view. A more flexible and secure solution may involve mounting projectors on the ceiling that project messages on the warehouse floor.

7. Strategically locate charging stations to ensure easy and efficient access throughout the shift. This is especially important for lithium-ion powered forklifts so they can be opportunity charged to increase runtime. Ideal locations are near breakrooms and dock areas.

Charging station locations should be considered when designing the warehouse layout and racking to ensure optimal use of the space and adequate access throughout the facility.

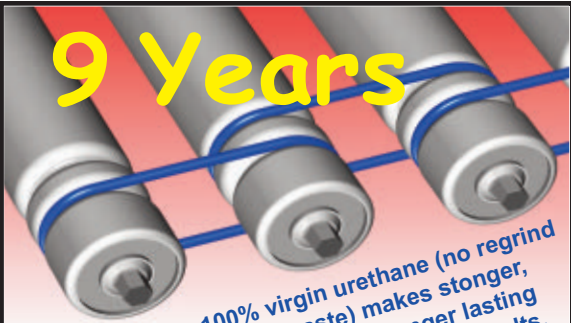
8. Update training programs to reflect changes in your operations, including those listed above. For instance, if you

change your rack layout or labeling, be sure warehouse employees are trained on the affected processes or workflow.

Taking one or more of these steps can not only help enhance warehouse performance and safety, it can also help build upon the efficiency gains you may have already achieved with your forklift fleet. ■

Michael Wiesenegg is director of branch and dealer sales with forklift manufacturer Crown Equipment.

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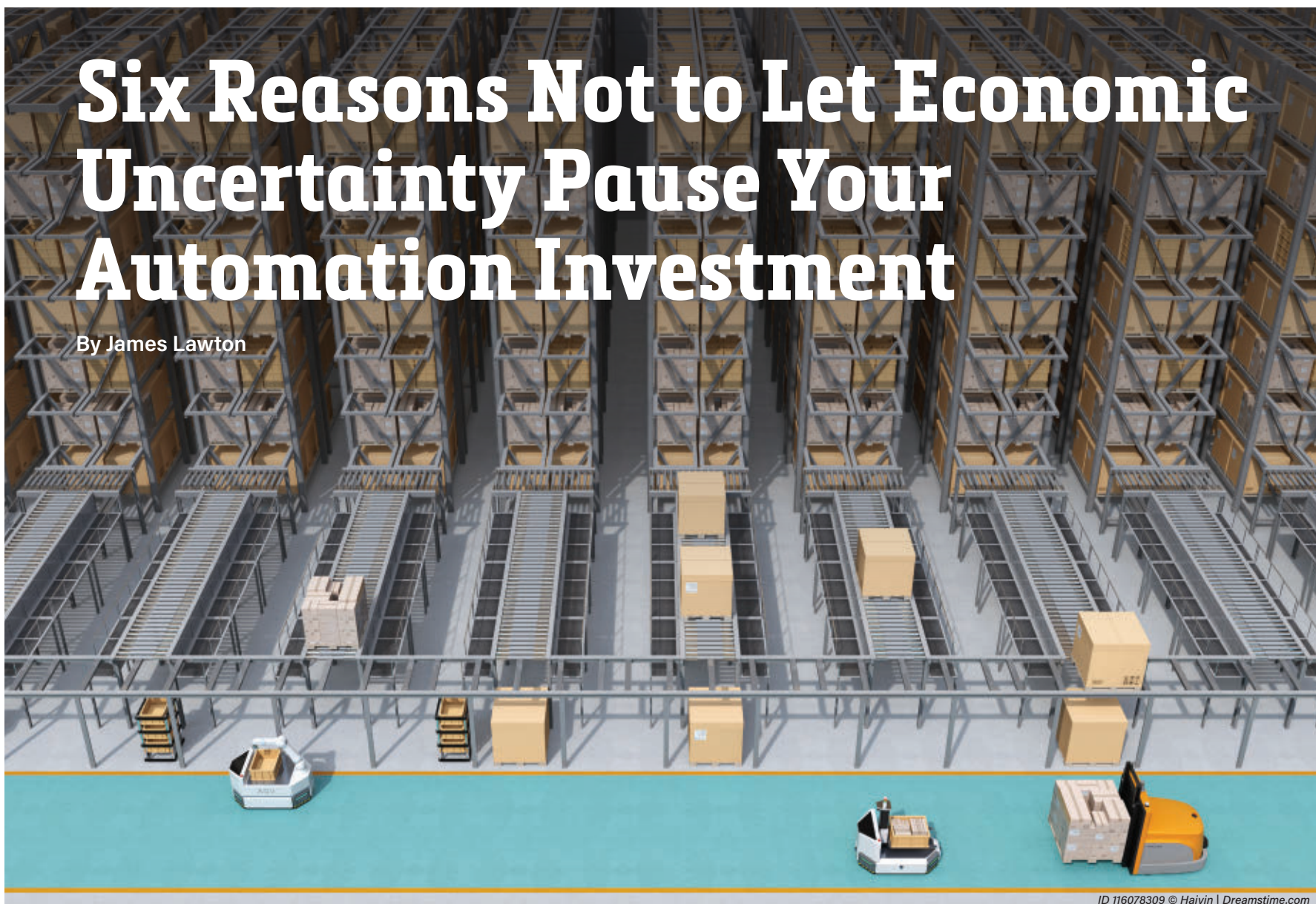
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Six Reasons Not to Let Economic Uncertainty Pause Your Automation Investment

By James Lawton



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Change, as we know, is constant. Today though, demand fluctuation, labor uncertainty and unforeseen disruption batter warehouse operations relentlessly. Navigating the uncertainty of today's operations with a focus on the short horizon might seem like a good way to go, but it can make it difficult to think strategically about return on investments—even those that might be able to smooth some of the bumps in the road.

Supply chain leaders in warehouse operations are aware of the conflict between getting through the next day, month or quarter—and the need to look at the long game. In 2022, the Zebra Warehouse Vision Study found that nearly 85% of respondents plan to rely more on automation in the future. At the same time, more than 60% said they do not know where to start. There are many reasons for this gap. Even though supply chain leaders are quick to recognize that technology can help reduce the labor uncertainty, many may still be reluctant to pursue automation because they believe these projects are risky, costly and complicated.

Risk-averse for good reason, supply chain leaders may be reluctant to test out a new technology that may disrupt operations. Given the ongoing uncertainty of the global economy, many believe that now is not the time to experiment. But today's ever-present state of uncertainty is exactly why those whose job it is to keep supply chains moving should look at ways to streamline and optimize workflows, information flows and decision-making throughout their operations.

Here are six reasons why taking a bold step toward innovation with today's advanced automation is the right one now.

1.

You are not going to find the people you need to get the job done.

Labor shortages are real, and they are not going to get any less real. Research shows that less than 3% of the Gen-Z demographic is interested in working in logistics; instead, they're looking at STEM-related fields. The interest in working in environments where technology is essential to the day-to-day resonates with today's workforce as well. In the afore-mentioned Warehouse Vision Study, more than 80% of associates shared that they are more likely to work for an employer that gives them modern devices—like handheld tablets, robots and wearables with augmented reality apps—to use on the job. Today's automation, and the technology it brings to the operation, is a powerful way to both retain and attract workers.

2.

The perception of automation projects as large-scale, expensive and requiring long consulting engagements in order to automate a single task is simply no longer true.

Today's automation solutions for material movement:

- are cost-accessible for operations of all sizes;
- can be deployed in less than a month;
- do not require massive infrastructure reconfiguration or additional investments like safety cages;
- can be configured to do multiple tasks without the need of robotics engineers;
- and include advanced software that accelerates the design and definition of workflows that incorporate the robot, devices, equipment and environment so it is easy to set up and modify them as processes evolve or needs change.

3.

Robot-as-a-service (RaaS) subscription models eliminate the need for capital expenditure to get the technology in place and make rapid deployments more feasible.

In addition, the cloud-based architectures of RaaS and SaaS automation solutions allow for remote manage-

ment by in-house or third-party solution providers. Automated mobile robots (AMRs), for example, can be physically unboxed by warehouse or factory managers and configured by a remote workflow manager using a cloud dashboard and simple programming tools. With this model, customers take delivery of the robot, work with an implementation team on configuring the robot to perform the tasks necessary, and pay a monthly subscription fee for the use of the robot.

When upgrades are offered, the customer receives them at no cost, and maintenance is part of the subscription.

4. Robots today are more brain than brawn.

Software is the key to making today's robots the engine for operational transformation they are quickly becoming. In the warehouse, data that can answer questions like which robot is carrying which order, how many items and orders are assigned to that robot, what is the best route for the robot to take to fully execute the order—from pick to pack to ship—are critical to quickly and efficiently completing orders. It is software that analyzes myriad variables and makes the optimal choices that need to be made in order for the operation to perform as it must.

5. Fixed automation, like conveyor lines, can only take you so far.

Waytek, a Minnesota-based electronics distributor, found that its fixed conveyor system made expanding capacity to meet rising demand a daunting challenge. With AMRs on the job, Waytek was able to capture a 25% increase in throughput, reclaim 13% of floor space, and automate manual tasks—including replenishment and dunnage—to free people from tedious tasks.

6. Incremental progress adds up quickly to sustained success.

With flexible automation like AMRs, you can start small and build on the success you achieve. The days of long, drawn-out pilots are well over. In fact, the best way to get started is to look around your operation and identify tasks that are done by people where the uniquely human abilities are not being applied. And start there.

It may be unloading and relocating inbound inventory to where it is needed, or taking a tote with an order to be packed and shipped, or delivering a returned item to the location where it can be re-picked and

shipped to a customer who is waiting for it. Once the productivity improvements are achieved, move on to the next workflow and watch the skeptics come around.

