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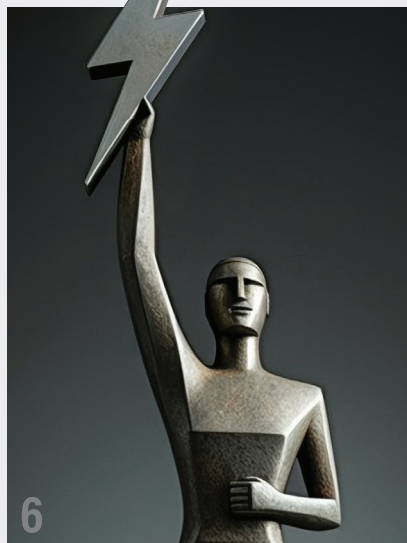
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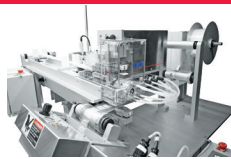


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**LEAN Manufacturing Products, LLC**

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**ePropelled, Inc.**

More online: [newequipment.com/55242619](http://newequipment.com/55242619)



**Simplify Energy Monitoring**

**Energy Manager** is a pre-engineered hardware and software solution designed to simplify energy monitoring from quick setup to intuitive operation. Ready out of the box, the Energy Manager monitors asset energy use in real time, allowing manufacturers to gain deeper insight into energy consumption and operating costs. Through its easy-to-use dashboard, operators can access asset-specific consumption—such as idle consumption and peak loads—associated costs, and carbon dioxide emissions for up to 10 endpoints (expandable to 50 with a license).

**Emerson Electric Co.**

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The **Vehicle Cradle Holder for Handheld Scanners** meets the needs of logistics and warehouse operations professionals who rely on rapid and accurate scanning on the go. It's compatible with Zebra TC2x, TC5x, TC7x, Honeywell Dolphin, ScanPal, Panasonic, and Datalogic Memor barcode scanners, snugly fitting to prevent movement or damage during transit with the non-slip cradle pad. The adjustable scanner mount holder offers a full range of motion with 360-degree rotation, 270-degree arm adjustability, and arm extension from 3 to 5 in (76 to 127 mm).



**AgozTech**

**More online:** [newequipment.com/55240450](http://newequipment.com/55240450)

**Modular, Compact Coil Racks**

The **Steel Coil Storage Rack** offers a new solution for storing steel coils with a vertically tiered cartridge design, either laying the coils flat or upright, allowing independent access to each coil and reducing the storage footprint. Customizable to fit any coil size, this system simplifies retrieval, improves productivity, and enhances safety. These racks securely store coils of various materials, ensuring they remain protected from damage. The modular design also allows businesses to expand storage as needed by being able to add or remove sections.

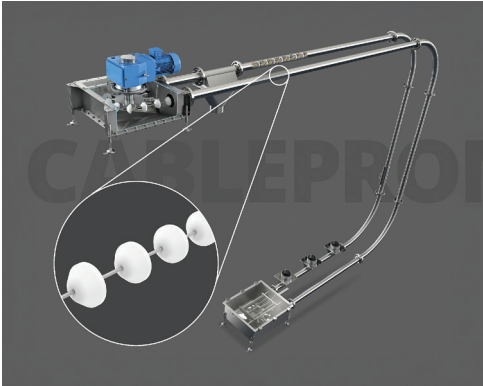


**LEAN Manufacturing Products, LLC**

**More online:** [newequipment.com/55242290](http://newequipment.com/55242290)

**FDA-Approved Bulk Food Conveyor**

The **CablePro Tubular Drag Conveyor** combines gentle handling, efficiency, and compliance with the most demanding food industry standards for products such as cereals, grains, nuts, frozen foods, pet food, and other delicate items. The system features FDA-approved components, self-lubricating UHMW disks, and an auto-tensioner to meet stringent sanitation standards and extend cable and disc life while reducing maintenance. The sealed design supports clean-in-place protocols, allowing for easier and faster cleaning through various options.



**Hapman**

**More online:** [newequipment.com/55241343](http://newequipment.com/55241343)

**Continuous Food Coating System**

**FlavorWright SmartSpray** food coating system for vitamins, gummies, and other confectionery goods, precisely applies oil and other liquids through continuous operation. It combines a belt conveyor, liquid applicator, and tumbling drum with a fully integrated control system. Featuring recipe-driven operation with automated controls through an HMI touchscreen, SmartSpray ensures consistent, repeatable results and enables quick changeovers without tools or manual adjustments. Processors can fine-tune both conveyor speed and drum angle to optimize dwell time based on each product's specific characteristics.

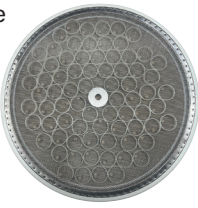


**PPM Technologies, LLC**

**More online:** [newequipment.com/55239167](http://newequipment.com/55239167)

**Self-Cleaning Sandwich Screens**

Addressing common challenges in industrial screening processes, **Self-Cleaning Sandwich Screens** feature a sandwich-style construction that enhances durability and prevents blinding and clogging. Able to be used for both dry and high moisture content materials, the screens are available in multiple aperture sizes ranging from 20 to 11,000  $\mu$ m (0.0008 to 0.4 in). The design minimizes manual cleaning and creates easy installation and integration into existing systems.



**Compass Wire Cloth**

**More online:** [newequipment.com/55241660](http://newequipment.com/55241660)

**Stress-Free Taping for Your Packaging Application**

The **SE 3.1 Tape Head** is the latest version of Dekka's tape head, featuring updates to the clutch roller, tape brace, and tape spring plate. The clutch roller has a conical spring that lets operators zero in on the right tension for their application. The tape brace keeps the tape upright for proper application and handles a variety of tape thicknesses. The tape spring plate features a sturdier mandrel to help the tape roll stay firmly in place while in use.



**Dekka**

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# Is Your Plant Safe Enough?

*Wearable and operational safety technologies offer new approaches to enduring problems.*

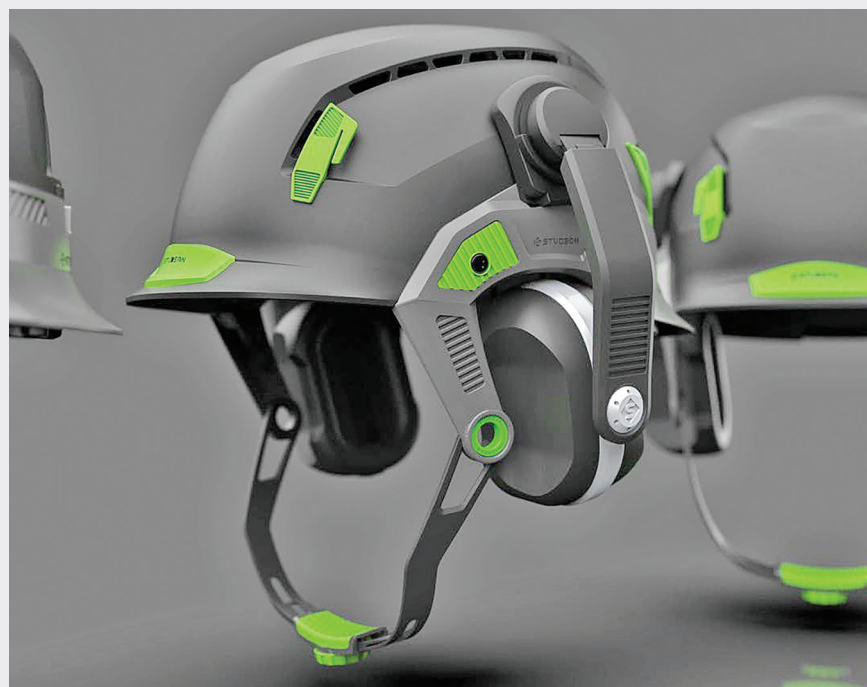
by Sheila Kennedy, CMRP

**P**lant safety technologies come in numerous forms and solve myriad challenges. Recent developments in personal protective equipment (PPE) address helmet fit and comfort, hands-free communication, and augmentation of physical abilities to avoid stress and strain. From an operational standpoint, advancements in lighting, safety switches, and access controls enhance workforce safety and efficiency. Moreover, modern safety solutions are advantageous in recruiting and retaining talent.

## Wearable Protection

Improved designs enhance safety helmet fit and function. The **HighBar by Studson Type II safety helmet** features a new mono-chinstrap system. Compared to conventional four-point nylon buckle systems, this buckle-free chinstrap can be tightened or loosened with a twist dial, even with heavy gloves, and it easily rotates up for stowing and down for use.

“Developing head protection that is comfortable and easy to wear for hours at



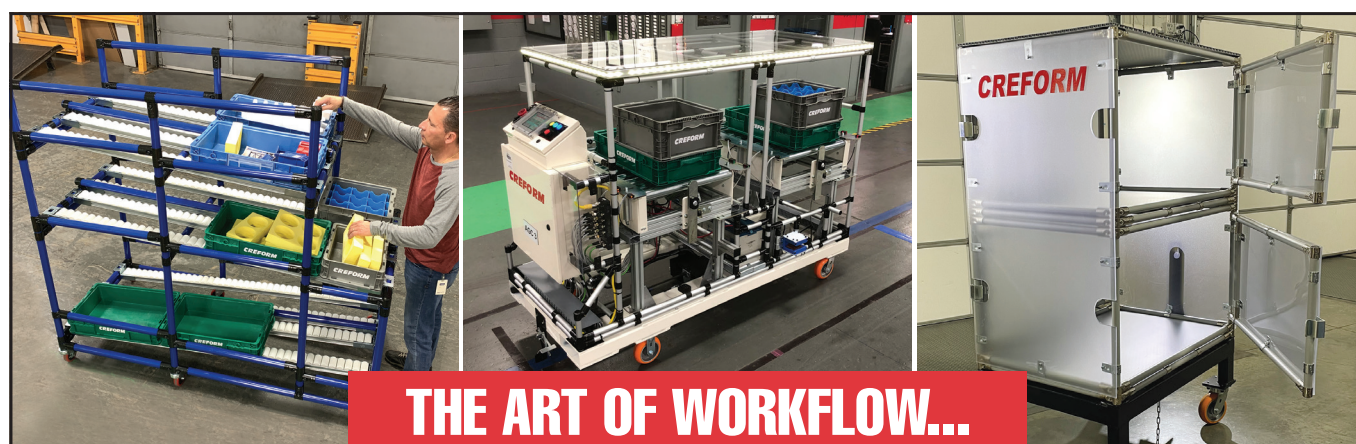
Initially developed for action sports athletes, the HighBar Safety Helmet's HighBar strap creates a better and safer fit of the SHK-1 Type II safety helmet and full-brim version for workers.

© STUDSON

a time is just as critical to offering effective 360-degree head protection,” observes Ryan Barnes, founder and CEO of Studson. The new HighBar-equipped version of the SHK-1 Full Brim and Standard Brim safety helmet “features an innovative chinstrap system designed to offer a more hygienic, consistent, and simple solution for achieving the perfect fit, ensuring enhanced comfort and safety for industrial workers on any job site.”

**Patent-pending Armor smart safety glasses from Lucyd** enhance worker safety and communication in industrial environments. Teams can communicate freely and hands-free using walkie-talkie style communication channels on their safety glasses. Instant, unlimited voice conferencing is enabled by sharing a channel number that users can join in real time.

“These glasses were specifically engineered to offer seamless, voice-activated access to AI tools and networks, making it easier for workers to stay connected while protected,” explains Joaquin Abondano, COO at Lucyd, an Innovative Eyewear business. “They empower industrial workers with hands-free AI capabilities and real-time connectivity, combining



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Lucyd Armor combines certified eye protection with advanced technology to enhance communications, information access, and awareness in the workplace.

© Lucyd Eyewear





Each model of the Apogee e-exoskeleton series offers up to 66 lb (30 kg) of support per lifting movement and provides users with active walking assistance.

© German Bionic Systems GmbH

cutting-edge technology with personal protective equipment.”

Smart power suits enhance the wearer's health and well-being. For example, **Apogee series e-exoskeletons from German Bionic** work together with a multitude of integrated sensors to actively support users when lifting, walking, and performing activities in a bent-forward position. A recent software update increased the performance of the e-exoskeletons to up to 80 lb (36 kg) of lifting support, along with better active walking assistance and smoother mode changes.



