

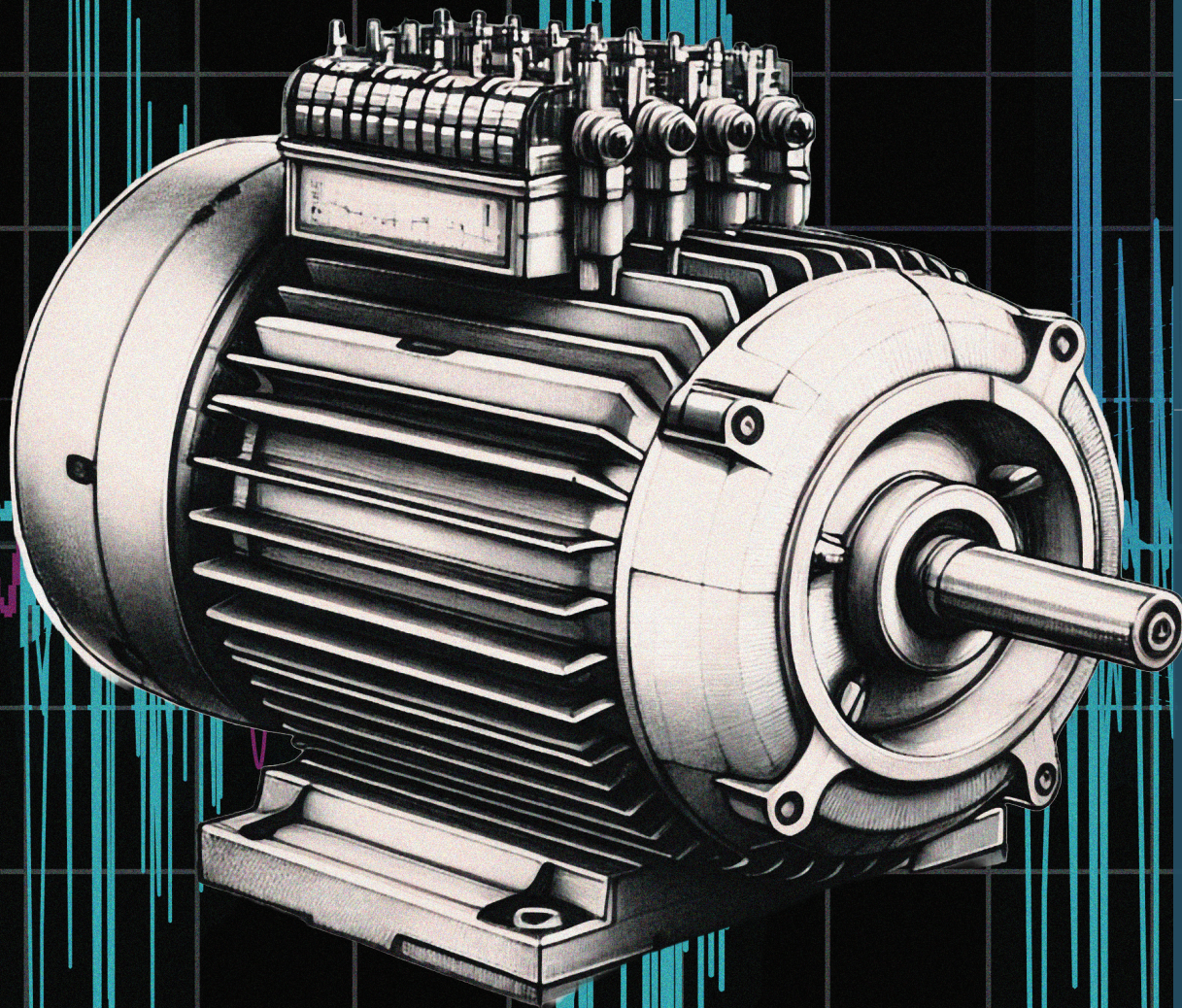
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2025

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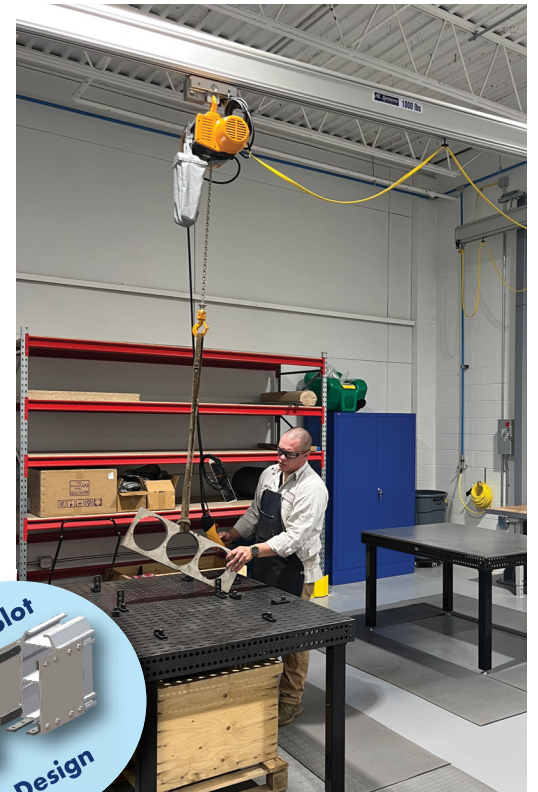
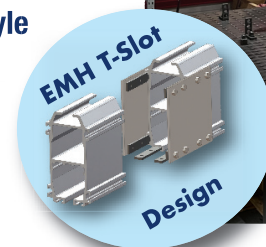
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YOUR WORKSTATION & FREESTANDING CRANE SOLUTION SOURCE... LOADS FROM 25 LBS. TO 20 TONS

Why AL SYSTEMS™ Workstation Cranes Work Better

With light weight track profiles and an exclusive EMH T-Slot design, AL Systems safely and efficiently handle a wide variety of lifters and handling devices. They are also easily configured to suit almost any application need. Plus, because the rail sections are surface treated and anodized, AL Systems Workstation Cranes are virtually maintenance-free.

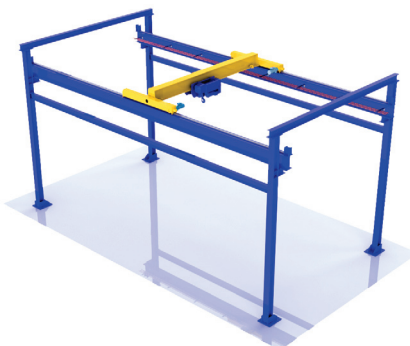
AL SYSTEMS Workstation Cranes are ideal for lighter weight installations, from 25 lbs up to 2,200 lbs. Also, ask about new AL-1 lightweight aluminum rails with capacities up to 500 lbs.



Why NOMAD® Freestanding Cranes Are Better Solutions

When manufacturing needs change, crane needs may change as well. Don't lock in your decision for crane location into a building structure. Modular NOMAD® Freestanding Crane Systems are also perfect solutions when overhead crane installation is either difficult or impractical. With bolted assembly, the NOMAD is easily dismantled, relocated and reassembled.

NOMAD® Freestanding Cranes easily handle capacities up to 10 tons. For even more capacity, up to 20 tons and 60-foot spans, ask about new NOMAD® XW Freestanding Cranes.



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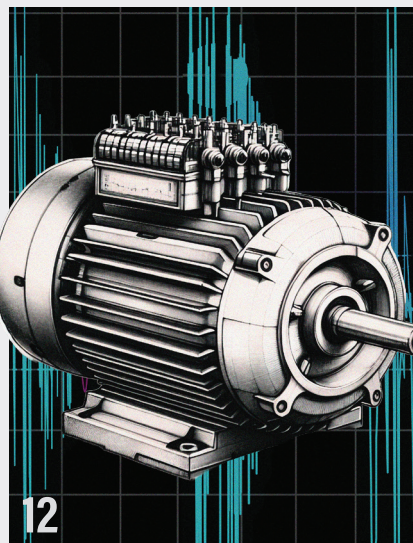
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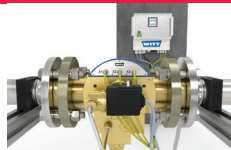
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Witt's COLDSTOP SMART dome-loaded pressure regulator stops gas flow if temperatures drop below a setpoint.

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ABB's IRB 1200 robots feature a lighter design and access to AI-powered software.

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K-Tool International's 1" air impact wrench includes a variable speed trigger and side handle for precision control.

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Bosch Rexroth's EcoSafe safety fences feature adjustable angles using a hinged universal foot for flexible, non-linear layouts.

WHEN PRECISION MATTERS.

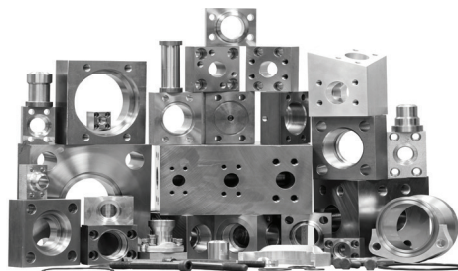


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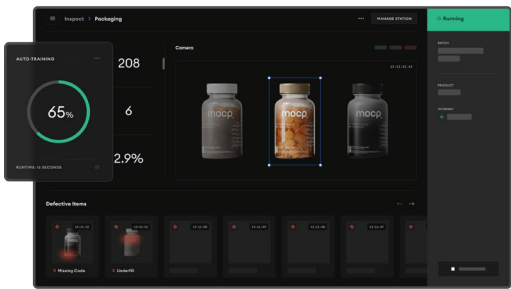
SELF POWERED ENGINE DIGITAL TACH/MAINTENANCE HOUR METER PT17 SERIES

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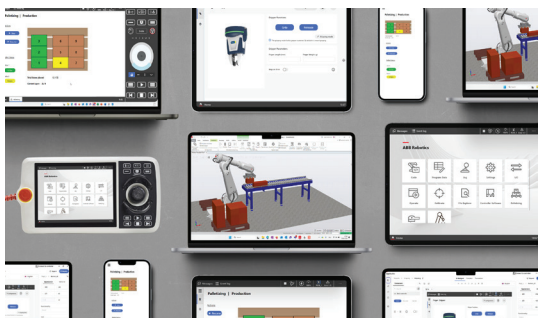


AI System Teaches Itself to Detect Defects

VisionStream is a machine vision inspection system that uses AI to learn directly from production lines in real time. It requires no labeled data, production stoppages, or operator input. The system can detect up to 99.9% of defects—subtle or unexpected—within seconds of observation. It supports integration with existing cameras and factory systems, making it suitable for short runs and high-mix lines.

Elementary

More online: newequipment.com/55298683



No-Code Tool Speeds Robot UI Setup

AppStudio is a no-code software platform that lets users quickly build and deploy custom robotic user interfaces without programming experience. Compatible with all robots on the OmniCore controller, it features drag-and-drop tools and a collaborative cloud-based library to reduce setup times by up to 80%. Interfaces can be tailored for devices like Flex-Pendant, tablets, or phones, and deployed to physical robots or digital twins in simulation environments.

ABB

More online: newequipment.com/55274624



Tool Maintenance Kit With Storage

The **256-Piece General Maintenance Kit** offers technicians a wide selection of tools including 14.4V and 18V impact wrenches, multiple drive sockets, wrenches, pliers, screwdrivers, and specialty tools. Packed in a heavy-duty hinged road chest with foam cutouts, it provides easy access and organization for use on the road or at job sites.

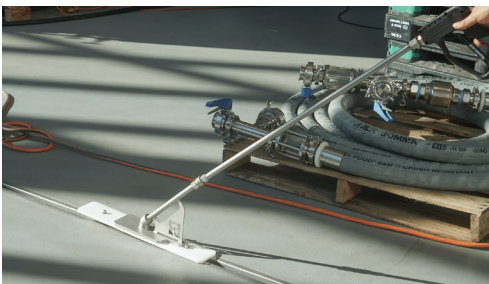
Snap-on Tools

More online: newequipment.com/55296881

Drain Cleaning Tool Reduces Floor Hazards

The **Slot Dog** is a high-pressure, water-based drain cleaning tool designed for slot drains used in food & beverage processing. It connects directly to the drain using a quick-release mechanism, isolating water below grade to prevent surface spills. A built-in guide ensures the nozzle aligns for precise spray coverage, removing debris and standing water. The stainless steel design allows use with extreme water temperatures.

Global Drain Technologies (GDT)



More online: newequipment.com/55287344



Press Tool and Jaw Kit Supports HVACR Installs

The **24kN press tool and jaw kit** is designed for crimping copper press fittings in HVACR systems rated up to 700 psi. The compact, one-handed tool includes two 20V MAX 2.0 Ah batteries, a charger, strap, and six jaw sizes from 1/4 to 7/8 in. The galvanized jaws resist corrosion and are compatible with NIBCO PressACR fittings.

DEWALT

More online: newequipment.com/55296864



Modular Placement System Delivers High-Speed Accuracy

The **NPM-GW Modular Placement Machine** is a high-speed placement system designed for electronics manufacturing environments that demand precision and flexibility. Capable of placing up to 104,000 components/h with ± 0.00098 in ($\pm 25 \mu\text{m}$) accuracy, it supports a wide range of component sizes and PCB formats. Features include predictive maintenance, smart feeders, and integration with AI-driven production planning tools for continuous operation.