There's No Room for Procrastination

The fundamentals have changed for material movement in ways that no one could have predicted five years ago. The shift centers on the strategic role that material handling and movement now play in supply chain, and there's no going back.

Agility and responsiveness are fast becoming key differentiators for warehouse operations, especially those in consumer-facing sectors. In the day-to-day, it can be hard to lose sight of the long game, but warehouse operations have to perform in a world that is more dynamic than ever, with more change always on the horizon. This reality is why it is essential to think strategically about the ways in which automation, for example, can meet consumers' ever-rising expectations for choice, cost and delivery options or how to design inbound and outbound operations to scale up and down in response to disruption and uncertainty.

Flexible automation solutions deliver the holistic solutions needed today and deliver speed, accuracy and volume—not just at the task level, but across entire workflows. It is by recognizing the interdependency of each step with another, and just how important it is to make the actions both within and between seamless and smooth, that operations advance and performance is optimized. ■

James Lawton is vice president and general manager, robotics automation, with Zebra Technologies, a digital solution provider enabling businesses to intelligently connect data, assets and people.







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FUTURE-PROOFING



By Adam Kline

The pandemic has driven the logistics and transportation industries to feel the sting of labor shortages, workforce retention challenges and higher overhead costs. In addition, the retail ecosystem has had to accelerate its transformation, as it caters to a consumer whose omnichannel shopping expectations have never

been higher. Not to mention, warehouses are running at or dangerously near the top of their capacity where stock is concerned, with companies stockpiling inventory to avoid shortage of goods.

All these factors result in heightened complexity for companies' supply chains, where the warehouse plays an increasingly

critical role. The need to future-proof the distribution center (DC) is immediate—the faster operations prepare for it, the easier it will be to adapt to the demands of today and those in the future. Here are five ways the right warehouse management system (WMS) can maximize the efficiency and adaptability of the warehouse:

1. Migrating to Cloud-Native Solutions

Geopolitical shifts and the pandemic have made the global supply chain increasingly unpredictable and complex. Today's ecosystem demands cloud-native solutions that are flexible and offer continuous innovation, meaning they do not stagnate as legacy-versioned software ages. Doing so eliminates the need for costly, time-consuming software upgrades and offers instant access to new capabilities which can be delivered on a regular cadence.

Cloud-native technology is engineered to handle the natural surges and recessions of demand which most businesses encounter, especially those with seasonal demand spikes around holidays or other events. The ability to scale up or down as demand changes helps ensure supply chains continue to run at peak performance while keeping costs in check.

2. Adopting a Platform with a Microservices Architecture

Solutions need to be purposefully built so different systems can work in conjunction with each other. Platforms that are engineered entirely from microservices are resilient and deliver constant innovation, along with extensibility, scalability and availability.

This type of architecture also allows supply chain commerce to be broken down into discrete functional components that can be assembled to create new experiences. It also eliminates redundancy because every component is part of a shared application platform, enabling seamless upgrades on a regular basis.

3. Unifying the Supply Chain

Modern, cloud-native technology is the key for unified solutions to work together instead of functioning in silos, offering manufacturers, distributors and retailers complete visibility into the product's journey. From order placement, to shipment, to delivery, a seamless supply chain is only possible when systems built for warehouse, transportation, inventory and order management work seamlessly with each other in real-time rather than via rigid and antiquated interfaces.

Unification also opens the door to agility and flexibility. Unified applications allow transportation to plan and continuously refine the plan as operations proceed in the warehouse. As exceptions occur such as inventory shortages or if actual weights/volumes do not match initial estimates, transportation can refine the plan immediately and ensure trailers are fully utilized, eliminating all the rushed manual intervention that attempts to fill up empty space.

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A unified approach to planning and execution also enables visibility along with the ability to proactively take action before issues arise. Unification helps eliminate costly integration and ensures that previously disparate applications operate in unison, driving lower transportation costs, reducing dwell time of trailers, reducing detention charges of trailers waiting to be loaded/unloaded, and providing insight so that warehouse labor plans may be optimized.

4. Driving Efficiency with Robotics and Automation

The growth of robotics and automation in the warehouse started prior to COVID. However, the labor shortages of the pandemic led to an explosion of these technologies. The key going forward is to orchestrate people, processes and automation together. Rather than replace the workforce, robotics complements it. Robots can handle mundane, repetitive tasks that do not require decision-making, enabling humans to use their time more efficiently.

As just one example, look at autonomous mobile robotics (AMRs), also called collaborative picking bots. Historically a person would visit various locations and pick items into a shippable LPN. Inevitably, that process would involve significant travel around the warehouse. To the distribution operation, the pick is what's valuable while the travel required between picking locations is a cost. AMRs can improve the utilization of the worker by reducing the travel and enabling more picking.

In terms of technology, the key is having a WMS with a warehouse execution system (WES) built in. That ensures DCs can integrate any combination of automation and robotics, both today and tomorrow.

5. Enhancing Human Efficiency with Gamification

Faced with labor shortages and greater competition for workers, it is critical that warehouses maximize employee productivity and engagement. This requires modern, intuitive user interfaces that reduce onboarding times, improve work experiences and increase motivation. Gamification, similar to the smartphone apps we all play, can deliver those benefits by combining human psychology with technology. Companies that have leveraged these tools have seen significant reduction in training costs associated with new hires and increased worker productivity.

At the same time, modern WMS solutions also provide supervisors with a host of new ways to monitor performance, solve problems, shift priorities and maintain critical SLAs, every hour of every day. Given the workforce shortages and turnover, DCs cannot afford installed WMS user tools that prove to be complicated and require extensive employee training. This is where cloud-native employee tools have an edge—they can deliver feature modern interfaces and deliver user experiences that today's workforce is familiar with, reducing training time and increasing productivity.

To conclude, companies are operating in a fast-moving, constantly transforming supply chain environment. To meet demands and remain competitive, distribution operations need greater efficiency and adaptability than ever. That's why industry leaders are turning to technology to help solve their most-pressing issues, weaving supply chain solutions into their core business strategies. Now more than ever, it is

important for technology providers to arm businesses with tools to maximize human and automated assets, unify supply chain processes and continuously innovate to stay ahead of whatever challenges arise. After all, a better future begins in the present. ■

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All About the P-F Curve: How and When to Use It

By Gregory Perry, CRL, CMRP and John Bernet, CMRP

The P-F Curve is a tool based on the concept of repairing or replacing assets according to their condition rather than their age. It's a visual that helps identify where an asset is in its lifespan and its progression toward failure.

"P" refers to potential failure, which is when an asset's physical or operating condition experiences some kind of measurable change, and "F" refers to functional failure, which is the point at which an asset fails to meet defined performance standards.

The P-F Curve was introduced in 1978, long before today's advanced condition monitoring equipment existed. The initial use case of the P-F Curve has more to do with failure modes than tools or technologies, and with helping teams identify and plan for the failure modes they encounter most.

Over time, as maintenance and reliability technologies and practices have changed and advanced, some people have used the P-F Curve in ways that stretch or dilute its original intended use. Understanding a tool is essential for using it most effectively.

Using the P-F Curve

Asset criticality helps maintenance and reliability teams understand all of their assets in a holistic and comprehensive

way. Completing an asset criticality assessment forces teams to truly rank and prioritize their assets according to their impact on production and the bottom line. Without performing an asset criticality assessment, teams can fall into the habit of giving the most attention and effort to the assets that were the most expensive or those that fail most often—even if those assets aren't in fact the most critical in their facility.

PM optimization involves eliminating tasks that ultimately don't add value to a maintenance program. Both asset criticality and the P-F Curve can help with identifying those tasks.

Understanding how the P-F Curve fits in alongside different maintenance approaches can help teams use it most effectively. Run-to-failure maintenance, preventive maintenance, and condition-based maintenance are all different maintenance approaches that intersect with the concept of the P-F Curve.

Common Maintenance Approaches

Run-to-failure maintenance should not be conflated with no maintenance. It's a planned and intentional approach that is appropriate for some assets and scenarios.

One benefit of this approach is that it simplifies decision-making; either an asset has failed or it hasn't. An asset



with a high mean time between failures (MTBF) is just one example of an asset type where the run-to-failure approach can make sense. The cost of regular maintenance over a long period of time could outweigh the cost of repair or replacement.

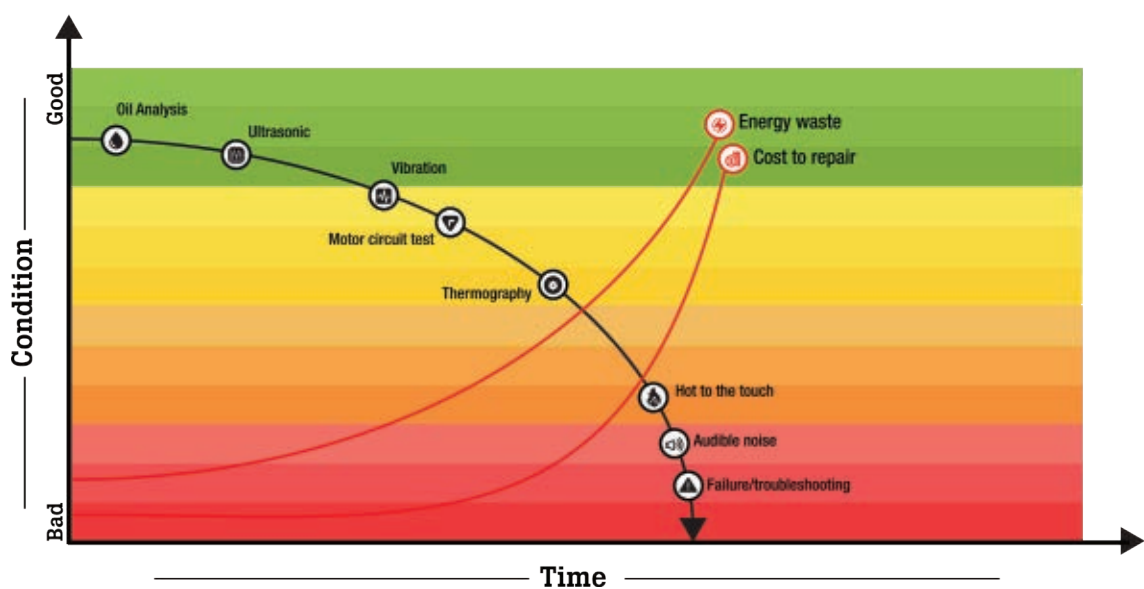
The P-F Curve can help provide a road map so that teams are less likely to be caught off guard when failure does occur.

