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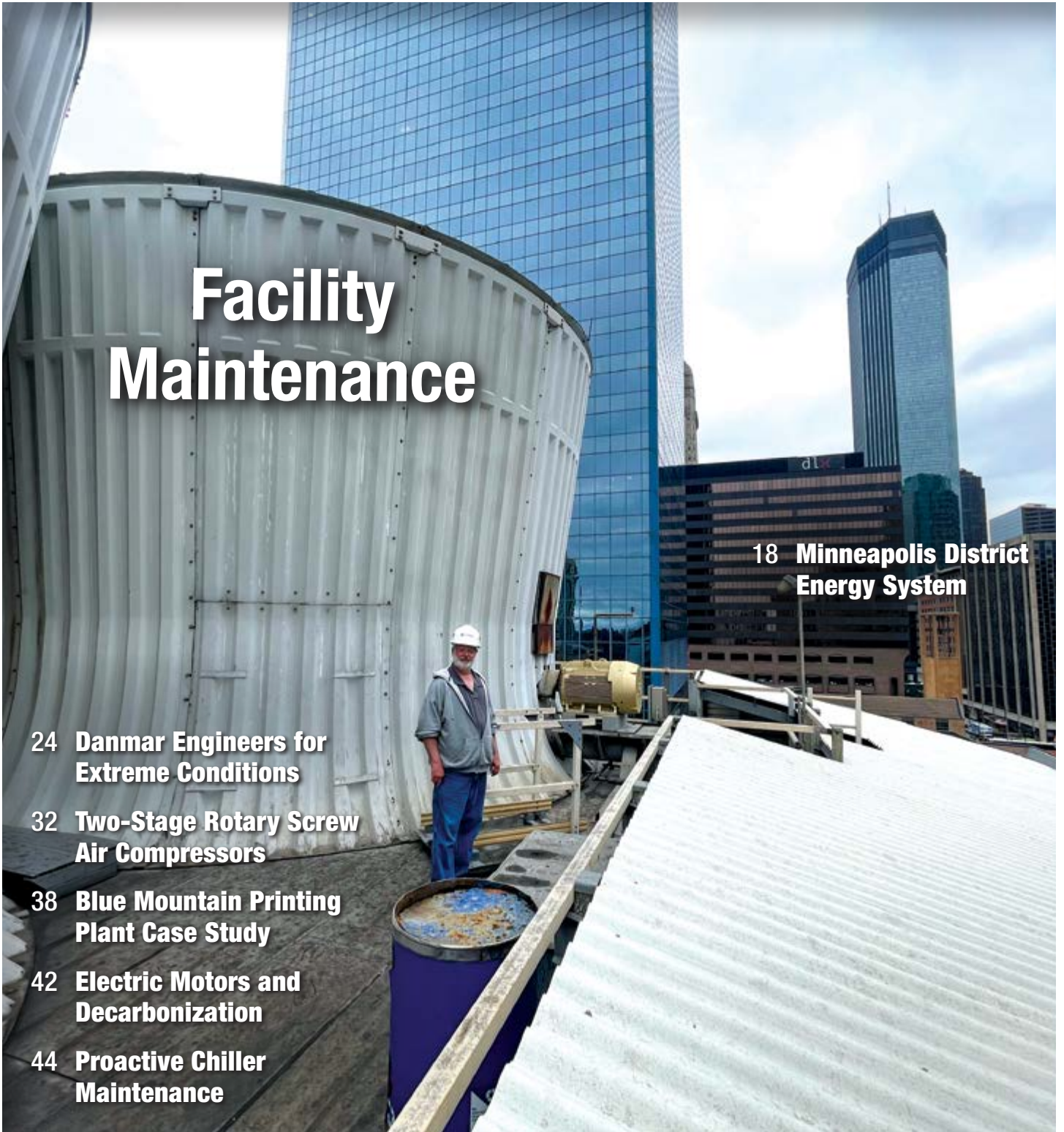
coolingbestpractices.com

June 2025

Facility Maintenance

18 **Minneapolis District
Energy System**

- 24 **Danmar Engineers for
Extreme Conditions**
- 32 **Two-Stage Rotary Screw
Air Compressors**
- 38 **Blue Mountain Printing
Plant Case Study**
- 42 **Electric Motors and
Decarbonization**
- 44 **Proactive Chiller
Maintenance**



The Atlas Copco logo is displayed in white script font within a blue rectangular box with white horizontal bars above and below the text. The background of the entire page is a photograph of a technician in a blue shirt and safety glasses working on an industrial air compressor. The technician is wearing white gloves and is holding a large, white, cylindrical air filter. The compressor is a large, grey metal unit with a control panel on the right side that includes a digital display and several buttons. The model number 'GA75V' is visible on the control panel. The technician is standing next to an open cardboard box containing various maintenance parts, including a pink-topped air filter, several small white containers, and other components. The overall scene is set in an industrial environment with a concrete floor and other equipment visible in the background.

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SCAN ME

COMPRESSED AIR SYSTEM FEATURES

24 Danmar Industries Custom Engineering for Oil and Gas
By Troy Dreier, *Compressed Air Best Practices® Magazine*

32 The Case For Low Horsepower, Two-Stage Rotary Screw Air Compressors
By Ed Maxwell, Eastern States Associates

38 Blue Mountain Reins in a Sprawling Compressed Air System
By Ken Morris, Blue Mountain Air Compressor Services

42 The Role of Electric Motors and Drives in Industrial Decarbonization
By Bevan Christiansen, ABB



COOLING SYSTEM FEATURES

18 Inside the Downtown Minneapolis District Energy System
By Troy Dreier, *Chiller & Cooling Best Practices Magazine*

44 The Advantages of Proactive Chiller Maintenance
By John Mitchell, Johnson Controls

LATEST NEWS

- 8 Compressed Air Industry & Technology
- 14 Chiller & Cooling Industry & Technology
- 16 Industrial Energy & Water Conservation

EVERY ISSUE

- 4 From the Editor
- 6 Subscribers From Around the World
- 46 Column | Facility Maintenance
- 48 Real-World Installations & Maintenance
- 49 Advertiser Index
- 49 The Marketplace | Jobs and Technology



Cover image: Greg Olson, Operations Manager, Cordia, on a cooling tower at the Minneapolis District Energy Main Plant.

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» FROM THE EDITOR



Maintaining Operations

This month's cover story took me to the top of a 45-foot-tall Marley cooling tower on the roof of the Cordia Minneapolis district energy system's main plant. During my tour with Greg Olson, Operations Manager, I saw the centrifugal pumps, centrifugal chillers and crossflow cooling towers serving my city's downtown with chilled water. The district energy system provides over 24 million square feet of building space with cooling. Its cooling system includes 18 chillers and 22 cooling towers, and has a cooling capacity of 37,550 tons.

Danmar Industries provides services few engineering firms can handle, custom designing and fabricating compressed air systems for harsh and remote environments. I spoke to them about a project estimated to take eight years, creating a compressed air system for an oil drilling site on Alaska's north shore. The firm was sent 40 different specifications for the custom equipment, with each specification ranging from 10 to 70 pages. This compressed air system will be inaccessible for much of the year and absolutely can't break down.

Low-horsepower, two-stage rotary screw air compressors have been introduced to the market, says an article from Eastern States Associates, and they're highly energy efficient. Owners can achieve energy savings of 15% to 25%.

Blue Mountain Air Compressor Services gives us the case study of an older printing plant with 11 reciprocating and rotary screw air compressors scattered across its facility. With no central control system, these air compressors fought for control guided by their own discharge pressure sensors. Getting the plant a 200 hp, variable speed drive, rotary screw air compressor solved the problem.

ABB notes that 70% of the electricity used by industry goes to electric motors, but many of the 300 million motors in use worldwide are inefficient. Its article explains how pairing them with variable speed drives reduces energy consumption and CO₂ emissions.

Finally, thanks to Johnson Controls for an excellent article on the value of proactive chiller maintenance. Taking a proactive approach reduces unplanned emergency chiller repairs by as much as 66%

TROY DREIER Senior Editor, tel: 412-409-9151, troy@airbestpractices.com

Henry Porter Van Ormer, Jr. †

Henry (Hank) Porter Van Ormer, Jr., passed away peacefully, surrounded by his loving family, on April 25, 2025. Hank worked for air compressor manufacturers from 1959 until he founded Air Power USA in 1985. He was a pioneer in compressed air energy auditing and a foundational contributor to the Compressed Air Challenge Program. He served on the Editorial Board of this publication since its 2006 inception, and we might not exist today were it not for his expert advice and quick wit. I know I speak for the entire compressed air industry in saying we will forever be grateful to him, were fortunate to know him and offer his family our most sincere condolences. God bless you, Hank.



Roderick M. Smith Publisher – May 1, 2025

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We salute all Best Practices Magazine subscribers from around the world who own, operate, maintain, engineer and provide expertise for the on-site utilities (compressed air, nitrogen generation, vacuum, blowers, chillers, cooling towers and pumps) powering modern plant automation. This subscriber-driven monthly column hopes to build community and recognize all subscribers!



We profiled Engineered Thermal Solutions of Houston, TX, in our May issue, but weren't able to get a picture of the company's two founders. Christopher Imiola, PE, (left) and Charles Marchetta, PE, (right) started the company in 2016, and represent Baltimore Aircoil Company to industrial customers. Here, they're hitting the links with David Ramirez, Project Manager, showing that the company that plays together stays together. Visit <https://engineeredthermalsolutions.com>.



The subject of a profile in our March 2025 issue, Fluid Equipment Solutions of New England is a manufacturer's representative firm based in Amesbury, MA. Here are Cam Fisher, Sales Engineer; Ben McLaughlin, Owner and Senior Sales Engineer and Paul Giurlando, Sales Engineer (left to right), showing off their favorite magazine. Visit <http://www.fesone.com>.



Plant operators, manufacturers and other compressed air experts from around the world visited the Best Practices 2024 EXPO & Conference in Atlanta, GA. We were pleased to meet Octavio Murillo, Chief Engineer, Ventologix. Based in Nuevo Leon, Mexico, the company audits, maintains and repairs compressed air systems. Visit <https://www.ventologix.com>.



Submission Guidelines

We invite our subscribers to send in pictures so we can see the people who read our Best Practices magazines! Those holding a recent magazine issue will receive first consideration. Please send a high-resolution picture as a JPG with a note describing the team and company to Troy Dreier at troy@airbestpractices.com.



↑ The Compressed Air Best Practices team stopped by the grand opening of a BEKO Technologies desiccant dryer production facility in Smyrna, GA, one day before the Best Practices 2024 EXPO & Conference in Atlanta. Tilo Fruth, President, BEKO Technologies, was happy to pose with his recent interview in our pages. Visit <https://www.beko-technologies.us/en-us/>.

↓ Ronda Holt is the Sales Manager for Samuel Pressure Vessel Group, which is based in Marinette, WI, and has locations across the U.S., Canada and Mexico. The company supplies manufacturing, oil and gas, construction, pharmaceutical and other industries with air receivers and custom pressure vessels. We caught up with Holt at the Best Practices 2024 EXPO & Conference in Atlanta, GA. Visit <https://www.samuelpressurevessel.com>.



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NEWS / Compressed Air Industry & Technology

Kaeser Compressors Leads in Sustainability with Solar Power Systems at its US Headquarters in Virginia

Kaeser Compressors has completed the installation of two advanced solar power systems at its U.S. headquarters in Fredericksburg, VA. These systems are set to significantly reduce the company's carbon footprint while generating clean, renewable energy to power its facilities.

The larger of the two solar systems will connect directly to the power supply (transformer) of Kaeser's original building, with an expected energy offset of 95%. The smaller system will link to the new power supply (transformer) for the recent office expansion. Due to the lack of historical energy use data for the new office space, the exact energy offset is yet to be determined. However, both systems are projected to generate a combined total of 1,208,486 kWh of electricity in their first year of operation, which equates to a reduction of approximately 856 metric tons of CO₂ emissions.

"These solar installations mark a critical milestone in our commitment to sustainability," said Frank Mueller, President, Kaeser Compressors. "We're proud to harness solar power to drive our operations,

demonstrating our dedication to reducing environmental impact and supporting renewable energy initiatives." For more information, visit <https://us.kaeser.com>.



The solar systems at Kaeser Compressors' U.S. headquarters in Fredericksburg, VA, are set to generate over 1.2 million kilowatt-hours of clean energy annually, significantly reducing the facility's carbon footprint.

Best Practices 2025 EXPO & Conference Registration Opens

Registration is now open for the 8th annual Best Practices EXPO & Conference happening Oct. 21-23, 2025, at the Kansas City Convention Center in Kansas City, MO. This event is devoted to sustainable, safe and reliable on-site utilities powering automation and can help you discover high-impact projects you can implement to save energy and water.

New for 2025! EXPO Pavilions

The exhibit hall will feature five all-new pavilions, offering a variety of interactive and educational experiences. Attendees can visit with over 80 world-class equipment manufacturers and get access to all of these pavilions for just \$55 with an EXPO Pass.