Schneider Electric's VisiPacT heavy-duty safety switch includes new features such as a viewing window, hook stick handle, QR code for quick access to information, touch-safe barriers, and more.

© Schneider Electric

The e-exoskeletons and their operating system, German Bionic OS, are part of the company's 360° Human Augmentation Platform. “The platform is designed to enhance everyday life, ensuring that each individual can achieve more with greater ease, comfort, and safety,” says Armin Schmidt, CEO and founder of German Bionic.

### Operational Safety

Proper, reliable lighting enhances work site safety, especially in harsh and hazardous environments. The **industrial LED High Bay fixture series from Dialight** now also includes a battery backup model, which keeps the fixture illuminated during power outages. Self-testing and diagnostics functionality, automatic testing capability, color-coded indicators for visual inspection, and a 10-year full-fixture warranty help to maintain safe operations and simplify upkeep.

“Our industrial-grade LED High Bay fixtures demonstrate Dialight's commitment to ensuring safety in the toughest environments, reducing maintenance needs, and providing reliable performance in hazardous areas like oil and gas or mining,” says Jon Rud, a vice president at Dialight.

A new version of the **Square D VisiPacT heavy-duty safety switch from**



**Schneider Electric** features a novel design focused on improved safety. Built for harsh environments, the new heavy-duty safety switch (30-200 A) includes design enhancements directly based on customer feedback, notes Antonio Di Vaira, senior vice president of power products at Schneider Electric.

These include a standard viewing window to visually verify the switch position without opening the door; a new ergonomic handle to accommodate a hook stick for safer operations; a QR code for quick access to critical product information; touch-safe barriers to prevent accidental contact; and allocated spacing for customer-required labeling. “This switch ensures long-lasting performance while meeting the highest safety standards for critical applications,” adds Di Vaira.

For machine access control and management, the new **Electronic-Key-System EKS2 from Euchner** was designed with simple implementation, operation, and adjustment in mind. Template projects with predefined functions and data fields simplify system integration. The selection of a safe operating mode at the highest safety level is supported. Users can select a suitable project and simply configure individual parameters, rather than programming the entire selection of safe operating modes in the control system as was previously required. **NED**

Technology Toolbox is a monthly feature by **Sheila Kennedy**, CMRP, that appears in our sister publication *Plant Services*. Email [sheila@addcomm.com](mailto:sheila@addcomm.com) with products for consideration. The full Tech Toolbox library is available at: <https://www.plantservices.com/voices/technology-toolbox>.

Euchner's EKS2 system is simple to implement, operate, and adjust for digital access control and selecting a safe operating mode.

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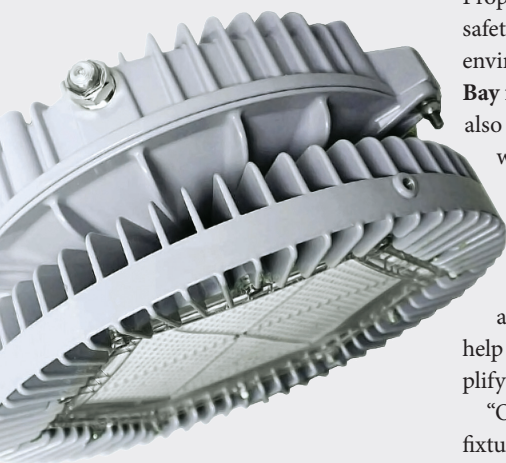


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Dialight's LED High Bay Fixture with battery backup ensures that the fixture will stay illuminated throughout emergency loss of power for 60 to 180 min, meeting Life Safety Codes under NFPA 101 guidance on emergency lighting.

© Dialight



# 2024 INNOVATION AWARDS NED

## HONORING EXCELLENCE IN ENGINEERING

*Your 2024 NED Innovation Award Winners*

**W**'re excited to announce the winners of our 2024 NED Innovation Awards. These annual awards recognize the most outstanding new tools, components, and equipment that have been featured in NED over the past year.

The eight winning products were selected through votes from our readers and industry professionals—the people who work with these technologies every day. We believe there's no better way to identify meaningful innovation than by turning to the expertise of our audience.

In addition to the winners, we're also pleased to feature seven finalist products that received strong support from voters. These runner-up entries showcase the depth of innovation happening throughout the engineering landscape.

Thank you to everyone who participated in the voting process. Your insights help us highlight the products that offer real value and advancement in the field.

Without further ado, let's introduce you to the products you selected as the 2024 NED Innovation Award recipients. Congratulations to all of our winners and finalists! **NED**

— *Laura Davis, editor-in-chief*





## AUTOMATION

### WINNER!

#### FoxBot Class 1, Stand-Up Autonomous Forklift

Fox Robotics' **FoxBot autonomous forklift**, the world's first Class 1 electric, stand-up autonomous forklift, is an autonomous mobile robot (AMR) that automates operator tasks and improves workplace safety, productivity, and employee satisfaction.

The flagship model features the ability to unload 60 double or 30 single-stacked 40 x 48 pallets/hr and reduces labor costs by eliminating drivers and only requiring one employee to manage up to 6 forklifts at once. Its 360-degree monitoring detects and avoids obstacles with LiDAR sensors, cameras, PLCs, and fully redundant safety braking. All-electric, the forklift is powered by a rechargeable battery with 18 to 20 hr of life and connects to cellular and Wi-Fi networks.

In 2024, Fox Robotics updated the forklift by providing the ability to integrate with AS/RS as well as the ability to load trailers by picking up pallets from an AS/RS or a staging area and placing pallets in the desired location/orientation inside the trailer. Additional sensors and a new forklift attachment were also added.

**Fox Robotics**

More online: [newequipment.com/55235657](https://newequipment.com/55235657)



## CONTROLS & INSTRUMENTATION

### WINNER!

#### PVA-1500 Series PV Analyzer, I-V Curve Tracer

The **PVA-1500 Series PV Analyzer, I-V Curve Tracer** is designed to empower utility-scale solar technicians with speed, accuracy, and streamlined testing operations for effective service and maintenance. This innovative tool addresses the critical need for efficient and reliable PV array testing, ultimately optimizing performance and maximizing ROI.

The PVA-1500 elevates utility-scale solar testing to a new level. By addressing the time, accuracy, and usability challenges faced by technicians, this tool empowers them to optimize PV array performance for maximum energy production, minimize downtime and ensure system health for long-term reliability, and maximize return on investment through efficient operations and informed decision-making.

It measures and displays I-V curves up to 1,500 V and 30 A; automates data management, analysis, and reporting; provides a built-in PV model for performance checking; features a sweep-to-sweep delay of 9 s to measure 3.5 MW in <1 h; and has wireless interfaces for faster setup, safer work environment, and freedom of movement during PV troubleshooting.

**Fluke Corporation**

More online: [newequipment.com/55235735](https://newequipment.com/55235735)



### HONORABLE MENTION

#### Sure Sort X With OPEX Xtract for High-Speed Automated Sortation

**OPEX Sure Sort X with OPEX Xtract** is a next-generation high-speed automated sortation and order retrieval solution. It's the only fully adaptable, turnkey offering designed to automate multiple manual tasks with a simple, one-touch solution, increasing efficiency and addressing labor challenges.

Sure Sort X handles nearly 100% of customer-sortable items weighing up to 20 lb (9 kg) and sorts items into a configurable array of mixed bin sizes and types, all while maintaining a consistent throughput of up to 2,100 items/h. iBOTs maneuver throughout the system, driving in and out while Sure Sort X continues to run.

When Sure Sort X is paired with Xtract, tote retrieval and transfer to shipping containers becomes fully automated, eliminating manual sorting and transferring of boxes downstream. Xtract iBOTs can handle up to 200 extracted totes/h.

**OPEX Corporation**

More online: [newequipment.com/55235679](https://newequipment.com/55235679)



### HONORABLE MENTION

#### VibXpert 3 Balancer Tool

The **VibXpert 3 Balancer** is a smart field balancing tool designed to combat unbalance by diagnosing and correcting rotational unbalance in the field or on the floor. The large interactive touch-screen display guides users through every step of the process making it possible for technicians of all skill levels to identify and correct unbalance swiftly and efficiently.

With 6 synchronous channels, it can record multichannel vibration measurements simultaneously, giving users a full picture of machine health quickly. Users can take measurements from multiple angles, compare them to historical data, and identify the root cause of the unbalance directly at the source.

The balancer can detect subtle changes in vibration levels that indicate unbalance, long before they become visible to the naked eye. The device can perform resonance tests, phase measurements, and deeper analysis using the FFT spectrum data to diagnose complex unbalance issues. Having access to comprehensive insights in real time makes diagnosing and correcting unbalance issues simple, efficient, and accurate.

**PRUFTECHNIK, Inc.**

More online: [newequipment.com/55235739](https://newequipment.com/55235739)





## ELECTRICAL & ELECTRONICS

### WINNER!

#### Series 09 Rugged Keypads for Heavy-Duty Vehicles

**Series 09 Rugged Keypads** are designed for E1 applications and safety-critical functions in compliance with ISO 26262 and EN ISO 13849 standards.

Featuring a CAN bus connection, these modules offer intelligent, programmable capabilities. Their modular construction, sealed up to IP6K9K as per DIN ISO 20653, alongside customizable legends, makes them ideal for strenuous usage in heavy-duty and specialized vehicles.

Available with 8 pushbuttons and various configurations, these keypads offer interchangeable legends, diverse illumination options, and connector types, catering to multifaceted needs. Moreover, certain variants are expressly suitable for safety-critical tasks, amplifying their utility. Targeting a spectrum of applications, from fire-fighting vehicles to construction machinery, these keypads find their niche in specialized vehicles and heavy-duty equipment.

A standout feature is the programmable 4-segment RGB halo ring illumination, providing intuitive function feedback. This, coupled with the flexibility of interchangeable ISO 7000 symbols or customized icons, amplifies usability and adaptability across various contexts.

**EAO Corporation**

More online: [newequipment.com/55235755](http://newequipment.com/55235755)



## FACILITY OPERATIONS

### WINNER!

#### Thermafit Air-Source Modular Multipipe Unit for Cooling and Heating

The **Trane Thermafit Air-Source Modular Multipipe Unit, Model MAS**, is a 30-ton (433 MBH) unit that is expandable up to 300 tons (4330 MBH bank). It's an all-electric, all-in-one solution capable of 3 modes of operation: cooling, heating, or simultaneous heating and cooling.

The system is lab-verified to provide reliable heating in outdoor ambient temperatures down to 0°F (-17°C) and hot water temperatures up to 140°F (60°C). It has a vapor injection scroll compressor for cold climate operation that extends the operating range of the compressor for water temperatures of ~130°F (54.4°C) to 0°F (-17.8°C) outdoor ambient temperatures.

The Thermafit MAS model can satisfy an entire building's heating and cooling needs by independently operating the mode of each module in the bank. Its chilled water and hot water loops have variable flows, improving overall system efficiency. Designed with genuine redundancy the model MAS has a modular design, eliminates a single point of failure, and helps support continuous operation.

**Trane**

More online: [newequipment.com/55235959](http://newequipment.com/55235959)



### HONORABLE MENTION

#### QUINT High-Powered AC UPS

The **QUINT high-powered (HP) AC uninterruptible power supply (UPS)** is designed for applications where the power needs exceed 1 KVA/900 W. The UPS IQ technology and battery management system gives users all system information about the UPS and connected batteries.

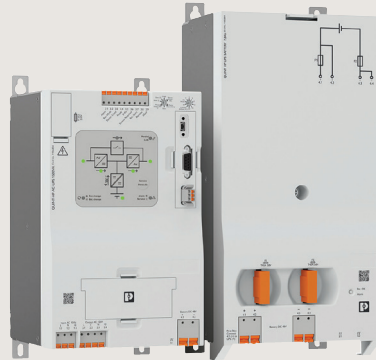
The QUINT HP AC UPS has a removable communications card for USB and RS-232/RS-485 for easy communication to PCs, RTUs, and HMIs. The Power Management Suite software gives real-time updates about the UPS' state of charge, buffer time, and energy storage service life. If a power failure occurs, the QUINT HP AC UPS ensures an uninterrupted transition to buffer mode and back again. Mains input and output voltages are synchronous.