Preventive maintenance is maintenance that is planned and performed based on time or usage. One common example is the practice of changing the oil in a car every three months or 3,000 miles driven. But preventive maintenance, as the result of ambiguity or incorrect intervals, can also actually lead to corrective maintenance becoming necessary.

For example, a vague PM calling for the lubrication of an asset may not account for the different needs of the asset's components. Different components may need different lubricants. Some components might become overly lubricated, while others don't get enough. Reducing ambiguity helps teams maintain the optimal operating conditions for each asset, extending the time before it reaches functional failure. Clarity and planning can help make preventive maintenance tasks an effective way of ensuring that assets perform as designed for as long as possible.

Condition-based maintenance is an approach that uses integrated sensors and software to determine the best time to perform maintenance. Doing so helps teams extend an asset's lifespan while minimizing disruptions and downtime because work is only scheduled and performed when needed.

Real-time asset health data, gathered from specialized condition-monitoring sensors, provides for optimal scheduling of maintenance tasks. Trending asset health data over time can help teams identify the failure modes they face, respond to them effectively, and ultimately minimize them. Condition-based maintenance improves uptime while decreasing wasted maintenance resources, including time, budget, and parts. Condition monitoring makes it possible to detect failures early on when it is possible to keep assets from reaching functional failure.



© Fluke Reliability



Assets fail in different ways, and both assets and failure modes have different levels of urgency. The P-F Curve is a tool that helps put the urgency of an issue into context and helps maintenance and reliability teams make the most of their resources.

5 Modalities to Use

The graph that the P-F Curve creates shows where an asset is in its lifespan based on its condition. Progressing along the P-F Curve, assets go from an indication of deterioration noting that functional failure is likely imminent, to functional failure where it's still operational but not performing as intended.

The P-F interval is the time between the first point of potential failure and functional failure. An asset does not become completely non-functional until it reaches catastrophic failure.

An asset's condition can be measured and monitored using any number of modalities. The right modality for each asset is based on a range of factors, including the operational context of the asset, its criticality, identified failure modes, and the maintenance budget available. The earlier a failure is detected, the more wear and damage can be prevented, and the life of the asset can be extended. But not every asset needs the earliest possible detection of failure.

The methods that can detect failure the soonest can require sophisticated tools or analysis that make them impractical for some assets or scenarios.

Five ultra-sensory modalities commonly used to identify an asset's inherent availability point on the P-F Curve are—roughly in order of how early they can detect indications of potential failure—oil analysis, ultrasound, vibration monitoring, thermography, and motor testing.

OIL ANALYSIS

Oil analysis is best for finding faults in oil-cooled components. It can detect signs of failure extremely early on, including the presence of lubrication breakdown, overheating, and component wear. It's most commonly used on gearboxes, compressors, and other moving or rotating parts. Oil analysis is an advanced method of detecting failures. Diagnosing failures detected using oil analysis may require an outside lab.

ULTRASOUND

Compressed air is an expensive resource, and it's the largest source of energy waste in manufacturing. Ultrasound can detect sounds that human ears can't, especially in noisy environments, making it possible to identify leaks so they can be fixed at the source. In addition to compressed air, other common types of leaks include refrigerant, gas, and ammonia.

Using ultrasonic leak detection, teams can find and fix

problems with valves, steam traps, bearing lubrication or potential electrical safety hazards.

VIBRATION MONITORING

Vibration monitoring is most effectively used to identify mechanical faults on rotating equipment. It is one of the most common and accessible ways to track an asset's condition. Vibration monitoring can pick up indicators of the four most common mechanical methods of failure: imbalance, misalignment, looseness, and bearing wear. It can also detect faults with rotating elements, resonances, structure, etc. When an issue is detected, vibration analysis can identify the specific fault and its severity.

THERMOGRAPHY

Thermography is best for finding process issues, electrical hot spots, and severe mechanical faults, such as misalignment, gearbox or belt problems. It's often recommended for time or fault-based inspection routes, because some damage may have already occurred by the time an asset experiences overheating.

MOTOR TESTING

Motor testing, also known as motor circuit analysis, is electrical condition monitoring intended to prolong the life of motors. Different types of tests can be performed on motors depending on whether they are in operation or not—in other words, while they are energized or de-energized. The different types of tests can uncover the same failure modes using different methods.

Inherent Reliability vs Inherent Availability

Inherent reliability measures how robust an asset or system is and represents its upper limit of reliability (left of the P-F Curve) that can be attained through design, installation, and proactive maintenance techniques. The P-F Curve helps teams identify where an asset is in its lifespan so that its lifespan can be maximized, and its inherent reliability can be fully realized.

Inherent availability represents the upper limit of maintainability when it considers only the corrective nature to restore an asset back to its upper limit of reliability. In other words, no amount of maintenance within the inherent availability realm (on the P-F Curve) will ever raise the inherent reliability factor, otherwise known as its resistance to failure.

Combining tools and techniques found in Reliability Centered Maintenance (RCM) and/or Defect Elimination approaches can help organizations continuously improve their maintenance strategies per asset according to fit, form, function, and failure to get the most out of their assets. Or otherwise called the asset's maximized inherent availability. That is the name of the game. **NED**

Gregory Perry is a Senior Capacity Assurance Consultant with eMaint, part of the Fluke Reliability family. He's a CRL and CMRP with nearly two decades of experience in maintenance and operational best practices.

John Bernet, a mechanical application and product specialist with Fluke Reliability has more than 30 years of experience in the maintenance and operation of machinery and as a nuclear power plant electrician in the U.S. Navy. He holds a Category II Vibration Analyst certification and is a CMRP.

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PLANT OPERATIONS AND MAINTENANCE



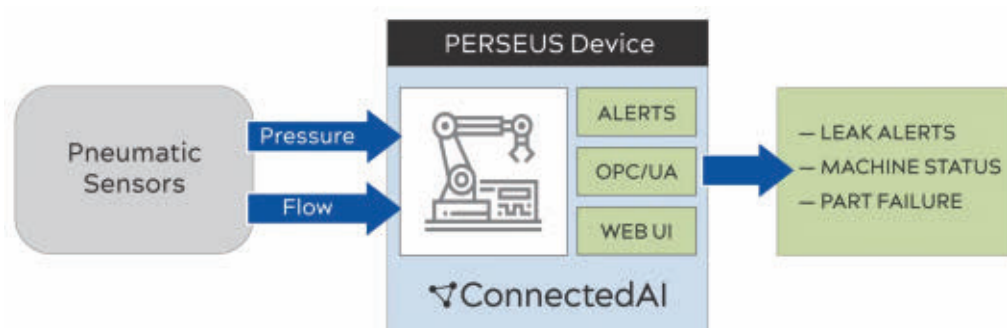
Enterprise-Wide Asset Tracking Solution

ATLAS (Accurate Tracking & Locating Asset Solution) wirelessly and precisely locates and tracks tagged items in densely packed metallic environments in real time.

Users can associate work orders or part numbers to tags instantly and track them throughout their entire manufacturing cycle on the floor and beyond. The solution provides continuous tracking, even through walls and obstacles with low power requirements and configurable battery life. The WISER Locator can also operate in concert with existing asset tracking systems like barcodes or RFID and can be scaled for nearly any number of tagged assets or size of setting.

WISER Systems, Inc.

More online: newequipment.com/21265953



AI Compressed Air Leak Detector

PERSEUS is a solution for compressed air monitoring that uses AI to monitor airflow, creating baseline measurements for its usage, and immediately detects changes in machine behavior, lapses or leaks.

The AI uses variables such as leak rate, power changes, and machine cycles to identify leaks and monitor machine state and behavior. When optimization opportunities are discovered, PERSEUS immediately notifies an operator. Insights can also be used to track machine failures or the effect of wear-and-tear by identifying changing air usage patterns. In addition, wireless connectivity permits networking of multiple remote machines to a single base.

ei3 Corporation

More online: newequipment.com/21268691

IO-Link, Multi-Color Signal Tower

An IO-Link-compatible stack light, the **LB6 Series** with 20 multi-color signaling segments offers enhanced visibility, flexibility, and smart control capabilities for facilities. The stack light has 3 modes for different applications: Simple Mode, Level Meter Mode, and Animation Mode.

In Simple Mode, users can divide lighting segments into 1 to 5 tiers and freely set each tier's colors and flashing patterns to either be distinct or the same. In Level Meter Mode, tank level and temperature can be visualized as well as displaying material replenishment timing and machine status changes. In Animation Mode, the takt time process can be visualized by changing the preset colors from bottom to top or from top to bottom.

PATLITE Corporation

More online: newequipment.com/21268355



Secure File Management for Data Compliance

Specifically designed for defense and aerospace CNC machining and manufacturing, **ProShop SAFE** (Secure Access File Ecosystem) is a secure, cloud-based ERP file management system that enables companies to achieve multi-dimensional, roll/user-based data security compliance to multiple standards such as NIST 800-171, CMMC, ITAR, HIPAA, SOC, GDPR, and ISO-2700X.