- **Leak Detection** – Learn to use different types of leak detectors and discover leak audit best practices. Enter the raffle to win the new LeakCam 600 Kit, a \$16,990 value. *Sponsored by CS Instruments.*



Best Practices 2025 EXPO & Conference will feature five new pavilions in the exhibit hall and four new conference workshops led by global experts.

- **Piping** – Get hands-on experience installing aluminum compressed air piping systems. Enter the raffle to win one of three Do-It-Yourself Unipipe Aluminum Piping Kits, valued between \$1,092 and \$2,347. *Sponsored by Unipipe.*
- **Technology** – Explore the latest cutting-edge technologies from 16 leading global OEMs.
- **Food Safety** – Engineer and verify compliance with FSMA/SQF/BRC/ISO Quality Systems.
- **Maintenance** – Get maintenance tips from air compressor, compressed air dryer, chiller, cooling tower, blower and vacuum pump global OEMs.

New for 2025! Hands-On Conference Workshops

This year's event will feature more specialized workshops than ever before. All of these conference workshops are included with a Conference Pass.

- **Hard Hat Compressed Air Maintenance Workshop** – This interactive workshop features fully operational table-top compressed air labs with pneumatic circuits. Led by experts from SMC, Ardagh Glass, The Analysts, UE Systems and Gentex. *Sponsored by SMC.*
- **Industrial Cooling Water Workshop** – Learn how to maximize energy and water savings. Led by experts from EVAPCO, Integrated Services Group, SPX Cooling Tech and 3M.
- **Blower Engineering Workshop** – This two-part workshop led by Tom Jenkins, P.E., President, JenTech, provides a deeper understanding of blower selection and specification for wastewater treatment and pneumatic conveying.
- **Sales Engineering Workshop** – Improve the performance of cooling or compressed air technology sales engineers. Led by Mark Allen Roberts, CEO, OTB Solutions.

For more information, visit <https://cabpexpo.com/attend>.

Hitachi Global Air Power US Expands Sales and Service Territories for Key Sullair Distributors

Hitachi Global Air Power US announced the expansion of sales and service territories for several independent Sullair distributors. The expansion further strengthens the company’s commitment to delivering industry-leading Sullair products and services with exceptional local support.

The expanded territories apply to four key authorized Sullair distributors: Atlas Machine & Supply, Comairco, Metro Air Compressor and Wayne-Vaughn Equipment. Each distributor will continue to provide full customer sales, service and warranty services for all Sullair lines including air compressors, air treatment products and Sullair Genuine Parts.

“Our customers come first at Hitachi Global Air Power, and we are proud to both continue and expand our deep partnership with key Sullair distributor partners in providing our customers the best sales and service experience,” said Joe Beyer, Senior Vice President Sales at Hitachi Global Air Power. “Our distributor partners play a vital role in upholding the Sullair legacy of reliability and durability. We are excited to support their growth as they expand their reach and provide exceptional service to even more Sullair customers.”

As part of this expansion, Atlas Machine and Supply, headquartered in Louisville, KY, will extend its Ohio coverage beyond the Cincinnati, Dayton and Columbus metro areas it serves currently to include the

Greater Cleveland areas in the northeastern part of the state. Comairco, based in Buffalo, NY, is expanding its coverage to the south and west into Western Pennsylvania and Northern West Virginia. Metro Air Compressor, headquartered in Detroit, will broaden its footprint by extending into North Central and Northwest Ohio. Wayne-Vaughn Equipment, based in Fort Wayne, IN, will expand eastward into Western Ohio. For more information, visit <https://www.hitachiglobalairpower.com>.



Sullair LS Series lubricated rotary screw air compressor





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NEWS / Compressed Air Industry & Technology

Henderson Engineering Celebrates Company President Terry Henderson's 80th Birthday

Sahara Air Products, a Division of Henderson Engineering Co., was founded in 1957 by Joe Henderson to provide engineered solutions for compressed air system problems. Now, over 60 years later, Henderson Engineering is celebrating not only three generations of Hendersons continuing the tradition of product excellence and customer service, it's celebrating the 80th birthday of the company President, Terry Henderson.

As Henderson began his career in the family business, he started in the position of gopher and systematically worked through many different aspects of the company's operations, moving from gopher to making Mity Dry, then as a Machinist, to Draftsman and Design Engineer. When the Chief Engineer left to become a competitor, Henderson graduated to Chief Engineer and, at his father Joe Henderson's retirement around 1982, the CEO. After Joe Henderson's passing



Management and employees at the 80th birthday celebration for Terry Henderson (front row center)

in 1987, Henderson took over as President. He attributes his experience in so many positions at the company as giving him a real heart for his coworkers. "Because I worked

all the different jobs, I truly appreciate the fine people doing their jobs today at HECO," said Henderson. For more information, visit <https://saharahenderson.com>.

Atlas Copco Acquires Distributor Powered Compressors and Supplies' Compressed Air Business

The compressed air business of the distributor Powered Compressors and Supplies (PCS), has become part of Atlas Copco Group.

The compressed air business of PCS located in Terre Haute, IN, offers sales and service of air compressors to a broad variety of industries. As part of the acquisition, 12 employees will join Atlas Copco Group.

"We are pleased to add this business to the group in order to further strengthen our presence and even better serve our customers in Illinois and Indiana," said Philippe Ernens, Business Area President Compressor Technique.

The acquired business becomes part of the service division within the Compressor Technique Business Area. For more information, visit <https://www.atlascopcogroup.com>.

Diversified Air Systems Announces Partnership with Kaishan Compressor USA

Diversified Air Systems (DAS) announced its new partnership with Kaishan Compressor USA as the company's primary compressed air product line, reinforcing its commitment to providing industry-leading technology, enhanced efficiency and cost-effective solutions.

"This partnership with Kaishan Compressor USA reflects our continued drive to deliver the best possible solutions for our customers' compressed air needs. By aligning with a trusted industry leader, we ensure our customers receive cutting-edge technology, exceptional performance and long-term reliability that support their success," said Joel Scipio, Vice President and General Manager, MCE Rotating Equipment Group.



Kaishan's family of products

Partnering with Kaishan brings a host of advantages. Kaishan's air compressors are known for their proven reliability, energy efficiency and lower operational costs without sacrificing output. The line is also designed with cost effective ownership in mind, offering competitive pricing paired with long-term savings. In addition, Kaishan's readily stocked products help minimize downtime and keep operations moving.

Customers can count on comprehensive product support, backed by a strong national service network and a reputation for responsive assistance. Most notably, Kaishan offers industry-leading warranties, including a lifetime airend warranty on air compressors manufactured in the U.S. Customers can also take advantage of a flexible 90-day trial program to evaluate performance firsthand. For more information, visit <https://mceautomation.com/diversifiedairsystems>.

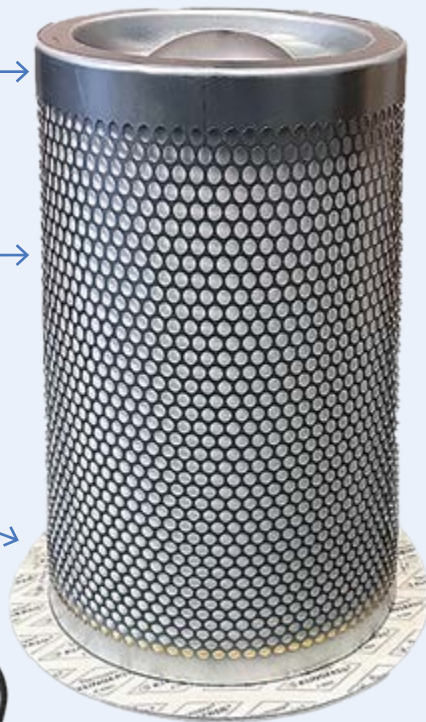
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Compressed Air Filters



Dryers

NEWS / Compressed Air Industry & Technology

Ingersoll Rand Introduces Next Generation R-Series Fixed and Variable Speed Rotary Screw Air Compressors

Ingersoll Rand has announced the Next Generation R-Series fixed and variable speed drive air compressors. Boost productivity and lower total cost of ownership through industry leading energy efficiency, reliability and best-in-class performance backed by Ingersoll Rand's extensive network of trained service professionals. With an

integrated on-board IoT platform, experience the latest technology that delivers continuous real-time monitoring to enable maximum operational uptime.

air compressors offer improved efficiency and superior airflow capacity compared to past generation models. This results in lower energy consumption and optimized performance.



Next Generation R-Series
160 kW rotary screw air compressor

The Next Generation R-Series fixed and variable speed drive air compressors from Ingersoll Rand are designed to deliver high performance, energy efficiency and reliability. Featuring a best-in-class airoend design with an optimized rotor profile, these

Features such as V-Shield Technology ensure a completely integrated, leak-free design with PTFE stainless steel-braided oil hoses and O-ring face seals, enhancing system integrity and reliability. Ingersoll Rand's design further enhances reliability through Progressive Adaptive Control (PAC™), which monitors key operating parameters and dynamically adjusts to avoid unexpected downtime. For more information, visit <https://www.irco.com>.

FLIR Launches Si1-LD Acoustic Imaging Camera for Compressed Air Leak Detection

FLIR, a Teledyne Technologies company, announced the Si1-LD, an industrial acoustic imaging camera that brings faster and more accurate compressed air leak detection to those operating on a modest condition monitoring budget. The new FLIR Si1-LD offers improved detection and quantification capabilities in comparison with the existing FLIR Si124-LD Plus, along with a higher upper limit frequency range.

An array of 96 microphones (2-100 kHz) facilitates the automatic detection, location and measurement of compressed air and vacuum leaks from a safe distance of up to 130 meters. Support comes from a 12 MP color camera with 8x digital zoom and LED lamp, facilitating the easy capture of visual details. Bandpass filtering allows inspectors to effectively tune out any confusing or incorrect sources of ultrasound without manual tuning. Ideal for challenging leak detection applications where user input is advantageous, the inspector simply uses the bandpass filter to undertake manual tuning of the required frequency range and clearly displays the source of interest on rare occasions when needed. For more information, visit <https://www.flir.com>.



Si1-LD industrial acoustic imaging camera

ISO 9001 Certification Solidifies Purity Gas's Dedication to Quality

Purity Gas has been awarded ISO 9001:2015 certification, the internationally recognized standard for quality management. Certification demonstrates a business has established – and is continually improving – a system that includes effective, repeatable processes as well as a trained, skilled staff and an overall dedication to meeting customer expectations for quality products and services.



Chris Styles and Alan Hopkins, Co-Founders, Purity Gas
(left to right)

Purity Gas empowers manufacturers to generate their own nitrogen gas – on-site and as needed – instead of relying on expensive deliveries of liquid nitrogen. Alan Hopkins and Chris Styles are its co-founders and leaders.

“We always want to ensure our foundation is as solid as it can possibly be. Especially when you consider how quickly we’re growing, meeting the ISO standard not only keeps us efficient – it shows the world that we’re committed to sound procedures and best practices. And that we’ll never stop improving,” said Styles.

The ISO 9001 standard is based on seven principles: customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making and relationship management. With such a broad definition of quality management, efforts to review and standardize operations reach every part of the business.

“We look at what each person does to be successful, and we ensure those best practices are properly recorded and standardized. Having a clear roadmap to success means we each perform at the highest level for our customers. When customers are satisfied, when we know we had a positive impact, that’s a win. Each win feeds our team’s motivation to get more wins,” said Hopkins. For more information, visit <https://puritygas.ca>.

SEW-EURODRIVE Introduces DR2C Permanent Magnet Motor, an IE5 Ultra-Premium Efficiency Motor

SEW-EURODRIVE has launched the DR2C motor, an IE5 ultra-premium efficiency motor engineered for wide speed range operation and maximum long-term energy cost reductions. Designed for industries focused on minimizing total cost of ownership, the DR2C reduces energy consumption, minimizes heat losses and enhances operational reliability, delivering a fast return on investment and sustained savings throughout its lifecycle.

The SEW-EURODRIVE DR2C motor series uses Interior Permanent Magnet (IPM) technology, which integrates permanent magnets within the rotor instead of surface-mounting them. This design increases torque density and achieves the highest normative efficiency class IE5, resulting in energy losses up to 50% lower than those of standard IE3 asynchronous motors in the same power class, achieving superior energy efficiency across the entire speed range. This leads to lower operating costs, extended service life and reduced environmental impact, all without compromising power or performance.

SEW-EURODRIVE's DR2C Permanent Magnet Motor delivers maximum torque in a compact design, making it up to two frame sizes smaller than comparable IE3 asynchronous motors. This high-power density is achieved through advanced IPM technology, ensuring exceptional efficiency and performance for heavy-load applications.

“The DR2C IE5 motor is more than just a motor upgrade – it’s a long-term, cost-saving strategy for businesses looking to cut energy expenses and improve efficiency,” said Eder Matias, Director of Sales, Drives Control & Automation, SEW-EURODRIVE. For more information, visit <https://www.seweurodrive.com>.