When in double conversion mode, the QUINT HP AC UPS is more than 95% efficient, lowering the operating costs. The modular design makes the system easy to implement and adapt to specific application requirements.

The UPS has an expandable battery system for extended run times, and the batteries are hot-swappable to circumvent battery-maintenance shutdown. The integrated fuses and fan are also easy to replace, extending service life.

**Phoenix Contact**

More online: [newequipment.com/55235757](http://newequipment.com/55235757)



### HONORABLE MENTION

#### RAM-5 Chiller Tube Cleaner With Reverse Stop Assembly Speed-Feed Gun

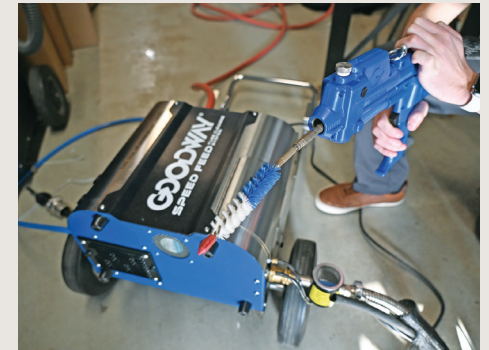
The latest innovation exclusively for the **RAM-5DC-ID chiller tube cleaner** is the new Reverse Stop Assembly Speed-Feed Gun which helps contractors and facility engineers clean large-volume smooth bore or enhanced tube bundles even faster and more effectively.

The updated gun combines speed-feed technology to fire the shaft quickly into the tube from a pull of the trigger with the new Reverse Stop Assembly that automatically detects when the brush is retracted from the tube and stops it in the optimal position. With the brush automatically in the optimal position, operators have more precision to move seamlessly and quickly to clean the next tube. The updated gun also improves on the trigger system reducing the force needed to pull the trigger by 50%.

The RAM-5DC-ID also features the Forward Stop Assembly that automatically stops the brush and shaft when it reaches the end of the tube. Plus, it has intuitive controls to dial in the shaft and brush rotation speed and the feed rate of the shaft, up to 3 ft/s (1 m/s), to meet the cleaning needs of an exact tube type.

**Goodway Technologies Corporation**

More online: [newequipment.com/55235964](http://newequipment.com/55235964)





## HYDRAULICS & PNEUMATICS

### WINNER!

#### 316 Stainless Steel ATEX Cabinet Cooler Systems for Explosive Environments

##### 316 Stainless Steel ATEX Cabinet Cooler Systems

protect sensitive electronics in ATEX classified areas. This low-cost, UL-tested, CE-compliant cooler meets requirements for classified purged and pressurized electrical enclosures within Zones 2 and 22. With cooling capacities up to 5,600 Btu/h, it protects electrical enclosures from overheating in areas with explosive atmospheres, both indoors and outdoors.

The Cabinet Coolers produce and circulate cold air inside enclosures to prevent overheating, high-temperature faults, and shutdowns. They easily mount via a standard electrical knockout while maintaining the NEMA 4/4X integrity of enclosures in explosive areas. These systems include an auto-drain filter separator to ensure no water, dirt, or contaminants from the compressed air system pass into the electrical enclosure. Thermostat controls are available to minimize compressed air use, and cold air distribution kits ensure balanced cold airflow to all areas of the enclosure.

**EXAIR Corporation**

More online: [newequipment.com/55040349](http://newequipment.com/55040349)



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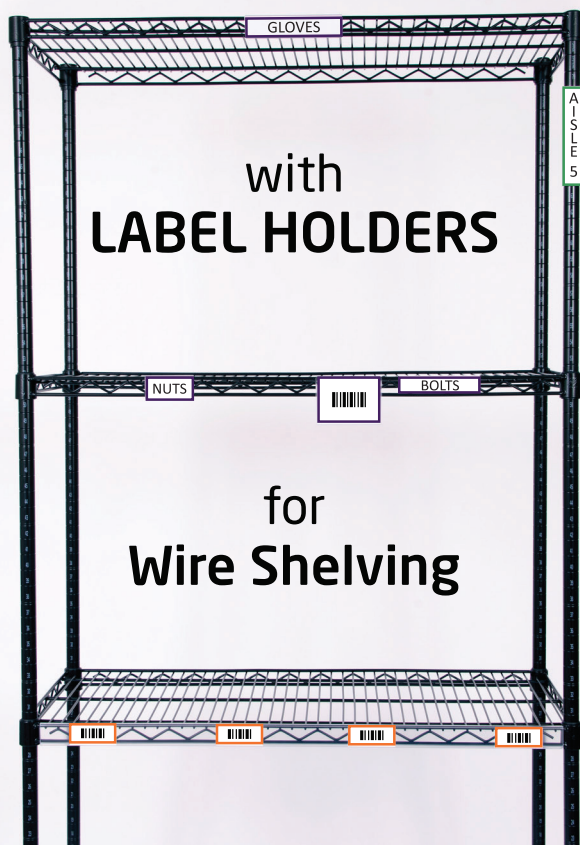
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## MACHINE TOOLS & METALWORKING

### WINNER!

#### Renegade VOLT ES 200i Portable Stick/TIG Battery-Powered Welding System

The **Renegade VOLT ES 200i Stick/TIG battery-powered welding system**, developed with Stanley Black & Decker, is powered by 4 DEWALT FLEXVOLT 12 Ah batteries offering a Stick output of 10 to 130 A and TIG output of 10 to 150 A on battery power. With fully charged batteries and set to an output of 80 A, it can weld up to 33 electrodes or TIG weld for up to 45 minutes on a single charge. An exclusive AMP + Hybrid Mode supplements wall power with battery power to mitigate circuit breaker tripping.



Made for difficult-to-reach locations and locations without power, it eliminates the costs and hassles of engine drives. It uses a next-generation current control module with built-in intelligence that detects and clears a short circuit or manages current transients faster than the microprocessor controls used on other units.

In Stick mode, it has an adjustable Hot Start which fine-tunes the optimal energy during the arc starting sequence for better strike performance and reduced sticking. Operators can adjust the arc characteristics based on different electrodes and applications. TIG mode provides Live-TIG for arc starts without high frequency.

**ESAB**

More online: [newequipment.com/55126622](http://newequipment.com/55126622)

## MATERIAL HANDLING & PACKAGING

### WINNER!

#### AP380 Label Applicator for Round Containers

The **AP380 Label Applicator** streamlines the label application process on round or cylindrical containers, offering increased speeds and new features.

With approximately 30% faster speed than Primera's other label applicators, it ensures labels are applied swiftly and accurately, providing a seamless finish on a wide variety of containers. The applicator features an all-new label liner rewriter to further optimize operations by keeping the waste liner material off of the floor and winding it into a roll for easy disposal.

The intuitive design makes it easy to operate, providing a hassle-free labeling experience, and with its enhanced speed capabilities, applies up to 1,500 labels/hr.



**Primera Technology**

More online: [newequipment.com/55236028](http://newequipment.com/55236028)

### HONORABLE MENTION

#### 3-Axis 1500MX Servo-Driven CNC Mill

The **1500MX CNC Mill** is a 3-axis, servo-driven machine featuring an epoxy granite frame that combines professional-grade capabilities with easy-to-use compact versatility.



With a 4 hp, 10K rpm, BT30 spindle, the 1500MX delivers ample torque for cutting through various materials and offers enough spindle speed to take advantage of modern carbide tooling. Every mill is TSC-ready for enhanced drilling efficiency, smoother finishes, part consistency, and extended tool life.

The machine eliminates the need for machine referencing due to servo motors with absolute encoders boasting 23-bit accuracy and battery backup. Cutting feed rates of up to 1,200 in./min (30 m/min) (XY) reduces cycle times and takes advantage of adaptive tool paths.

Additionally, users can add accessories over time, including a 16-tool capacity umbrella-style automatic tool changer, fourth axis harmonic gear reducer, TSC and washdown bar kits, wireless probe and tool setter, mist collector, and chip conveyor system with lift functionality. Plus, the 1500MX operates on Tormach's free, open-source PathPilot control software, offering users unlimited access to advanced machining functionalities without software lockouts.

**Tormach, Inc.**

More online: [newequipment.com/55236004](http://newequipment.com/55236004)

### HONORABLE MENTION

#### Varistat Benchtop Ionizer

The **Varistat Benchtop Ionizer** neutralizes static on charged surfaces. Using ionizing technology, it offers a hands-free solution that requires no compressed air and provides a constant stream of particulate-free and static-eliminating air. It's easily mounted on benchtops or machines, is manually adjustable, and works great for processes that need comprehensive coverage, like part assembly, web cleaning, printing, and more.

The Varistat is the first fan-driven static eliminator from EXAIR. Once plugged in, the Varistat provides rapid static decay capable of reducing 1,000 to 100V in 0.8 s.

The ionizer features 2 replaceable ion emitter points and two 30 PPI foam filters to ensure optimal performance over extended periods, as well as LED lights to signify proper function. It also offers customizable options like selectable voltage, variable fan speed, and adjustable polarity.



**EXAIR Corporation**

More online: [newequipment.com/21280750](http://newequipment.com/21280750)



## SOFTWARE & COMPUTERS

### WINNER!

#### FactoryTalk DataMosaix Industrial DataOps Solution

**FactoryTalk DataMosaix** is a groundbreaking industrial DataOps solution that helps drive operational value with industrial analytics. The software brings together information technology (IT), operational technology (OT), and engineering technology (ET) data in a single solution to securely deliver trusted data that's ready to use. From root cause analysis and trending to predictive analytics, FactoryTalk DataMosaix provides a single source of truth to solve challenging problems.

Manufacturers want the capability to fast-track their data journey and get more value from data by making complex industrial data easy to access and understand. With FactoryTalk DataMosaix they can use and re-use data across a variety of applications. The initial release is available as software as a service (SaaS) and more deployment options for on-premise and private cloud are coming soon. By integrating data from any vendor and all parts of the production system, it will make data available, meaningful, and useful so that standard applications and custom app development platforms can make data valuable.

**Rockwell Automation, Inc.**

More online: [newequipment.com/55236045](http://newequipment.com/55236045)



## TOOLS

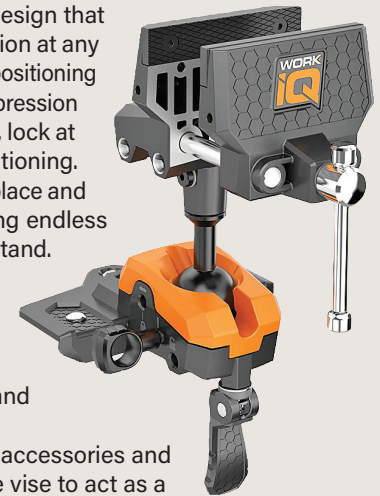
### WINNER!

#### 360-Degree Rotating Vise

The **IQ Vise** features a ball and socket design that allows articulation and 360-degree rotation at any angle, allowing the user to find the perfect positioning to work. It also includes a Quick Cam compression lever that allows the vise to lay down flat, lock at any angle, or rotate for optimal work positioning.

The 8-position IQ Lok locks the ball in place and allows up to 130 ft-lb of torque, delivering endless possibilities of projects the vise can withstand. Additionally, 5 different task-specific IQ Vise Jaws allow users to tailor the vise's grip for the project at hand. Double-sided, textured jaws are specifically engineered to secure materials such as wood, pipe, and fine and delicate items.

Additional IQ Connect plug-and-play accessories and mounts are available and connect to the vise to act as a problem-solving workshop helper. The system includes 3 hands-free accessories with flexible, extended arms: a work light, a cell phone holder, and a 5-in. (127 mm) magnifying glass. It also includes 3 bench mounts to place and hold the accessories around a workbench. A magnetic and- clamp mount are also available to extend possible mounting locations.



**Work IQ Tools**

More online: [newequipment.com/21284454](http://newequipment.com/21284454)

### HONORABLE MENTION

#### FactoryTalk Optix Portfolio

The **FactoryTalk Optix portfolio** combines cloud-based software and hardware that lets customers build versatile HMI solutions to meet diverse requirements and adapt to evolving needs and technologies.

The open portfolio allows users to choose their own technology mix.

For the first time, Rockwell Automation customers can use visualization software to design HMI applications that natively work with Rockwell Automation and third-party controllers and run it on their choice of hardware. Users can connect to third-party software, devices, or systems using software designed for interoperability and full OPC UA support. Users also only pay for the features they need, reducing unnecessary spending on unused features.