The system enables only authorized users to have access to specific files and folders managed through the unified credentials and authentication of their login. It can limit a shop's Controlled Unclassified Information (CUI) footprint, simplifying and economizing compliance efforts, as well as protecting other sensitive data.

ProShop USA, Inc.

More online: newequipment.com/21268682

The Atlas Copco logo, featuring the company name in a white serif font on a blue rectangular background.

Atlas Copco

A blue triangular graphic overlay containing a white technical drawing of a mechanical part, likely a compressor or valve, with various dimensions and labels.

Thank You

In 2023, Atlas Copco celebrates our 150th anniversary. From the compressed air and gas team, we want to say a heartfelt 'thank you' to all our employees, customers, and suppliers who have been part of our journey. We could not have achieved it without you! As we pass this milestone, our unwavering commitment is to continue to provide innovation which empowers our customers to grow and drive society forward.

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The True Pioneer of Electric Actuators

RACO International, LP

RACO Electric Actuators provide a reliable solution for all of your linear and rotary motion needs. A variety of design configurations provide a multitude of thrust and speed ratings. RACO Electric Actuators are designed to be robust with virtually no maintenance while also being economical to operate and friendly to the environment.



RACO MA-Series

The modular design of RACO ACME and Ballscrew Electric Actuators allow for a variety of design configurations while offering a Linear Thrust range from 70lbs to 225,000lbs, Linear Rod Speeds from 0.2"/sec to 30"/sec and Linear Travel (stroke) up to 20 ft.

RACO LM-Series

The RACO LM-Series is designed for high speeds and long travel (stroke) with capabilities that are frequently found in today's automation processes. The LM can be used as a single axis system or can be combined to form a multiple axis system.



RACO Rotary-Series

The Rotary Actuator is designed to automate the operation of valves, gates, dampers, louvers and other positioning applications requiring partial or multi-turn rotational movement.



RACO International, LP

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AS/RS for Tube Laser Cutting Systems

An **automated tube storage and retrieval solution** has been added to BLM's tube laser systems. It fully integrates using special cassettes that can be loaded directly inside the machine. The storage system automatically retrieves the correct material and loads it into the machine. When jobs are complete, the system removes the used cassette with any remaining stock to be placed back into the tower. The system also automatically checks the stock level and updates the WMS.

For additional flexibility, BLM Group offers a second retrieval system style for use with a central warehouse. In this style, the bundle is extracted from the storage tower and staged near the machine in a queue for either crane or forklift loading for users that have legacy equipment.

BLM Group

More online: newequipment.com/21268556



I/O Interface Future-Proofs Operations

DeltaV IO.CONNECT is a subscription software service that helps plants simplify modernization with an open architecture pathway that makes it possible to transition to more efficient control schemes without the need to overhaul infrastructure.

IO.CONNECT provides a faster, easier, more cost-effective path to replacing any legacy system while leaving existing I/O infrastructure in place—no legacy vendor software is required for the configuration and maintenance of I/O.

Once the interface is installed and the plant is running new control technologies, technicians can update I/O on their preferred schedule while the plant runs, shifting what used to be a capital expenditure to the operations budget and driving immediate ROI through improved process control performance.

Emerson Electric Co.

More online: newequipment.com/21269002



Transmitters for Rotary Equipment Condition Monitoring

Versatilis Transmitters provide condition-based monitoring for rotating equipment such as pumps, motors, compressors, fans, blowers, and gearboxes. The transmitters are a multi-variant instrument based on the LoRaWAN protocol to take measurements of vibration, surface temperature, and acoustics, as well as heat exchange and substation reliability. This technology can predict equipment failures such as asset imbalance, misalignment, and bearing-related issues before they happen.

Versatilis transmitters can be configured through the Honeywell Versatilis Connect app to connect, configure, set limits, and view live as well as historical data. The application can run on mobile devices and tablets supporting iOS, Android, and Windows operating systems.

Honeywell Process Solutions

More online: newequipment.com/21267808



Control Loop Optimization Software

PlantESP is a software for increasing plant production throughput and efficiency by leveraging historical data to optimize control loops. It proactively monitors control loop performance across a plant or even multiple sites to help users get to the root causes of common problems. It also provides advanced warning of mechanical, tuning, and interaction issues.

Functions include a calculation engine, visualization engine, and system operations. The calculation engine handles KPI target metrics, analysis and setting thresholds, power spectrum, cross-correlation, and corrective action recommendations. A visualization engine provides alerts, trends and gauges, reports, and notes. System operations include historian communication and other application administration.

Control Station, Inc.

More online: newequipment.com/21267854

GSM Retrofit Modem for SMS Fault Alerts

An economical and easy-to-retrofit solution for off-grid controllers, the **GSM-TMM Modem** converts all messages from the controller's fault output to



text messages and automatically sends them to up to 5 recipients. The modem uses LTE-M or NB-IoT communication and works for all controllers with a live interference output.

It's connected to a PC via USB and once a SIM card has been inserted, the modem and controller fault outputs can be powered via a 230V AC, 12V DC or 24V AC/DC supply connected to the modem's external screw terminals. It features a red/green LED on its front to indicate operating states, text message dispatch, configuration errors, and potential reception problems.

CONTA-CLIP, Inc.

More online: newequipment.com/21268759

IIoT Radar Sensors for Tight Spaces

Micropilot 80 GHz radar sensors are compact level measurement Bluetooth devices designed specifically for areas that aren't easily accessible in harsh environments with extreme temperatures and conditions.

The sensors come with wizards that operate through multiple HMI formats and can be remotely controlled through the SmartBlue app which also allows users to fix or change settings from outside the danger zone. In conjunction with Heartbeat Technology, processes can be monitored continuously, and verifications performed in less than 3 minutes while the process is running.

Instrument-led sequences guide the user step by step through commissioning, parameter configuration or SIL proof testing to prevent systematic errors and increase safety.

Endress+Hauser

More online: newequipment.com/21269048



Battery-Operated Grease Gun

The **20V Lithium-Ion Series 598/599** battery-operated grease guns provide high-end performance in a lightweight, ergonomic design.

The 598 comes with a 2.5 mAh battery, while the 599 comes with a 4.0 mAh battery. Its 2-speed, dual-output lets users adjust for low or high-volume lubrication points, all with one grease gun.

A built-in LCD screen provides real-time information, including a pre-warning light for early action, a red backlight when stalling, flashes when a low grease condition occurs, and always shows exactly how much grease is left in the tube.

Alemite

More online: newequipment.com/21269056



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Detachable, Wireless Thermal Camera

A wireless thermal-visible camera for mobile devices, the **FLIR ONE Edge Pro** is unlike its predecessors as it doesn't need to be physically connected to the mobile device nor does it have separate models for specific operating systems.

The camera has a detachable form factor and is designed to fit comfortably in your hand, eliminating the need for specific connection ports or operating systems.

The camera has a spring-loaded clip to allow users to attach the camera to many types of mobile phones and tablets. With Bluetooth and Wi-Fi, users can operate the Edge Pro up to 100 ft (30 m) away.

Teledyne FLIR, LLC

More online: newequipment.com/21267894



Digital Information for Analog Components

Anyone who uses planetary gearboxes from Neugart can now access **digital product information** through its new online service by scanning the data matrix code that appears on the gearbox nameplate. Users can see all product documents and digital functions available including being able to download the appropriate operating and mounting instructions.

If customers require a technical adjustment or wish to submit a complaint, they can contact Neugart customer service directly via the connected service request. Additionally, if a gearbox shows signs of wear, users can conveniently request an identical replacement gearbox (including express delivery) with just a few clicks.

Neugart

More online: newequipment.com/21268997



Large-Capacity Jig Borer Series

The **J12/J16 jig borer series** combines large capacity and high precision to meet the increasing need for accuracy for machining workpieces such as molds and castings. The machines offer Y-axis strokes of either 49 or 63 in. (1,250 or 1,600 mm), with standard table sizes of 94 x 49 or 114 x 63 in. (2,400 x 1,250 or 2,900 x 1,600 mm).

The structure provides table lateral movement accuracy of 2.5 µm or better and the Z-axis guide system is restrained on 4 sides to maximize rigidity and reliability, and dual ball screws ensure stable feed motion. The machines feature a 12,000 rpm 50 taper spindle and an automatic tool-change capacity of 60 tools.

XY interpolation enables the machines to carry out high-precision contouring by using an end mill instead of a boring tool, eliminating the need to manually adjust a boring tool to accurately finish the hole diameter avoiding bottlenecks.

Mitsui Seiki USA, Inc.

More online: newequipment.com/21268998



Optimize Tube-Forming Production

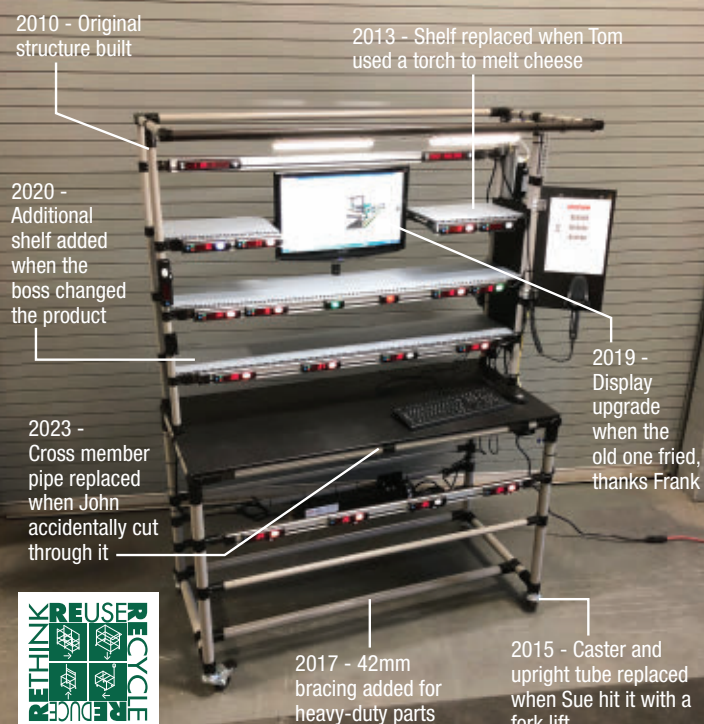
With digital features, data tracking, and cloud connectivity, the **Wal-formConnect tube-forming machine** enables simple and safe hydraulic tube forming of steel and stainless steel tubing of 0.2 to 1.6 in. (6 to 42 mm).