Panasonic Corporation of North America

More online: newequipment.com/55293193



Shop Floor CMMs Offer High Accuracy

Altera SF coordinate measuring machines are bridge-type CMMs designed for high-accuracy inspection directly on the production floor. With large measuring volumes and robust construction, they enable rapid, in-place quality control of bulky components. Features include ceramic bridges, glass-ceramic optical scales with zero thermal expansion, and optional 5-axis scanning. Active vibration damping and thermal compensation ensure consistent performance in uncontrolled environments.

LK Metrology

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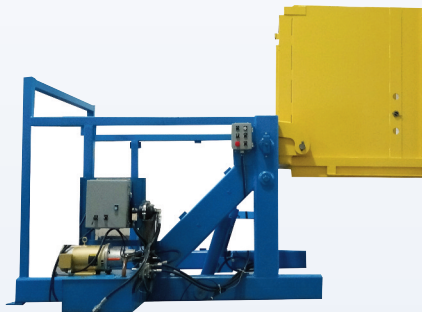
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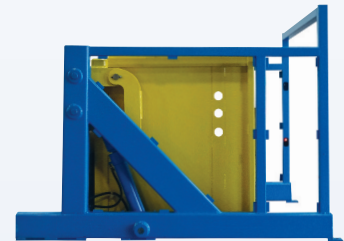
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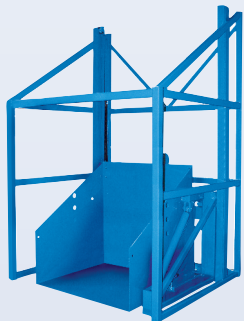
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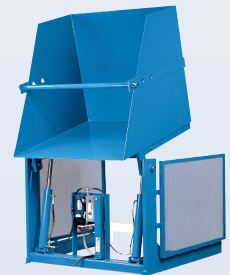
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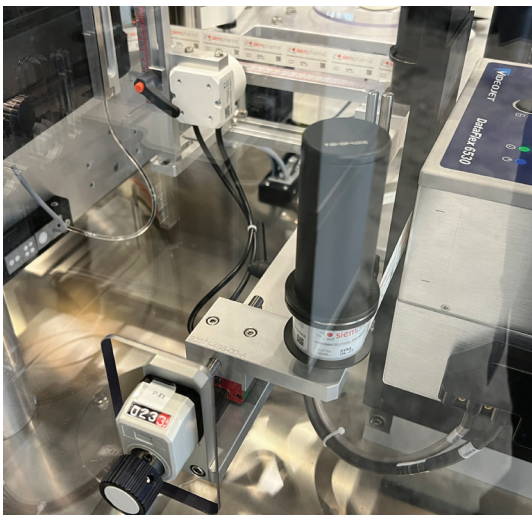


Belt-Fed Optical Sorter Improves Food Safety

The **COMPASS belt-fed optical sorter** detects and removes foreign material and product defects for wet, sticky, and delicate foods. This belt-fed version handles produce, snack foods, and other products that are not suitable for chute-fed sorters. Its horizontal belt configuration provides gentle handling to reduce breakage and lowers installation costs by minimizing elevation changes. Customizable cameras and up to eight channels of multispectral sensor data allow it to find more and smaller defects than conventional three-channel cameras, often removing the need for laser or hyperspectral sensors.

Key Technology

More online: newequipment.com/55303473



Labeling Machine Enables Quick Changeovers

The **ETF-300 Labeling Machine** is a high-speed automatic system for applying labels to cylindrical pharmaceutical containers such as bottles and jars. It handles containers up to 7 in (180 mm) tall and applies labels as wide as 4 in (100 mm) at speeds of up to 260 ft/min (80 m/min). Changeovers take just 15 to 30 minutes, and the system supports multiple printing methods and track-and-trace integration.

Antares Vision Group

More online: newequipment.com/55306739

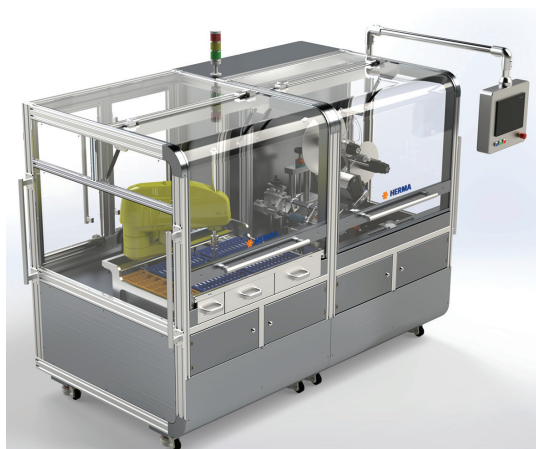


Modular Palletizer Offers Highest Stack Reach

The **Rapid Series Palletizer** is a modular end-of-line automation system that supports stacking heights up to 11 ft (3 m) and payloads up to 308 lb (140 kg). Compatible with cobots and articulated robots, it handles bags, boxes, trays, and pails. It features plug-and-play mobility, unlimited SKU support, integrated analytics, and live video support within 10 minutes for fast deployment and 24/7 remote diagnostics.

Vention

More online: newequipment.com/55304043



Labeling Cell Automates Small-Batch Handling

The **211 HC RC** is a robotics-assisted labeling cell designed for wrap-around labeling of unstable pharmaceutical products such as syringes, vials, pens, and carpules. It performs up to 20 labeling and inspection cycles per minute and eliminates manual handling using a robot with a hygienic gripper and an integrated tray system. Configurable for variable data printing, it offers scalability, ISO class 5 compliance, and reduced risk of labeling errors.

HERMA USA

More online: newequipment.com/55304182



Tablet Counter Handles 200 Bottles/Minute

The **CFE tablet counter** is a compact solid-dose counting and filling system for pharmaceutical and nutraceutical applications. It integrates bottle handling and controls with counting technology to deliver up to 200 bottles/minute with 100% counting accuracy. It can handle coated and uncoated tablets, capsules, and softgels, filling round, oval, or rectangular bottles made of plastic or glass. It's available with 3 or 4 counting modules and 6 discharge channels. Bottle handling provides smooth infeed, rejection, and outfeed, with up to 40 ft (12 m) of uninterrupted conveyor available for integration with upstream and downstream equipment.

NJM Packaging

More online: newequipment.com/55303471

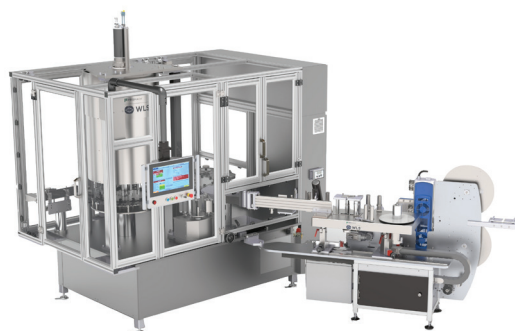


Touch-Screen Terminal Enhances Heat Seal Control

The **PIREG-548 Touch-Screen Interface Terminal** is a panel-mounted display that connects with PIREG-C2 heat seal controllers to provide real-time graphical and numerical temperature readings. It enables sealing temperature settings and calibration through the display, with optional thermocouple integration for advanced calibration. The terminal reads heat sealing band resistance directly, ensuring fast, accurate temperature response and seamless PLC integration.

TOSS Machine Components, Inc.

More online: newequipment.com/55308175



Syringe Systems Improve Label Accuracy

PR-12 and PR-24 are syringe plunger rod insertion and labeling systems that combine two critical operations into one compact unit. With automated torque regulation and compensation for plunger placement variation, they ensure consistent rod seating without disrupting seal integrity. Labeling is performed in continuous motion using a vacuum drum for precise application and reduced web break, supporting speeds up to 600 syringes/min.

WLS

More online: newequipment.com/55304153



X-ray Scanner Detects Leaks, Contaminants

The **SC-S 5020 X-ray Scanner** is an in-line inspection system for sealed bottles, jars, and cans in food & beverage production. It detects microleaks as small as 0.1 mm, verifies fill levels, identifies foreign objects, and confirms cap or lid placement. Dual-view detectors with multiple beam angle options ensure full product coverage, while segment-based analysis enables high-speed, accurate inspection at up to 1,200 items/min.

WIPOTEC-OCS Inc.

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High Flow, Flexible Pneumatic Valves

AVENTICS Series XV pneumatic valves are designed for flexible and cost-effective performance in factory automation, automotive & tire, and food & packaging applications. The valves deliver higher flow rates in a compact package, helping boost productivity and customization. The Series XV includes the XV03 with up to 12.4 scfm (350 NL/min) and the XV05 with up to 31.1 scfm (880 NL/min). Consistent interfaces, metal threads, parallel wiring, and wide fieldbus protocol support simplify system design and integration.

Emerson Electric Co.

More online: newequipment.com/55301056



Powder Test System Streamlines QA
The **Powder Testing Workstation PTW** and **Powder Testing Assistant PTA 100i** are modular systems designed to evaluate powder flowability using 6 standard methods in one unit: Angle of repose, flow through an orifice via cylinder or funnel, shear cell, and Scott Volumeter for bulk density measurements. With automated measurement, real-time guidance, and support for ISO, ASTM, USP, and Ph. Eur. standards, these tools help users improve accuracy and streamline workflows across industries such as pharmaceuticals, food, metals, and chemicals.

Copley Scientific Ltd.
More online: newequipment.com/55304904



Autonomous Pallet Streamlines Logistics
The **Logic Pallet** is an autonomous mobile robotic pallet that replaces traditional pallets and forklifts to automate goods movement within and between facilities. Designed to handle boxed consumer goods and food, it supports 2,000 lb (910 kg) payloads, runs up to 160 h/charge, and enables aisleless storage layouts. Real-time inventory visibility, self-loading capabilities, and rapid trailer unloading reduce labor demands and improve throughput.

Logic Robotics
More online: newequipment.com/55291670



Energy Storage System Reduces Power Use
The **Center L Ultra** is a liquid-cooled energy storage system that delivers 6.25 MWh in a standard 20 ft (6 m) container. Designed for 2 to 8 h storage applications, it features dual-battery compatibility and an intelligent cooling system that cuts auxiliary power use by 30%. Its built-in thermal management, predictive safety tech, and quick grid connection make it suitable for diverse environments.

Narada Power Source Co., Ltd.
More online: newequipment.com/55301078



Labeling System Streamlines Batch Changeovers
The **LABELQ Print and Inspection Verification System** is a labeling platform that integrates printing, inspection, and reconciliation for regulated manufacturers. It offers 100% automatic inspection with real-time feedback and a two-touch changeover to reduce downtime. Designed for batch sizes from 50 to 50,000, the system supports full traceability and compliance with 21 CFR Part 11 while minimizing manual tasks and label errors.

Verista
More online: newequipment.com/55292294

AI Cleaning Robot Maps and Re-Cleans Floors
PUDU CC1 Pro is an AI-powered autonomous cleaning robot that combines sweeping, scrubbing, vacuuming, and dust-mopping into one system. Designed for large commercial environments, it uses a rear AI camera to detect floor stains in real time and automatically re-clean affected areas. Adaptive cleaning modes optimize performance by adjusting to dirt levels and floor types, while built-in heat maps and dashboards enhance operational transparency.

Pudu Robotics US

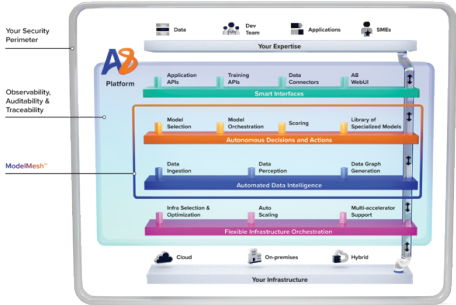
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Multi-Agent GenAI Platform Streamlines Aerospace Engineering Challenges
Articul8's **multi-agent domain-specific AI platform** is a next-generation system designed to help aerospace manufacturers detect, resolve, and prevent engineering integration issues across design, modeling, and production, without halting operations. Demonstrated at the 2025 Paris Air Show, the platform orchestrates a team of autonomous agents—each powered by domain-specific models from the A8-Supply-Chain family and coordinated by the company's proprietary ModelMesh reasoning engine. The platform enhances and operationalizes Articul8's domain-specific GenAI architecture by combining real-time coordination, embedded reasoning, and system-wide auditability—all without requiring structured data or custom model tuning.

Articul8, Inc.