The FactoryTalk Optix portfolio includes 5 core solutions: FactoryTalk Optix Software, OptixPanel graphic terminals, FactoryTalk Remote Access, ASEM 6300 Industrial PC, and an Embedded Edge Compute Module.

**Rockwell Automation, Inc.**

More online: [newequipment.com/55236054](http://newequipment.com/55236054)



### HONORABLE MENTION

#### E.FOX S 10 Wire- Stripping Device

The **E.FOX S 10** is an electric-driven wire-stripping device for efficiently processing 28-8 AWG conductors with a strip length between .08 to 0.8 in. (2 to 20 mm). Motorized drives quickly adjust to the desired cross-section and full or partial stripping length. Switching from a full to a partial strip or vice versa is simple with the touch of a button.

The E.FOX S 10 is operated via a 5-in. (127 mm) touch display. LED lights at the insertion point indicate the device's status. A white light indicates standard readiness, a green light indicates data received from software, and a red light indicates an issue with further instructions on the display.

The device can store up to 100 jobs, and barcodes can be created to access these stored favorites for quick and easy recall, using a barcode scanner. The device features an integrated handle, making it easy to relocate throughout the panel shop. The E.FOX S 10 can reduce wire-stripping time to less than half a second. The machine can also be integrated into worker assistance systems and controlled through its software program.



**Phoenix Contact**

More online: [newequipment.com/55236096](http://newequipment.com/55236096)



# Reshaping the Future of Intermodal Operations: Insights from a Rail Industry Leader

© CSX



**Carrie Ann Crozier**  
Vice President of Intermodal  
Operations at CSX.

**C**arrie Ann Crozier, a seasoned veteran of the rail industry, was appointed as the Vice President of Intermodal Operations at CSX in January 2024. With over two decades of experience spanning various operational roles, Crozier brings a wealth of expertise to her current position overseeing the company's 40+ intermodal terminals.

Prior to joining CSX, Crozier held leadership positions at Canadian National Railway (CN), where she managed the railroad's intermodal ports, terminals, and trucking operations. Her career journey began as an intermodal operations employee, providing her with invaluable hands-on experience and a deep understanding of field-level operations.

In this Q&A, Crozier discusses her motivations for joining CSX, the key initiatives she has spearheaded to drive operational excellence, and her perspectives on navigating recent industry disruptions.

## What interested you in coming to CSX?

**A:** My interest in joining CSX was sparked by the company's cultural transformation, which is focused on its commitment to fostering a strong sense of teamwork, and its growth potential. CSX plays an important role in trade, particularly along the East Coast and in heavily populated regions, making it a key player that's poised for substantial growth.

Throughout my career in the rail industry, I have faced various challenges, particularly as a woman in transportation.

Although, in some ways, you feel like you're a trailblazer, there came a time when I felt ready for a new chapter. CSX presented itself as that perfect opportunity. The leadership team at CSX is not only experienced but also genuine in their approach, and the company's focus on improving both employee and customer experiences, coupled with its dedication to diversity and inclusion, aligns seamlessly with my desire to contribute to a meaningful and dynamic workplace.

## When you were first starting in this role, what areas did you think you would be able to make the biggest impact on?

**A:** I saw an opportunity to leverage the fact that I'm very process-driven and have diverse experience across operations, network planning, and supply chain to make a significant impact. My background equips me with a comprehensive understanding of the business, that enables me to evaluate situations from both an outside-in and inside-out perspective, which I believe is crucial for driving meaningful change. At CSX, I am fortunate to work within a collaborative and innovative team environment. The team here is exceptional—everyone is eager to try new things and open to feedback, which creates a vibrant atmosphere for experimentation and growth. With such a strong core team, we have the freedom to explore different approaches and implement positive change in our processes.

## Can tell me about some of those changes? What are some things that you've started to do or some things that you're looking to do?

**A:** Right off the hop, one of the most significant projects I undertook was addressing the challenges at the Fairburn intermodal terminal in Georgia. Initially, Fairburn had a history of underperformance, often standing out as an outlier in intermodal standards. I was asked by both the company and our customers for my insights on how we could improve its operations.

It's an impressive terminal – technologically advanced, on a beautiful plot of land, and well-positioned near Atlanta where you see so many trucks driving through that can be taken off the road to ease traffic. Recognizing its immense potential, we quickly implemented several strategic changes.

We began by revisiting the operating plan, making swift adjustments that, while not revolutionary, were essential. By collaborating with talented individuals across the CSX network—from operations to commercial teams—we tackled each area of opportunity methodically. This process started with a comprehensive whiteboard listing 36 target areas, which we addressed systematically, resulting in rapid improvements that received positive feedback from our customers.

One of our key achievements was transforming truck turn times at Fairburn from industry-lagging to best-in-class. This improvement enhanced the overall



© CSX



A CSX train on the French Mills Rd. tracks in Guilderland, NY.

experience for truckers and unlocked additional capacity in what was previously thought to be a fully utilized terminal. This newfound capacity allowed us to better handle disruptions and support growth, especially with key partners.

The success at Fairburn has been a blueprint for other terminals. We've applied these best practices to places like Winter Haven in Florida, which is like a "Fairburn 2.0." It's one of our terminals in Orlando. There we witnessed significant improvements in customer experience and throughput. There are opportunities like this across our vast network, in areas like New Jersey, Baltimore, and Philadelphia, where similar strategies can drive growth and operational excellence.

What excites me most is the untapped potential within CSX's extensive network. The opportunity to explore and expand these strategic initiatives has been both challenging and rewarding.

**How do you deal with the complexities of CSX's large network? Does it impact intermodal and is that something you had to comb through as well?**

**A:** Yes, indeed, it's a complex network! I'm used to a linear network—like East, West, North, South—so my previous experience is completely different. However, I've come to appreciate its intricacies. Our business thrives on having multiple access points, which are essential for meeting diverse logistical needs. This complexity is a

competitive advantage, especially when it comes to converting truck freight to rail. Bringing goods into urban centers, even if they are relatively close in distance, is a critical aspect of our operation and represents a significant opportunity. Navigating the intermodal aspect of this network involves understanding and managing 31 terminals along with 14 port operations. Each of these 45 locations brings its own set of challenges and learning curves but mastering them is important for our success in the competitive landscape. This complexity is precisely what enables us to provide superior service and flexibility to our customers.

**What are some of the other items that you're looking at addressing or looking to help improve as we move forward?**

**A:** Our strategic focus moving forward is centered on a few key areas. First, leveraging data more strategically is imperative. This involves using data to enhance our forecasting capabilities and align our objectives with actual results. We've undertaken a comprehensive review of our equipment across all terminals, identifying best practices and setting benchmarks for optimal operation. As a result, we've significantly reduced our equipment footprint, which enhances our resilience, ensures continuity, and improves access to quality maintenance and repair services.

One of my primary focuses is the continuous development of our people.

We've restructured our teams by adding resources, promoting from within, and bringing in external talent with diverse backgrounds and expertise. This approach has helped us create a team that's not only operationally focused but also aligned with our commercial and service partners. To seize business opportunities, we have to embrace diversity of thought and experience, challenging ourselves to innovate and adapt.

A large part of this is ensuring every team member feels engaged, valued, and safe. It's important to foster an environment where individuals feel they can excel and continually grow.

**You're involved in a couple of mentoring programs as well, in addition to the day-to-day. Can you talk about those?**

**A:** I'm involved in mentoring programs that provide positive experiences both for me and for those I mentor. Through the United Way Stein Fellowship, I've had the privilege of mentoring a local young professional in Jacksonville. My current mentee is someone from a different industry, still early in her career. It's an incredible opportunity to provide guidance and share insights across sectors, and I was eager to participate when asked. I am also involved with the Creative Destruction Lab (CDL) at the University of Montreal, where I mentor innovators and entrepreneurs four times a year, working alongside experts from diverse fields like technology, supply chain, and emerging business ventures. A significant focus of mine is addressing the underrepresentation of women in the rail industry, particularly in operations. Collaborating with Diana Sorfleet, CSX's EVP and Chief Administrative Officer, we've sponsored initiatives that empower women in rail. These efforts have inspired a network of cross-functional and cross-railway female leaders to come together and carve meaningful paths forward.

**How did you and your team respond to the recent storms and the port worker's strike, which required operations to be restructured on the intermodal side?**

**A:** Our team adopted a strategic and proactive approach to managing operations. Rather than following the typical procedure of gradually winding down

operations in anticipation of the strike, we maintained rail activities right up until the labor disruption occurred. This was possible due to our strong network condition and terminal capacity, which allowed us to keep operations fluid.

We built resilience at our terminals by continuing to receive traffic, staging it efficiently. This approach minimized the supply chain shock, enabling a smoother shutdown and a more agile startup once the strike ended. By having a backlog of staged traffic, we were prepared to resume operations quickly and effectively, reducing the impact on our partners, including trucking companies and customers involved in the first and last miles of intermodal transport. This innovative approach turned a potential disruption into a non-event, thanks largely to our collaborative efforts with our commercial team, led by Maryclare Kenney, Vice President of Intermodal and Auto, and our supply chain partners. The controlled shutdown and restart during the International Longshoremen's Association strike were exceptionally positive for the supply chain.

Regarding the hurricanes, our primary concern was the safety and well-being of our employees, who are essential to our resilience and recovery capabilities. Once their safety was secured, we executed our shutdown, recovery, and startup plans smoothly and efficiently through a collaborative effort with open communication both within our organization and with external partners. I personally engaged with key customers facing similar challenges, and our teams worked together to overcome obstacles. This all-inclusive, cooperative approach ensured that we navigated the disruptions effectively and maintained our service standards.

**Do you feel the stress of having to be the one who actually makes those calls and how do you manage that stress?**

**A:** Managing stress in decision-making roles is something I've become accustomed to. What I focus more on is refining processes. I often ask myself what we could have done differently, where my blind spots might be, and how to leverage our successes to continually improve. Every situation presents an opportunity to get better and recognize the small wins along the way. **NED**



# FORGING®



2024-2025

## FORGING BUYERS' GUIDE

The Forging Buyer's Guide is designed to help forgers locate suppliers for all of their operating needs and purchasing decisions – quickly and conveniently.

Keep this directory available throughout the coming year. The sections listed here will save you time in your search for vendors of equipment, supplies, and services.

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## Custom Machining Planned for SFIL Expansion

**O**pen-die forger Sheffield Forgemasters is adding an advanced machining operation for large forgings as an extension of its ongoing development in Sheffield, England. Construction is scheduled to start before the end of 2024 for a 16-acre building to house 17 new machines, reportedly to include some of the largest and most advanced five-axis vertical turning centers ever produced.

All the new machines will be custom-designed and engineered, in particular to support future defense manufacturing programs. The new facility will be operational by the end of 2028.

Gareth Barker, chief operating officer at Sheffield Forgemasters, said: "Creating this new facility on derelict ground, which was once part of Sheffield's engineering past, is an amazing investment for the city and for the wider U.K., which will create highly skilled engineering jobs for decades to come."

The 220-year-old engineering firm, now owned by the U.K. Ministry of Defence, manufactures steel forgings and castings and is a primary supplier of forgings for civil nuclear programs, nuclear submarines, oil-and-gas exploration, and other defense manufacturing programs.

In addition to the new machining operation, construction is proceeding on the U.K.'s largest open-die forging press, a 13,000-mt machine that will be operational next year. SFIL currently operates open-die machines rated at 4,500 mt and 10,000 mt.



An illustration of the 16-acre building planned to house 17 custom machine centers, at Sheffield Forgemasters International Ltd., in Sheffield, England. [SFIL]

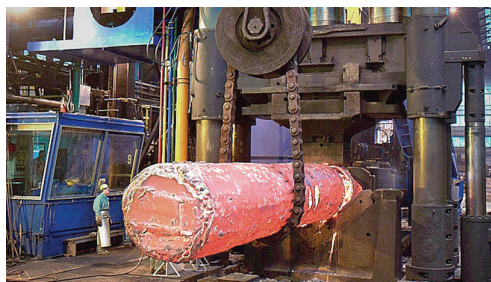
## DOD Funds Lehigh's Capacity Expansion

**T**he U.S. Dept. of Defense awarded \$15 million to Lehigh Heavy Forge in Bethlehem, PA, to aid in financing press equipment upgrades and expand heavy forging production capacity. The money is to be supplied by the federal Defense Production Act Investments (DPAI) program.