DR2C Permanent Magnet Motor

C-Aire Compressors Introduces the Zero Loss Tank Drain Kit, a Fully Pneumatic Solution

C-Aire Compressors announced the release of its innovative Zero Loss Tank Drain Kit. This kit is designed to efficiently remove condensate from compressed air systems without wasting valuable air pressure.

The new ZLOSS Kit offers a fully pneumatic solution that requires no electricity while ensuring maximum efficiency. This innovative product quietly and efficiently drains air compressor tanks with zero air loss, meaning no compressed air pressure is wasted during the drainage process. The kit comes preassembled with thread tape for quick installation and includes all necessary hoses and hardware. It is compatible with any tank-mounted reciprocating piston air compressor.

Customers can order the kit pre-installed on new C-Aire compressors by simply adding a “Z” to the end of the model number when ordering.

The Zero Loss Tank Drain Kit represents C-Aire’s commitment to providing innovative

solutions that improve efficiency, reduce maintenance requirements and extend equipment life span. For more information, visit <https://cairecompressors.com>.



C-Aire Compressors' ZLOSS Kit

The Ultimate Workshop Companion

Chicago Pneumatic CPM VS

The CPM VS is the workshop compressor that checks all your boxes: powerful, easy to use, versatile, and always reliable. Thanks to its rotary screw technology, you get more air while enjoying lower operational costs. The CPM VS is built to last – even in tough conditions. Its variable speed drive technology reduces wear on key components. No matter the industry or application, the answer is **always CP**.

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NEWS / Chiller & Cooling Industry & Technology

AIR Control Concepts Announces Acquisition of REA in Tennessee

AIR Control Concepts announced the acquisition of REA, a leading commercial HVAC manufacturers' representative with over 50 years of service to customers in middle and eastern Tennessee.

Brad Hobbs, Founder and CEO, AIR Control Concepts, said, "The team at REA has a proven track record, spanning multiple decades, of finding innovative ways to solve complex HVAC engineering challenges for their customers. We're thrilled to welcome them to the larger AIR network of brands across the country."

This latest expansion highlights AIR Control Concepts' continued investment strategy in both manufacturer and customer support across the Volunteer State.

"At REA, we strive to be the premier partner in the commercial HVAC space," said Myron Carter, President, REA. "By joining alongside AIR, we believe we'll reach new heights of partnerships, adding value to both our customer and manufacturer partners." For more information, visit <https://www.aircontrolconcepts.com> and <https://www.reahvac.com>.

Smardt Introduces AeroPure AF Series Air-Cooled Chillers with Magnetically Suspended Refrigerant Compressors

Smardt Chiller Group introduced the AeroPure AF Series, a new generation of air-cooled chillers with oil-free, magnetically suspended refrigerant compressors. The AF Series chillers are available in 72 predesigned, preconfigured models, including 36 models for comfort air conditioning, with capacities ranging from 211 to 1,800 kW (60 to 510 TR).

The AF Series is Smardt's next series of air-cooled chillers, a development of the tried-and-tested AE Series, operating with an energy efficiency ratio (EER) from 10.1 – 13.4 and an integrated part-load value (IPLV) from 19.3 to 25.9 based on AHRI conditions and EER up to 16 (based on 88°F/31°C EWT, 74°F/23°C LWT, 113°F/45°C OAT), making it even more energy-efficient than previous models. Certifications by AHRI, ETL and CE guarantee reliable, safe and code-compliant operation of the new chiller series.

The AF Series features a modular design with the capability for containerized shipment for units with standard options, designed with utmost consideration for easy accessibility to all major chiller components, enabling quick and easy maintenance on-site. The upgraded controls via the Smardt Global Controls Platform ensure seamless integration into building management or DCIM systems, as well as intuitive operation directly on the unit.



Smardt AeroPure is an advanced oil-free, air-cooled chiller engineered for efficiency, reliability and mission-critical performance.

To simplify installation and operation in confined building spaces, the overall footprint and dimensions of the chillers have been optimized compared to the previous models. For easy global transportation and shipment requirements, the units in the AeroPure AF Series have been designed to fit comfortably into 20- or 40-foot high-cube shipping containers for most configurations. For more information, visit <https://smardt.com>.

Danfoss Climate Solutions Appoints Dennis Appel as Divisional President, Controls and Thermal Management



Dennis Appel, Divisional President, Controls and Thermal Management, Danfoss Climate Solutions

Danfoss Climate Solutions named Dennis Appel as Divisional President of its newly established Controls and Thermal Management division. This division unites the expertise of heat exchangers with refrigeration, cooling and air conditioning technologies to accelerate innovation and enhance efficiency.

"Dennis has successfully led our heat exchangers business, and his leadership will be a tremendous asset to our refrigeration and components business. With 20 years of leadership experience in international heat transfer and thermal management companies, he brings deep industry expertise to this role," said Kristian Strand, President, Danfoss Climate Solutions.

Appel said, "I am excited to build upon our strong foundation and history of exceptional products, solutions and customer relationships, while bringing together two talented teams with a proven track record of success. Most importantly, I look forward to driving impactful results for our customers."

By combining heat exchangers and refrigeration technologies, Danfoss Climate Solutions is strengthening its ability to respond swiftly to evolving customer needs, technological advancements and regulatory requirements. For more information, visit <https://www.danfoss.com>.

G&D Chillers Furthers Commitment to Cleaner Refrigeration Technology with Propane Product Application

G&D Chillers announced its latest innovation as part of its Elite 290 line of propane chillers introduced earlier this year.

The Elite 290 Microseries features a compact design that makes it easier to put the chiller in tight spaces. The new design leverages efficient variable speed fans that allow for stable operation in all weather conditions (especially cold weather) and increases fan efficiency. The fans on the Microseries chillers vent vertically as opposed to horizontally, making them ideal for compact conditions.

Ideal customers for this type of chiller include those in the beer, wine, dairy and industrial industries, which G&D Chillers has been serving for over 30 years.

“Our customers’ needs are always informing the types of chillers we build and we’re really excited to offer our most versatile chiller yet featuring future-proof R-290 refrigerant,” said Justin Thomas, President, G&D Chillers.

G&D Chillers Elite 290 Micro-Series chillers use propane as a natural refrigerant. Propane (R-290) lowers the users’ GWP to near zero. R-290 is a highly efficient refrigerant as well, benefiting a wide array of industries from breweries to industrial biogas. G&D Chillers takes pride in being one of the first in the commercial chilling industry to reintroduce propane as a natural refrigerant in America, offering a safer, environmentally sound and more efficient chilling solution. For more information, visit <https://gdchillers.com>.



Elite 290 Microseries
GD-30H-2C-NR model

LMI Announces the TD Series of Chemical Metering Pumps, Offering High Level of Flexibility

In the ever-evolving landscape of industrial automation, the quest for equipment that combines versatility, precision and connectivity has been relentless. “We’re thrilled to introduce a product that not only meets these demands but sets a new benchmark for excellence in the field of chemical metering pumps,” said Josh Donegia, Global Product Manager, LMI Pumps.

The TD Series emerges as adaptable chemical metering pumps, standing out with its extraordinary range of control features. From optional manual speed adjustment to its compatibility with SCADA systems for full remote control, the TD Series offers a high level of flexibility. The inclusion of MODBUS and Bluetooth connectivity ensures these pumps are ready to integrate seamlessly into the modern, interconnected industrial environment.

LMI’s commitment to innovation is evident in the completely redesigned liquid-ends of the TD



LMI's TD
Series chemical
metering pump

Series pumps. The new liquid-ends are crafted with superior materials, integrating double-ball check valves and over molded diaphragms engineered for extended durability, capable of operating continuously for up to 40 million strokes. Coupled with the proven FASTPRIME™ technology, these pumps guarantee quick, effortless commissioning and priming. For more information, visit <https://www.lmipumps.com> and <https://www.ingersollrand.com>.

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Billerud’s Science Based Targets Approved with Largest Reductions to Come From North American Operations

Billerud, a paper and packaging materials manufacturer, has received official approval



Ulrika Wedberg, EVP Sustainability & Public Affairs, Billerud

for its new Science Based Targets, marking a significant milestone in the company’s commitment to supporting a low-carbon society. This approval highlights Billerud’s ambition to lead the industry in producing high performing, renewable paper and packaging materials.

As part of this commitment, Billerud has committed to reduce Scope 1 and 2 greenhouse gas emissions by 42% by 2030, using 2022 as the baseline year.

“We have already made significant progress in European operations, and while continuing our efforts there, the largest reductions going forward will come from our North American operations. We have established plans including a dedicated organization and the necessary investments to achieve these targets,”

said Ulrika Wedberg, EVP Sustainability & Public Affairs.

“2024 has been the warmest year on record, emphasizing the urgency for companies to remain focused on reducing carbon footprints. Re-committing to science-based targets is not just about setting goals; it’s about taking real, decisive action to combat climate change and move towards a low-carbon society,” Wedberg said.

The new approved targets represent an important step in driving climate action across the packaging industry. By offering high-performing and renewable materials, Billerud aims to support customers in achieving sustainability goals while contributing to the broader transition to a low-carbon economy. For more information, visit <https://www.billerud.com>.

Kensing Earns Recognition for Leadership in Climate Action, Receiving an A- Rating From CDP

Kensing, a global leader in plant-based vitamin E and phytosterols and a North American leader in surfactants, announced it has been awarded an A- rating from global environmental non-profit CDP for its 2024 Climate Change disclosure.

Kensing’s A- score for climate change reflects its robust efforts to minimize carbon emissions, source renewable electricity and use lower-carbon, plant-based ingredients derived from waste residues or upcycled materials. In 2023, the company reduced operational carbon emissions by 27% compared to 2022 levels, driven by operational efficiencies and renewable energy projects including on-site solar installations at its Spanish facilities. These achievements mark solid progress toward Kensing’s approved science-based target of reducing absolute Scope 1 and 2 emissions by 42% by 2030, versus 2022 levels.

In addition to its strong CDP performance, Kensing retained its EcoVadis Gold Medal, placing it among the top 3% of all companies assessed despite more rigorous evaluation criteria introduced in 2024. The Gold Medal reflects Kensing’s consistent performance across key pillars: environment, labor and human rights, business ethics, sustainable procurement and carbon management.

“We are honored to receive these top ratings from both CDP and EcoVadis, particularly in a year with more stringent reporting requirements,” said Serge Rogasik, CEO, Kensing. “We’re proud to be among the few private market companies that publicly disclose detailed environmental and sustainability information. Our entire

team is deeply committed to embedding sustainability and transparency across our business, and these recognitions validate our ongoing efforts to reduce our environmental footprint in partnership with customers, suppliers and stakeholders.” For more information, visit <https://kensingolutions.com>.



Kensing’s Valencia facility (Photo: Jaime Brotons)

Nidec Named to Sustainability A List by Carbon Reduction Organization CDP

CDP (formerly Carbon Disclosure Project), a non-profit organization that holds the world's largest, most comprehensive dataset on environmental action, has selected Nidec Corporation as a 2024 A List company.

As a company that operates globally, Nidec considers contributing to a sustainable global environment as one of its key goals, and aims to achieve net zero CO₂ emissions from its operations by FY2040 and across the entire supply chain by FY2050.



Katia Drusian, CEO, Nidec ACIM

For one of the company's largest business units, Nidec Appliance, Commercial and Industrial Motors (ACIM), the rating comes as a recognition of its commitment to continuously evolve on the sustainability journey, focusing on four bold sustainability targets encompassing its operations, people, solutions and suppliers.

The company's U.S. MOTORS line is working closely with ACIM to achieve the four targets. Three are carbon-related: the achievement of carbon neutrality in its manufacturing plants by 2030, followed by the aim to reduce its customers' carbon footprint by one gigaton and closing the cycle with an assessment of its key suppliers on environmental, social and governance (ESG) topics.

"Our journey with CDP began over five years ago, and in 2024, we formalized the goals to align with those of the Nidec Corporation team," said Katia Drusian, CEO, Nidec ACIM. "Being part of this prestigious A List is an honor as well as a responsibility since we now stand among a select group of companies expected to be role models in leading positive change. As a global provider of solutions and services to over 4,000 customers, we remain committed to engaging our employees, customers and suppliers in this movement toward a more sustainable future." For more information, visit <https://www.nidec.com>.

Pyxus Releases Fiscal Year 2024 Sustainability Report, Announces the Reduction of Total Emissions by 14%

Pyxus International, a global value-added agricultural company, published its fiscal year 2024 sustainability report detailing the measurable impacts of the company's sustainability initiatives as it progresses toward achieving its global targets.

"Fiscal year 2024 was an exceptional year for Pyxus and this report highlights the positive impacts of our environmental and social initiatives, including collaboration with our contracted growers to reduce Scope 3 emissions, improvement of our employee health and safety practices and providing support to those in need," said Pieter Sikkel, President and CEO, Pyxus. "We remain committed to viewing all aspects of our business through a sustainable lens, helping us progress against our targets while delivering value to our stakeholders, the environment and the communities in which we operate."