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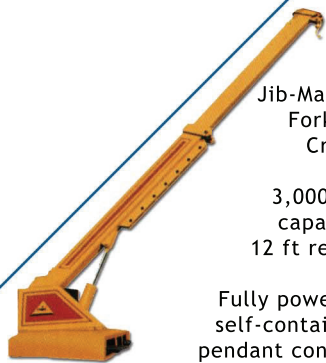
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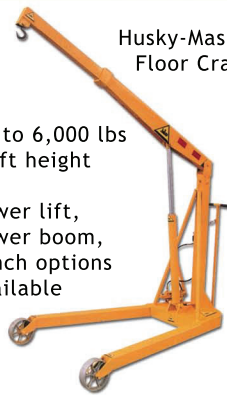
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available



Lift Tables

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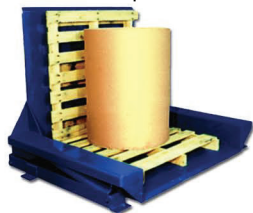
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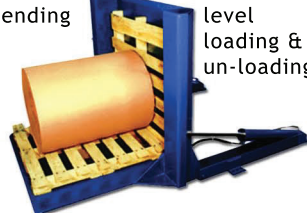
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Straddle Crane



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Keep Your Systems and Components in Line

Developments in alignment technology are a boon to manufacturers.

by Sheila Kennedy, CMRP

The importance of proper alignment to manufacturing reliability, efficiency, and quality cannot be overstated. Making alignment processes easier and more precise is a key goal of machine and system designers. Shaft and bore alignment, optical assembly alignment, and 3D-printing alignment are some of the processes seeing improvements.

Alignment System Capabilities

Efficient and effective features are in demand, and **X-Series Laser Shaft Alignment systems from Hamar Laser Instruments** remove the need to perform a rough-in. “Part of the pre-alignment checklist is a rough alignment when setting up the system to take data. With our X-Series tools, it is unnecessary due to the dual beams pointing in the same direction, angularity built into the

heads, and the fact that we have one of the largest position sensing detectors (PSD) on the market,” explains Terry Southall, global brand and distribution manager at Hamar Laser Instruments.

Technicians using X-Series systems outdoors benefit from Light Shield with Narrow-Band Filter technology, which blocks out 97 to 98% of UV sunlight that would otherwise interfere with the infrared (IR) light of the laser beam, adds Southall.

For the **AT-300 digital line laser system and AT-400 high-end dual-axis shaft alignment system from Acoem**, a new Shim Simulator feature is available to optimize machine alignment. Used during machine setup, it allows users to instantly preview how different shims affect coupling alignment, enabling them to make informed decisions.

The Shim Simulator is provided as a function of the Acoem HSA app, a companion app for performing horizontal shaft alignment, and is powered by the company’s GuideU interface. As users adjust shim values up or down in the app, they are promptly shown the effect on alignment so they can fine-tune the setup accordingly

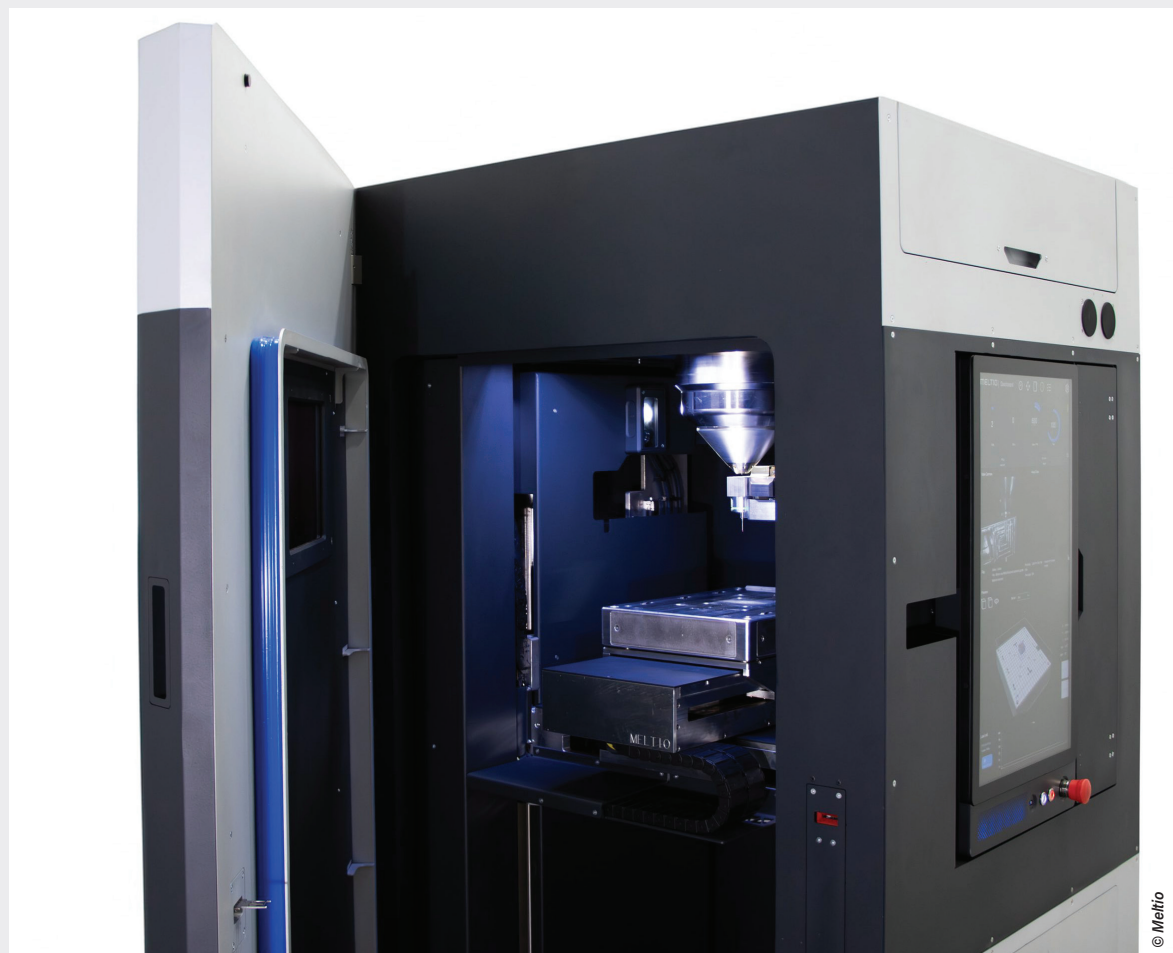
The **XT950 Bore alignment system from Easy-Laser** measures the straightness of bore centerlines, bearing journals, and cylindrical components. Designed for applications such as engines, gearboxes, and compressors, it accurately measures bore sizes between 80 and 500 mm (3.15 to 19.68 in). The XT Alignment app’s Bore Center program, which measures from 3 to 50 points at each position for high accuracy, walks the user through the measurement process.



Acoem’s AT-400 Shaft Alignment System features 2-axis PSD alignment sensors, dual sweep, and dual multipoint methods, ensuring accurate alignment over a 65 ft (20 m) measuring distance.



Easy-Laser’s XT950 bore alignment system ensures reliability with a resolution of 0.001 mm (0.05 mils) over distances up to 130 ft (40 m).



Meltio’s M600 uses welding wire as its feedstock instead of powder, creating a cheaper and safer 3D printer that also doesn’t risk contaminating CNC Machines.



MRSI's MRSI-A-L Active Aligner offers precise control over reflective surface angles, laser beam profile measurement & processing, and 1 μm accuracy laser height detection functions.

“Laser-based bore measurement with the Easy-Laser XT950 provides the utmost in accuracy and operator-independent repeatability,” observes Daus Studenberg, product manager for Ludeca, Easy-Laser’s U.S. distributor. “With a simple setup, data can be taken promptly without concern for wire sag, making the whole job more efficient and less time-consuming.”

For optical components assembly, the **MRSI-A-L Active Aligner from MRSI Systems** provides active alignment capabilities in the nanometer and millidegree range. The modular machine has integrated pick-and-place, dot or pattern dispensing, machine vision, optical alignment, and

UV curing functions for components such as transceivers, silicon photonics, arrayed waveguide gratings (AWG), LiDAR, and integrated optics.

3D Printing Refinements

Alignment capabilities in additive manufacturing keep improving. For TruPrint 3D printing systems from TRUMPF, **Automatic Multilaser Alignment (AMA)** enables intelligent monitoring, analysis, and calibration of laser metal fusion (LMF) processes. AMA facilitates the production of printed multilaser parts for industries with

stringent quality standards, such as semiconductor, automotive, and aerospace.

TRUMPF lasers can be calibrated during the build process and without the need for a special service mission, unlike many multilaser machines that need to be calibrated during installation and then aligned again on a regular basis to ensure consistent quality, says Adam Simons, head of additive manufacturing for TRUMPF in North America. “Automatic Multilaser Alignment provides fully automated online monitoring and correction of beam source positioning relative to each other and up to 27.5 μm accuracy,” Simons adds.

The AMA system relies on high-resolution cameras to continuously monitor and adjust laser beam positioning after each layer, maintaining precision down to 27.5 μm . This real-time correction not only supports reproducible part quality but also enables faster acquisition and finer adjustments in its latest release. By aligning multiple lasers automatically between layers at user-defined intervals, AMA helps manufacturers meet the stringent demands of semiconductor production while also boosting overall productivity. When paired with TRUMPF’s live melt pool monitoring, the technology provides an added layer of quality assurance that can reduce the need for costly post-process inspections such as CT scans.

The **M600 metal 3D printer from Meltio** needs no manual alignment because its newly developed deposition head removes the need for laser alignment. Calibration of the printer is likewise not required. Features such as these are designed to help modernize machine shops and encourage large-scale adoption of metal additive manufacturing.

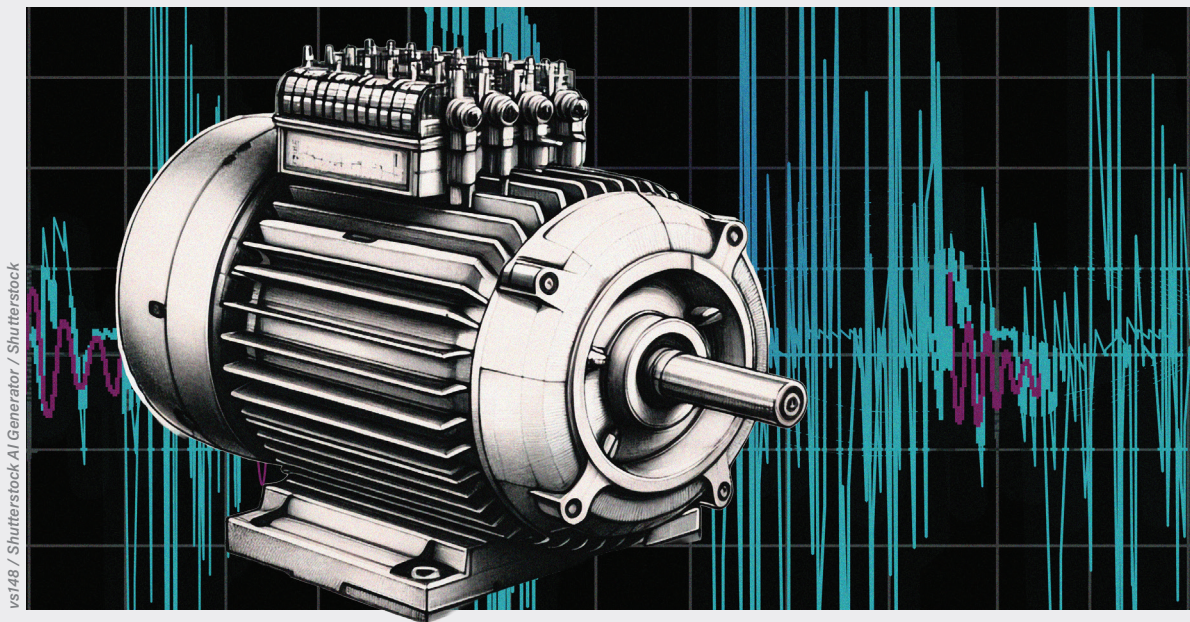
The M600 also advances industrial integration by relying on wire as its feedstock instead of metal powder, offering a safer, lower-cost alternative that avoids contamination risks in machine shop environments. Its Blue Laser deposition head further improves speed and efficiency, particularly with reflective materials such as copper and aluminum alloys, while reducing overall energy consumption. Combined with a fully inert workspace and improved sensor monitoring, the system delivers consistent output with minimal maintenance. Designed to interface directly with CNC machines, the M600 supports part repair and hybrid manufacturing applications, making it a versatile option for industries seeking reduced lead times, lower material waste, and reliable around-the-clock production.

“The vast majority of metal 3D printed parts require post-processing, which is carried out in the machine shop,” notes Lukas Hoppe, director of R&D at Meltio. “The Meltio M600 metal 3D printer is highly autonomous, meaning that operator interaction is minimal, common touch points such as manual laser alignment have been removed for increased reliability, and programming is a matter of minutes thanks to the Meltio Horizon, the dedicated slicer for the Meltio M600.” NED



Trumpf’s Automatic Multilaser Alignment (AMA) provides fully automated online monitoring and correction of beam source positioning relative to each other and up to 27.5 μm accuracy.

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



Vibration Analysis: Reading the Warning Signs

By Steven M. Lindholm, PE, PMP, NAMS-CMS

A lot of the time, vibration issues don't make themselves known until something goes wrong. You might hear an odd noise, see premature wear on a coupling, premature bearing failure, or get a complaint from someone working near the equipment. By that point, you're already behind. From where I sit, in the field of failure analysis and root cause investigation, I can tell you: The costs of waiting are high.