Designed to ensure the correct forming of hydraulic tubes, the machine reduces the risk of assembly errors with a barcode scanner that verifies the correct tooling to use and automatically indicates the compatible clamping jaw part number and tube parameters.

Cycle times, machine temperature, and tool clamping status data are monitored in real time, providing maintenance teams support for error resolution, while remote updates and failure analysis reduce the risk of production delays.

Danfoss Power Solutions

More online: newequipment.com/21268991



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HOW ADVANCES IN INDUSTRIAL MOTORS AND CONTROLS CAN BOOST THE BOTTOM LINE

By Sheila Kennedy, CMRP

Motor and drive providers are moving forward with new solutions for persistent challenges. Thinking out of the box, they are embracing technological and environmental opportunities to help customers improve operations and maintenance and boost the bottom line.

Innovative Motor Designs

Sustainability, reliability, and maintainability are common aspirations for motor designers. The **Aircore EC motor** from Infinitum delivers reduced energy consumption, extended life, and minimal waste. The integrated motor and drive is smaller and lighter than traditional iron core motors and its PCB stators use 66% less copper than conventional wire-wound stators.

“Fewer raw materials and modular design simplify maintenance for industrial plant professionals and allow for remanufacturing and re-use, while an integrated VFD made with silicon carbide technology results in unparalleled control of the motor, and can save upwards of 65% of energy use, depending on the application,” says Ramon Guitart, VP of engineering at Infinitum.

ABB’s **HydroCool XT water-cooled motor** delivers high power density in a small footprint. Water-jacket cooling offers higher thermal conductivity than air cooling and eliminates the need for fans, air filters, and associated maintenance. Offered in NEMA frame sizes 360 to 5,800, the motor is available in an induction design, reaching IE3 efficiency levels, or a permanent magnet design reaching IE5.

Its internal shaft grounding reduces shaft currents and its positive lubrication system “ensures proper bearing lubrication in all mounting configurations, allowing the bearings to run 5 to 7° cooler than standard bearings, increasing the life of motor components,” explains Matt Felt, global product manager for engineered motors at ABB.

The **AKMA servo motor** from Kollmorgen, designed for medium to heavy wash-down environments, is built for durability, reliability, and high-performance motion control. Its smooth, hardened surface and

“one-piece” rounded housing are cleanable and prevent contamination droplets from pooling.

“With its lightweight IP69K design and anodized aluminum housing that provides strong chemical resistance, these motors deliver exceptional value and performance, meeting a wide range of motion requirements in challenging and harsh operating conditions,” says Jon Spensieri, Kollmorgen product manager.

Modern Motor Control and Maintenance

The **Armor PowerFlex drive** from Rockwell Automation is a scalable, on-machine motor control solution that helps reduce cabinet-based challenges.

“Armor PowerFlex is not a repackaged drive, but rather a smart, on-machine product carefully designed to be an integral part of a complete automation solution,” explains Michael Harris, senior commercial project engineer at Rockwell Automation. “The compact design not only provides a rich feature set, like functional safety and security for today’s demanding applications, but also saves our customers money by reducing cabling and installation costs with its local IO and power feed-thru with integral branch circuit protection.”

To improve drive management, **DrivesMatrix** from IndustrialMatrix is a remote monitoring, troubleshooting, and control solution available to OEMs and end users. Dashboards are customizable with more than 1,000 operating param-

eters to choose from. A complementary module, **PDMMatrix**, facilitates real-time, sensor-based predictive maintenance.

DrivesMatrix “redefines industrial connectivity by offering manufacturers the ability to put any machine online while providing a flexible platform where customers can set their own rules,” says Steven Pamensky, founder and CEO of IndustrialMatrix. “It unlocks the vast potential of cloud computing, facilitating online data logging, remote monitoring, troubleshooting, and autonomously generated insights and notifications,” he adds. **NED**

Technology Toolbox is a monthly feature by Sheila Kennedy, CMRP, that appears in our sister publication *Plant Services*. Email sheila@ad-dcomm.com with products for consideration. The full Tech Toolbox library is available at: www.plantservices.com/voices/technology-toolbox.



Infinitum's Aircore EC motor.
Infinitum



Rockwell Automation's Armor PowerFlex drive.
Rockwell Automation

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Double-girder models have been added to the NOMAD Free-Standing Crane line for heavy-duty operations. They are available in widths up to 50 ft (15 m) and heights up to 25 ft (8 m), with capacities of 2 to 10 tons. NOMAD cranes are modular, flexible solutions for when traditional overhead cranes are too difficult or impractical.

EMH, Inc.



More online: newequipment.com/21268548

Wet Dust Collector

eliminates sticky residues

The large capacity **Whirl/Wet dust collector** has a capacity of 52,500 cfm and collects soluble and non-soluble particulate 3 microns and larger, at efficiencies of 97 to 99%. It's ideal for dust from flour, grains and sugars, pharmaceuticals, and exotic metals. Energy generated inside the unit prevents the system from clogging, eliminating sticky residues.

Tri-Mer Corporation



More online: newequipment.com/21269120

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MANN+HUMMEL

More online:
newequipment.com/21269132



Metal-Cutting Band Saw

has a 3-speed belt-driven system

Featuring a welded steel frame construction with a solid cast iron table surface, the **10-in. Vertical Metal-Cutting Band Saw** cuts ferrous and non-ferrous metals. With quick tensioning and a comprehensive tracking mechanism, it's easy and quick to change the blade. The saw also has a rip fence, miter gauge, and dust collection port.

Palmgren

More online:
newequipment.com/21269118

FROM THE COVER



Cobot Feeder CNC Loader

only needs one operator per 5 stations

The **Cobot Feeder** is an automation tool to help small to medium-sized companies boost robot production without significant increases in labor or cost by assisting cobots and other robotic applications by providing a continuous arsenal of machinable parts over a much longer time frame. It achieves this by consistently loading and unloading up to 17 consecutive dunnage trays onto the cobot-accessible work area, eliminating the need to manually replace each one.

Acclimating to many industrial applications including CNC lathes and mills, material handling, assembly, and others, the feeder allows shop floors to maximize robot output by decreasing changeovers and robot downtimes as the machine offers a boost in production when compared to single-tray applications.

It also offers open-spaced shelving for various part sizes up to 18 in. (457 mm) in height along with station-to-station mobility.

PBC Linear

More online:
newequipment.com/21268996

Brushless Servo Motors

offer frame sizes from 1.6 to 3 in. (42 to 85 mm)



A range of high-performance brushless DC motors, the **RapidPower Enhanced (RPE) Series**, combine performance, flexibility, and affordability to give OEMs a motor for automation and assembly operations. They feature a high torque density, peak torques up to 300%, continuous speeds of 6,000+ rpm, and low cogging torque for smooth motion.

ElectroCraft

More online:
newequipment.com/21269121



Reaction Arms for Torque Control

replace the need for multiple reaction arms

The **ERAK-Series Reaction Arm Kits** reduce the twisting reaction force produced during torque wrench bolting, prevent operator fatigue, and eliminate the need for extended reaction arms and reaction tubes. It can be configured in unique standard setups which are suitable for repetitive work and can be used with the hexagon Allen-Key drives on the torque wrench.

Enerpac

More online:
newequipment.com/21268993



Fluoropolymer Pressure Transducer

works with 0.25 to 0.5-in. (6 to 13 mm) pipe diameters

For reliable and repeatable pressure measurements in corrosive environments, the **ZL95 fluoropolymer pressure transducer with a display** features a 4-digit LED display with NPN switch outputs, a capacitance sensor for thermal stability, and PTFE/PFA wetted parts with a vented design for extended cycle life and resistance to chemicals.

Ashcroft, Inc.

More online:
newequipment.com/21269102

28-Port Ethernet Switches for Automation

improve security and visibility of industrial networks

RKS-G4028 Series Gigabit Ethernet managed switches serve as building blocks in power sub-

stations with up to 28 Gigabit ports to fulfill scalability, modular interfaces for flexible connector combinations, certified IEC 62443-4-2 cybersecurity, and IEC 61850-3 high EMC immunity requirements. With 22 designs, the switches deliver layer 3 switching functionality; 24

or 48V DC or 110/220V DC/AC dual isolated redundant power supplies; and PoE++ support for powering 90 W field devices.

Moxa



More online: newequipment.com/21268989

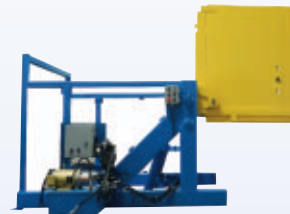


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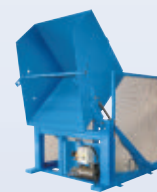
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removes PVC residue with thermal stability up to 500°F (260°C)

For most ferrous and non-ferrous metals, **CS-1331** offers PVC plastic release and wear resistance properties with thermal stability up to 500°F (260°C). By solving PVC sticking and wear, this coating reduces the downtime and expenses caused by these issues. Advantages include corrosion, outgassing, and chemical resistance, as well as a low CoF, high contact angle, and USDA/FDA compliance.

General Magnaplate Corp.