Pyxus decreased total emissions by approximately 14% since its 2020 base year, contributing to the company's near-term greenhouse gas reduction targets and 2050 net-zero emissions goal. It continued to surpass its global water target, achieving an approximate 17% reduction in total water withdrawal per product unit since its 2020 base year. For more information, visit <https://www.pyxus.com>.

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Inside the Downtown Minneapolis District Energy System

By Troy Dreier, Senior Editor, Chiller & Cooling Best Practices



► The Cordia Minneapolis district energy system has evolved since it first went online in 1972 to include one main plant and nine satellite plants providing heating and cooling to over 100 buildings. Those buildings are some of the biggest in the state, including the homes of three professional sports teams (U.S. Bank Stadium, Target Field and Target Center), the Minneapolis Convention Center, the Minnesota Star Tribune printing plant and Augsburg University. The steam and hot water system

includes 39,000 feet of piping. The chilled water system includes 24,900 feet of piping and has a cooling capacity of 37,550 tons.

The system began with the main plant in central downtown Minneapolis created to serve the IDS Center, then and still the tallest building in the state, as it neared completion. Originally, the system was a partnership between the IDS and Minnegasco (then the name of the state's natural gas utility) with

each owning 50%. Over the years, the system grew as new buildings were constructed downtown and chose to join. The number of plants grew, as well, with nine plants added to provide heating and cooling where needed.

In 1972, the system served 2,700,000 square feet of building space with cooling. By 1982, it grew to 6,220,000 square feet, and by 1992 to 13,990,000 square feet. Today, it serves over 24,000,000 square feet.

Above: The main plant of the Minneapolis district energy system. The Goulds 250 hp centrifugal pump in the foreground is known as the Vikings pump.



Jacob Graff, Regional President, Cordia



Christopher Rheineck, General Manager, Cordia



Patrick Gerdes, Business Development Manager, Cordia

Ownership of the district energy system has changed many times over the years. Some of the employees have worked at the same plant under five different names. The current owner is Cordia, a distributed energy business that owns and operates energy systems around the country. Its portfolio includes district energy systems in Phoenix, Tucson, Tempe, San Francisco, San Diego and Omaha, as well as microgrids at Princeton Health and the Pittsburgh International Airport. Cordia is owned by KKR, a private equity firm.

“As the city grew, we grew with it,” said Jacob Graff, Regional President, Cordia.

“District energy is more efficient than each one of these buildings owning and operating their own system in downtown Minneapolis,” added Christopher Rheineck, General Manager, Cordia. “We’re reliable. We offer reliability through built-in redundancy. We can shift our efficiencies and share resources. Partnering with us allows our customers to focus on their core business. A healthcare company can focus on healthcare, not energy.”

Supplying Reliable Chilled Water and Steam through Redundancy

Half of the Minneapolis district energy main plant supplies steam and half supplies chilled

water. Its intricate piping network is color-coded with blue and green used for the chilled water system, and red and orange used for steam. The main plant has five York and Carrier



Shell-and-tube centrifugal chillers in the district energy system’s main plant.

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» Inside the Downtown Minneapolis District Energy System



A view of the rooftop crossflow cooling towers. Most of the buildings shown, including the IDS Center at right, are district energy system customers.

centrifugal chillers, with six satellite plants holding 13 additional centrifugal chillers from Trane and YORK. The main plant also has six Marley crossflow cooling towers. Six satellite plants have 16 additional cooling towers from Baltimore Aircoil Company, Ecodyne, Marley and EVAPCO.

“What we’re trying to sell is reliability. That’s the way I look at it,” said Greg Olson, Operations Manager, Cordia. “The best way to get reliability is through redundancy. Currently, we have four boilers in the main plant. If I had 11 boilers, I wouldn’t have to worry much about reliability. In order to get the reliability we want, we have to get our redundancy other ways like training, good practices, good maintenance – whatever you can do to make sure your equipment’s going to run 24/7/365.”

One of the main plant’s centrifugal pumps is known as the Vikings pump, because this 250 horsepower (hp) centrifugal Goulds pump was installed to deliver chilled water to and draw warm return water from the home of the Minnesota Vikings, U.S. Bank Stadium, when it was completed in 2016. Purchase and installation costs for the pump were \$400,000, which is how much adding a second pump for redundancy would cost. Rather than taking on that expense, the plant tied into an existing plant header where the same water could reach already existing pumps if needed. That gave the

plant the security it needed for an additional \$60,000 in piping.

“When the Vikings are playing there are 60,000 people in U.S. Bank Stadium. If it’s hot outside they need a lot of cooling. If it’s cold outside, they need a lot of heating,” said Patrick Gerdes, Business Development Manager, Cordia. “On a day like today, when the stadium is empty, their demand drops. If they owned their own equipment, they’d have costly systems sitting

idle. With district energy, we can put that capacity to use elsewhere – sharing resources across the city.”

The chiller leaving water temperature is 40°F (4°C) and the returning water temperature is 54°F (12°C). It’s chilled in five water-cooled centrifugal chillers using shell-and-tube heat exchangers with a total of around 31,000 ¾-inch diameter copper and nickel tubes. The rooftop cooling towers provide a 12°F (7°C) range for the open cooling loop.

Four-Season Operations Are Essential

Thanks to Minneapolis’s four-season climate, the district energy system needs to be run differently in the summer and winter. In the summer, satellite plants to the north, west and south of the main plant work like spokes in a hub, running their chillers as needed to support cooling loads during the warmer months. The system maintains a minimum differential pressure of 10 psid from supply to return with a differential temperature of 14°F (8°C). Pressures and temperatures are monitored at the edges of the system to ensure proper service to customers across the system. The main plant has two 2,000 ton YORK centrifugal chillers, as well as 3,600, 5,000 and 5,200 ton Carrier centrifugal chillers.

The two YORK chillers are electric motor-driven, while the Carrier units are turbine-



Inside the main plant’s crossflow cooling towers.

driven and run on steam. When demand is low, not all the chillers are operational. This gives the system flexibility to manage costs, responding to electricity or gas prices by running whichever chillers are most economical. The system is one of the largest natural gas purchasers in the state.

In the winter, the main plant only needs to run a tower fan, condenser pump and chilled water pump to provide chilled water service. A plate-and-frame heat exchanger with 512 thin stainless steel plates has 35°F (2°C) condenser water on one side and warmed water returning from customers on the other. Condenser water

takes the place of chillers in cooling the water for customers. The heat exchanger has no mechanical parts and operates around the clock. It and an identical unit run in parallel, providing 4,000 tons of cooling per hour.

While the main plant has six cooling towers on its roof, only one is needed in the winter. It's been hardened to handle ice buildup. The cooling tower's fan runs in reverse a quarter of the time to thaw the ice. For six hours, it runs at normal operation, then reverses for two hours.

“The tower will ice up and then we have to thaw it out,” explained Olson. “We have two ways of doing that. One, we turn the tower fan in reverse, so instead of pulling the cool air through the tower and sending it out warm, we reverse the cooling fan to go backwards. We take warm air and push it out through the cooling tower. That thaws out the ice that's forming on the exterior fill of the cooling tower. The other thing we do is turn a turbine chiller on. We run a turbine chiller to warm the condenser water to 70-something degrees, then we just thaw our tower out.”



A porthole view of one of the fans atop the main plant's induced draft cooling towers.

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» Inside the Downtown Minneapolis District Energy System



Water Treatment Prevents Scale Buildup with Chemistry

One section of the main plant is devoted to chemistry. Twice each day – for two to three hours in the morning and 30 to 45 minutes in the evening – employees test the condenser water, chilled water, the water returned from customers and the water going into the boilers. They’re hunting for early warning signs of corrosion. The condenser water system relies on well water, but the mineral content of that water demands precise testing and correction. An automated Nalco Traser system monitors and controls the pH balance.

“City water costs \$9 for every 758 gallons. That’s expensive compared to free well water. It adds up if you use 100 million gallons per year. That’s why we cycle up to five times in the condenser water and monitor the water in our chemistry area. We monitor here and we double-check with our daily tests. We put a lot of time and money into our chemistry,” Olson said.

Color-coding the pipes helps the Minneapolis district energy main plant stay organized. The area where employees perform chemistry testing is in the front.

While older buildings in the district energy system have direct connections to the chilled water loop, newer buildings take the chilled water and run it through their own secondary heat exchangers.

An Employee Pipeline from the U.S. Navy

Over half of the system’s 46 employees are veterans, most from the U.S. Navy. Olson has worked there for 37 years, hired directly after leaving the Navy in the 1980s. In the Navy, he was a nuclear operator – or a “nuke” – maintaining nuclear reactors on Navy nuclear-powered cruisers. Maintenance Manager Gary Lindberg and Plant Manager Michael Tweet were also nukes. The plant hired nine additional Navy nukes in the past five years.

“A lot of us came out of the Navy either as a nuke, a conventional machinist mate or a boiler technician. That was the pipeline into this trade,” Olson said. Minnesota requires boiler operators be licensed, but candidates need two years of experience before they can take the license exam. The Navy offered a way to get experience without a license.

“That’s what the Navy was good for, it gave you all the experience. When I got out of the Navy, I could go take my test,” Olson said.

That pipeline has nearly dried up, however, as the Navy began transitioning to natural gas-powered submarines by the end of the 1980s.

“We’ve got all of downtown riding on our back, but nobody knows about us. We’ve never shut this plant down. I think that’s one of the things I’m most proud of,” Olson said.

The goal is to maintain a pH balance of 7.8-8.0. The calcium and magnesium content of the well water has a natural pH of 8.4-8.8. The danger is that minerals can drop out of the water and form scale, reducing heat transfer efficiency.

The main plant keeps 3,000 gallons of sulfuric acid on hand to treat the well water. The acid



The main plant uses air compressors to start its CAT engines and run pneumatic controls.

keeps the minerals in suspension so they don't drop out and form scale. The plant is then able to cycle water up to five times and blow it down to the sewer when fully cycled.

"The better job we do on corrosion control today, the more money we save long-term," Olson said.

Air Compressors Are Essential Equipment

While the chillers, cooling towers, pumps and boilers take up a lot more space, air compressors play an important role in the district energy system. The main plant has two air compressors and two older models stored as backups. The active models are 45 hp water-cooled, lubricated, rotary screw Quincy VSD air compressors. They run at a constant 40% load. The system previously relied on fixed-speed air compressors, saving about \$11,000 yearly in energy costs by switching to VSD air compressors. The main plant also has refrigerated compressed air dryers and backup refrigerated compressed air dryers, as well as large compressed air storage tanks.

The district energy system uses air compressors to start its CAT engines and run pneumatic controls on its boilers and chillers. Starting CAT engines takes a large amount of compressed air but it's only done occasionally, which is why the main plant has large compressed air storage tanks.

The district energy system also owns a trailer-mounted portable air compressor. Each satellite plant has a main and a backup air compressor, as well as a mount for the portable air compressor.

"We've already had the infrastructure installed to be able to bring the portable air compressor up, hook it up, start it up, and boom, we're

back on air. That's how critical air is," Olson said.

ESG Goals for the Year Ahead

The district energy system is currently working to achieve its ESG goals, which include achieving net zero emissions by 2050, transitioning to a fleet of electric vehicles, improving water conservation and working with contractors and suppliers that are aligned with these goals. It recently halted use of a gas-driven chiller in its Convention Center plant and disconnected it from the system because it didn't meet the ESG goals. That meant a loss of capacity, so it will likely be replaced with an electric chiller.

For more information, visit <https://cordiaenergy.com>.

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Danmar Industries Custom Engineering for Oil and Gas

By Troy Dreier, Senior Editor, Compressed Air Best Practices® Magazine



► Danmar Industries, based in Houston, TX, is a Gardner Denver distributor, but it's better known for the custom-fabricated packages it provides customers in the oil and gas industry. Some of its fabrications are simple, involving a few off-the-shelf air compressors and piping on a skid, while others feature completely custom-built air compressors where the company buys subassemblies and joins them with custom controls and user-specific instrumentation.

The company was founded in the early 1980s, and is currently owned by founder Dennis DePauw and the family of founder Mark DePauw.

“We buy equipment and do modifications in-house,” explained Patrick Gebhart, Engineering Packaging Manager, Danmar Industries. “Some of it, like the air compressors we’re building now, involves buying an airend from Gardner Denver and building our own skid in-house. We bought a separate motor, basically the coupling was separate. We did

all the piping in-house. So it wasn’t just modifications, it was a one-off ground-up build

of a Danmar air compressor with a Gardner Denver airend.”

Above: Danmar Industries employees pose with a custom nitrogen generation system.



Danmar Industries' Houston, TX, headquarters occupies 40,000 square feet on four acres.



Qualified welders weld carbon steel and stainless steel with dedicated buildings for separation.