That's why vibration analysis is such a powerful tool. It lets us monitor the machine while it's still working and catch problems before they become costly. Whether it's imbalance, misalignment, resonance, or wear, these issues have signatures. If you know what to look for, you can prevent a lot of pain.

I've spent more than 30 years working in marine and industrial environments—places where equipment needs to perform reliably, often in harsh conditions. Vibration analysis is one of the few diagnostic tools I trust to give early, actionable insight. And when we combine it with simulation tools like FEA (finite element analysis), we can do even more. We can design out the problems before they ever make it to the field.

Seeing the Problem Before It Happens—and Preventing It From Happening Again

All machines vibrate. That's normal. But when those vibrations change, or start to appear in the wrong frequencies, or increase in amplitude, those are signs that something's

off. It could be a bearing starting to wear, or a rotating shaft that's slightly out of balance. Left unchecked, those small issues become big issues.

With the right sensors, we can measure vibration in three dimensions and watch how it evolves. If something changes, we can intervene early. It doesn't just help with breakdowns—sometimes it flags the issues behind excessive noise, fatigue cracking, or surface wear. These aren't headline failures, but they still generate customer complaints and long-term costs.

Designing and Installing Equipment to Prevent Vibration Problems From the Start

Vibration problems don't just come from age or wear. Some of the most frustrating ones are baked in from the start. A poorly designed base, a support structure that resonates, or even a bolt that's torqued unevenly can create long-term issues.

That's where FEA comes in as a foundational part of a vibration analysis strategy. We use it to model how equipment behaves under load and predict where vibration might become a problem. FEA doesn't just show where structures might flex—it also highlights where natural frequencies may align with operating speeds, which is a recipe for trouble. We can simulate the stresses due to vibrational loads and adjust the design before anything is ever built. FEA is a complement to vibrational studies as it can point to inherent interactions that the vibration studies pick up.

After installation, vibration monitoring is like a sanity check. I've had cases where everything looked good on paper, but the vibration data told a different story. We tracked down foundation issues and installation misalignments that would've cost a lot more if we caught them later.

Real-World Results

Vibration analysis is being used across industries to catch problems early and support smarter maintenance decisions. In my own experience, I worked on a case involving three evaporative coolers mounted on the roof of a municipal building where noise was inhibiting the use of meeting rooms. A vibrational analysis of their foundation indicated excessive vibrations in the audible frequency range were present in the vertical and lateral axes. Corrective action of adding more compliant mounting under the coolers resolved the vibrations by damping out the frequencies to a tolerable level.

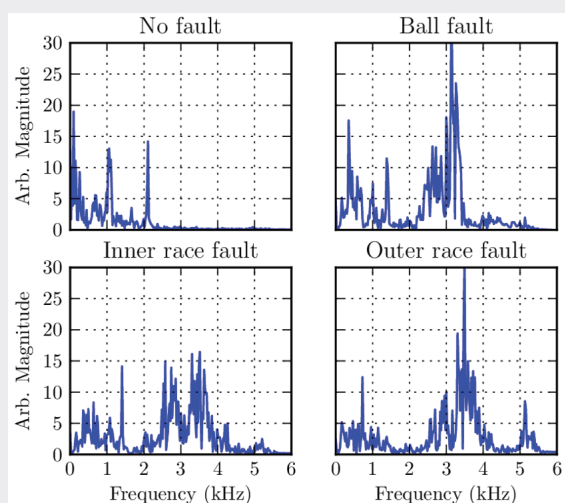
I had another case where an industrial fan was generating excessive noise and showed signs of uneven wear. Through vibration analysis, we traced the issue to an imbalance in one of the fan blades, which in turn was causing resonance in the support structure. After rebalancing, performance normalized, and the risk of long-term fatigue damage was minimized.

I have used vibration analysis to pinpoint where the structural support of satellite antennas on ships amplifies the fundamental frequencies of ship motion. While these motions would not affect the tracking of the antennas, they reacted with the antenna isolation system to damage the structure of the antennas. By reducing the compliance of the support, these low frequencies could be damped out, so the isolation system would absorb the higher frequency fundamentals.

These firsthand examples underscore just how varied and practical vibration analysis can be across equipment types and industries. Take semiconductor manufacturing, for instance. Vibration monitoring plays a key role in keeping motion stages operating with tight precision. If those stages start to drift or chatter, you're looking at lost accuracy and lost time. By tracking vibrations early, you can catch problems before they take a toll on throughput or bring the line down altogether.



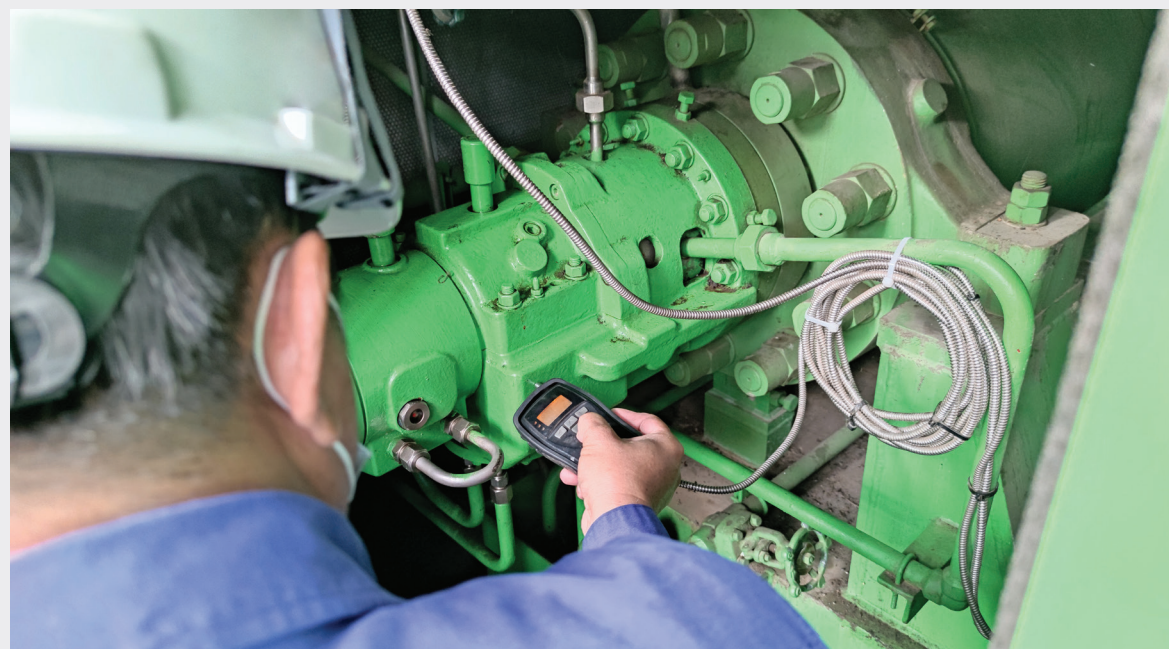
A flexible expansion joint connecting industrial pipes is engineered to absorb vibration and movement in fluid systems, enhancing stability and protecting equipment.



Vibration spectra of an electric motor with various drive-end bearing faults at 1,772 rpm and 2 hp load.

Low-Power Analog Processing for Sensing Applications: Low-Frequency Harmonic Signal Classification - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/bration-spectra-of-an-electric-motor-with-various-drive-end-bearing-faults-at-1-772-RPM_fig5_253335133 [accessed 21 Aug 2025]

In heavier industries, like steel mills, the stakes are different but just as high. Equipment like conveyors and crushers sees a lot of abuse, and if there's a resonance issue or some harmonic frequency that doesn't belong, it can quietly start tearing things apart. These are the kinds of problems that don't always show up in a routine inspection, but vibration analysis



An inspector uses a handheld vibration tester to evaluate bearing condition and overall motor vibration for predictive maintenance.

will pick them up before they lead to major failures or shutdowns.

What's important here is that this kind of analysis isn't just for one niche. Whether it's precision manufacturing or heavy infrastructure, vibration data gives you an early warning system. And when you use it right, you're not just avoiding damage—you're extending the life of

your equipment and cutting down on those surprise maintenance costs. That's a win for both operations and the bottom line.

The Technology Is Catching Up

The tools we have now are far better than those we had 10 years ago. Machine learning can pick up on patterns

Rotating Equipment Vibrations

While vibrations can be caused by many factors—the environment, operational conditions, natural phenomena, or external input—they're commonly associated with rotating equipment. By rotating equipment, we mean engines, pumps, compressors, fans, and any equipment which had an internal element that spins. For this discussion, the term 'element' will be any object attached to the shaft within the equipment that fulfills the equipment's function. Vibration in rotating equipment has been extensively studied, mostly because it's so common and because it's readily reproduced. Vibrations from a rotating element can be classed into different overlapping categories:

SYNCHRONOUS VIBRATIONS

Synchronous vibrations occur at the rotational speed of the equipment's shaft, expressed as rotations per minute (rpm). These appear in vibration analysis as amplitude peaks at the operating speed of the equipment or discrete multiples of that speed (1, 2, 3x the rpm). Synchronous vibrations are caused by problems with loads—unbalanced elements, eccentric elements, an unbalanced overhung load, uneven gear loading, or misaligned drive belts—or with the rotating shaft—bent

shaft, offset shaft alignment, angular shaft misalignment, or a 'cocked' misaligned bearing. Vibrations from unbalanced overhung loads, uneven gear loadings, and misaligned drive belts can look the same—they're loads from the outside driving the shaft, which are causing fluctuations at the driven speed of the equipment.

SUB-SYNCHRONOUS VIBRATIONS

Sub-synchronous vibrations occur at fractions of the equipment's driven rpm. These appear at discrete fractions (1/2, 1/3, 1/4x the rpm) of the shaft speed, though mostly commonly at even fractions (1/2, 1/4, 1/8...) of the shaft speed. Causes for sub-synchronous vibrations include rubbing in the equipment, improper gear meshing, pole passing (in electric motors), belt natural frequency vibration (belt-driven equipment), or lubrication faults.

HARMONIC VIBRATIONS

Harmonic vibrations are a superset of synchronous and sub-synchronous vibrations. Harmonic simply means the vibration occurs at intervals which coincide with either a driven speed or the natural frequency of the object, or some multiple of that speed. Some other causes of harmonic vibrations can be the blade

passing frequency for fans and pumps, or damage to a rotor bar in electric motors.

NON-SYNCHRONOUS VIBRATIONS

Non-synchronous vibrations have amplitude peaks that do not coincide with the rpm of the equipment or some multiple of that speed. Non-synchronous vibrations are often hard to find—the harmonic vibrations usually have large, distinct amplitudes, whereas non-synchronous vibrations can be diffuse and with smaller amplitudes. Causes of non-synchronous vibrations include the excitation of the natural frequency of an element, electrical line frequency (for AC motors), SCR frequency (for DC motors), turbulent flow or cavitation, the electrical pole passing frequency, drive belt frequency, and lubrication problems. It can also be problems with roller (anti-friction) bearings—fretting of the race, local overloading, out-of-round rolling elements, cage damage, or incorrect pre-load.

RADIAL VIBRATIONS

When the vibration amplitudes are oriented horizontally and/or vertically relative to the axis of the shaft, then the cause is radial in orientation. Causes which show up as radial vibrations are all acting somehow to cause the shaft

to vibrate out-of-plane—unbalanced elements, eccentric elements, rubbing, offset alignment, and belt natural frequencies can be considered.

AXIAL VIBRATIONS

When the vibration amplitudes are oriented along the axis of the shaft, then the cause is axial in orientation. Causes that show up as axial vibration are acting in a way to cause the shaft to vibrate along its axis—misaligned bearings, angular misalignment, a bent shaft, misaligned drive belts, and an unbalanced overhung load will exhibit axial vibrations. If the vibrations are only axial, these are the main causes. Often, though, these will also manifest some degree of radial vibration.

When analyzing vibrations, it's important to make sure all possible vibrations are captured by using multi-axis accelerometers or accelerometers oriented in each axis. Ignoring an axis because that's not how the vibration seems to be acting can mislead the investigator. It's equally important to examine the equipment before a vibration analysis so that one, the monitoring sensors are placed in an appropriate location, and two, the investigator can visualize the potential areas of concern.

What to Look for in a Vibration Monitoring System

Whether you're selecting your first vibration monitoring solution or upgrading an existing setup, the right features can make a significant difference in usability, accuracy, and long-term value. Here are some key capabilities to look for:

- **Tri-Axial Sensing:** Enables vibration measurement across three axes (X, Y, Z) to capture a complete picture of equipment behavior.
- **High-Frequency Range:** The ability to detect a wide range of frequencies is critical for identifying subtle faults like bearing defects.
- **Wireless Connectivity:** Systems with Wi-Fi, Bluetooth, or cellular capabilities reduce cabling and make installation easier, especially in hard-to-reach areas.
- **Edge Computing or Onboard Analytics:** Onboard processing can detect anomalies in real time and reduce the volume of raw data sent to the cloud.
- **Integration with CMMS or SCADA:** Seamless data sharing with existing maintenance platforms helps close the loop between detection and action.
- **Battery Life and Power Options:** Long battery life or alternative power options (e.g., energy harvesting) are essential for remote or inaccessible installations.
- **Cloud-Based Dashboards:** Centralized dashboards simplify remote monitoring, historical trend analysis, and fleet-wide comparisons.
- **AI and Machine Learning Support:** Advanced systems can detect patterns over time and predict failures earlier than rule-based systems alone.

humans might miss. Cloud platforms let teams share and compare data across multiple sites. Triaxial MEMS sensors allow small monitoring packages to be installed where previously we needed multiple piezoelectric accelerometers to measure all axes of vibration. What's really shifting is how vibration analysis is being used. It's no longer just about condition monitoring or reacting to problems after the fact. It's something we use to manage risk more intelligently and make proactive decisions before issues turn into failures. That shift has real

value, especially when you're looking to improve reliability and extend equipment life.