Specifically, Lehigh Heavy Forge plans to install a new forging manipulator that will improve the capacity of its 10,000-ton open die forging press, improve its heat treatment furnace capabilities, and install automated ultrasonic forging testing – all in support of the 2024 National Defense Industrial Strategy to expand support for domestic production and to enhance supply chain resilience.

"Heavy forging production is needed across many critical defense applications – including naval ship shafts and critical propulsion and structural components," stated Dr. Laura Taylor-Kale, Assistant Secretary of Defense for Industrial Base Policy, or ASD(IBP). "This award helps address the many capacity challenges faced by the U.S. heavy forge industry resulting from aging equipment and facilities."

Heavy forgings are expected to be required for construction Virginia- and Columbia-class nuclear submarines, and in forming driveshafts for U.S. Navy submarines, destroyers, amphibious transport docks, and aircraft carriers.



The 10,000-ton open die forging press at Lehigh Heavy Forge in Bethlehem, PA. [Lehigh Heavy Forge]

## Bearing Maker Adopts Aluminum Forging

**I**ljin USA, a domestic subsidiary of a South Korean manufacturer of automotive and industrial bearings and chassis, is investing close to \$100 million for a new, closed-die aluminum forging operation in Auburn, AL. The plant will employ about 160 people, according to state officials. No start-up date was announced.

Iljin supplies control arms, stabilizer links, ball joints and other components to major automakers. While it has manufactured steel bearings, the new aluminum forging capability will support a new series of lightweight automotive components.

"By combining our in-house forging capabilities with world-class technology, we'll be able to produce the highest quality and lowest cost aluminum forgings for our customers," stated John Dix, president.

Forged parts will be shipped to Iljin's assembly plant in Greer, S.C., for final processing.



Iljin USA will introduce aluminum forging as it develops lighter bearings and joints for automotive manufacturing. [Iljin USA]

## American Axle Exits India Truck Market

**A**merican Axle & Manufacturing is selling its commercial vehicle axle business in India to a regional rival, Bharat Forge Ltd., for an agreed price of \$65 million. The sale includes two manufacturing plants at Pune and Chennai, and an engineering and development center at Pune.

Bharat Forge is India's largest manufacturing of closed- and open-die forgings, among other engineered components, which is the base for a global manufacturing business supplying automotive, power, oil-and-gas, rail, marine, aerospace, construction/mining, and defense manufacturers from plants in the United States, Europe, and Australia, along with India.

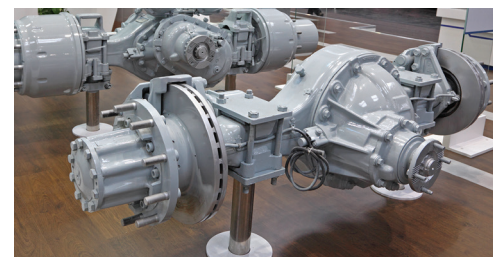
According to AAM's statement, AAM India Manufacturing Corporation Pvt. Ltd. had 12-month sales worth \$156 million through June 30. The transaction is expected to close by the end of Q4 2024.

"The strategic decision to sell our commercial vehicle axle business in India enables us to strengthen our focus on ICE, hybrid, and full electric passenger car, pickup truck / SUV, and van applications globally and provides additional financial flexibility," stated AAM chairman and CEO David C. Dauch. "We are committed to collaborating with Bharat Forge to execute this agreement efficiently and support the continuity of supply from these facilities to customers during the ownership transition."

The Chennai plant opened in 2012, producing front and rear axles for commercial vehicles, for Asian markets. The Pune plant produces axle assemblies for heavy commercial vehicles produced in India and abroad.

Not included in the sale are the AAM components manufacturing plant at Chakan and the Pune business center that handles engineering, IT, and procurement shared services for AAM global operations.

Detroit-based American Axle & Manufacturing designs and manufactures driveline and drivetrain components at operations worldwide, including the U.S., Asia, Central and South America. It entered the Indian market through a joint-venture in 2007, and later acquired the business outright in 2011. **FORGING**



The driveline manufacturer is selling its commercial vehicle axle business in India, explaining it will focus on passenger car, pickup trucks, SUVs, and van products for ICE, hybrid, and EV programs worldwide. [typhoonski | Dreamstime]



# FORGING<sup>®</sup>

## BUYER'S GUIDE

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www.ssdie.com

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www.weldmold.com

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773-975-2510  
www.finkl.com

**Metal Forming Lubricants**  
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440-458-5730  
www.mflube.com

**Parker Rust Proof**  
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216-481-7400  
www.parkerhq.com

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**Blast Cleaning Technologies**  
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FROM THE COVER



Highly Flexible, Multiaxis Machining

**SmartReach Comau**, a system that combines the precision of a machine tool with the agility of 5-axis articulation, offers a modular design for 6-sided machining in only one clamping, boosting Overall Equipment Efficiency (OEE) while reducing time and costs.

Born as a CNC, with its linear X axis, reinforced rotary axes with double encoders, and other specifically designed configuration, it's able to deliver high-end CNC-level performance, combining dynamics, stiffness, and precision.

In a single-part clamping posture of the part, the high-speed spindle can easily reach compound angles and access any side of large or multifaceted parts without frequent recourse to angular heads. In this way, it's easy to realize one-set-up machining, the key to megacasting and large lightweight parts machining.

With its modular structure, the machine can be easily reconfigured into mono, twin spindle, or multi-spindle configuration, with one frame to multiframe, to work with different configurations of turntable. The standard configuration with one frame has a stroke of 10 x 6 x 3 ft (3,000 x 1,890 x 1,000 mm), and with this flexibility, the machine can adapt to different part sizes and different production needs.

Comau

More online: [newequipment.com/55234741](http://newequipment.com/55234741)



Easily Electrify Your Pneumatic Actuators

Simplifying the electrification of pneumatic actuators in a closed-loop system, the **ERDP Remote Drive** uses air lines to connect to one or more pneumatic actuators to enable the power system to be located near the point of use, offering easy setup and a user-friendly solution. The drive is designed to save energy compared to traditional compressed air systems and can be used for a wide range of applications.

PHD, Inc.

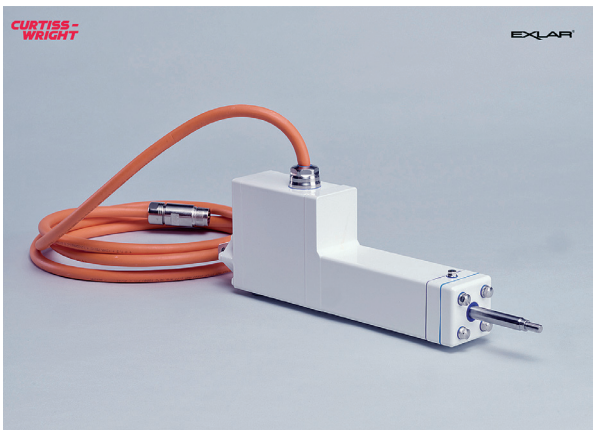
More online: [newequipment.com/55234425](http://newequipment.com/55234425)

Job Management for Tool Manufacturing

**AIMS Connect** is a job management and production control software for tool manufacturing that optimizes processes, enhances quality, and reduces costs. AIMS Connect is an accessible entry point into digital manufacturing, emphasizing the logical connection of machines and systems. It delivers transparent and verifiable processes, featuring a worker guidance system that informs employees about production stages and task schedules. Each tool is meticulously described in a job order process, ensuring consistent quality through defined compensation strategies and logical frameworks.

ANCA, Inc.

More online: [newequipment.com/55236259](http://newequipment.com/55236259)



FDA-Approved Electric Actuator

Designed for automation systems in the food & beverage, packaging, and pharmaceutical industries, the **GTF actuator** helps customers achieve hygienic certifications such as USDA, 3-A, BISSC, and EHEDG more economically. It offers numerous configuration options including an IP69K wash-down variant, critical for motion applications with potential food contact. As with all Exlar integrated actuators, the high-performance inverted roller screw, servo-driven design, and compact form make it ideal for builders of hygienic machinery to easily incorporate into their designs.

Curtiss-Wright

More online: [newequipment.com/55240740](http://newequipment.com/55240740)



Control Valve Enhances Flow Control

Distributing and controlling liquids and gases, the **Apollo v-port series control valve** provides a flexible solution for many industries. The pressure-balanced solid ball reduces operating torque, while compression-controlled spiral wound gaskets improve sealing and reduce leakage. The anti-blowout one-piece bottom entry stem prevents stem ejection under pressure, and the statically grounded ball, stem, and body reduce the risk of static electricity buildup. Live-loaded stem packing maintains seal integrity and reduces maintenance frequency.

Aalberts IPS (Aalberts Integrated Piping Systems)

More online: [newequipment.com/55134180](http://newequipment.com/55134180)



High-Voltage Connectors for Compact Spaces

The **REDEL 2P High Voltage** connector features a patent-pending design that delivers up to 5 kV with up to 34 contacts in a compact Ø 18 mm body. This new addition offers better safety, performance, and reliability, making it a great solution for cutting-edge medical devices. These connectors feature LEMO's best-in-class push-pull self-latching system, ensuring secure and effortless connections. Designed for durability, they can endure sterilization and over 5,000 mating cycles, providing better performance in demanding environments.

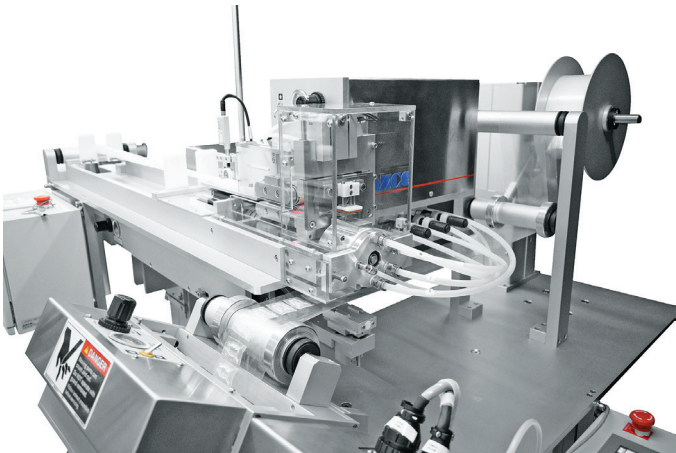
LEMO USA, INC.

More online: [newequipment.com/55240674](http://newequipment.com/55240674)



**Efficient and Sustainable  
Valve Applicator**

The **VPS Automated Valve Placing Process** is a plug-and-play machine that applies ValvPak valve technology to pouches, offering a sustainable and efficient liquid packaging solution. Requiring only air and power to operate, it can be integrated into existing lines and keeps up with typical pouch machine speeds of over 80 units/min. The machine includes unwind, feeder, indexing, and heat seal stations, all of which are mounted on an easy-to-install equipment frame.



**AZCO Corporation**

More online: [newequipment.com/55241352](http://newequipment.com/55241352)

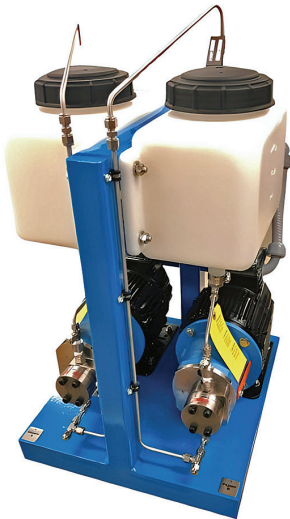


**High-Performance Microwave  
Cable Assemblies**

**LL043 Series** Nitrowave high-performance microwave cable assemblies are a flexible, low-loss microwave coaxial cable product line with amplitude and phase stability. The inclusion of an interlayer enables consistent electrical performance throughout the cable's life span while the low-density PTFE dielectric material ensures mechanical robustness. Flex life was tested to 400,000 cycles and torque life to 1,000,000 cycles. Performance is optimized to 43.5 GHz with a maximum VSWR of 1.4:1.