Patrick Gebhart, Engineering Packaging Manager,
Danmar Industries

Much of the company's output goes to oil and gas companies. Reliability and ruggedness are key for these customers since the compressed air systems often operate in remote or harsh environments. These customers are willing to sacrifice efficiency for air compressor systems that are rugged.

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Creating custom-built compressed air systems is just as involved as it sounds. Customers often provide an approved manufacturer list for purchases, typically where they have large-scale contracts. The customer will have oversight of purchases and verify its specifications are followed. Danmar provides these specifications

to the provider— such as ABB Baldor for the project in this article – and works in partnership to ensure all parties understand what’s required. The company ensures compliance with API specifications, such as API 547 and 541 for medium-voltage motors.

“What’s unique about these motors is their service factor and duty rating,” Gebhart said.

“On top of that, they’re monitored heavily. They typically have bearing and winding temperature monitoring, as well as vibration monitoring. There will be space heaters both inside the motor and in the conduit box. With the 550 horsepower motors in our shop, the conduit box is literally half the size of the motor, so it has its own structure supporting it. It is that large.”

Producing a custom motor to exact specifications isn’t quick work. This one had a 36-week lead time from the manufacturer, then 12 tests were conducted before it left the facility. All custom parts are thoroughly tested, inspected and confirmed to operate within the customer’s specifications. The company creates a data sheet for every piece of equipment it delivers.

Customers want to be able to monitor and control the equipment even when human operators aren’t at a site, so remote functionality is standard, most often through an Allen Bradley PLC.

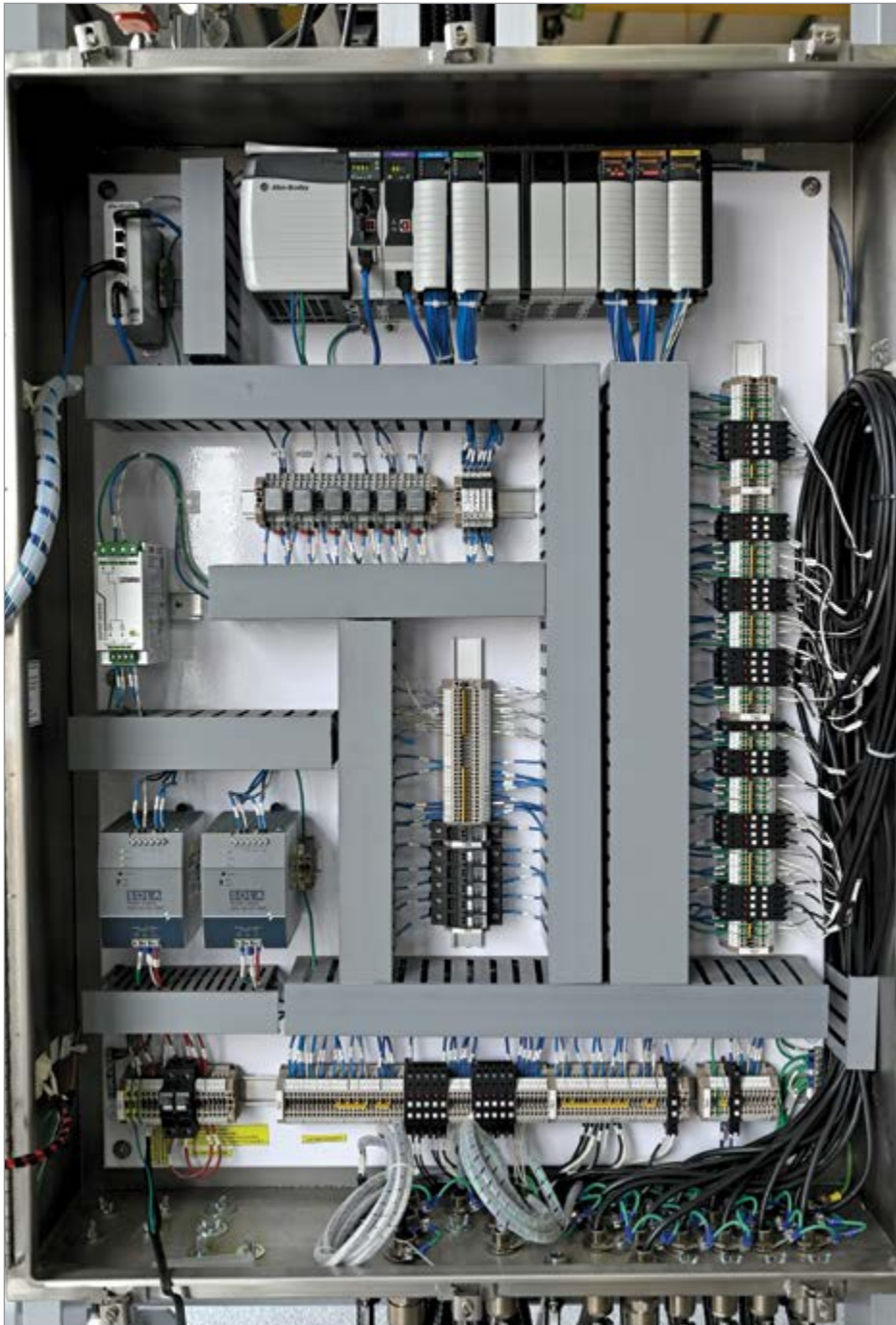
“What’s unique about these motors is their service factor and duty rating. On top of that, they’re monitored heavily.”

— Patrick Gebhart, Engineering Packaging Manager, Danmar Industries

For air compressor coolers, the company prefers Alfa Laval plate-and-frame coolers. They can be broken apart easily for cleaning, and their stainless steel construction is durable. Their wavy houndstooth pattern creates a turbulent flow path, which provides self-cleaning.

The company has a small engineering team working in its 30,000-square-foot production facility, so employees need to wear several hats. The engineering team includes an in-house engineer to draw up the controls, a 3D modeler, a document control specialist and a fabrication shop manager.

“What makes our team special is everybody has to come together and help out,” Gebhart said. “On the shop floor, we have six full-time guys. The quality of the work is second to none. Four employees are structural steel welders. They are tested to Danmar’s weld procedures and stay current to make sure that the quality of



A control panel built to customer specifications.



One of three custom-built 550 HP air compressors headed for the north shore of Alaska.

the welds meet the requirements. Three of the guys are qualified in carbon steel piping for our own procedures. Two are qualified for stainless steel piping for our weld procedures. One is our shop electrician. Our shop electrician builds the panels and assembles everything as per the wiring schematics. He also helps with installation on all the skids and does a lot of instrumentation wiring. Like the rest of our teams, those guys have to pitch in wherever they're needed because in a small shop, you have to do whatever is needed at the time."

Texas Prepares Compressed Air Skids for Alaska

Danmar is currently in the middle of a large project that began in 2021 when it was contacted by an engineering firm with a request for proposal. The job involved an oil and gas drilling station on the north shore of Alaska that would be inaccessible for much of the year. The equipment provided needed to be highly robust so breakdowns would be rare and the on-premises team could handle maintenance without outside help.

"They are going to have to ensure they have all of their maintenance items onsite so that whatever they need they can do themselves,"

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Gebhart said. “They can call out and talk to somebody, but physical help can take a long time to arrive. Whatever the issue, they have to deal with it themselves.”

Working out the requirements for the project was a years-long process that involved considering different scenarios and deliverables. The proposal stage didn’t wind down until the third quarter

of 2023, when all considerations had been made and the engineering firm asked for final bids. In late 2023, the firm completed its evaluations and awarded the purchase order to Danmar.



This skid contains two 60 HP air compressors with two heatless desiccant compressed air dryers.

Facility Maintenance for Extreme Conditions

“The most critical thing for maintenance in extreme conditions, whether it’s cold or hot, is oil temperature” explained Patrick Gebhart, Engineering Packaging Manager, Danmar.

“In cold applications, oil temperature is the biggest thing people overlook. They assume the air compressor is going to be able to start. But in cold temperatures, you need to heat the oil before starting. Otherwise, you risk damaging your equipment at startup.

“In hot temperatures, you have the opposite problem. You have to keep the temperature cool enough so air compressors can continue to operate. It’s a balancing act at every one of these facilities. You need to keep it in the right area so you get proper lubrication without a lot of water entrained in your oil. That would physically damage the equipment.

“The other critical facility maintenance item is setting and keeping a maintenance schedule. In remote facilities,

they need to have all their spares onsite. Maintenance is on a schedule and they do it on time. That is critical. They replace solenoid valves, inlet valves, the IVC and IVO that control the inlet valves. They replace them on schedule whether they went out or not. They don’t wait for parts to fail; they replace them on time to prevent issues before they occur.

“Whether it’s a ball valve or butterfly valve, they take apart the actuator on schedule. The worst thing they can see is an unplanned event. All these guys will tell you the more data they have, the better it is. They can see events coming. So, whether it’s vibration or temperature data, they collect it. This data is fed past our controller to their DCS and they extrapolate it over years of service so they can see events coming and plan maintenance before events occur. When they see oil temperature starting to rise or vibrations starting to trend up, they check and rebuild the part before it fails because they’re not willing to risk a catastrophic event.”

The items requested included three 550 horsepower (hp), oil-flooded, water-cooled, single-stage air compressors with inlet valve modulation capable of providing 1,540 scfm at 165 psi (11.4 bar), two heatless desiccant, 3,138 cfm, 165 psi (11.4 bar) compressed air dryers, and two nitrogen generators for the main station, as well as two smaller air compressors and heatless desiccant compressed air dryers for each of three smaller facilities. Air compressor packages typically meet API 619, but the customer did not request that in this case. The motors, however, need to meet API 547. Air compressor system piping needed to be carbon steel built to ASME B31.3.

“In cold applications, oil temperature is the biggest thing people overlook. You need to heat the oil before starting.”

— Patrick Gebhart, Engineering Packaging Manager, Danmar Industries

“There’ll be three different skids for the air compressors. The air treatment skid has two heatless desiccant dryers on it, and parallel filtration banks with a block and bypass valve for all of it so operators can switch between which filtration bank they want or which

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compressed air dryer they want to have online,” Gebhart said.

The desiccant compressed air dryer skid used all stainless steel piping. The only thing not stainless steel were the desiccant dryer vessels themselves, which were carbon steel. The filter housings, piping and valving were all stainless steel.

“We do have purge control,” Gebhart said. “Once the unit hits -60°F (-51°C) dew point, it will basically re-pressurize the regenerating tower and then it stalls at the inlet valve switch. That stays in the state it is in until you go back above -60°F (-51°C) dew point. Once it goes back above -60°F (-51°C) it switches the inlet valves and starts the next cycle. One thing we do a little bit differently is it has a little bit higher purge rate and shorter cycle time. Instead of it being a five-minute cycle, it’s a three-and-a-half-minute cycle.” The desiccant dryer uses standard activated alumina with 1/8-inch beads.

The engineering firm also sent around 40 different specifications for the equipment, and each specification ranged from 10 to 70 pages. Specifications covered everything required for the job including environmental conditions,

pipe welding, pressure vessel welding, coatings, noise requirements and supplier documents. Danmar was expected to procure all equipment

from an approved suppliers list, and get prior approval if it needed to use equipment providers not on the list.



Three air compressors and a heatless desiccant air dryer in one container wired for a single power feed.

One unique requirement for this contract was the constrained footprints the packages needed to have. The company worked with the pressure vessel manufacturers to get nozzles oriented exactly as needed. Off-the-shelf components wouldn't fit the space.

A 12-Membrane Nitrogen Generation System

Besides creating a compressed air system for its client, Danmar is creating a nitrogen generation system, as well. The nitrogen generation system is membrane-based using Evonik membranes since only 97% purity is required. The nitrogen generation system is laid out in two banks with 12 membranes, including two spares built into the system. This allows the operators to expand the system in the future, as needed. As -60°F (-51°C) dew point compressed air enters the membrane bank it goes through two stages of filtration, including a coalescing filter and a carbon absorber filter, to ensure any residual oil is removed. It then passes through a heater which raises the temperature to 90°F (32°C) in order maintain a stable temperature, then it passes through a particulate filter and one of the membrane banks.

After the membrane bank, the nitrogen generation system includes a control valve holding the system to 135 psi (9.3 bar) for even, controlled performance. Next is an off-spec valve monitoring for low-purity nitrogen. If that occurs, the valve tries to get the system back on spec. Once it does, the nitrogen passes to a low-pressure output. The nitrogen generation system includes a booster pump capable of boosting the nitrogen to 3,300 psi (227.5 bar), as the facility requires both low-pressure and high-pressure nitrogen.

Storage tanks for the nitrogen generation system were purchased separately and placed around the facility wherever they could fit. This system uses stainless steel piping, as well.