That is why the market for vibration analysis and predictive maintenance is growing quickly. Vibration monitoring applications are expected to hit revenues of \$2.91 billion by 2030. And predictive maintenance overall? It's projected to reach \$71.2 billion by 2032. That tells me companies are starting to see the value in doing things before they break.

Vibration problems don't always destroy equipment. But they often show up in the

Designing Around Vibrations

When designing new rotating equipment, a new facility with rotating equipment, or installing new rotating equipment in an existing facility, being cognizant of potential vibrations can pay off with lower operating costs. I emphasize rotating equipment because it's often the action of a shaft, fan, wheel, pump, or other spinning element that induces vibration. That act of spinning—or rather, the spinning action of the element—is where imbalance, misalignment, offset loading, and other imperfections become unwanted vibrations. To prevent those imperfections from becoming maintenance headaches, the designer should be aware of a few critical concepts about rotating equipment:

NATURAL FREQUENCIES AND HARMONICS

I'm about to make an audacious statement: All things vibrate at a certain frequency. Even a blade of grass, held in the gas between your thumbs, will vibrate if blown on with the right velocity of air. This is a natural frequency, the number of oscillations in a second that something will inherently vibrate at. It's crucial to know the natural frequencies—not only of the designed system but also what the system is mounted to—to not accidentally excite a response in something unrelated to the installation. For beams, plates, and other structures, derivative equations from the stresses and strains can be used to find the natural frequencies. For more complex assemblies, FEA programs commonly have eigenvalue functions for the fundamental frequencies.

Harmonics are when some forcing function—say, an out-of-balance fan—excites a natural frequency of something else. The lowest natural frequency, known as the first harmonic, is the easiest to force into response; it takes the lowest energy to excite, and the response has the highest magnitude. Note, though, the frequency of the forcing function does not have to be at the first harmonic; it could be a multiple of the first harmonic.

BEARING SELECTION

Rotating equipment, to last for any amount of time, needs to be supported on bearings. The types of bearings are as varied as the applications—hydrodynamic bearings, sleeve bearings, rotating element ('anti-friction') bearings, and even magnetic bearings. Each has its advantages and disadvantages, which are beyond the scope of this article. The choice of bearing and bearing mount is another crucial aspect of designing around vibrations. Ideally, any two sets of bearings should be precisely aligned. Inside a machine, it can be done fairly simply—make sure the case or body is rigid and the bearing mounts are concentric. Once the bearing mounts are no longer integral to the housing, then alignment is more problematic. A plain bearing in a misaligned mount is subject to a number of failure modes that result in vibrations. Consider self-aligning or spherical bearings when using pillow blocks in equipment.

MOUNTING

When mounting equipment, it can be critical to ensure the mount is suitable for the equipment and for the foundation. Rubber pads, blocks, and cones have been used to dampen higher frequencies from equipment into a foundation. For lower frequencies, consider springs or wire coils to dampen the greater amplitude generated by low frequencies. For many applications, such as large engines and forming machinery, damping vibrations is not possible because of the rigid support this equipment needs. It becomes part of the design to make a very rigid foundation with a high first harmonic and use a bedding compound to ensure full contact between the machinery and the foundation.

Lastly, be aware that your design may be subject to field modifications. A good example can be a ship's masts; I have seen masts intended to support only small (less than 100 lb [50 kg]) antennas, which have large walking surfaces for ease of access—just right for adding a 350 lb (150 kg) satellite antenna! What you end up with is an inverted pendulum, imparting extra motions into the satellite antenna at very low frequency.

form of unexpected downtime, warranty claims, or unhappy customers—all of which carry their own price tag.

We can't keep waiting for failures to tell us what went wrong. With the tools we have today, we don't have to. **NED**

Steven M. Lindholm PE, PMP, NAMS-CMS, is a consulting engineer and assistant vice president at Engineering Design & Testing Corp. With over 40 years of experience in mechanical and marine engineering, he specializes in vibration analysis, finite element modeling, and failure investigations.



An operator measures vibration on a steel workpiece during machining on a CNC lathe to ensure precision and equipment stability.

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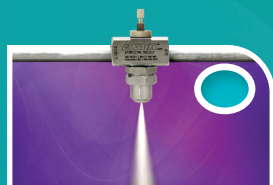
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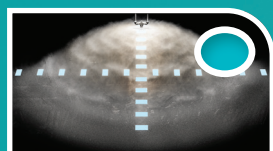
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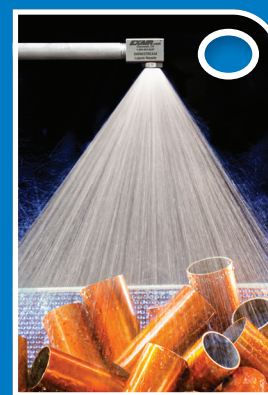
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How to Configure Forklifts: From Off-the-Rack to Complete Customization

Learn how to create a forklift configuration that strikes a balance between upfront cost and long-term benefits.

by Phil Mean

What should buyers consider when choosing a new forklift? Capacity? Terrain? Power? Ergonomics? And that's just determining operating requirements. Turning to equipment, accounting for options and even special engineering features create a spectrum of lift trucks that range from standard to customized offerings.

A properly equipped forklift can provide significant benefits to an operation in terms of productivity and total cost of ownership. But to enjoy those benefits, operations must understand the pitfalls of over- and under-equipping their lift trucks,

how to determine the degree of customization required for their industry and application, and how to create a configuration that strikes a balance between upfront cost and long-term benefits.

Finding the Balance between Over- and Under-equipping

Configuration requirements vary widely depending on the type of lift truck and application, but it is important to strike a balance between "too much" and "not enough."

Over-equipping a lift truck with features that aren't needed ultimately creates a

higher upfront cost. Sometimes, these features are baked into the design. For example, some lift trucks incorporate features like a full lighting package as standard equipment, but if the truck is always going to be used in well-lit areas, or only during daylight hours outside, the lights may not be necessary. But their cost is folded into the price of the truck.

Apart from cost considerations, over-spec'ing lift trucks presents a number of practical concerns. Each feature—even if it does not get used—is a potential "opportunity" for additional maintenance or replacement over the life of the truck. If a

feature is not justified by an application, its presence can also introduce unnecessary complexity, introducing the need for further operator training.

There are also definite disadvantages to under-spec'ing lift trucks. Lower-cost trucks that are equipped for occasional or light duty cycles tend not to stand up well to hard or intense operations. If the truck is struggling to perform the job at hand, it slows down the operation and negatively impacts productivity and key performance indicators (KPIs). An imbalance between the truck and the requirements of the job can also make breakdowns more likely, further undercutting productivity and increasing maintenance and repair costs. Avoid under-spec'ing by making sure that the features and performance are up to the task at hand.

Forklift Configuration Possibilities

When configuring a lift truck there are several fundamental factors that must be weighed to help make it a good fit for the job.

Load. It is best practice to start specifying the lift truck based on the loads it is expected to handle. Consider weight, size and how high loads must be lifted. Typically, the heaviest loads and/or the load that needs to be lifted the highest should have the greatest influence on truck specification, but all loads should be considered.

Hours in Use. The age of a forklift is measured in hours rather than years, so the expected use plays a significant role in lift truck configuration. It helps determine maintenance schedules, predict equipment lifespan, optimize performance for efficiency and safety, and in the case of electric lift trucks, helps determine the required battery capacity and charging schedule.

Environment. The environment in which the lift truck operates also figures heavily in the configuration process. Initially it's important to think through the physical dimensions of the work area, such as aisle widths, turning areas, doors and ramps. Further factors to consider include indoor and outdoor use, the surrounding temperature, altitude and terrain.

Power Source. Decisions around power source are not limited to just the truck itself, especially when shifting to a different power source. Questions arise about the

need to add or change infrastructure and how to manage the switch across an entire fleet. This is particularly true for operations transitioning from internal combustion engine to electric power. An electrification expert from a forklift dealer or manufacturer can perform an evaluation of your operation to determine whether electric trucks are a good fit.

Telemetry Data. If available, telemetry data from an operation's current truck fleet can be invaluable to inform proper lift truck configuration. In addition to providing an accurate picture of how many hours trucks are in use, telemetry tracks maintenance and repair information, making it easier to make better-informed decisions for the entire fleet.

Understanding All Configuration Options

The breadth of available options varies widely by manufacturer. Some manufacturers have a large variety of configuration options but a smaller line of trucks, making under- and overselling much more likely. Others have a broad line of trucks,

each with a variety of standard features with a relatively small number of available options. Top manufacturers, on the other hand, offer both a broad line of trucks and a deep pool of options ranging from existing technologies and features to custom-engineered solutions.

Regardless of the level of customization, it is advantageous to choose a manufacturer that has both a wide range of options and the ability to custom-tailor options to meet operational needs. In addition to the advantages of being able to closely match the truck specification to specific applications, custom engineering tends to drive improvement across the manufacturer's entire product line. When the manufacturer recognizes a feature as being of value to one customer, it is often made available as a new option for other customers, or even incorporated as a standard feature.

Balancing Upfront Costs and Long-term Potential

Ideally, operations should come into the configuration process with specific metrics or KPIs that they would like to meet. But, at the very least, they should have a

clear, data-driven understanding of their application. For example, perhaps a business wants to move 300 one-ton loads per eight-hour shift. They could have one very busy truck or, alternatively, they could invest in a double pallet handler and a truck with a higher load capacity to halve the number of journeys. That means spending more initially in terms of customization, but that additional cost is offset by a reduction in running costs over time.

Another option might be to use lower-cost trucks to move the pallets horizontally and then another truck to store vertically. In most situations there is usually more than one viable solution. Operations can benefit from working with a manufacturer or dealer that understands their business and can help guide the purchase and configuration process to deliver a best-fit solution.

Configuring the Right Truck for Your Operation

With all the configuration options available, avoiding over- or under-equipping lift trucks should always come back to an

analysis of what the job and environment require balanced against the monetary considerations of up-front cost, impact on productivity and cost over time.

A good lift truck provider will always start by gaining a thorough understanding of an operation's application and, as a starting point will—if possible—suggest a standard solution to meet their needs, typically saving time and money. For applications that require special options, working with a manufacturer that has a dedicated special engineering team is important to achieving the right level of customization.

These experts can tap into specialized knowledge and experience gained from other users with similar applications to develop a lift truck that is equipped to best fit the application at hand. Plus, the benefit of working with a manufacturer with a specialized engineering team is that operations get the same factory-backed support for a custom-configured truck as they get for an off-the-rack version. **MH&L**

Phil Mean is global product manager with forklift manufacturer Hyster.

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With some simple ergonomic improvements in your facility, you can reduce the risk of injuries, enhance productivity, and ultimately lead to a much more efficient operation. So, what is ergonomics, and how can facilities leverage it effectively for both owners and operators?

What is Ergonomics?

Ergonomics is the science of optimally designing and arranging workspaces to fit the tasks performed and the people performing them. Ensuring a worker's physical and psychological safety are key to any ergonomic evaluation. You want to create a workspace where employees can perform their tasks with minimal physical effort or strain. This approach reduces the risk of musculoskeletal disorders (MSDs) and enhances overall operational efficiency. In many places, ergonomic efficiency is not just a best practice: it's the law. For instance, the New York State Senate recently established the Warehouse Worker Injury Reduction Program as an amendment to its labor law. This act mandates that employers develop and enforce formal injury reduction programs, assessing workplace risks and minimizing musculoskeletal injury hazards. Compliance with OSHA ergonomic standards is also essential for ensuring worker safety and avoiding penalties. So, how do you create ergonomic workspaces to protect facility owners and operators?

Common Ergonomic Issues for Warehouse Workers

Warehouse employees often face various ergonomic challenges throughout their workday, including:

- **Physical strain from repetitive movements:** Repeating the same motions, such as lifting, reaching, or scanning, can lead to strain injuries over time. This is a common issue in shipping departments, on loading dock, and in manufacturing facilities.
- **Poor posture:** Awkward bending, twisting, or prolonged standing can cause long-term musculoskeletal problems. For instance, a worker in a



manufacturing cell or material handling role may spend a good deal of the day hunching or straining to do their job.

- **Fatigue:** Physically demanding work, especially without adequate breaks or supportive equipment, can lead to exhaustion, increasing the risk of mistakes and injuries. Workers in packaging and shipping departments, loading docks, and inventory management roles can experience excess wear-and-tear on their body and mind – especially managing peak season.