More online: newequipment.com/21268732

Panel Mount Connectors for Power Supply

are used for hand, wave, and reflow PCB soldering

The **M12-L** coded connector with dip solder contacts is a space-saving alternative to the 7/8-in. connectors typically used in power supply, making it ideal for Industrial Ethernet applications in the PROFINET environment. When mated, the connector offers IP68 protection and works for front and rear panel mounting.

Binder USA

More online: newequipment.com/21268523



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FROM THE COVER



3D Scanner Creates Digital Twins

rapidly captures high-accuracy data from far away

Artec Ray II is a high-precision 3D LiDAR scanner designed for the digitization of large objects and spaces with unprecedented speed and accuracy. With its ability to capture a full dome in 1.7 min, and at a 3D point accuracy of 0.07 in. (1.9 mm) from 33 ft (10 m) away, the Artec Ray II is ideal for creating digital twins of large-scale objects and complex scenes.

In addition to its speed, the scanner features automated targetless field registration, real-time scan alignment, and a double-scan feature for the automatic deletion of moving objects. With its touchscreen and mobile device interface, and IP54 protection, the Artec Ray II is a user-friendly solution ready for indoor and outdoor use.

When paired with Artec Leo, the Ray II is ideal for creating digital twins of objects, from wind turbines to ship propellers, from airplanes to bridges to factory floors, and even complex forensic scenes and archaeological sites.

Artec 3D

More online: newequipment.com/21269008



Safer Brake Pedal Sensor

supports hydraulic, electro-hydraulic, and brake-by-wire architectures

A **Brake Pedal Force Sensor** for electromechanical brakes enables safer and better-performing braking systems by reducing a vehicle's stopping distance and correctly and quickly capturing a driver's braking intent. Able to withstand forces up to 600N, the sensor meets safety requirements up to ASIL C and can operate at temperatures up to 284°F (140°C).

Sensata Technologies, Inc.

More online: newequipment.com/21269108



Field Connector Transforms Patchcords

protects against harsh environments and vibration

The **MPO Field TV Connector** solution lets users transform a standard MPO patchcord into a connector that resists harsh environments. The patchcord is integrated into a metallic plug that protects it from shocks, dust, and fluids. The connector combines the high speed and density of MPO/MTP Fiber Optic connectors using MT ferrules.

Amphenol SOCAPEX

More online: newequipment.com/21269104

Recycled Tag Fasteners

are available in 0.5 to 3-in. (13 to 76 mm) sizes

Part of the Ecotach portfolio, GRS-certified (Global Recycled Standard) **recycled Polypropylene (rPP) fasteners** help apparel manufacturers reach internal plastics recycling targets and compliance. Featuring 30% recycled polypropylene content sourced from clear plastic takeout food containers, the paddle-type fasteners are for apparel hang tag applications, including price tags and informational tags.

Avery Dennison

More online: newequipment.com/21268985





Pipe Patching Kit

works on straights, bends, and p-traps

An all-inclusive, start-to-finish solution for faster and simpler trenchless repairs, the **Pipe Patching System** offers many types of repairs with fewer materials and equipment. With a fiberglass patch, it can repair small sections of damaged pipe in commercial and industrial settings. It's intended for a one-time patch for 2 to 6-in. (50 to 152 mm) broken pipe up to 6 ft (2 m) long and can be used on all sections of pipe including straights, bends, and p-traps.

RIDGID

More online:
newequipment.com/21268737



Electronic Housing Heatsinks and Fillers

ensure optimum heat dissipation in the enclosure

The Industrial Case System (ICS) housing family now includes **customizable passive heatsinks and heatsink fillers** that are available in widths of 1 and 2 in. (25 and 50 mm). Base position can vary, making it possible to connect electronic components with a height up to 0.5 or 0.6 in. (13 or 15 mm). The heatsink can be custom-designed and manufactured to meet the specific layout of the electronics.

Phoenix Contact

More online:
newequipment.com/21268988



Edge-to-Edge Package Detector









detects flat or irregularly shaped objects

Roller Sensor Bar (RSB) is a photoelectric sensor that handles a variety of packaging shapes and sizes. With its spring-loaded end cap, it removes the need for tools to teach and align the sensor. When mounted between rollers or belted sections, it detects objects between sections and in transfer zones. It has housing lengths of 8 to 47 in. (200 to 1,200 mm) and beam spacing of 2 to 8 in. (50 to 200 mm) to detect a range of packaging.

SICK USA

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	Motorcycle	105 dB	
	Orchestra	100 dB	
	Factory Noise	95 dB	
	Tractor	90 dB	
	Garbage Disposal	85 dB	
	Vacuum Cleaner	80 dB	
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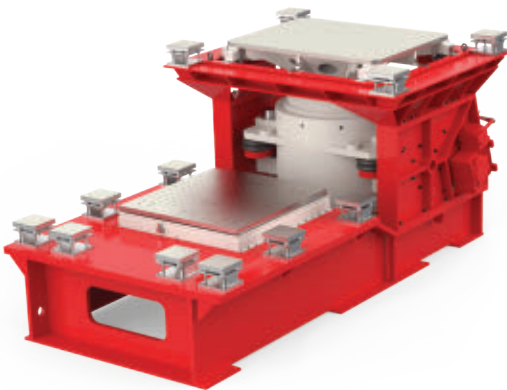
Standard IP65 Slip Rings

provide fast data transmission

Standard slip rings with IP65 protection provide washdown tolerance in food, beverage, and pharmaceutical manufacturing applications. They feature stainless steel or aluminum housings with mounting options with through-hole diameters ranging from 1 to 4 in. (25 to 100 mm), or capsule style when a through-hole is not required. They also support standard network protocols, such as Ethernet/IP, EtherCAT, Profibus, etc.

The Orbex Group

More online: [newequipment.com/21268987](https://www.newequipment.com/21268987)



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tests sinusoidal, random, and transient excitations

To help vehicle and battery manufacturers optimize their designs, the **V9940 shaker platform** tests vibration and shock on EV battery modules and packs, e-axes, and e-drive trains. The water-cooled electrodynamic shaker with a Sine force rating of 300 kN tests extra-large payloads of up to 11,000 lb. (5,000 kg). Primarily for testing during prototype development, it can also be used for end-of-line sample testing.

HBK

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Trane

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Thomson Industries, Inc.

More online: [newequipment.com/21269062](https://www.newequipment.com/21269062)

Hard Hat Accessory System

offers eye visors, face shields, and headlamps that are interchangeable

BOLT is a hard hat system that lets users secure accessories for complete head protection including eye visors/shields, polycarbonate face shields, metal mesh face shields, and a special USB headlamp. The eye visors and face shields have an anti-scratch and fog-free coating, large fields of view, can be adjusted for the right fit, and are ANSI Z87.1+ rated. The headlamp delivers 600 lm of floodlighting with a 70-deg. pivot. It also has 4 light output modes: high, medium, low, and eco and provides up to 32 hours of runtime.

Milwaukee Tool

More online: [newequipment.com/21268767](https://www.newequipment.com/21268767)



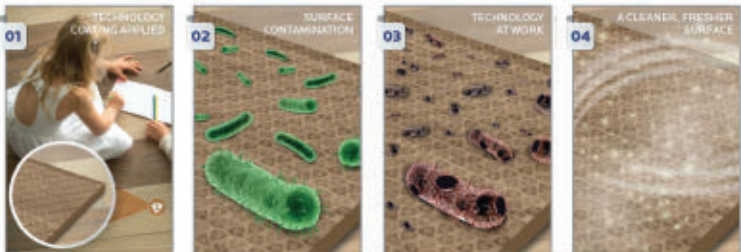
Water-Based Antimicrobial Coating

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Microban International

More online: [newequipment.com/21269109](https://www.newequipment.com/21269109)



FROM THE COVER



VR Training for Yard Operations

helps reduce equipment use and emissions

DriverSIM is a simulated training tool for terminal yard tractor drivers, leveraging VR technology so terminals can transition part of their equipment training to a virtual environment.

As a simulation tool, DriverSIM allows repeatable training on high-incident yard scenarios at no risk to drivers or equipment. This feature provides real-time metrics to help improve training outcomes and accuracy, leading to immediate and long-term cost savings.

The tool can be customized so terminals can tailor the simulation and training to reflect their yard layout, operations, and equipment types. It's also available as an out-of-the-box configuration to help terminal operators meet immediate training needs and cost savings. Training modules for additional equipment types and interactions between equipment are on the roadmap for future product direction.

Tideworks Technology, Inc.

More online:
newequipment.com/21269011



Cut-to-Length Blister Module

integrates with both new and existing equipment

Creating a way to provide different-size blister cards without the need for extra tooling or change-overs, the **SUR-SIZE FG-250** is a cut-to-length module unit that integrates with any blister machine. Fitted with shear-cut knife assemblies, it achieves precise cutting of blisters, ensuring consistent quality and accurate sizing. The unit is free-standing—users place into position, plug into a 110 to 220V AC outlet, and connect an airline.

AZCO Corp.

More online:
newequipment.com/21268424



Portable Scanner and Scale Tablet Accessories

work with all major tablet providers

The **xScanHandle G200** and **xScale S200** provide portability and Bluetooth communication to work wherever inventory needs to be managed or shipped. The handle and scale act as add-ons for MobileDemand's line of tablets, complementary to all major tablet providers. The scanner provides haptic feedback, LED light indicators, and a 100-lm flashlight. The scale offers a lightweight, compact form to collect data quickly.