**Samtec, Inc.**

More online: [newequipment.com/55242728](http://newequipment.com/55242728)



**Gear Metering System for  
Multicomponent Mixing**

The **Zenith 2K Precision Gear Metering System** is designed with the needs of the foam, adhesives, and sealants industries in mind to enhance precision and efficiency in multicomponent material dispensing. Meeting multicomponent applications in metering and mixing processes, they feature high-precision rotary gears to provide a smooth, continuous, and pulse-less flow. They provide stable, precise, and repeatable flow control of process fluids, regardless of variations in temperature, viscosity, or pressure. The 2K systems also feature multi-pump capability, allowing for one or more pumps to be driven by a single motor or more.

**CIRCOR International, Inc.**

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FROM THE COVER



**Pre-Engineered Robot Work Cell**

The **ARIA (Automated Robotic Industrial Assistant)** robotic work cell has a small footprint, is fully configurable, and offers a broad array of options and preprogrammed software packages that enable the unit to be tailored to an application.

With a payload capacity of up to 28.6 lb (13 kg) and reach capabilities of 59 in. (1,503 mm), it can be used as a stand-alone cell or it can be implemented into a larger solution and offers two different base options: "standard" and "machine tool" bases. The standard base option is for a variety of applications where flexibility and mobility are needed. The machine tool base is for tending CNC mill, lathe, and swiss applications. Both bases are suitable for Mitsubishi's collaborative, vertical/articulated, and SCARA robots.

**Mitsubishi Electric Automation, Inc.**

**More online:**  
[newequipment.com/55238809](http://newequipment.com/55238809)



**UL-Approved Cut-to-Length Bulk Wire**

**CanFlex bulk wire** provides high-quality, customizable bulk wire solutions in cut-to-length sizes ranging from 50 to 5,000 ft (15 to 1,500 m). CanFlex wires, currently available in PVC with various gauge sizes, are ready to ship in any specified length. With UL approval for all available wire types, distributors and end-users can easily maintain inventory and respond quickly to project demands.

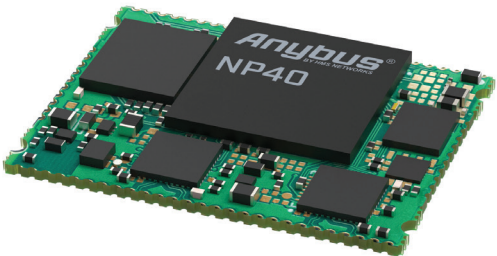
**Canfield Connector**

**More online:**  
[newequipment.com/55139252](http://newequipment.com/55139252)

**Choose Your Preferred Network in the Field**

The Anybus CompactCom family offers a range of ready-made communication interfaces that can be embedded into any industrial machine or device, enabling connectivity to all major industrial networks. The new **Anybus CompactCom B40 Mini** adds a soldered-on option to the existing lineup of modules and pluggable bricks. The B40 Mini enables device manufacturers to simplify product design and production with one design and batch for all protocols, providing end customers the flexibility to choose the network in the field.

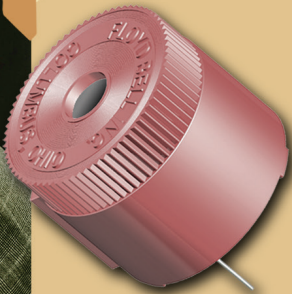
**HMS Industrial Networks**



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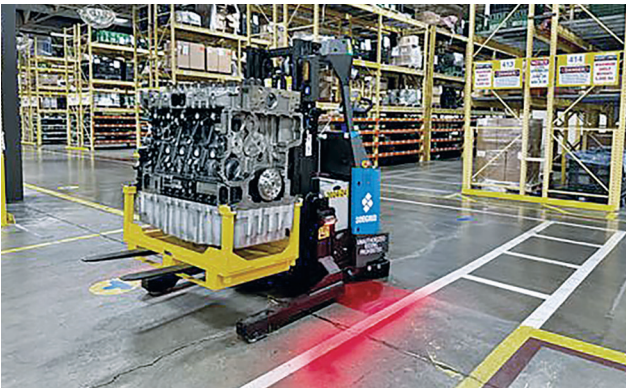
**Floyd Bell Inc**  
SOUND SOLUTIONS



AMR for Efficient, Heavy-Load Handling

Seegrid's **Lift RS1 autonomous mobile robot** (AMR) is capable of a 6-ft lift height, making it ideal for low-lift processes across the most prevalent industrial facility applications. With a payload capacity of 3,500 lb (1,587 kg), it enables facilities to handle heavy loads more efficiently, boosting productivity.

With its vision-guided technology, the RS1 can safely and reliably navigate dynamic environments without the need for infrastructure such as magnets or reflectors. The RS1 features Seegrid's pioneering Sliding Scale Autonomy that blends the agility of AMRs and the predictability of automated guided vehicles (AGVs), allowing the truck to navigate differently based on what's best suited for the application. With LiDAR-based SLAM technology, the RS1 plans routes based on real-time perception feedback for reliable picks and drops without training. Lift RS1 offers 360-degree safety coverage with primary and secondary safety sensing capabilities.



Seegrid Corporation

More online: [newequipment.com/55234744](https://newequipment.com/55234744)



Master Socket Bit Sets in 18, 26, or 36 Pieces

**Master Socket Bit Sets** include a 36-piece TORX Master socket bit set, a 26-piece Metrix Hex Master socket bit set, and an 18-piece Triple Square Master socket bit set. Each has a variety of both long and short bits, all packaged in a custom-cut foam tray that stores each tool. The foam tray is solvent-resistant, allows for easy access and organization of tools, and fits into most tool chests and drawers. Each tray features accented color coding based on its specific type, i.e. TORX (green), Metrix Hex (orange), and Triple Square (purple).

Mayhew Steel Products, Inc.

More online: [newequipment.com/55134212](https://newequipment.com/55134212)



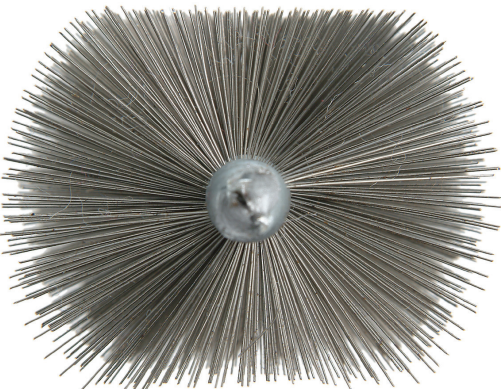
Modern Work Sneaker

The **Overton** is a modern work sneaker built with a wide toe and snug heel for a workday-enhancing fit. It has an athletic-level KEEN.ReGEN cushioning that provides up to 50% energy return with every step, lightweight carbon-fiber safety toes to protect without holding you back, and a slip-resistant, EH-rated rubber outsole for dependable footing on hard surfaces. A versatile, throwback-inspired work shoe, the Overton is available for men and women in several collar heights and colorways.

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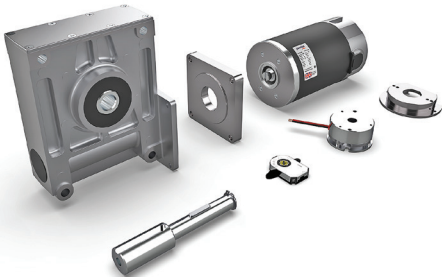


5-Axis Clamping Vises

**CP170 5-axis clamping vises** for workholding during 5-axis machining, comprise centering clamps, jaws, flex zero bases, and clamping pins. The self-centering vises, with center-moving jaws for stability, come in lengths of 5 and 7 in. (130 and 170 mm) and provide a clamping force of up to 4,500 lb (20 kN). Dovetail and serrated jaws are available in 79 mm lengths and in sets for the vises to hold the workpiece at two surfaces and provide positive clamping force.

Fixtureworks

More online: [newequipment.com/55234447](https://newequipment.com/55234447)



Modular Components Create Optimal Motor Drives

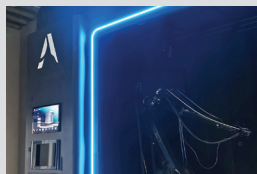
Parvalux by maxon has designed and manufactured a series of **modular components** that are easily mixed and matched so that users get a paired system from one manufacturer rather than piecing together components such as motors, gearheads, brakes, and encoders from various manufacturers. In a three-step selection process, designers can purchase a motor that's built to order using the company's online configuration platform. Designers can determine the required output performance, make a quick selection, and then fine-tune it using accessories including brakes, encoders, shaft extension kits, and controllers.

maxon precision motors, inc.

More online: [newequipment.com/55136419](https://newequipment.com/55136419)



FROM THE COVER



**Robotic Platform for Large-Scale Metal Parts**

**Vipra AM** is a robotic Direct Energy Deposition platform that transforms how large-scale metal parts are produced. It uses wire arc additive manufacturing processes, developed into a hardware, software, and automation proprietary turnkey system. The platform was created to maximize users' flexibility, control, and performance, expanding LFAM's possibilities to a broader range of applications.

There are two configurations of Vipra: Vipra XQ and Vipra XP.

Vipra XQ uses Plasma Arc Deposition to produce high-quality components with exceptional finishing and precision. It's ideal for large-scale, high-strength parts for sectors that need the ability to process a broad range of metals.

Vipra XP maximizes productivity and minimizes operating costs in large-scale metal projects. It's ideal for parts where lead times and lightweight are critical, offering more throughput.

**Caracol**

More online:  
[newequipment.com/55241671](http://newequipment.com/55241671)

**Intrinsically Safe, Highly Accurate, Ultrasonic Sensor RPS-429A-IS**

The **RPS-429AA-40P-IS2** sensor delivers unparalleled accuracy and reliability in distance measurement/object detection, with ATEX/IECE<sub>x</sub>, & C-UL-US certifications. It features the latest non-digital technology, eliminating bugs and error codes. It provides precise distance readings from 1 to 40 in (0.02 to 1,016 mm), making it ideal for industrial automation and tank level monitoring in the oil, gas, and mining industries. Featuring a 4-20mA 2-wire current loop design, the RPS-429AA-40P-IS2 will integrate with existing and new equipment.



**Migatron Corporation**

More online:  
[newequipment.com/55236236](http://newequipment.com/55236236)

**Membrane Bioreactor for Water Treatment**

The **TITAN MEM-BOX**, a packaged membrane process zone that transforms activated processes into fully functional MBRs, elevates conventional wastewater treatment plants to water resource recovery facilities by improving plant capacity, improving effluent quality, implementing water reuse to counter water scarcity, and meeting population growth and tightening permit demands. The membrane system eliminates the need for additional treatment basins and reduces project time and costs associated with concrete tank construction.

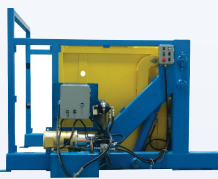


**Smith & Loveless, Inc.**

More online: [newequipment.com/55239090](http://newequipment.com/55239090)

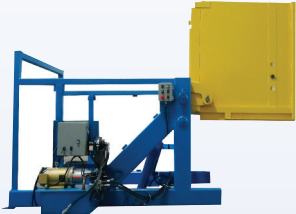


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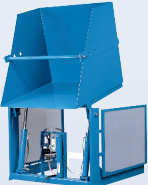
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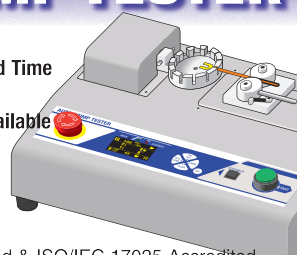
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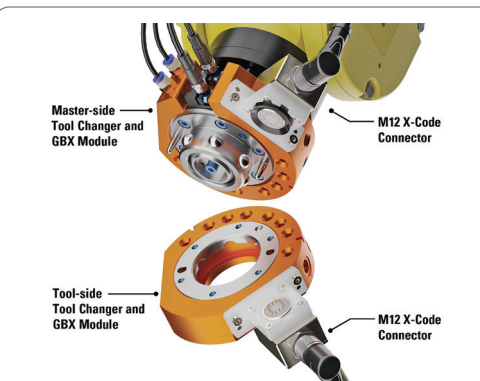


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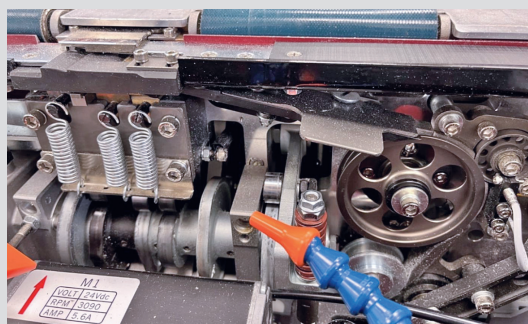
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## 3D Scanning Meets the Dentist's Chair

I recently had to get my first dental crown ever, and I was not thrilled about it. I have a hate-hate relationship with dentistry and don't understand why anyone would ever want to cause the pain that only nerves in your teeth can create. I've had numerous fillings over the years, but that has thankfully stopped being a topic of discussion at every cleaning.