Workplace Injury Prevention

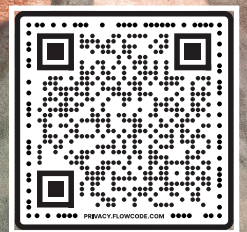
Minimizing repetitive motions and awkward postures helps prevent musculoskeletal disorders such as back pain, carpal tunnel syndrome, and muscle strains. Prioritizing ergonomics supports workplace injury prevention strategies by reducing employee accidents and injuries, creating a safer, more productive workplace.

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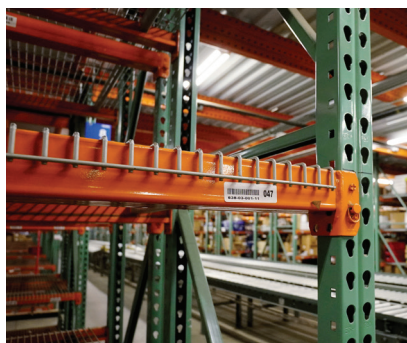
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A Dose of Reality: Tips to Integrate VR into Forklift Training Programs

A VR forklift simulator can help operator trainees gain familiarity with the forklift's operation in a controlled, virtual environment.

by Brent McKinney

Immersive learning through virtual reality (VR) simulation is one way organizations can help prepare workers to operate forklifts. VR training can enhance forklift operator training programs with benefits for both trainees and organizations.

The Case for Virtual Reality

Much of the material handling equipment used in supply chains is highly specialized. Improper operation can result in increased risk to employees, disruptions in workflow, and damaged products and equipment.

This is why a robust and effective operator training program is essential. For instance, a forklift's multifunction control handle may look like a video game joystick, but it requires substantial operator skill and training to master. Operators must understand how the control works and demonstrate proficiency in its use.

This is where virtual reality can play a substantial role. Operators are more likely to retain what they have learned when actively involved in simulated tasks that engage sight, sound and touch, rather than by just observing.

A VR forklift simulator can help operator trainees gain familiarity with the forklift's operation in a controlled, virtual environment. Traditionally, an operator is provided training videos and manuals in a classroom setting. Then the trainer teaches the operator about the forklift with the unit powered down and its battery removed. At this stage the operator-in-training must demonstrate initial familiarity with the controls, without the feedback provided by operating a live lift truck. The trainee does not practice moving and maneuvering the truck until the truck is "live" and the stakes for errors rise significantly. A training regimen that includes VR can provide trainees an opportunity to build confidence as they begin to acquire proficiency in a controlled, virtual world where mistakes are simply learning opportunities.

VR training systems can also instantly track and assess operator performance and give feedback and guidance based on the operator's actions. Trainees can begin to

develop their skills on the spot, and trainers can keep track of individual progress. Tracking performance data helps identify areas where the operator may need more practice and ensures they are prepared for live operations.

Tips for Integrating VR into Forklift Training

VR is an additional tool that is available for training forklift operators. It's not a miracle fix or a one-size-fits-all solution, but it can be an effective element in addition to required training. We developed an 11-step Demonstrated Performance (DP) training program to help companies train new forklift operators. This DP operator training program can be supplemented with VR simulation equipment to bridge a gap between observation and actual operation.

The following tips can help companies realize tangible benefits from adding VR to their forklift operator training programs.

1. Determine how the technology best fits into your operator training program.

By staggering the conventional parts of early-stage operator training with controlled, VR-based sessions, trainees can demonstrate what they've learned in theoretical lessons. They can learn how to anticipate and quickly identify unexpected circumstances, then react appropriately to the situation without real-life consequences.

Integrating VR training into the early steps of a training program helps reinforce lessons like safe raising and lowering of forks and pallet acquisition. Trainees also virtually perform the most important actions they'll perform later on a live forklift: steering, travel, braking and plugging.

2. Understand and account for the limitations of technology.

Technology cannot completely replace traditional, hands-on training. VR training, while not an OSHA requirement, is a supplement to a conventional training program. Safe behaviors start with trainers and managers that help trainees understand forklift operation and develop safe operating habits. VR should not be considered a



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replacement for these essential leadership roles and training requirements.

Another possible limitation is the equipment itself. Ideally, a VR training system should include physical equipment that replicates the operator compartment, including controls used by the operator's hands and feet. This provides the operator with an accurate feel of the controls they will encounter on the actual forklift.

Some VR training systems can provide haptic feedback, which gives physical feedback to the trainee like emitting a vibration when a trainee bumps a virtual shelving unit with their simulated forks. This vibration or "buzzing" provides physical feedback to the trainee, in addition to the VR system's visual and audible feedback.

Physical limitations of the operator trainee can be another limitation. Many VR training integrators have observed that sessions lasting more than five minutes can increase the trainee's risk of experiencing motion sickness. Sessions are most effective when kept short. Trainees can experience multiple simulation sessions in the course of their training while minimizing the risk to their physical wellness.

3. Carefully select your VR training partner.

It is essential to choose a VR training program that provides realism but is also flexible. While an immersive VR environment is helpful for the training experience, it shouldn't be treated like a video game. The system should focus on faithfully representing actual forklift controls and

an actual forklift's response to operator commands.

Ideally, VR training software will provide flexible scenarios that help address the specific needs of your application, such as a crowded work environment or a low-lit, narrow aisle storage configuration, as well as hardware that matches the material handling equipment used in your warehouse. For example, we collaborated with VR industry experts to develop a VR training system, which includes a floorboard equipped with a brake pedal and presence

switch, and an actual multifunction control handle that is used on our reach trucks and stand-up counterbalance forklifts.

The combination of a VR headset, a laptop computer, hand controls, floorboard and specialized software can provide trainees a controlled way to develop their skills without the added time and cost of scheduling and setting up scenarios using full-scale forklifts in allocated physical spaces associated with traditional training.

As you explore adopting VR forklift operator training at your organization,

remember that no VR training can replace conventional forklift operator training. However, the integration of virtual training to classroom, demonstration and hands-on learning should be given strong consideration in providing new forklift operators with the skills they will need to move products safely and efficiently. **MH&L**

Brent McKinney is general manager, operator training, with forklift manufacturer Crown Equipment.

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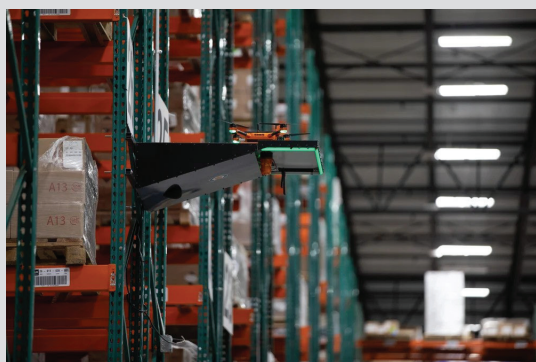
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FROM THE COVER



Autonomous Drones Enable 24/7 Inventory Audits

Corvus One, a fully autonomous inventory management system, uses AI-powered drones to perform real-time audits inside warehouses and DCs without GPS, Wi-Fi, beacons, or human operators. Designed to operate in lights-out environments, the system improves inventory accuracy, reduces labor costs, and enhances supply chain efficiency with fast implementation and zero infrastructure requirements.

Able to safely navigate through narrow (minimum 4 ft [1 m]) or wide aisles, the lightweight drones scan and count cases and pallets at walking speed while avoiding obstacles like forklifts, racks, and people. Advanced computer vision and generative AI allow the drones to recognize and decode barcodes in any orientation and under low-light conditions.

The Corvus One system integrates with or without a WMS, offering flexible data exports in CSV or XLS formats. The Robot as a Service (RaaS) model ensures facilities always have the latest software and hardware through automatic upgrades.

Corvus Robotics

More online: newequipment.com/55290381



Battery Connectors Allow Vertical Mating

The **9155-900 Series** is a line of 2.5 mm-pitch vertical-mating battery connectors that support full vertical engagement without damaging contacts. Designed for high-reliability applications, these connectors feature gold-plated beryllium copper contacts, optional locating bosses, and a sweeping beam contact design with anti-snap protection. They are rated for up to 5,000 mating cycles and operate in temperatures from -40 to 257°F (-40 to 125°C).

Kyocera AVX Components Corporation

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All-in-One Air/Charging/Welding Unit

HDI Air Pak series are hydraulic, all-in-one units for work trucks that eliminate standalone compressors and welders. Each model, integrated into the truck chassis, features onboard compressed air of 40 or 60 cfm at 100% duty cycle. The battery charge/crank assist produces up to 150 A of DC to charge 12/24V batteries. The 7,000 W generator powers tools, lights, and more. Air Paks provide 265 or 325 A of output at 100% duty cycle, supporting DC stick, MIG, Aluminum MIG, Flux-cored, DC TIG, and Air carbon arc with preset weld settings.

Miller Electric Mfg.

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Cloud-Connected Modules for Remote HVAC Monitoring

PENN System 550 C550A control modules are web-enabled temperature, humidity, and pressure control replacements for discontinued System 350 models. They support one sensor input with a guided setup that allows users to configure the module to match the System 350 unit being replaced. Connecting to the System Cloud platform, they enable 2-way remote communication for system health monitoring, alerts, and troubleshooting. Wi-Fi allows authorized users to access HVAC-R system data and receive notifications for issues. The series supports hundreds of HVAC-R control applications.

Johnson Controls

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Optical Sensor Cuts Oxygen Measurement Costs

The **Rosemount 490A Optical Dissolved Oxygen Sensor** is a digital Modbus-enabled device designed for accurate monitoring in water treatment, biopharmaceutical, food & beverage, and power generation applications. It delivers reliable measurements in both liquid and gas phases without separate calibrations and eliminates the need for electrolyte refills. With an IP68-rated design, quick response time, and a 2-year sensing cap lifespan, it reduces downtime and simplifies integration.



Emerson Electric Co.

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Waterproof Work Shoe With Energy Return

The **Synchro** is a waterproof work shoe designed for all-day performance, combining a KEEN.ReGEN+ midsole that returns over 60% of energy with every step and a lightweight build for increased mobility. A redesigned carbon toe offers a low-profile fit, while KEEN.LOCKFIT technology provides added heel stability. The breathable mesh upper and slip-resistant outsole make it suitable for both indoor and outdoor environments.

KEEN Utility

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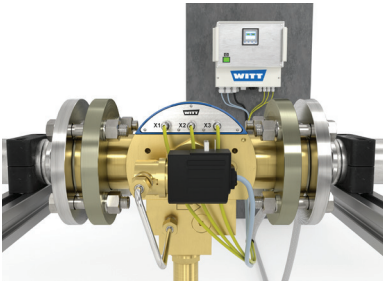


Protective Eyewear Designed for All-Day Wear

EMU Safety Glasses are high-impact protective eyewear that meet the Z87.1+ standard while featuring sunglass-inspired frames and lens options. The collection includes clear, tinted, and polarized lenses in a variety of frame shapes and colors, providing options for a wide range of jobs and face shapes. Each pair is engineered for long-term comfort and durability in settings such as construction, mining, healthcare, and general industry.

EMU Safety

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Dome-Loaded Regulator Stops Flow at Low Temps

The **COLDSTOP SMART** is a dome-loaded pressure regulator that detects critically low temperatures and automatically stops gas flow to protect piping and downstream equipment from brittle fractures. Combining a regulator, solenoid valves, and a control unit, it ensures safe cryogenic system operation while supporting real-time monitoring and remote configuration for better control and compliance with EIGA, CGA, and AIGA standards.

Witt Gas Controls LP

More online: newequipment.com/55303605



Shaft Gearmotors Handle Extreme Washdowns

The **261 Series Sanimotor Inline Parallel Shaft Washdown Gearmotors** for washdown environments are rated IP69K and encased in a sealed 304 stainless steel enclosure to endure high-pressure, high-temperature cleaning processes. A two-part, spring-loaded shaft seal combined with EPDM O-rings ensures a secure, leak-proof barrier. The gearmotors feature sealed ball bearings and are lubricated for life with food-grade H1 grease. A laser-etched permanent nameplate withstands repeated washdowns without fading or degradation. Available in 1/7 or 1/8 hp AC inverter duty motor options, the gearmotors deliver speeds from 8 to 350 rpm and output torque ranging from 16 to 500 in-lb.

Bison Gear & Engineering

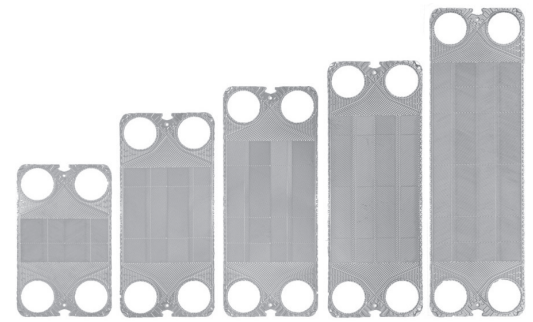
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High-Intensity Heat Exchanger Plates Improve Efficiency

Capella heat exchanger plates deliver superior heat transfer performance, requiring fewer plates to achieve the same results. This leads to reduced energy consumption, lower operating costs, and a more cost-effective solution for industrial applications like HVAC and Data Centers. Their optimized design ensures long-lasting equipment performance with minimal capital expenditure.