Preparing for the Journey to Alaska's North Shore

As of this writing, Danmar is cleaning up the compressed air and nitrogen system skids and preparing for the next phase of their journey. First, the skids will travel to a Gulf Coast location near Corpus Christi, where the oil and gas customer has an offshore division. The entire facility will be built there. When that's complete, it will travel by barge to Alaska's north shore and be offloaded. Its last leg will

involve traveling 100 miles via an ice road. The final destination is an oil drilling site roughly 80 miles from Alaska's north shore.

First, the skids will travel to a Gulf Coast location near Corpus Christi. The entire facility will be built there. When that's complete, it will travel by barge to Alaska's north shore.

"Everything at the drilling site is operated by compressed air or nitrogen," Gebhart said. "Their entire facility, all the valving that operates the entire facility operates off

compressed air. The seals in the turbines need nitrogen as pad gas, otherwise they have to shut down. The storage tanks and sump piles all have to be blanketed with nitrogen to make the facility safe and operable. Everything that operates the facility or makes the facility safe is being operated by the compressed air and nitrogen generation system we're building. Without it, nothing's going to operate and they're going to have to shut down everything."

With the construction and travel left, the system will likely not be operational for another four years.

For more information, visit <https://www.danmarind.com>.

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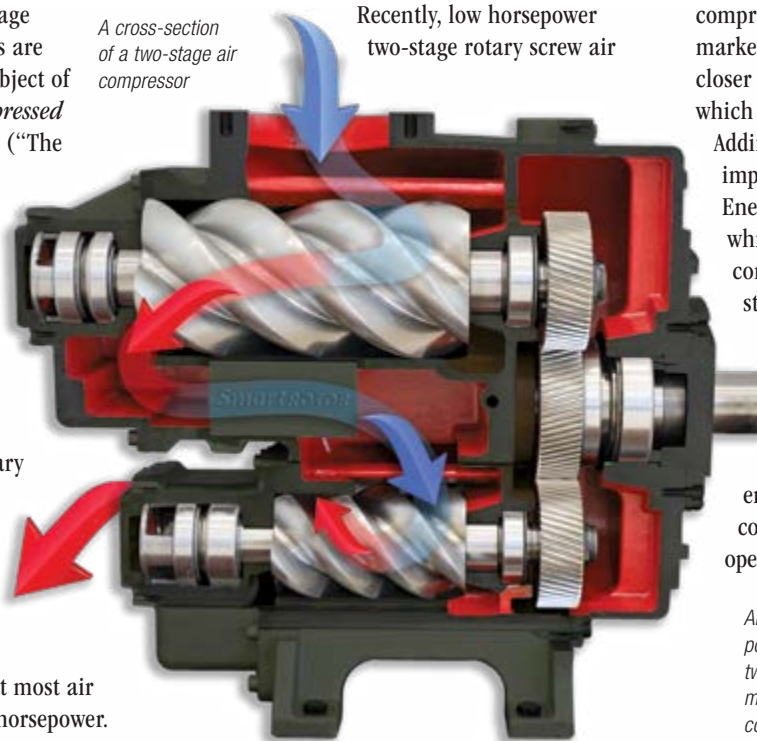
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The Case For Low Horsepower, Two-Stage Rotary Screw Air Compressors

By Ed Maxwell, CEO, Eastern States Associates

► The advantages of two-stage rotary screw air compressors are well-known and were the subject of an excellent article in *Compressed Air Best Practices Magazine* (“The Pros and Cons of Single-Stage and Two-Stage Air Compressors,” July 29, 2020). However, because two-stage rotary screw air compressors at that time were only available in large horsepower options (100 hp and above), the advantages of two-stage rotary screw air compressors were often ignored because large horsepower two-stage rotary screw air compressors were much more expensive than single-stage, as well as the fact that most air compressors sold are lower horsepower.



Recently, low horsepower two-stage rotary screw air

compressors have been introduced into the market (30 hp and above) with pricing much closer to their single-stage counterparts, which makes revisiting this issue worthwhile.

Adding to the importance is the implementation of the U.S. Department of Energy’s Title 10, Part 431, Subpart U rules, which require testing of rotary screw air compressors to meet isentropic efficiency standards. As will be shown here, two-stage rotary screw air compressors will certainly meet or exceed future isentropic efficiency requirements.

Industrial manufacturing environments demand high-performance compressed air systems that balance operational efficiency, reliability and energy

Above: A major producer of engines for outdoor power equipment in New York State installed two two-stage air compressors for its laser cutting machines, realizing significant energy savings compared to its previous air compressors.

consumption. Two-stage rotary screw air compressors are a transformative technology, offering substantial advantages over traditional single-stage air compressors, particularly in energy savings and operational performance.

Much of the discussion here is theoretical since low-horsepower two-stage air compressors are new to the market. The calculations used here are based on well-accepted CAGI formulas.

Understanding Two-Stage Air Compression Technology

Two-stage rotary screw air compressors differ fundamentally from single-stage models by implementing a more efficiently designed air compression process. In these systems, air undergoes compression in two distinct stages, with an intercooler between the first and second stages. This allows for more effective and controlled compressed air production.

The first stage compresses air to an intermediate pressure level, after which the air passes through an intercooler (usually an oil shower) that reduces the air temperature. Then, the partially compressed air enters the second stage, where it undergoes final compression to the desired pressure. This methodical approach provides several critical advantages for industrial applications.

Energy Efficiency Gains

Two-stage rotary screw compressors demonstrate remarkable energy efficiency compared to their single-stage counterparts. By distributing the air compression workload across two stages, these systems can achieve energy savings ranging from 15% to 25%, translating to significant cost reductions for industrial operations.

The three examples shown in Tables 1, 2 and 3 compare a direct drive single-stage air compressor, a single-stage variable speed air

| Load | Cfm | Hrs | %Load | % Power |
|------|-----|------|-------|---------|
| 1 | 200 | 4000 | 92% | 92% |
| 2 | 160 | 1500 | 74% | 74% |
| 3 | 110 | 750 | 51% | 51% |

Table 2. Using this load profile, I calculated the total kWh annual usage at 216,000 kWh for a single-stage VSD rotary screw air compressor.

compressor and a two-stage variable speed air compressor. I created a sample load profile for all three, assuming the factory is working 4,000 hours first shift, 1,500 hours second shift and 750 hours third shift. The load profile for the direct drive single-stage air compressor in Table 1 is derived from the Compressed Air Challenge power curve for fixed-speed machines. (See “Optimizing the Specific Power of Part Loaded Systems,” *Compressed Air Best Practices*, June 4, 2012.)

Table 2 shows a load profile for a single-stage variable speed drive (VSD) rotary screw

air compressor. This profile takes isentropic efficiency into account. Based on CAGI data performance publications, approximately 15% more power is required for a typical single-stage VSD rotary screw air compressor to produce the same result as a two-stage VSD rotary screw air compressor.

Table 3 uses the same load profile for a two-stage rotary screw air compressor, with the major difference being the specific power since the rotary screw air compressor is variable speed and the relationship between the %Load and the %Power is linear.

| Load | Cfm | Hrs | %Load | % Power |
|------|-----|------|-------|---------|
| 1 | 200 | 4000 | 83% | 83% |
| 2 | 160 | 1500 | 66% | 66% |
| 3 | 110 | 750 | 46% | 46% |

Table 3. In the case of a two-stage rotary screw air compressor, I calculated the total kWh annual usage at 188,500 kilowatt hours.

| Load | Cfm | Hrs | %Load | % Power |
|------|-----|------|-------|---------|
| 1 | 200 | 4000 | 88% | 97% |
| 2 | 160 | 1500 | 70% | 91% |
| 3 | 110 | 750 | 48% | 80% |

Table 1. Using this load profile, I calculated the total kWh annual usage at about 229,000 kilowatt hours for a direct drive single-stage air compressor.

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Using the national average of 15.5 cents per kWh, that's a savings of approximately \$6,000 a year over a single-stage fixed-speed rotary screw air compressor, or \$4,200 a year savings over a single-stage VSD rotary screw air compressor. (Electrical costs are much higher in the northeastern U.S. and somewhat lower in the south. Even at 10 cents per kWh, that's a savings of almost \$4,000 per year. And remember, airend warranties are for 10 years.) In just one or two years, an owner will, in most cases, recover the cost differential between a single-stage and a two-stage rotary screw air compressor.

Heat Reduction and Two-Stage Rotary Screw Air Compressors

Heat is the enemy of air compression. The intercooler between compression stages plays

a pivotal role in heat reduction and energy optimization. By systematically reducing air temperature during compression, these systems minimize the energy required to

Increased thrust load may necessitate more frequent maintenance and inspections to ensure the air compressor continues to operate effectively and safely.

achieve target pressures. This temperature management directly correlates to reduced electrical input and enhanced overall system efficiency. Intermediate cooling during the air compression process ensures more

stable and consistent compressed air quality. This characteristic is crucial in industrial environments where precision and reliability are paramount, such as pharmaceutical manufacturing, automotive production and precision engineering.

Reduction of Thrust Load

The two-stage rotary screw air compressor design inherently reduces mechanical stress on compression components. By dividing the air compression process, these systems experience lower temperature and pressure extremes, resulting in decreased component wear, extended equipment lifespan, reduced maintenance requirements and lower long-term operational costs. Thrust load can significantly impact the life of an airend in a rotary screw air compressor. The higher thrust loads of single-stage rotary screw air compressors can lead to increased friction and wear on the air compressor's internal components, such as the rotors and bearings. This can reduce the overall lifespan of the airend. Excessive thrust load can cause higher temperatures within the air compressor, which can degrade the lubricating oil and damage seals and other components. Finally, higher thrust loads can reduce the efficiency of the air compression process, leading to higher energy consumption and increased operational costs.

In a single-stage rotary screw air compressor, one stage is responsible for raising the compression from atmospheric to the desired pressure. The following is the formula to calculate the air compression ratio on a single-stage air compressor. (The compression ratio is the relationship between the discharge pressure compared to the inlet pressure. Rotor thrust loads are directly proportional to the air compression ratio.)

$125 \text{ psia} / 14.7 \text{ psia} = 8.5$, the compression ratio for a single-stage air compressor with 125 psia as its desired output pressure.

In a two-stage air compressor, the first stage raises the compression to, say, 35 psia resulting in a compression ratio of 2.38. The second stage raises the compression from 35 psia to the desired 125 psia, resulting in a compression ratio of 3.57. Each airend on a two-stage machine is subjected to less than half the compression ratio of a single-stage airend.



A Connecticut manufacturer of steel, plastic and fiber drums, as well as other packaging products, installed a two-stage 150 hp variable speed rotary screw air compressor to save energy and create a heat recovery system.

35 psia/14.7 psia = 2.38, the compression ratio in the first stage, which raises the air pressure to 35 psia.

125 psia/35 psia = 3.57, the compression ratio in the second stage, which raises the air pressure from 35 psia to 125 psia.

The magnitude and direction of thrust loads directly impact bearing life expectancy, rotor wear patterns, maintenance intervals and overall reliability.

Finally, increased thrust load may necessitate more frequent maintenance and inspections to ensure the air compressor continues to operate effectively and safely.

Isentropic Efficiency

All manufactured rotary screw air compressors are imperfect and inefficient: The friction between the rotors and casing generates heat, there are air leaks between the rotors and housing, there is oil injection into the compressed air and there is constant pressure on seals and bearings – all working together to



A 75 hp two-stage rotary screw air compressor was installed at an anodizing and impregnating company in Illinois. The customer is realizing 10% more compressed air with a 10% energy savings compared to the 75 hp VSD air compressor it replaced. This air compressor was sold and installed by Compressor Services of Johnsburg, IL.

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air pressure needed. Two-stage rotary screws run cooler, create less friction and have lower thrust loads, all resulting in higher isentropic efficiency and energy savings.

Two-stage air compressors achieve significantly higher isentropic efficiencies than single-stage air compressors, typically from 80-88%.

Conclusion

Two-stage rotary screw air compressors represent an excellent solution for industrial compressed air requirements. By prioritizing energy efficiency, reliability and performance, these systems offer a compelling technological advancement that addresses the complex demands of modern manufacturing environments.

Industrial engineers and facility managers seeking to optimize operational efficiency should strongly consider the benefits of two-stage rotary screw air compression technology. Now that two-stage variable speed air compressors are available at 30 hp and up, two-stage rotary screw air compressors should be the only choice for efficiency and energy savings. **BP**

About the Author

Ed Maxwell, CEO, Eastern States Associates, has spent over 50 years selling industrial air compressors in the northeastern U.S.



About Eastern States Associates

Eastern States Associates, headquartered in Palmer, MA, has been selling air compressors in the northeast U.S. for 70 years. Its sales team is located from Maryland to Massachusetts. The company is the exclusive northeastern representative for Hertz-Kompressoren U.S.

Jared Lambert, owner of Pneu-Air Technology, replaced two air compressors – a 25 hp and a 30 hp – with a 40 hp two-stage air compressor at a Connecticut chemical manufacturing plant. The two-stage air compressor produces more air than the two air compressors it replaced while using 15% less energy.

make an inefficient system. In ideal isentropic air compression, the process would be perfectly reversible with no friction or heat transfer. Entropy would remain constant throughout air compression (no heat would be generated during the air compression process) resulting in the theoretical minimum work performed to achieve a given pressure ratio.