Then the dentist informed me that one of my molars, which was mostly fillings at this point, needed a crown due to the old fillings degrading. He did offer that he could just refill the spot, but I would still need a crown in a couple of years. Being the smart adult I am, I decided to just get the crown and get it over with.

I walked into the office a nervous wreck after researching the crown process and seeing just how much drilling was going to take place, especially on a bottom tooth. If it had been a top tooth, I wouldn't have been as nervous since they're easier to numb. So I told my dentist to give me more Novocaine at the start because I've had too many instances where I tell them I'm not numb enough and it hurts, and then they begrudgingly give me another shot.

Thankfully, my dentist is smart and gave me 3 big ole shots. I would take those shots in my gums any day of the week over having to get a tooth drilled again.

The only upside to my visit was when they said they were going to scan my tooth for the crown mold and pulled out a 3D scanner that looked like an electric shaver. I was impressed and interested, but also numb and eager to get out of there as fast as possible.

While the 3D scanner was cool, I have a couple of critiques. First, even though it's smaller than industrial scanners, it still wasn't small enough to easily fit in my mouth. It seemed the actual camera or sensor was microscopic for such a big surface area, and it took about 10 minutes for them to scan each tiny angle of my tooth.

Second, I don't understand why 3D scanning still takes so long. You'd think the technology would be faster by now. No one wants to sit there with a giant electric shaver-like object keeping their mouth open in an uncomfortable position.

Regardless of my issues with the process, I was genuinely amazed and intrigued to see this technology being used in a dental setting, rather than just reading about it in an industrial context. It seems like every 6 months, my dentist has some new piece of tech they're using to get more accurate results, make processes easier, and be more transparent with patients.

Last year, they showed off their new camera that casts a live image of your mouth onto a TV in front of you while they're cleaning your teeth. Cool? Sure. Gross? Yes. I don't need to see the high-definition detail of my mouth, even if it is clean and cavity-free.

Seeing industrial tech like 3D scanners used in everyday settings like the dentist's office is always fun and interesting to me. Even though people's eyes tend to glaze over when I start talking about industrial technology, I can't help but get a little nerdy about it. After all, that's what I write about for a living. NED

— **Laura Davis**, Editor-in-Chief

# The Real-World Impact of Exoskeletons in the Workplace

by **Karl Zelik**, Chief Scientific Officer & Co-Founder — HeroWear

**P**reventing back injuries has been a hot topic within the modern workplace. Back pain is the leading cause of disability in 160 countries—and up to 80% of Americans experience it in their lifetime. In materials handling industries, repetitive bending and lifting puts tremendous strain on workers' backs, resulting in injury rates that far exceed those in the general public and other industries.

Exoskeletons, a kind of wearable assistive technology, are advancing rapidly. Over the past five years, academic studies and industry pilots have evaluated their effectiveness in reducing muscle activity, back strain, and leading indicators of injury risk. Based on these promising results, thousands of companies began exploring exoskeletons as a way to complement existing ergonomics programs. Now, there are growing accounts of larger exoskeleton deployments in the industry and new studies highlighting the economic, operational, and longitudinal impacts on worker safety and well-being.

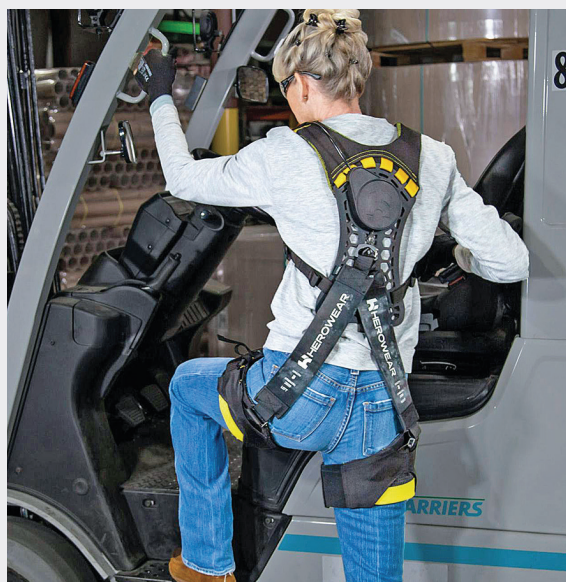
## Hollywood vs. Real-Life Exoskeletons

The term exoskeleton may conjure thoughts of futuristic superheroes like Iron Man or an association with heavy, bulky, rigid machinery worn on the body. In reality, most modern exoskeletons are lightweight, low profile, and flexible. Exosuits, a subclass of exoskeletons, even include solutions made primarily of elastic, flexible textiles. Many of these exosuits resemble safety harnesses or small backpacks and weigh less than a pair of work boots.

Exoskeletons act like an extra set of muscles to mitigate musculoskeletal loading, such as the repetitive strain that leads to back pain. While some are powered by motors and batteries, most use elastic bands or springs to assist specific parts of the body. Both classes of exoskeletons can provide substantial back relief during bending and lifting.

A key aspect of exoskeleton design is ensuring freedom of movement and comfort for workers who need to move quickly and operate equipment such as forklifts. This is part of the reason that the exoskeleton field has seen a recent shift toward lighter and softer devices like exosuits.

One leading ergonomics researcher, Dr. Maury Nussbaum of Virginia Tech, remarked in a recent keynote presentation that “the future of exoskeletons is soft.” He also noted that many workers he interacted with and studied in construction, mining, and other sectors have a clear message that they are more receptive to softer materials due to lasting comfort. Focusing on the users' priorities and daily tasks is important in designing and choosing devices.



## Longitudinal Data and the Impact of Exoskeletons on Injury Incidence

In a recent longitudinal study, workers in four distribution centers used exosuits regularly and worked for more than 281,000 hours. Those warehouses would have historically seen 10.5 back strain injuries during that time, but the workers using exosuits experienced zero injuries based on safety data shared by their employers.

These findings align with some prior longitudinal data on exoskeletons. For instance, one Toyota factory reported that after implementing shoulder exoskeletons on certain jobs, the injuries and associated workers' compensation costs dropped to zero for three years straight. Ford Motor Company also conducted an 18-month study with shoulder exoskeletons and found the number of medical visits among the exoskeleton group was 52% lower than the control group. However, more long-term research is still needed and the safety community continues to collect and analyze data from larger-scale, longer-term deployments of exoskeletons. Exoskeletons are part of a comprehensive ergonomics program—not a replacement for good ergonomic practices.

Exoskeletons offer a new way to support people who do physical work and to help them feel better at the end of the day. Within the hierarchy of ergonomic controls, some companies classify exoskeletons as administrative or engineering controls, while others treat them as personal protective equipment (PPE) or tools. There's growing evidence

that exoskeletons, when matched with the right jobs, can provide a strong return on investment (ROI), based on a combination of productivity gains, long-term injury education, ergonomic impacts, and associated costs.

## How to Deploy Exoskeletons for Your Workforce

Change management is important for the overall adoption and success of any new piece of equipment. Training users is an important part of this so that workers understand proper usage, as well as exoskeleton benefits and limitations. Proper fit of exoskeletons is also critical. There's a lot to learn from the history of PPE—and issues with one-size-fits-most approaches—which emphasizes the importance of wearables having appropriate sizing and adjustability to fit men and women of all different shapes and sizes.

Many people falsely assume exoskeletons must cost tens of thousands of dollars per worker. Admittedly, a few do. But many are closer to \$1,000 to \$3,000 per worker and can last for multiple years. Coupled with the fact that each injury prevented and every minute of productivity boost has the potential to save thousands of dollars per worker per year, there is a clear line to compelling ROI.

For instance, one recent industry study found that an exosuit increased warehouse worker productivity (cases picked per hour) by an average of 8%, while simultaneously reducing MSD injury incidence and employee turnover. In this study, each exosuit solution—including the device, training, and roll-out support—costs about \$1,500 to purchase outright. The measured productivity boost alone equated to estimated returns of about \$4,000/worker/year. Reductions in back injuries and turnover were estimated to save another \$3,000/worker/year. This example highlights that when the right type of exoskeleton is paired with the right type of job, there is potential for high ROI and a payback period in a matter of months. Finally, some exoskeleton manufacturers offer per-user subscription (or “Exos As A Service”) options that keep initial cost outlay modest.

Ultimately, determining how to balance what's best for your company and the safety of your workers is one of the most important decisions you can make as a business or safety leader. Fortunately, exoskeletons are emerging as a tool that may empower leaders to help both workers and the bottom line at the same time. **NED**

[Read the full article: newequipment.com/55241193](https://www.newequipment.com/55241193)





# Versa Pullers



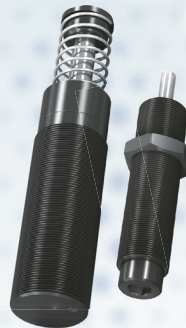
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Email: [Sales@versamachinery.com](mailto:Sales@versamachinery.com)



# WHEN PERFORMANCE MATTERS

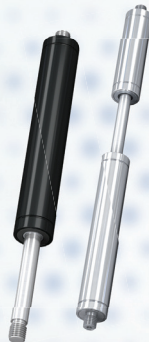
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## AUTOMATION CONTROL



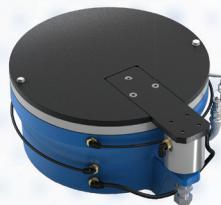
- INDUSTRIAL SHOCK ABSORBERS
- MINIATURE SHOCK ABSORBERS
- HEAVY DUTY SHOCK ABSORBERS
- PROFILE DAMPERS

## MOTION CONTROL



- INDUSTRIAL GAS SPRINGS
- HYDRAULIC DAMPERS
- HYDRAULIC FEED CONTROLS
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## 2025 CALENDAR

### JANUARY

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 1  |     |     |     | 1   | 2   | 3   | 4   |
| 2  | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
| 3  | 12  | 13  | 14  | 15  | 16  | 17  | 18  |
| 4  | 19  | 20  | 21  | 22  | 23  | 24  | 25  |
| 5  | 26  | 27  | 28  | 29  | 30  | 31  |     |

### JUNE

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
| 24 | 8   | 9   | 10  | 11  | 12  | 13  | 14  |
| 25 | 15  | 16  | 17  | 18  | 19  | 20  | 21  |
| 26 | 22  | 23  | 24  | 25  | 26  | 27  | 28  |
| 27 | 29  | 30  |     |     |     |     |     |

### NOVEMBER

| WK | SUN   | MON | TUE | WED | THU | FRI | SAT |
|----|-------|-----|-----|-----|-----|-----|-----|
| 44 |       |     |     |     |     |     | 1   |
| 45 | 2     | 3   | 4   | 5   | 6   | 7   | 8   |
| 46 | 9     | 10  | 11  | 12  | 13  | 14  | 15  |
| 47 | 16    | 17  | 18  | 19  | 20  | 21  | 22  |
| 48 | 23/30 | 24  | 25  | 26  | 27  | 28  | 29  |

### FEBRUARY

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 5  |     |     |     |     |     |     | 1   |
| 6  | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| 7  | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
| 8  | 16  | 17  | 18  | 19  | 20  | 21  | 22  |
| 9  | 23  | 24  | 25  | 26  | 27  | 28  |     |

### JULY

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 27 |     |     | 1   | 2   | 3   | 4   | 5   |
| 28 | 6   | 7   | 8   | 9   | 10  | 11  | 12  |
| 29 | 13  | 14  | 15  | 16  | 17  | 18  | 19  |
| 30 | 20  | 21  | 22  | 23  | 24  | 25  | 26  |
| 31 | 27  | 28  | 29  | 30  | 31  |     |     |