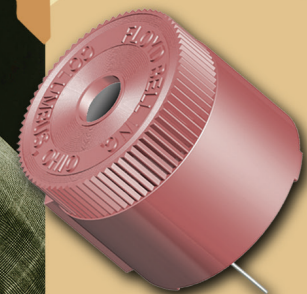
SPX Flow, Inc.

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FROM THE COVER



Mobile Bending Cell Supports Small-Part Automation

Flex Cell mobile bending automation cell is designed to work with Trumpf's TruBend 7050 press brake. In just a few steps, operators can dock the robot cell to the machine and begin automated operation. The system can run unattended, working for night shifts and lights-out production.

The system features a vacuum combination gripper on the robot arm for loading and unloading. A double-sized material buffer ensures that the machine has enough input to run throughout extended shifts. The Flex Cell uses Trumpf's TecZone Bend software to generate bending programs in seconds. Operators can then use an app and a teach panel to program the robot.

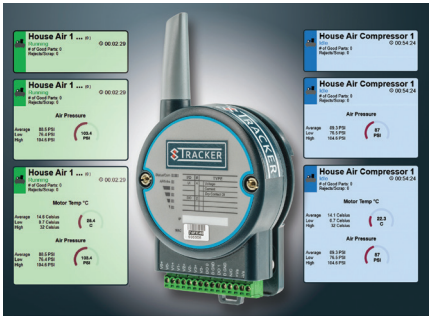
Designed for small and simple parts, the Flex Cell supports components up to 24 x 16 in (60 x 40 cm) and sheet thicknesses from 0.03 to 0.23 in (0.7 to 6 mm). The system also includes automatic double-sheet detection, which ejects stuck-together material to reduce scrap and material waste.

TRUMPF

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Wireless Tracker Enhances OEE Monitoring

The **ShopFloorConnect Tracker** is a Wi-Fi-enabled device for OEE and production tracking that automatically collects machine data with minimal operator input. Version 6.0 adds real-time dashboards, flexible scheduling, multi-language support, conditional alerts, and improved reporting for scrap and batch processes. It captures digital and analog inputs, integrates into existing ShopFloorConnect systems, and helps manufacturers reduce downtime, identify bottlenecks, and improve overall productivity.



Wintriss Controls Group, LLC

More online: newequipment.com/55120575

Thread Milling Cutter Adds Chamfering

The **TC620 Supreme** thread milling cutter is a multiple-row tool designed for creating blind-hole and through-hole threads across a wide range of materials, including steel, stainless steel, and super alloys. It features a countersink that enables 90-degree chamfering through axial movement.



With internal coolant supply, vibration-damping technology, and support for threads up to 3 x DN, the tool promotes precision, efficiency, and long tool life.

Walter USA, LLC

More online: newequipment.com/55299629



Cable Certifier With Modular Flexibility

The **WireXpert MP** is a modular cable certifier platform designed for both fiber optic and copper installations. Its central unit connects with various adapters to meet different testing needs. Key features include a built-in camera for accurate visual documentation, auto-scanning of barcodes and labels for faster data entry, and a magnetic flip tag for seamless mode switching. A rotating touchscreen and dual test buttons improve usability in the field.

Softing, Inc.

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245MP Camera Boosts Inspection Detail

The **shr811CCX12** ultra-high-resolution camera integrates a 245.8 MP Sony sensor with a quad CXP-12 interface, capturing detailed 19200 x 12800 pixel color images at 12.4 fps. Its aggregated 50 Gbps CXP-12 links boost accuracy, throughput, and yield, especially for large fields of view or intricate pattern analysis. Ideal for surface inspection of semiconductors, PCBs, solar panels, and FPDs, its high resolution distinguishes subtle details, even in challenging lighting. Features include I/O with signal voltage, RS232, and galvanically isolated input, along with a sequencer, binning, and an integrated LED strobe controller.

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ABB

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The **Combined Tube Light** is a 3-in-1 LED linescan illumination module that reduces complexity, cost, and footprint in machine vision systems. It integrates tube, dark field, and bright field lighting configurations into a single housing, allowing images of a single object to be captured under three different lighting conditions in one pass. Each lighting segment detects specific types of defects, including scratches, dents, dimensional inconsistencies, and missing components. The tube light has a maximum brightness of 1,000,000 lx.

Chromasens GmbH

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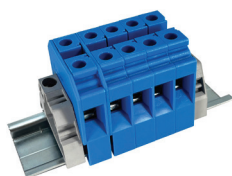
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Leuze electronic, Inc.

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Electric Walkie Stackers for Tight Spaces

The **6310, 6410, and 6510 Walkie Counterbalanced Stackers** are electric walkie models for heavy-duty pallet moving up to 4,000 lb (1,800 kg). The 6410 moves pallets quickly while supporting multiple tasks with a single truck. The 6510 features a compact, ergonomic design for handling large loads with increased security and control. The 6310 offers versatility for heavy loads in confined spaces. All models include operator-focused features to improve control, turning, and power in tight environments. Powered by Li-ion batteries, the stackers can be fitted with technology from the iWAREHOUSE Intelligent Warehouse Solutions suite for smarter fleet management.

The Raymond Corporation

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Digital Multimeters Offer Triple Display Readout

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Hapman

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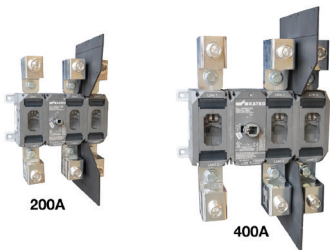
Air Impact Wrench Provides High Torque Power

The **Super Duty 1" Drive Air Impact Wrench** is a pneumatic tool designed for high-demand automotive applications. It delivers 2,700 ft-lbs (3,660 Nm) of break-away torque and 1,000 blows/min, powered by a seven-vane motor producing 5,500 rpm. Weighing only 12 lb (6 kg), it combines magnesium and composite housings for a balance of strength and reduced weight, while a variable speed trigger and side handle enhance precision.



K-Tool International

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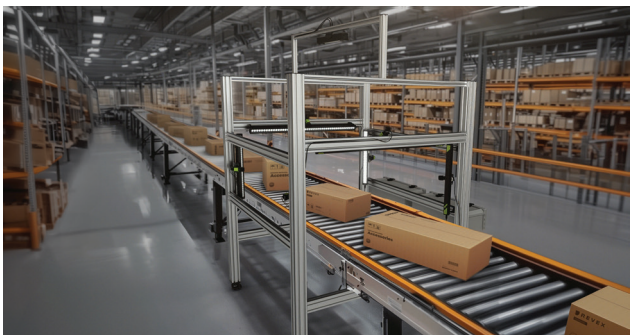


Disconnect Switches Support Green Upgrades

200A and 400A Disconnect Switches are high-amperage UL 98 devices made from 100% recyclable plastic. Designed for demanding industrial environments, they feature operator-independent actuation and flexible modular configurations. Built-in inspection windows enhance safety, while the switches support up to 300 hp at 600V AC. Models are available in three- and four-pole configurations with wire capacity up to 600 kcmil.

Altech Corporation

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Error-Free Fast Sorting

The **Aurora Velocity scan tunnel** creates automated, efficient, error-free package sorting and routing for warehouse operations. Velocity uses centralized processing to deliver fast and accurate barcode reading with read rates of up to 660 ft/min (200 m/min), while its scalable architecture allows combining multiple machine vision capabilities in a single scan tunnel. Capabilities include dimensioning, AI-powered HAZMAT/Dangerous Goods label detection, optical character recognition, and package damage inspection. Velocity can also integrate additional functionality such as RFID, weighing, 3D sensors, and print & apply.

Zebra Technologies Corporation

More online: newequipment.com/55277826

Flow Wrapper Enables Fast, Sanitary MAP Sealing

The **FM400** is a horizontal flow wrap machine designed for high-speed Modified Atmosphere Packaging (MAP) of fresh food products. It delivers up to 150 packs/min with hermetic seals using a Long-Dwell head and orbital motion. Built for rigorous sanitation, it features a stainless-steel body, IP66-rated electronics, and modular configuration options to support various film types and packaging needs.



Harpak Ulma

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Ethernet Connectors Simplify Industrial Networks

The **6780-000 Series** line of IP20 T1 Industrial Single-Pair Ethernet (SPE) connectors and cable assemblies transmit Ethernet and power over a single twisted pair to reduce wiring, board space, and system complexity. The connectors support up to 1 Gb/s at 131 ft (40 m) and 10 Mb/s at 3,281 ft (1,000 m) and are rated for 4 A at 140°F (60°C) and 60V DC.



Kyocera AVX Components Corporation

More online: newequipment.com/55305346

Double-Insulated Pry Bars Provide Safe Leverage

Double-insulated pry bars are engineered to deliver reliable leverage while maintaining a protective barrier against electrical hazards. Tested to 10,000V and rated for live use up to 1,000V AC/1,500V DC, they feature Cementex's orange-over-yellow insulation for quick wear detection and safety compliance. Available in 12 and 36 in lengths, the pry bars help professionals meet OSHA, NFPA 70E, and CSA-Z462 requirements.



Cementex Products, Inc.

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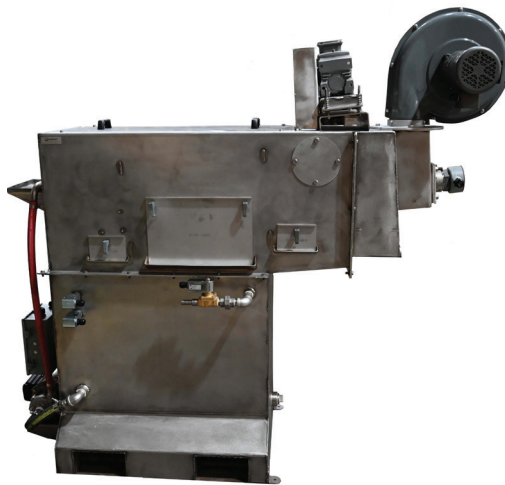
The **Walt Smart Radio System** digital communication platform for frontline teams combines radio simplicity with modern software capabilities, including real-time voice, text, picture, and video messaging. Supporting 20+ languages with automatic translation and transcription, the radio lets workers use push-to-talk, tap-to-authenticate, and glove-friendly physical controls for easy operation in harsh environments.

A dedicated SOS button transmits worker data and GPS location for rapid emergency response. The Walt Web Console and mobile app enable real-time communication between staff, anywhere and anytime.

The system works with private cellular networks, public LTE, Wi-Fi, Bluetooth, and analog radios, ensuring connectivity even in remote job sites. The radio holds a Class 1 Div 2 safety rating, meets IP68 standards, and includes ATEX Zone 2 and UL listings.

Weavix

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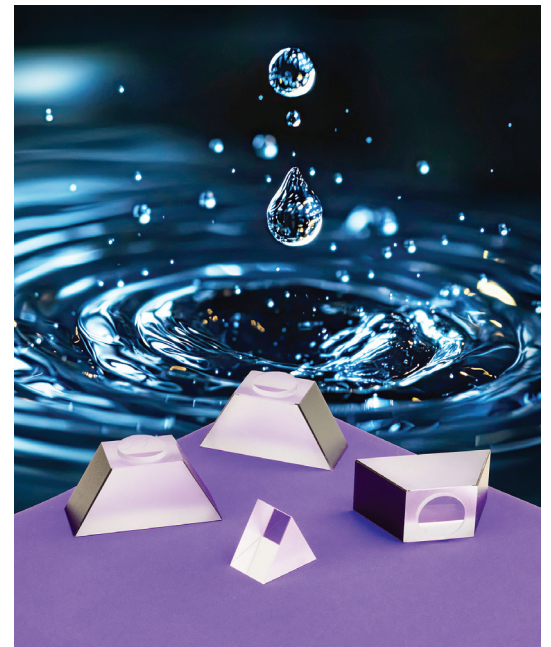


Compact Parts Washer Reduces Downtime

Washmaster MD-12 is a compact drum-style parts washer that combines full immersion and spray cleaning in one system. Designed with a stainless-steel tank, drum, and housing, it reduces energy loss and chemical consumption compared to traditional spray-only equipment. Integrated forced air-drying helps ensure parts are completely dry before discharge. Easy-access features support safer and faster drum inspection, cleaning, and maintenance, reducing unplanned downtime. Additional features include enhanced oil control for longer bath life and lower operating costs.

Ransohoff

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Meller Optics, Inc.

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ELOKON, Inc.