MobileDemand

More online: newequipment.com/21267807

Antennas Support Light Rail Demands

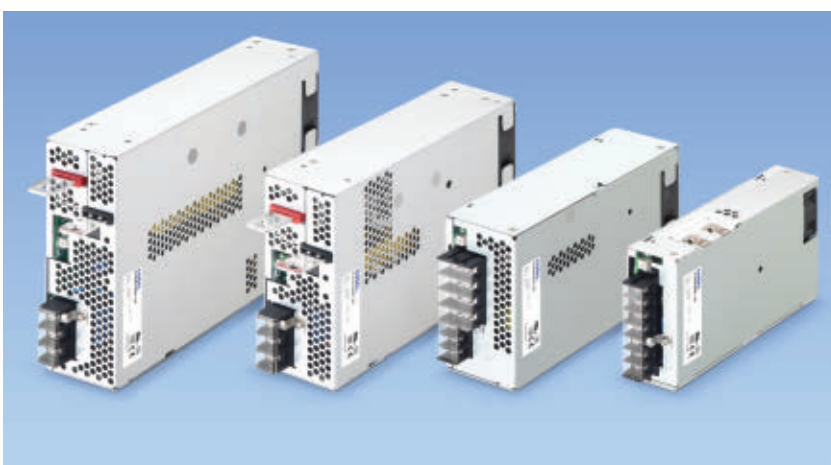
achieve a maximum MIMO throughput

The **SENCITY Tram rooftop antenna range** provides an all-in-one wireless solution to meet the requirements of light rail vehicles such as trams and metros.

The three products—SENCITY Tram, SENCITY Tram MIMO, and SENCITY Tram MULTI—are multi-application rooftop antennas for cellular, Wi-Fi, Tetra, UHF, and GNSS. The antennas provide up to 9 radiating elements in one housing, offering support for 4x4 cellular, 4x4 Wi-Fi, and dual-band GNSS option.

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Seco Tools, LLC



More online: newequipment.com/21268765

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Magnetic Sensor Systems



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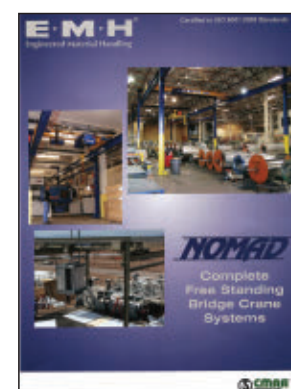
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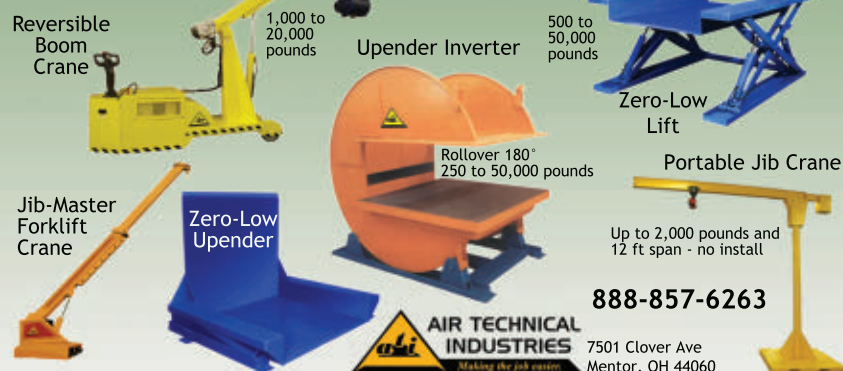


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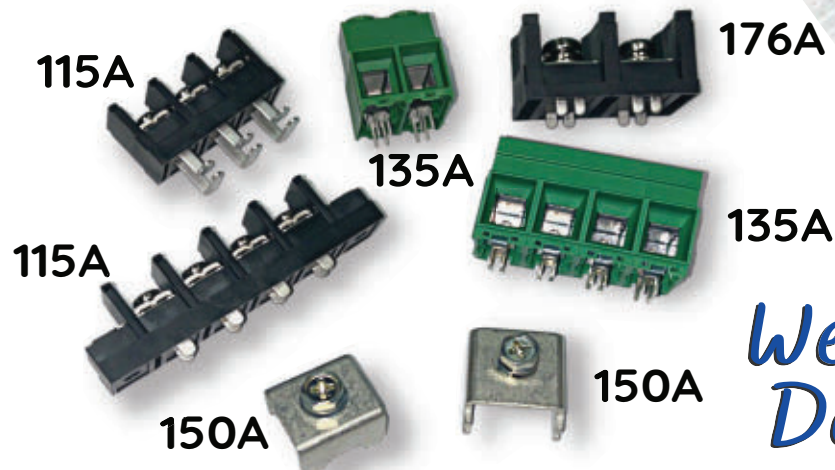
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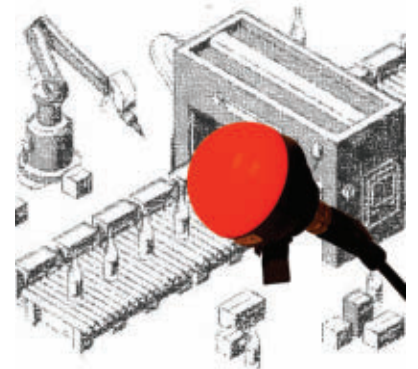
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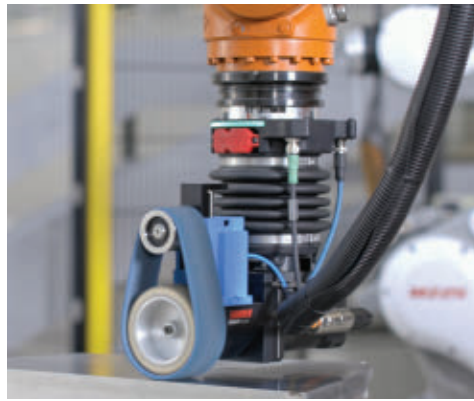
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Robotic End-of-Arm Grinder provides programming with web or Fieldbus communication

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Suhner Industrial Products, LLC

More online: newequipment.com/21267704

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identifies inclusion type,
number, size, and inclusion
volume



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FROM THE COVER



Wire Tracers Eliminate Guesswork

quickly pinpoint energized/de-energized wires, breaks, and shorts

Fluke's **2052 Advanced** and **2062 Advanced Pro Wire Tracers** accurately and safely troubleshoot energized and de-energized wires up to CAT IV 600V. They feature different modes and functions to troubleshoot a wide range of wiring and circuitry problems and are designed to protect electricians from spikes up to 8,000V where equipment cannot be taken offline.

Smart Sensor technology (only on 2062) locates and displays energized wires within walls, floors, and ceilings on a color display, while the tip sensor provides an audible tone when locating wires.

The 2052R and 2062R detect the signal in wires and cables using two methods: passive tracing without the transmitter for non-contact voltage detection and active tracing with the transmitter for all other modes.

Both wire tracers are available in kits that include test leads, test probes, blade and round outlet adapters, and alligator clips to connect the transmitter to electrical systems.

Fluke Corporation

More online: newequipment.com/21269015



Portable Tanks for Demineralized Water

allow easy transportation and quick installation

Containerized WT Solutions, a line of compact water treatment containers, use membrane-based technologies to remove suspended solids, dissolved solids and organics, and remaining trace ions to produce demineralized water for industrial processes. Designed and assembled using a 20 or 40-ft (6 or 12-m) shipping container as both the skid structure and building, the line simplifies deployability for rapid installation and production.

Marmon Industrial Water

More online: newequipment.com/21269112

FROM THE EDITOR

A Little Help

This week I was thrilled to check a project off my to-do list that's been taking a bit more time than I initially planned: adding shelves to a wall in my living room. I got the grand idea about a year ago that I wanted two full wall-length shelves that would be at least one inch thick and about five to six feet long. All I needed to do was find the studs.



I was immediately stopped in my tracks because I couldn't find any of the studs except for the first one closest to the end of the wall. I watched all the YouTube videos, googled tips for using stud finders, and found the old manual for my specific stud finder and they all were of absolutely no help. Not a stud to be found in my house.

Maybe the reason is my stud finder, so I go buy a new one. I go through all the motions and again...no studs. Getting very frustrated, I happened upon a magnetic stud finder at my father-in-law's house and asked to borrow it. Surely this magnet could find the stud.

Once again, no. Each stud finder was only able to find the first stud in the wall.

So then I'm researching about different materials used to build houses that might be stopping the stud finder from detecting the stud. This doesn't help though because I'm not about to put a hole in my wall to find out. And that's where this task was left in the unfinished project graveyard. I still have pencil markings on my wall from trying to measure out where the studs would likely be.

I know this is an easy DIY task and others have had no problem, so why is this turning out to be so hard?

I took one more stab at it over this past weekend with a clear mind thinking I would find that I had been doing something wrong all along and that I would be triumphant in my shelf endeavor.

News flash, I didn't, and now I have even more pencil markings on my wall.

Finally, I realized that I needed help. I needed a professional who hopefully could either tell me I'm doing it wrong or have a professional-grade tool that would be able to find the studs. Because if not, my next bet was going to be to buy the strongest magnet I could find and stick it to my wall.

So I've called a pro in to handle this task for me. They're due to come in the next week, mount the shelves for me, and this whole ordeal will be done.

What really grinds my gears is that it took me this long to realize that I needed help. I took a year of procrastinating, thinking I could figure this out on my own when I could have just called someone in sooner and this would be behind me instead of my living room walls still looking the same as the day I moved in.

So here's the lesson if you didn't catch it:

We all need extra help sometimes, even for seemingly simple tasks.

If things aren't working out, whatever they may be, it's OK to ask for help. It's not admitting defeat, it's being smart and clearing the way for the next task.