### DECEMBER

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 49 |     | 1   | 2   | 3   | 4   | 5   | 6   |
| 50 | 7   | 8   | 9   | 10  | 11  | 12  | 13  |
| 51 | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
| 52 | 21  | 22  | 23  | 24  | 25  | 26  | 27  |
| 53 | 28  | 29  | 30  | 31  |     |     |     |

### MARCH

| WK | SUN   | MON   | TUE | WED | THU | FRI | SAT |
|----|-------|-------|-----|-----|-----|-----|-----|
| 9  |       |       |     |     |     |     | 1   |
| 10 | 2     | 3     | 4   | 5   | 6   | 7   | 8   |
| 11 | 9     | 10    | 11  | 12  | 13  | 14  | 15  |
| 12 | 16    | 17    | 18  | 19  | 20  | 21  | 22  |
| 13 | 23/30 | 24/31 | 25  | 26  | 27  | 28  | 29  |

### AUGUST

| WK | SUN   | MON | TUE | WED | THU | FRI | SAT |
|----|-------|-----|-----|-----|-----|-----|-----|
| 31 |       |     |     |     |     | 1   | 2   |
| 32 | 3     | 4   | 5   | 6   | 7   | 8   | 9   |
| 33 | 10    | 11  | 12  | 13  | 14  | 15  | 16  |
| 34 | 17    | 18  | 19  | 20  | 21  | 22  | 23  |
| 35 | 24/31 | 25  | 26  | 27  | 28  | 29  | 30  |

### 2026 JANUARY 2026

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 1  |     |     |     |     | 1   | 2   | 3   |
| 2  | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 3  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
| 4  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| 5  | 25  | 26  | 27  | 28  | 29  | 30  | 31  |

### APRIL

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 14 |     |     | 1   | 2   | 3   | 4   | 5   |
| 15 | 6   | 7   | 8   | 9   | 10  | 11  | 12  |
| 16 | 13  | 14  | 15  | 16  | 17  | 18  | 19  |
| 17 | 20  | 21  | 22  | 23  | 24  | 25  | 26  |
| 18 | 27  | 28  | 29  | 30  |     |     |     |

### SEPTEMBER

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 36 |     | 1   | 2   | 3   | 4   | 5   | 6   |
| 37 | 7   | 8   | 9   | 10  | 11  | 12  | 13  |
| 38 | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
| 39 | 21  | 22  | 23  | 24  | 25  | 26  | 27  |
| 40 | 28  | 29  | 30  |     |     |     |     |

### 2026 FEBRUARY 2026

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 6  | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
| 7  | 8   | 9   | 10  | 11  | 12  | 13  | 14  |
| 8  | 15  | 16  | 17  | 18  | 19  | 20  | 21  |
| 9  | 22  | 23  | 24  | 25  | 26  | 27  | 28  |

### MAY

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 18 |     |     |     |     | 1   | 2   | 3   |
| 19 | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 20 | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
| 21 | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| 22 | 25  | 26  | 27  | 28  | 29  | 30  | 31  |

### OCTOBER

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 40 |     |     |     | 1   | 2   | 3   | 4   |
| 41 | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
| 42 | 12  | 13  | 14  | 15  | 16  | 17  | 18  |
| 43 | 19  | 20  | 21  | 22  | 23  | 24  | 25  |
| 44 | 26  | 27  | 28  | 29  | 30  | 31  |     |

### 2026 MARCH 2026

| WK | SUN | MON | TUE | WED | THU | FRI | SAT |
|----|-----|-----|-----|-----|-----|-----|-----|
| 10 | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
| 11 | 8   | 9   | 10  | 11  | 12  | 13  | 14  |
| 12 | 15  | 16  | 17  | 18  | 19  | 20  | 21  |
| 13 | 22  | 23  | 24  | 25  | 26  | 27  | 28  |
| 14 | 29  | 30  | 31  |     |     |     |     |



## DECIMAL & MILLIMETER EQUIVALENTS

|                 | DECIMALS        | MILLIMETERS           |
|-----------------|-----------------|-----------------------|
|                 | $\frac{1}{64}$  | 0.015625 — 0.397      |
|                 | $\frac{1}{32}$  | .03125 — 0.794        |
|                 | $\frac{3}{64}$  | .046875 — 1.191       |
| $\frac{1}{16}$  |                 | <b>.0625 — 1.588</b>  |
|                 | $\frac{5}{64}$  | .078125 — 1.984       |
| $\frac{3}{32}$  |                 | .09375 — 2.381        |
|                 | $\frac{7}{64}$  | .109375 — 2.778       |
| $\frac{1}{8}$   |                 | <b>.1250 — 3.175</b>  |
|                 | $\frac{9}{64}$  | .140625 — 3.572       |
| $\frac{5}{32}$  |                 | .15625 — 3.969        |
|                 | $\frac{11}{64}$ | .171875 — 4.366       |
| $\frac{3}{16}$  |                 | <b>.1875 — 4.763</b>  |
|                 | $\frac{13}{64}$ | .203125 — 5.159       |
| $\frac{7}{32}$  |                 | .21875 — 5.556        |
|                 | $\frac{15}{64}$ | .234375 — 5.953       |
| $\frac{1}{4}$   |                 | <b>.2500 — 6.350</b>  |
|                 | $\frac{17}{64}$ | .265625 — 6.747       |
| $\frac{9}{32}$  |                 | .28125 — 7.144        |
|                 | $\frac{19}{64}$ | .296875 — 7.541       |
| $\frac{5}{16}$  |                 | <b>.3125 — 7.938</b>  |
|                 | $\frac{21}{64}$ | .328125 — 8.334       |
| $\frac{11}{32}$ |                 | .34375 — 8.731        |
|                 | $\frac{23}{64}$ | .359375 — 9.128       |
| $\frac{3}{8}$   |                 | <b>.3750 — 9.525</b>  |
|                 | $\frac{25}{64}$ | .390625 — 9.922       |
| $\frac{13}{32}$ |                 | .40625 — 10.319       |
|                 | $\frac{27}{64}$ | .421875 — 10.716      |
| $\frac{7}{16}$  |                 | <b>.4375 — 11.113</b> |
|                 | $\frac{29}{64}$ | .453125 — 11.509      |
| $\frac{15}{32}$ |                 | .46875 — 11.906       |
|                 | $\frac{31}{64}$ | .484375 — 12.303      |
| $\frac{1}{2}$   |                 | <b>.5000 — 12.700</b> |

1 mm = .03937"

|                 | DECIMALS        | MILLIMETERS           |
|-----------------|-----------------|-----------------------|
|                 | $\frac{33}{64}$ | 0.515625 — 13.097     |
|                 | $\frac{17}{32}$ | .53125 — 13.494       |
|                 | $\frac{35}{64}$ | .546875 — 13.891      |
| $\frac{9}{16}$  |                 | <b>.5625 — 14.288</b> |
|                 | $\frac{37}{64}$ | .578125 — 14.684      |
| $\frac{19}{32}$ |                 | .59375 — 15.081       |
|                 | $\frac{39}{64}$ | .609375 — 15.478      |
| $\frac{5}{8}$   |                 | <b>.6250 — 15.875</b> |
|                 | $\frac{41}{64}$ | .640625 — 16.272      |
| $\frac{21}{32}$ |                 | .65625 — 16.669       |
|                 | $\frac{43}{64}$ | .671875 — 17.066      |
| $\frac{11}{16}$ |                 | <b>.6875 — 17.463</b> |
|                 | $\frac{45}{64}$ | .703125 — 17.859      |
| $\frac{23}{32}$ |                 | .71875 — 18.256       |
|                 | $\frac{47}{64}$ | .734375 — 18.653      |
| $\frac{3}{4}$   |                 | <b>.7500 — 19.050</b> |
|                 | $\frac{49}{64}$ | .765625 — 19.447      |
| $\frac{25}{32}$ |                 | .78125 — 19.844       |
|                 | $\frac{51}{64}$ | .796875 — 20.241      |
| $\frac{13}{16}$ |                 | <b>.8125 — 20.638</b> |
|                 | $\frac{53}{64}$ | .828125 — 21.034      |
| $\frac{27}{32}$ |                 | .84375 — 21.431       |
|                 | $\frac{55}{64}$ | .859375 — 21.828      |
| $\frac{7}{8}$   |                 | <b>.8750 — 22.225</b> |
|                 | $\frac{57}{64}$ | .890625 — 22.622      |
| $\frac{29}{32}$ |                 | .90625 — 23.019       |
|                 | $\frac{59}{64}$ | .921875 — 23.416      |
| $\frac{15}{16}$ |                 | <b>.9375 — 23.813</b> |
|                 | $\frac{61}{64}$ | .953125 — 24.209      |
| $\frac{31}{32}$ |                 | .96875 — 24.606       |
|                 | $\frac{63}{64}$ | .984375 — 25.003      |
| <b>1</b>        |                 | <b>1.000 — 25.400</b> |

.001" = .0254 mm

| MM   | INCHES | MM    | INCHES |
|------|--------|-------|--------|
| .1 — | .0039  | 46 —  | 1.8110 |
| .2 — | .0079  | 47 —  | 1.8504 |
| .3 — | .0118  | 48 —  | 1.8898 |
| .4 — | .0157  | 49 —  | 1.9291 |
| .5 — | .0197  | 50 —  | 1.9685 |
| .6 — | .0236  | 51 —  | 2.0079 |
| .7 — | .0276  | 52 —  | 2.0472 |
| .8 — | .0315  | 53 —  | 2.0866 |
| .9 — | .0354  | 54 —  | 2.1260 |
| 1 —  | .0394  | 55 —  | 2.1654 |
| 2 —  | .0787  | 56 —  | 2.2047 |
| 3 —  | .1181  | 57 —  | 2.2441 |
| 4 —  | .1575  | 58 —  | 2.2835 |
| 5 —  | .1969  | 59 —  | 2.3228 |
| 6 —  | .2362  | 60 —  | 2.3622 |
| 7 —  | .2756  | 61 —  | 2.4016 |
| 8 —  | .3150  | 62 —  | 2.4409 |
| 9 —  | .3543  | 63 —  | 2.4803 |
| 10 — | .3937  | 64 —  | 2.5197 |
| 11 — | .4331  | 65 —  | 2.5591 |
| 12 — | .4724  | 66 —  | 2.5984 |
| 13 — | .5118  | 67 —  | 2.6378 |
| 14 — | .5512  | 68 —  | 2.6772 |
| 15 — | .5906  | 69 —  | 2.7165 |
| 16 — | .6299  | 70 —  | 2.7559 |
| 17 — | .6693  | 71 —  | 2.7953 |
| 18 — | .7087  | 72 —  | 2.8346 |
| 19 — | .7480  | 73 —  | 2.8740 |
| 20 — | .7874  | 74 —  | 2.9134 |
| 21 — | .8268  | 75 —  | 2.9528 |
| 22 — | .8661  | 76 —  | 2.9921 |
| 23 — | .9055  | 77 —  | 3.0315 |
| 24 — | .9449  | 78 —  | 3.0709 |
| 25 — | .9843  | 79 —  | 3.1102 |
| 26 — | 1.0236 | 80 —  | 3.1496 |
| 27 — | 1.0630 | 81 —  | 3.1890 |
| 28 — | 1.1024 | 82 —  | 3.2283 |
| 29 — | 1.1417 | 83 —  | 3.2677 |
| 30 — | 1.1811 | 84 —  | 3.3071 |
| 31 — | 1.2205 | 85 —  | 3.3465 |
| 32 — | 1.2598 | 86 —  | 3.3858 |
| 33 — | 1.2992 | 87 —  | 3.4252 |
| 34 — | 1.3386 | 88 —  | 3.4646 |
| 35 — | 1.3780 | 89 —  | 3.5039 |
| 36 — | 1.4173 | 90 —  | 3.5433 |
| 37 — | 1.4567 | 91 —  | 3.5827 |
| 38 — | 1.4961 | 92 —  | 3.6220 |
| 39 — | 1.5354 | 93 —  | 3.6614 |
| 40 — | 1.5748 | 94 —  | 3.7008 |
| 41 — | 1.6142 | 95 —  | 3.7402 |
| 42 — | 1.6535 | 96 —  | 3.7795 |
| 43 — | 1.6929 | 97 —  | 3.8189 |
| 44 — | 1.7323 | 98 —  | 3.8583 |
| 45 — | 1.7717 | 99 —  | 3.8976 |
|      |        | 100 — | 3.9370 |