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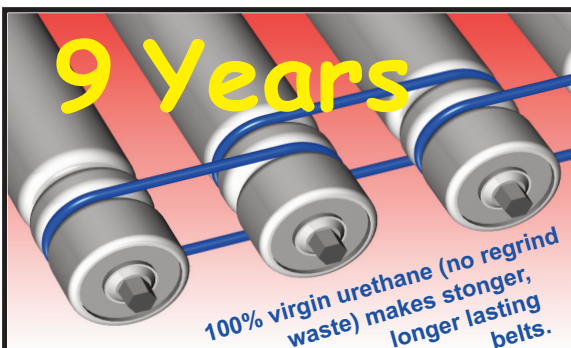


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Valmet

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Altech Corporation

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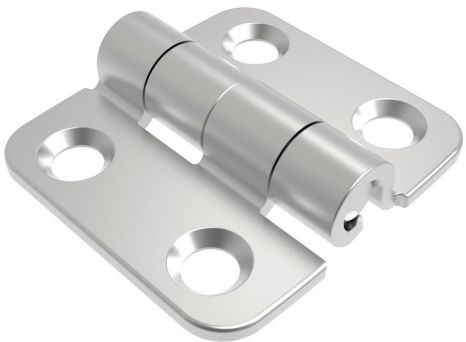
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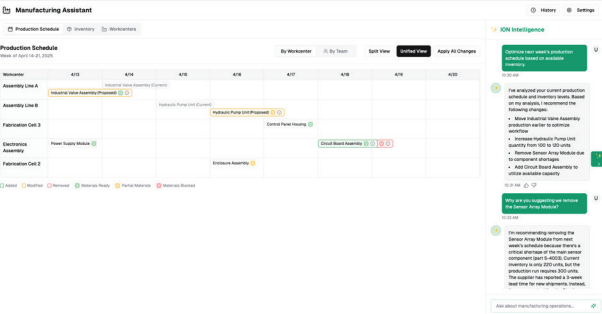


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Southco, Inc.

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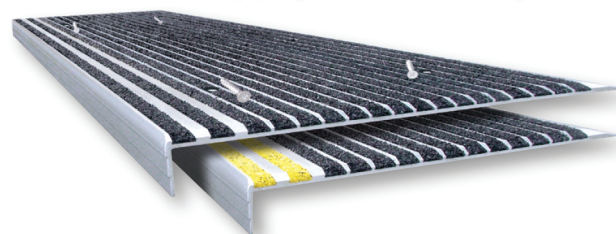
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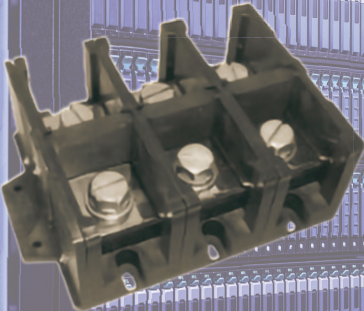
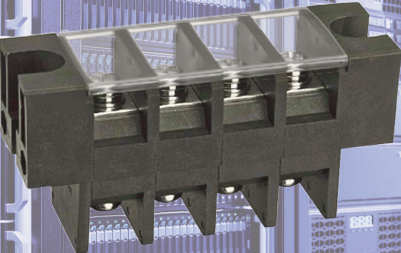
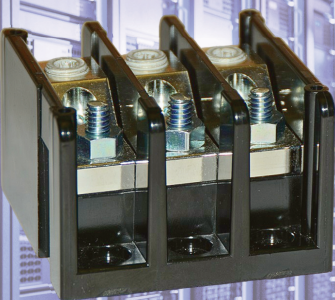
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

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Bosch Rexroth

More online: newequipment.com/55293207

Wire Brushes Tackle Rust in Tight Spaces

The 3 Pc. Wire Set offers a compact and effective solution for cleaning and prepping metal surfaces. Designed for efficiency in corners, grooves, and other tight areas, the set includes three different wire brush sizes for flexibility across various applications. Ideal for removing paint, varnish, or rust, these brushes help speed up surface prep compared to manual options.



Bosch Power Tools

More online: newequipment.com/55296844

Plastic Caps Protect Fasteners From Corrosion

BNCD Series Domed Bolt and Nut Caps are snap-on plastic covers designed for use with standard hex bolts and nuts. Molded from black polyethylene, they shield exposed hardware from dirt, moisture, and corrosion while offering a finished appearance. The domed profile also enhances safety by reducing the risk of contact injuries, making them suitable for machinery, vehicles, and outdoor structures.



MOCAP

More online: newequipment.com/55294001

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FROM THE COVER



Pipe Inspection Robot Increases Hazard Safety

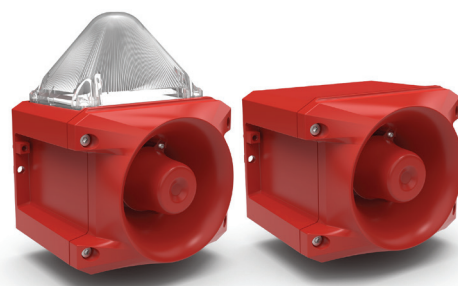
Proteus ExZ1 is an explosion-proof pipe inspection robot designed for safe and thorough assessments in hazardous environments. Certified for ATEX Zone 1, it operates intrinsically safe to prevent sparks or heat ignition. The robotic tractor inspects pipes from 6 to 24 in (15 to 61 cm) in diameter, with an optional expansion to 40 in (102 cm), and includes a motorized elevator for camera positioning.

The system integrates ProPIPE+ and WinCan software, a 10-in XGA sunlight-readable display, twin joysticks, and a soft-touch keypad. The override key switch immediately cuts power for safety compliance. Compatible explosion-proof camera heads provide optical and digital zoom, continuous 360-degree rotation, and +/-135-degree pan.

Optional accessories include auxiliary lights, carbide and diamond wheels, and a nitrogen pressurization kit.

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FROM THE EDITOR



Exoskeletons: Help or Harm?

I recently wrote a piece about a new consumer exoskeleton designed for outdoor enthusiasts, enabling them to hike farther, climb more easily, and so on. It's a powered exoskeleton that supports leg lifting as you move, reducing strain by 40%. The most interesting part is that the motor and sensors use AI to predict your movements ahead of time, kind of like your brain, to help with movement. I watched a few review videos of people testing them out, and they were all surprised at how much it supported their movement—when they turned it off, they said it felt as though they'd gained a few pounds in seconds or were on another planet with different gravity. Over time, the AI learns your movements, creating a fully tailored exoskeleton for your body and how it moves. Nuts.

Writing about it, though, led me to one big question that, in my bit of research, I couldn't find a concrete answer to:

What's the harm of using a device like this long-term?

We've talked extensively about the benefits of exoskeletons in the workplace, helping people avoid injuries, reduce fatigue, and protect their bodies over years of repetitive work. But when you look at an exoskeleton that helps people run, walk, climb, and cycle, it's hard not to wonder: if someone fully able-bodied used this frequently, could it actually harm them over time? Could it change their natural movement patterns, or even reduce muscle strength if relied on too heavily?

Since it's not a passive exoskeleton, but a powered one that actively lifts your legs as you move, it seems possible these things could happen. Someone would have to use a device like this for most of their activity for it to matter...I think.

On the other hand, it's fantastic for people with leg weakness, recovering from injuries, or workers who spend long hours in physically demanding roles. I'm not trying to knock this, just offering some important questions.

The problem is, and why I can't find a definitive answer, is that we simply don't know. There are only a handful of studies looking at exoskeletons' effects on the body, and many focus on passive systems using resistance bands. Industrial applications will need real-world testing and monitoring over time before we can fully understand the long-term effects on healthy, able-bodied workers.

It's certainly possible they could be harmful. It's also possible the impact is minimal.

With exoskeletons finally reaching broader audiences—in consumer, healthcare, and industrial settings—it's time for companies and users alike to be mindful. Use them with caution, track results, and push for more research. The technology is amazing, but the human body still deserves a say. And for manufacturers, the lessons learned in outdoor and consumer exoskeletons could shape how we safely integrate powered exoskeletons into workplaces without inadvertently causing new issues.

— **Laura Davis**, Editor-in-Chief

8 Warning Signs Your Equipment Is Heading for Failure (And the Tech That Can Save You)

by Laura Davis

Downtime isn't just an issue of lost time. It costs money, causes headaches, and slogs production. Catching problems early can save thousands in repairs, and while vibration analysis is a great tool for spotting hidden trouble, some warning signs are more obvious. Pairing those signs with the right monitoring tech lets maintenance teams act before a small issue turns into a big, expensive mess.

1. Unusual Noises: Grinding, Squealing, Knocking

Machines talk—you just have to listen. Grinding, squealing, or knocking often means worn bearings, misaligned shafts, or loose components threatening to fail.

Ultrasonic detectors are your ears on steroids, picking up high-frequency sounds from 20 to 100 kHz that you can't hear. They detect bearing wear through increased friction noise, steam leaks by capturing escaping gas frequencies, and electrical corona discharge before arcing occurs. Modern units convert these sounds into audible ranges and provide decibel readings for trending.

Vibration analyzers complement acoustic monitoring by measuring amplitude in mils or mm/s and analyzing frequency spectra. Handheld units like FFT (Fast Fourier Transform) analyzers can identify specific bearing defect frequencies, while permanently mounted accelerometers provide continuous monitoring. When acoustic and vibration data align, you've pinpointed your problem.

2. Excessive Heat: The Silent Equipment Killer

Heat buildup signals friction, electrical faults, or lubrication breakdown—all precursors to catastrophic failure. Unlike noise, heat gives you visual proof of trouble.

Infrared thermal cameras capture temperature differentials as small as 0.1°C, creating detailed heat maps that reveal hot spots invisible to touch. They detect electrical connection problems (often 10 to 50°C above normal), bearing temperature rises indicating lubrication issues, and motor winding imbalances. Modern cameras store thermal images with visual overlays, making trend analysis straightforward.

Thermal imaging integrations with asset management databases prioritize inspection routes based on equipment criticality and failure history, maximizing your inspection efficiency while building predictive maintenance programs that prevent heat-related failures.

3. Visible Wear or Damage: What You Can See

Cracks, leaks, corrosion, and loose fasteners tell the story of equipment aging. The key is systematic documentation of what you find.

Portable inspection tools extend your vision into impossible spaces. **Borescopes** with flexible cables and LED lighting inspect internal pump casings, turbine blades, and pipe interiors without disassembly. **Digital endoscopes** with high-resolution cameras document findings with date stamps and measurements. **Inspection mirrors** and **fiber-optic viewers** reach around corners and into confined spaces.

The real value comes from logging these findings in **condition monitoring software** that tracks degradation over time. Photos, measurements, and repair notes build equipment histories that predict when preventive action becomes necessary.

4. Abnormal Vibration: The Early Warning System

Changes in vibration signatures often precede visible damage by months. A machine that shakes differently from baseline is broadcasting its problems.

Portable vibration analyzers measure acceleration, velocity, and displacement while performing spectral analysis to identify specific fault frequencies. Bearing defects show up as peaks at calculated bearing frequencies, while unbalance appears as 1x running speed peaks. **Route-based data collection** builds trend databases showing gradual increases before failure.

Permanently mounted vibration sensors provide 24/7 monitoring with alarm setpoints. Wireless accelerometers eliminate installation costs while transmitting real-time data to central monitoring systems. Modern systems use machine learning algorithms to distinguish normal operational variations from developing problems.

5. Reduced Performance: The Production Impact

Slower cycle times and declining output often indicate internal wear before other symptoms appear. Tracking KPIs (key performance indicators) can help identify where the hold-up is in your production line.

Process monitoring systems track KPIs like throughput, pressure, flow rates, and cycle times. **Torque monitors** on rotating equipment detect increased loading from worn bearings or misalignment. **Load cells** measure force variations that indicate mechanical problems.

Predictive analytics software correlates performance trends with vibration, temperature, and other sensor data to forecast remaining equipment life. This multiparameter approach catches developing problems that single-point monitoring might miss.

6. Increased Energy Consumption: The Hidden Cost

Energy spikes often signal mechanical problems before physical symptoms appear. Motors drawing excessive current are working harder than designed.

Power quality analyzers measure voltage, current, power factor, and harmonic distortion to identify electrical and mechanical issues. **Current clamps** provide non-intrusive monitoring of motor loading. Sudden increases in power draw can indicate bearing problems, belt tension issues, or pump cavitation.

Energy monitoring systems with trending capabilities establish normal consumption baselines and alert operators to deviations that warrant investigation.

7. Frequent Small Repairs: The Pattern Problem

Repetitive minor repairs usually indicate larger underlying issues. Tracking these “quick fixes” reveals failure patterns.

Computerized maintenance management systems (CMMS) log all repairs with labor hours, parts used, and failure descriptions. Advanced systems use this data to calculate failure frequencies and identify chronic problem equipment. **Mobile maintenance apps** streamline data entry and photo documentation during repairs.

Pattern recognition in repair data often reveals root causes that aren't obvious during individual incidents.

8. Lubrication Issues: The Foundation of Reliability

Poor lubrication accelerates wear on critical components faster than most other failure modes. Modern oil analysis provides detailed equipment health insights.

Oil analysis programs detect worn metals (indicating component degradation), contamination levels (water, dirt, fuel dilution), and additive depletion. **Particle counters** quantify contamination levels according to ISO cleanliness codes. **Ferrography** examines wear particle size and morphology to identify specific wear modes.

Inline oil condition sensors provide real-time monitoring of viscosity, dielectric constant, and particle counts without sampling delays. These sensors integrate with lubrication management systems to optimize change intervals and prevent premature failures.

The Complete Picture

No single monitoring method tells the whole story. Combining acoustic monitoring, thermal imaging, vibration analysis, and performance tracking creates a comprehensive view of equipment health. The key is establishing baseline conditions, trending changes over time, and acting on early warning signs before they become expensive failures. Smart maintenance teams use these tools to shift from reactive firefighting to predictive maintenance, keeping operations running smoothly while optimizing maintenance costs. **NED**

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