However, no air compressor can achieve 100% isentropic efficiency.

The isentropic efficiency of single-stage rotary screw air compressors, as reported by CAGI data, typically falls between 65% and 75%. Since isentropic efficiency is the ratio of ideal work to actual work, this range suggests these air compressors consume roughly 33% to 54%

more power than the theoretical minimum for the given air pressure output.

Using the same CAGI data source, we find two-stage air compressors achieve significantly higher isentropic efficiencies than single-stage air compressors, typically from 80-88%. Using the same formula showing the ratio of ideal work to actual work, two-stage machines require only 14-25% more power to produce the

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Blue Mountain Reins in a Sprawling Compressed Air System

By Ken Morris, Service and Sales Consultant, Blue Mountain Air Compressor Services

► Blue Mountain Air Compressor Services was founded in 2007 by Tom Yaukey in Chambersburg, PA, as a one-man operation. Yaukey started by serving a handful of smaller customers he had built relationships with over the years. By 2021, the company had grown to 11 employees and was ready for its next chapter: making a strategic push into the large horsepower air compressor market and becoming a Kaishan distributor. That decision led to this case study, where a custom printer based in south-central Pennsylvania not only saved money, but also freed its maintenance staff to focus on production equipment.

A Custom Printer with Too Many Air Compressors

The job started in the fall of 2021 with a phone call from the customer looking to purchase a 100 horsepower (hp) air compressor. The customer had been running several smaller air compressors and wanted to consolidate to two main air compressors. The company scheduled a time to visit the customer to determine the specifics of its compressed air system before providing any quotes.

When the company arrived at the facility it quickly saw the challenge it faced. The

customer was intermittently operating a staggering 11 air compressors scattered across its facility. Its system was a patchwork of different air compressor sizes and technologies, including two 25 hp fixed-speed rotary screw air compressors, one 30 hp fixed-speed rotary screw air compressor and one 100 hp fixed-speed rotary screw air compressor as its primary air compressors. It also kept several 15 to 50 hp reciprocating air compressors on standby, turning to them when primary units were down for maintenance.

Often, these backup air compressors failed to start or run properly.

The way the customer's compressed air system was set up made it impossible to manage efficiently. Air compressors were often left running unloaded during low production times, using electricity without delivering any value. Air compressors were spread out across the facility, which made monitoring difficult and routine maintenance inefficient. Three air compressors lacked modern auto-standby features, allowing



Blue Mountain Air Compressor Services headquarters in Chambersburg, PA

Above: High-speed printing presses rely on compressed air for pneumatic automation.

unnecessary runtime. Other air compressors were frequently started in the wrong operational mode, creating inefficiencies. Air compressors were set to load at 115 psi (7.9 bar) and unload at 125 psi (8.6 bar). However, with no central control system each machine ran independently, fighting for control based on its own discharge pressure sensor. This led to inconsistent compressed air system pressure and unnecessary wear and tear on the air compressors.

The maintenance team, despite its best efforts, was overwhelmed. With so many different air compressors of various ages, it was caught in a reactive cycle of waiting for things to break and then scrambling to repair them or simply starting another of the 11 air compressors. Preventive maintenance was impossible to maintain. As is often the case, no one had time to stop and ask why the facility had so many air compressors. In many manufacturing facilities, the health of the compressed air system equipment is thought to be satisfactory if the required plant air pressure is maintained.

Compressed Air System Audit Provides a Clearer Picture

To get a clear picture of what was happening, Blue Mountain recommended conducting a compressed air audit. The compressed air audit was completed over a 14-day period using test equipment and software that looked at compressed air system pressure and air compressor voltage and amperage. From that information, software calculated system efficiency and air compressor power consumption, as well as the minimum, maximum and average air consumption values. The maximum peak air consumption values ranged from 800 cfm on first shift to 400 cfm on third shift.

The compressed air system audit uncovered exactly what Blue Mountain had seen previously: The air compressors were poorly sequenced and far too reliant on old technology. During third-shift operations, two air compressors were left running without being needed. At other times, air compressors operated far below their capacity while cycling inefficiently.

One Recommendation for a Variety of Applications

Based on the compressed air system audit, Blue Mountain recommended the customer invest in a 200 hp variable speed drive

(VSD), rotary screw air compressor. The recommendation was based on several factors: Pairing a new 100 hp VSD air compressor with the existing 100 hp fixed-speed air compressor would lead to inefficiencies, as the VSD air compressor would frequently reach full capacity while the fixed-speed air compressor would load and unload – especially during second and third shifts. The 200 hp VSD air compressor offered a capacity range of 231-922 cfm at 125 psi (8.6 bar), ensuring it could meet all production demands across all three shifts without running unloaded or being fully loaded.

Based on the average system flow calculations, the 200 hp VSD air compressor would operate primarily between 55% and 70% capacity. It would thereby maximize energy savings by staying within the optimal efficiency range of its specific power ratings. This larger air compressor would provide flexibility for future production changes, allowing for increases or decreases in demand without requiring another air compressor purchase, all while eliminating multiple inefficient air compressors and lowering energy consumption.



The plant's compressed air system included this older reciprocating air compressor.





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A 200 horsepower VSD rotary screw air compressor

Facility Maintenance Tips for Improved Performance

The time from Blue Mountain’s first meeting with the customer to its new air compressor and refrigerated compressed air dryer becoming operational was five months. Once the equipment order was placed, the task of making room for the 200 hp air compressor began. Three of four reciprocating air compressors needed to be removed. The new refrigerated compressed air dryer would be placed where the existing compressed air dryer sat. Local contractors removed the three older air compressors, then repaired and leveled the concrete pad where the new air compressor would sit. The customer decided to use its existing air storage tank due to space and budgetary restraints, so only a 50-foot section of three-inch compressed air piping needed to be installed from the new air compressor to the compressed air storage tank manifold. Additionally, a piping modification was needed to adapt the new refrigerated compressed air dryer to the existing air header.

Throughout the process, the company emphasized key maintenance tips every facility should follow. Stick to a routine preventive maintenance schedule, even if the compressed air system appears to be running optimally. It is easier and less expensive to prevent failures than to react to them. To show the importance of this practice, consider the cost of one lost production hour compared to the cost of an hour of preventive maintenance.

A compressed air system preventive maintenance program should include, at a minimum, the following items: taking routine oil samples; cleaning and testing condensate drain valves; cleaning coolers and changing the air filters, oil filters, oil separator and oil per the air compressor manufacturer’s guidelines.

Dirty coolers can result in aird discharge temperatures running above the rated oil temperature – on average 200°F (93°C), depending on the specific brand – which can result in premature oil failure and higher maintenance costs. Compressed air systems naturally accumulate moisture, which can damage production equipment if not effectively managed. Therefore, it’s important to test and clean all condensate drain valves in the compressed air system routinely.



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Every manufacturing facility should include routine inspection and repair of compressed air system piping as part of its preventive maintenance schedule. Compressed air system piping and production equipment leaks can result in losses of 20% or more of system capacity, depending on the compressed air system size and application. The best time to identify compressed air system piping leaks is with the compressed air system pressurized and production shut down. All compressed air system leaks not repaired contribute to decreased compressed air system efficiency and increased operating costs.

Blue Mountain also explained the importance of proper compressed air system controls and equipment setup. For the customer's newly installed single air compressor primary compressed air system, the setup was simple. After reviewing production equipment pressure demands, the compressed air system target pressure was set to 115 psi (7.9 bar), which has been steadily maintained due to the sizing of the VSD air compressor coupled with the compressed air system demand. As for the customer's old system, it should have included a sequencer operating from a centrally located pressure switch. This would have allowed various air compressor priorities to be established based on specific production demands. Always keep in mind, whether operating a simple one air compressor system or a compressed air system with multiple air compressors, that production demands change. Routinely review the compressed air system and make adjustments as needed. What worked a year ago – or even a few months ago – might not be right today.

Improvements the Customer Could Bank On

For this customer, simplifying its compressed air system saved \$30,000 annually in electricity costs, resulting in a three-year return on investment. It also resulted in a 15% increase in time spent on production equipment maintenance. The customer now has a compressed air system that's easier to maintain and monitor, and ready to grow with the company. Maintenance is free to focus on production equipment repairs and upgrades.

Eight of the original 11 air compressors are still in place, and seven are operational. These remaining operational air compressors are run monthly and whenever the 200 hp

VSD air compressor is down for preventive maintenance. These eight air compressors will continue providing backup compressed air until budgetary considerations allow for the purchase of a redundant 200 hp VSD air compressor.

The installation of the 200 hp VSD air compressor has not only delivered substantial cost savings, but also streamlined operations, improved efficiency and reduced maintenance demands. By optimizing the compressed air system, the customer has positioned itself for long-term reliability and flexibility in meeting production demands. As it looks ahead, the eventual addition of a redundant 200 hp air compressor will further enhance system reliability, ensuring continued

efficiency and operational success. This project stands as a testament to the value of strategic investing in compressed air system optimization, delivering measurable benefits across energy costs, maintenance and overall productivity. **BP**

For more information on Blue Mountain Air Compressor Services, visit <https://bmacomp.com>.

About the Author



Ken Morris is a Service and Sales Consultant at Blue Mountain Air Compressor Services with experience ranging from industrial plant maintenance and supervision to nuclear power plant operations and maintenance.

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PREMIUM OEM COMPONENTS

The Role of Electric Motors and Drives in Industrial Decarbonization

By Bevan Christiansen, Global Segment Manager, ABB

► Industrial applications account for 37% of global energy consumption and 24% of CO₂ emissions. As climate change worsens, industries must adopt solutions that maximize energy efficiency and reduce emissions. While renewable energy sources like solar and wind are essential, they alone cannot solve the issue. The Intergovernmental Panel on Climate Change states that carbon emissions must decrease by 43% by 2030 to prevent irreversible climate impacts. To achieve this, improving the efficiency of existing systems is key.

The steel industry, for example, produces one of the most significant materials for engineering and construction, yet is also among the biggest producers of carbon emissions. As demand for steel grows, decarbonizing the industry becomes increasingly important for accelerating the transition to clean energy.

A core element of industrial decarbonization is replacing gas- and diesel-powered turbines and motors with electric motors. Electric motors have been integral in industrial operations for over 150 years, powering a vast range of applications, including air compressors, pumps, fans and conveyors, which are essential in manufacturing, HVACR and water treatment. However, just like with wind and solar, the move from gas and diesel

Above: Upgrading to high-efficiency motors and drives leads to energy savings and cost reductions while contributing to industrial decarbonization efforts.

to electric is not an immediate solution. By replacing older, less efficient motors currently in operation with new, high-efficiency models, we can reduce energy consumption and costs now, with the potential for financial return in as little as a few years.

Improving Industrial Efficiency with Electric Motors and VSDs

Approximately 70% of electricity consumed by industries is used by electric motor systems. While electric motors play a crucial role in industrial systems, many of the 300 million motors in use worldwide are inefficient, resulting in substantial energy waste.

When paired with variable speed drives (VSDs), electric motors present an even greater opportunity to reduce energy

consumption and CO₂ emissions. Drives control motor speed by adjusting the frequency and voltage of the power supply, allowing the motor to operate at precisely the required speed. This optimization ensures energy efficiency by aligning power use with real-time demand.

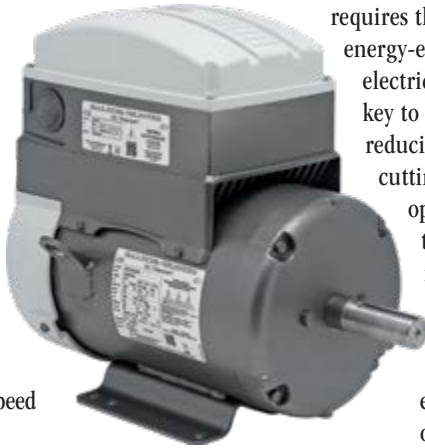
The energy efficiency of motors and drives has improved in recent years, with modern systems offering higher efficiency than older designs. These improvements translate into lower energy costs and minimized environmental impact, making investments highly beneficial for businesses looking to meet sustainability goals. Research suggests if all outdated motors were replaced with high-efficiency models, global electricity consumption could be reduced by as much as 10%, contributing to the global reduction of greenhouse gas emissions needed to meet climate targets.

Heavy industry depends on powerful motors and drives to keep air compressors, pumps, fans and belts running. These motor-driven systems, which convert 45% of the world's electricity into motion, present an opportunity for addressing climate impacts. Industrial motors that meet the highest standards for energy



A high-efficiency electric motor achieves even higher efficiency levels when paired with a variable speed drive.

efficiency hold promise in reducing energy consumption, leading to reductions in greenhouse gas emissions associated with electricity usage across industrial facilities. For instance, high-efficiency induction and synchronous reluctance motors paired with variable speed drives offer superior efficiency, translating to lower energy demand and a smaller environmental footprint for heavy industry operations.