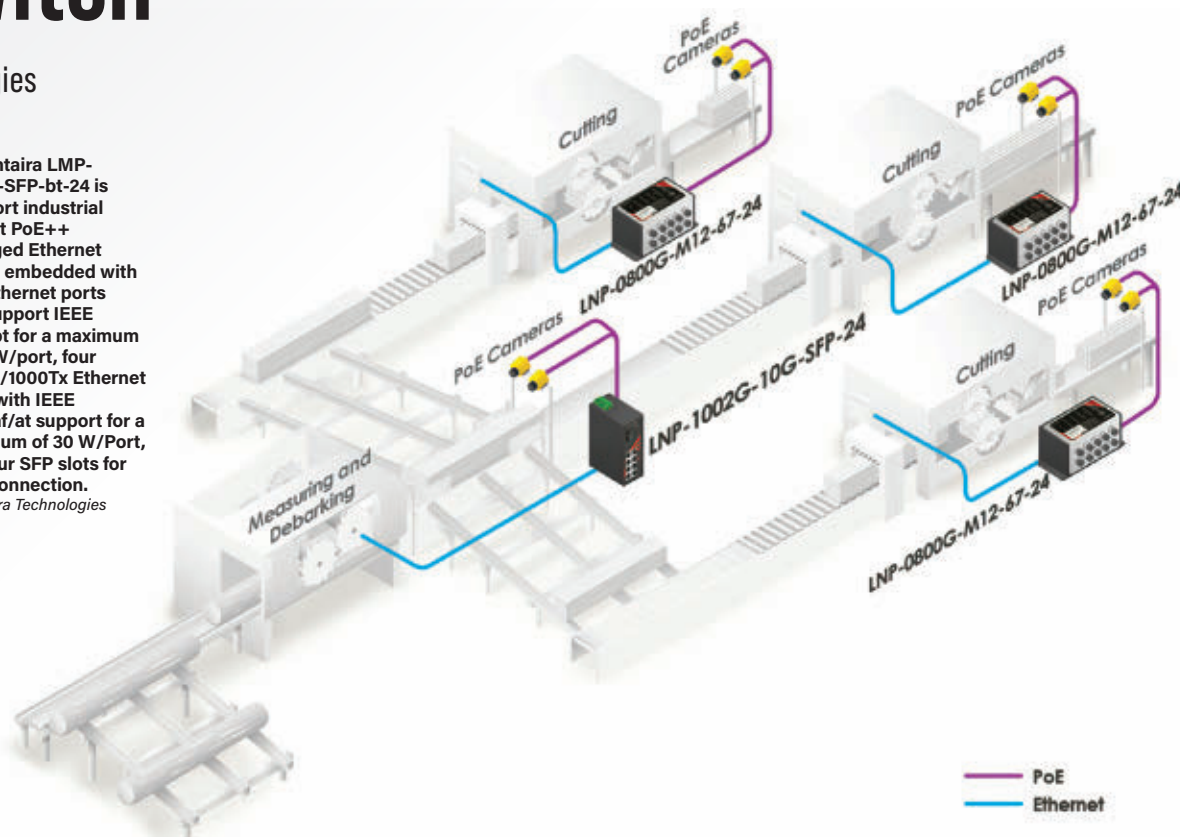
— Laura Davis, Editor-in-Chief

5 Reasons Why Your Industrial Network Needs an Ethernet Switch

By Henry Martel, Engineer, Antaira Technologies



The Antaira LMP-1204G-SFP-bt-24 is a 12-port industrial Gigabit PoE++ managed Ethernet switch embedded with four Ethernet ports that support IEEE 802.3bt for a maximum of 90 W/port, four 10/100/1000Tx Ethernet ports with IEEE 802.3af/at support for a maximum of 30 W/Port, and four SFP slots for fiber connection.
© Antaira Technologies



SINCE THE RATIFICATION OF THE FIRST POE

standard in 2003 by the Institute of Electronics Engineers (IEEE), Power over Ethernet (PoE) use cases have increased dramatically in industrial circles having made headway into factory automation, oil & gas processing, and utilities. IEEE 802.3bt, also known as PoE++, is the latest revision to the PoE standard.

Released in 2018, IEEE 802.3bt increases the amount of power supplied from Power Sourcing Equipment (PSEs) to Powered Devices (PD) nearly threefold by using all four pairs in the specified structured wiring plant, while significantly reducing the standby power required for PDs thanks to Short MPS. Inventive new features of IEEE 802.3bt also include Autoclass, 10G-BaseT with PoE support, Single/Dual Signature PD, and Power Class Levels.

There are two types of IEEE 802.3bt: Type 3 delivers 60 W from the PSE for up to 51 W input power at the PD while Type 4 PoE delivers 90 W from the PSE for up to 73 W input power at the PD. Both types are backward compatible with 802.3af and 802.3at.

Managed and unmanaged industrial Ethernet switches are the most common type of industrial PSE to embed IEEE 802.3bt technology.

Below are five reasons to upgrade your existing Ethernet switches to models with IEEE 802.3bt.

1. More Power Means More Opportunities

Unlike previous generations, IEEE 802.3bt has the muscle to support PTZ security cameras, sensors, level measurement devices, PLCs, 802.11ac and 802.11ax wireless access

points, controllers, actuators, and LED lighting, among other high-power PDs found on factory floors. Besides supplying more power, an 802.3bt switch plays its traditional role of creating reliable networks for connected devices to communicate and exchange data.

2. Improved Network Reliability

Gartner estimates that one minute of downtime for an industrial network cost \$5,600 (USD) on average or approximately \$300,000 an hour. An industrial switch with 802.3bt will help to improve the reliability and uptime of your industrial network by providing redundant connections and failover mechanisms.

3. Real-Time Control and Communication

IEEE 802.3bt expands support for Ethernet data speeds up to 10 Gigabits per second. This is significant because the growing majority of operations technology (OT) applications require real-time control and communication to cut costs and push efficiency. Consider this example: instructions are sent from a presence sensor to a robotic arm when it detects a part is ready to be picked up. Next, the arm must precisely place the part onto a moving assembly belt. Here, time-critical information must reach all machines without latency. An industrial IEEE 802.3bt switch is optimized so that OT networks remain highly responsive and reliable.

4. Flexible Installation for Applications

Like all versions of PoE, IEEE 802.3bt is standards-based. This means interoperability across vendors of multiple PDs from a

single industrial Ethernet switch. It also means that third-party non-PoE PDs will be detected and therefore not damaged by power transmitted on the CAT cable by the industrial switch. Many industrial switches with IEEE 802.3bt also enable the configuration of network topologies, such as ring, mesh, and others. Plus, they'll support RSTP/STP, IGMP, and VLANs.

Finally, backward compatibility is not sacrificed for IEEE 802.3bt's increased wattage. Ethernet switches equipped with IEEE 802.3bt will work with existing PD types standardized in IEEE 802.3af and IEEE 802.3at.

5. Industrial Internet of Things (IIoT)

IIoT technology is becoming increasingly sophisticated and more power-hungry. Until IEEE 802.3bt was introduced, the most power that IIoT networks have been able to transmit on a single port has been 60W. IEEE 802.3bt takes a big step forward with 90 W. Safe delivery of 90 W over one cable enables the speedy implementation of a host of IIoT technologies.

Antaira industrial PoE switches with IEEE 802.3bt give you the freedom to design your plant's layout exactly as you want. IEEE 802.3bt means power lines do not have to be run, and PoE-enabled devices can be installed in previously inaccessible places. Plus, more devices can be run by a single Antaira Ethernet device transmitting both power and high-speed data.

Like all Antaira network solutions, Antaira's industrial IEEE 802.3bt switches are ruggedly designed for industrial environments subject to wide temperature fluctuations, heavy vibration, shock, and EMI. **NED**

More online: newequipment.com/21267897

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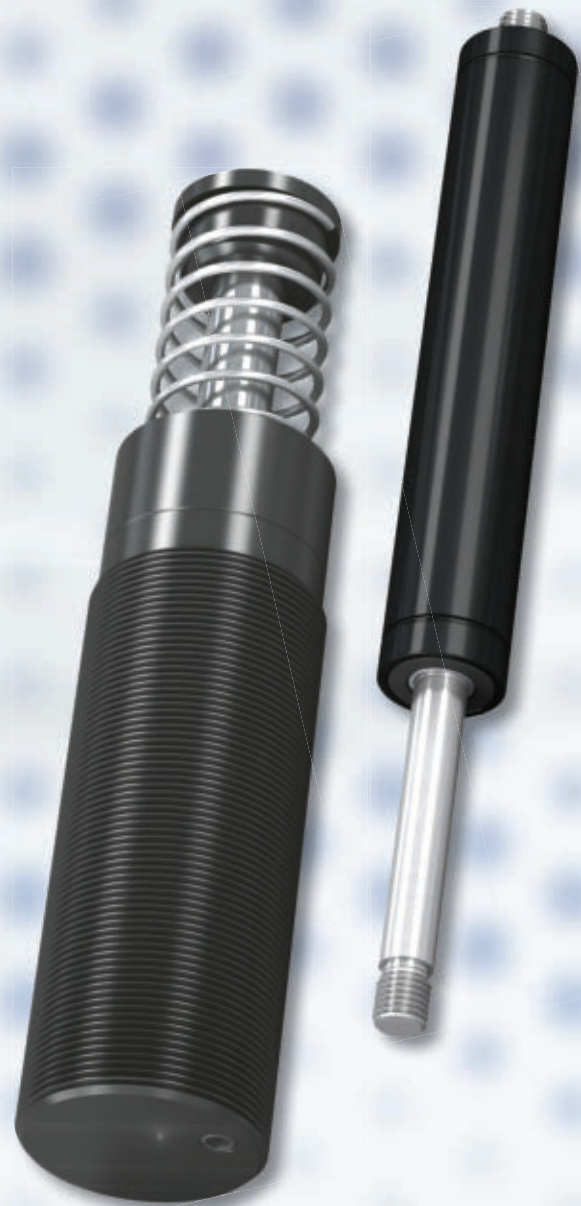
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- ACE CAD database
- ACETips video tutorials
- Technical blog & case studies





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