The EC Titanium integrated motor drive couples a VSD directly to a synchronous motor for simplicity, flexibility and ease of installation and maintenance.

The transition to a decarbonized economy requires the widespread adoption of energy-efficient technologies, and electric motors and drives are key to this transformation. By reducing energy consumption, cutting emissions and optimizing industrial operations, these systems play a critical role in decarbonizing industries worldwide. The adoption of high-efficiency motors, VSDs and intelligent energy management solutions offers a pathway to a more sustainable future – one where economic growth and environmental protection go hand in hand. **BP**



About the Author

Bevan Christiansen is the Segment Manager for Air Handling & HVAC at ABB's NEMA Motors Division. With 20 years of experience at ABB, he brings a strong background in mechanical design engineering.

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ABB is a technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. The company's solutions connect engineering know-how and software to optimize how things are manufactured, moved, powered and operated. Building on more than 140 years of excellence, the company's more than 105,000 employees are committed to driving innovations that accelerate industrial transformation. For more information, visit <https://global.abb>.

Financial Incentives for Businesses

The transition to high-efficiency motors and drives also presents a strong financial case for businesses. While the initial investment in energy-efficient equipment may seem high, the payback period is typically short due to significant energy savings. The return on investment is even greater during periods of high energy prices, as the savings from reduced energy consumption offset the upfront costs. For industries looking to optimize energy use while contributing to global decarbonization efforts, upgrading to modern motor and drive systems offers a compelling business case.

The financial incentives for rapid uptake of energy-efficient systems can be hindered by fluctuating energy prices and competing investment opportunities. Despite these challenges, the long-term benefits of energy efficiency – reduced operating costs, lower emissions and improved sustainability – make investments in motors and drives an attractive proposition for companies.

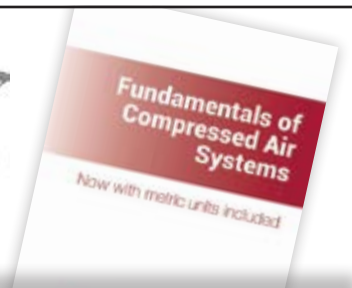
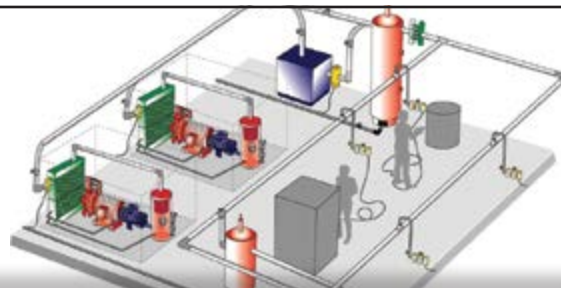
Meeting Industrial Decarbonization Goals

Decarbonizing industry is a complex global challenge that requires innovation, collaboration and technological advancements. No single solution will transform industries, but a combination of strategies – including the adoption of energy-efficient motors and drives – will reduce industrial emissions and energy consumption.

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The Advantages of Proactive Chiller Maintenance

By John Mitchell, Senior Account Executive, Johnson Controls

► Chillers are essential for many industrial processes, making proactive maintenance vital for achieving energy efficiency, reducing operational costs and ensuring uptime. The average chiller lifecycle can be as much as 20 years¹ making maintenance a continuous process requiring a holistic and proactive approach. By integrating smart equipment engineered to simplify maintenance with intelligent automation solutions, chillers can be optimized to drive building performance and help operators overcome common maintenance challenges.

Magnetic Bearing Chiller Advantages

Chiller design can directly impact service requirements. For example, magnetic bearing chillers contain 80% fewer moving parts than traditional oil- or refrigerant-lubricated drivelines.² By eliminating the need for reservoirs, pumps and heat exchangers, the time between service intervals is increased. The lack of reservoirs also makes routine maintenance less complicated, consisting only of cleaning tubes and checking refrigerant levels. Additionally, oil- or refrigerant-lubricated chillers can require multiple teardowns and replacements over the equipment lifespan, whereas magnetic bearing chiller compressors are engineered to be repaired instead of replaced. This is more economical and helps support scope three decarbonization.

Driving Performance with Digital Solutions

Connected chillers with on-board smart controls can take chiller maintenance a step further by leveraging performance-based algorithms and built-in fault detection and diagnostics. This technology allows operators to shift away from manual, routine maintenance processes by enabling automated, 24/7 real-time monitoring. These built-in equipment controls alert operations teams to performance slippage or potential issues such as condenser or evaporator tube fouling or low refrigerant levels while they are in their early stages. This proactive approach not only streamlines maintenance processes, but also reduces unplanned emergency chiller repairs by as much as 66%.³ Additionally, the platform enables data to be digitally stored, freeing operators from manual logging and reporting while also providing insight into performance trends.

Streamlining routine chiller maintenance and integrating preventive measures

starts with equipment optimization and on-board controls. Intelligent platforms drive performance further by unlocking the data necessary to enable predictive maintenance strategies and automating repetitive tasks.

Powered by artificial intelligence, smart solutions digitally integrate the complete central utility plant to analyze how each subsystem contributes to the whole. Dynamic inputs like operational schedules, historical heating and cooling loads, occupant behavior, weather patterns and utility rates are also factored in to further optimize building and equipment performance. Through this process, the platform continuously reads the



An air-cooled magnetic bearing centrifugal chiller

environment and adapts in real time to identify issues and make adjustments. Equipment health is monitored through advanced fault detection and diagnostics to quickly identify performance drift or potential malfunctions. If equipment goes out of service unexpectedly, the system re-optimizes based on the remaining equipment to maintain building performance and energy efficiency standards.

Intelligent platforms not only drive building performance, but also serve as virtual coworkers to support facility teams. By leveraging these solutions, operators can effectively manage buildings and assets using a unified and remote command center. Within the platform, interactive digital twins allow operators to easily configure and control standard operating schedules and plan for future changes such as equipment upgrades or “what-if” scenarios that can impact central utility plant performance. Routine and repetitive workflows can be automated to save time and allow teams to focus on higher-value tasks. If operator intervention is required, live dashboards and reporting tools help identify issues faster than standard processes relying on manually collected and analyzed data. Teams can leverage AI troubleshooting modules to further streamline problem-solving workflows allowing them to get to the root cause of issues sooner so unplanned downtime is minimized or eliminated.

Service-based remote monitoring is another option that provides 24/7 support to in-house teams. Using a secure connection, a remote operations center serves as a first line of defense in keeping equipment operating at peak performance while creating a single point of contact if support is needed. With the support of remote monitoring and equipment analysis the remote operations center proactively evaluates and responds to fault alarms without interrupting chiller performance.

Changing the Status Quo on Chiller Maintenance

Advancements in magnetic bearing drivelines and onboard controls have made chillers more intuitive to operate and maintain than ever before. Combining these innovations with intelligent, AI-powered building automation platforms transforms central utility plant operations and empowers facility teams with data-backed insights. Using intelligent plant optimization, maintenance moves from a

state of routine and reactive tasks to strategic protocols that drive energy efficiency, lower operating costs and unburden operations teams so they can focus their time and energy where it matters most. **BP**



About the Author

John Mitchell is Senior Account Executive for Johnson Controls Data Center Solutions based in San Leandro, CA. He's responsible for delivering HVAC products in the technology

vertical market, developing strategic technology roadmaps and supporting data center design and construction. He's been with Johnson Controls for 25 years.

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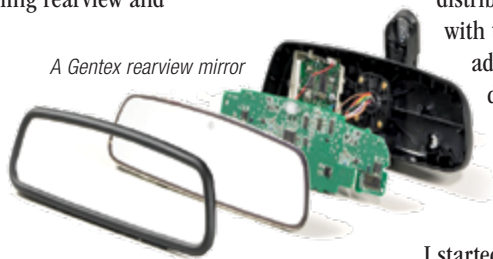
FACILITY MAINTENANCE

Pressure Gauges Uncover Compressed Air Pressure Drop Locations

By John Bilsky, Facilities Specialist, Gentex Corporation



Compressed air is used in all steps of the manufacturing process. Gentex Corporation provides OEM self-dimming rearview and side mirrors to the automotive industry, as well as dimmable aircraft windows, fire protection devices and a host of other electronic devices including microchips.



A Gentex rearview mirror

When I arrived at Gentex Corporation 21 years ago, it was often assumed if production equipment worked as it should, then the compressed air system must be fine. That's not unusual: I've been told some companies check on their compressed air systems only after experiencing low-pressure problems in their production areas.

Before long, I was overwhelmed with calls from production due to compressed air pressure problems. Our compressed air system needed automated feedback probes in place for pressure, flow, voltage and dew point that data logged and sounded the alarm when pressure was low or dew point was high. Creating a comprehensive monitoring system is both expensive and time-consuming. In today's business environment, it is difficult to justify spending thousands on monitoring equipment and the labor to install it, as was the case in 2004. So, to be initiative-taking, I installed pressure gauges at key points to troubleshoot low-pressure situations.

We're not looking for precision at this point, only a way to see where we have a lack of flow which will display as low pressure on a pressure gauge. Also, a sudden high flow rate could drop pressure in the compressed air system which would also show as low pressure on a pressure gauge.

To understand where pressure gauges were needed, I created a compressed air piping distribution map. I started with the main header, then added branch lines and dead legs. I color-coded pipe sizes to make finding pressure drops easier.

I started with production equipment fed from the smallest compressed air lines and put a pressure gauge in the feed line. Then, I added a pressure gauge after the regulator on the production equipment. Some smaller lines had multiple pieces of end-use equipment attached to them. These smaller



A compressed air system's main header pressure gauge

lines could not supply the needed flow, so pressure drops caused equipment to fault out.

Next, I added a pressure gauge further upstream towards the air compressor room where the pipe size changed, as well as a pressure gauge on the compressed air dry storage tank.

When comparing pressure gauges in the compressed air piping system I would expect zero pressure drop. Where I do expect a small pressure drop is the compressed air treatment and purification equipment.

Many companies slam on the brakes when investing in their compressed air system. If you find that's the case, start small with pressure gauges. Pressure gauges let plant managers solve production low-pressure problems quickly.

To take compressed air system data gathering to the next level, add pressure transmitters, flow meters, kilowatt meters and dew point probes! Use the internet to collect data in real time and discover problems before production does!

About the Author

John Bilsky is the Facilities Specialist for compressed air, nitrogen and purified water at Gentex Corporation. He's experienced in engineering design, engineering improvements and maintenance for compressed air, nitrogen and water purification systems supporting production, R&D and lab services. For more information, visit <https://www.linkedin.com/in/john-bilsky-24715b10/>.

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Real-World Installations & Maintenance

Edited by Troy Dreier, Senior Editor, Compressed Air Best Practices® Magazine

There's much we can learn from real-world compressed air, blower, vacuum, chiller and cooling tower installations. This column asks readers to share lessons learned from system installations and maintenance practices they encounter in the real world.

A Crossflow Cooling Tower Gets a Makeover

Founded in 1965, Brentwood Industries of Reading, PA, provides expertly engineered cooling tower fill, drift eliminators, inlet louvers and other components. K.M. Facility Services has been an Arizona leader in commercial building maintenance since 2001, and is based in Glendale, AZ. Visit <https://www.brentwoodindustries.com> and <https://kmfacserv.com>.

Jason Hill, Marketing Specialist, Brentwood Industries, sent us this impressive makeover: "Following years of demanding service, a crossflow cooling tower showed significant signs of wear—corroded metal, failing fill and a need for a full retrofit. K.M. Facility Services stepped in to replace the OEM fill with Brentwood's XF75Pro and Crossflow Support System.



This crossflow cooling tower looks new again following a full fill replacement.

Internal surfaces were coated, and deteriorated metal components were replaced. Brentwood's block fill design helped reduce installation time, minimizing downtime. Real-world

projects like this demonstrate how proactive maintenance and smart system upgrades can not only extend equipment life but also enhance overall cooling tower performance."



Compressed Air Pressure Controller Has Lost Control

Andrew Smith-Carrier is a Mechanical Engineer who has worked in industrial energy efficiency with a focus on compressed air for over 15 years, currently through SMARTCAir, which he founded. Visit <https://smartcair.com>.

Smith-Carrier found this pressure controller while auditing a rubber-based products manufacturer in Cambridge, ON. It controls the pressure for one part of the company's compressed air system, but it doesn't seem to be doing a good job since the setpoint is 95 psi but the reading is 100 psi. "Time to upgrade the pressure display," he notes.

Replacing this pressure controller with a newer and more accurate model should have a quick return on investment.

Submission Guidelines

We invite subscribers to share stories and photos of remarkable system installations they've come across. Email Troy Dreier at troy@airbestpractices.com. Please send a high-resolution image as a JPG or GIF file and a note describing the installation. If we publish your submission, we'll thank you with a \$25 Amazon gift card.



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