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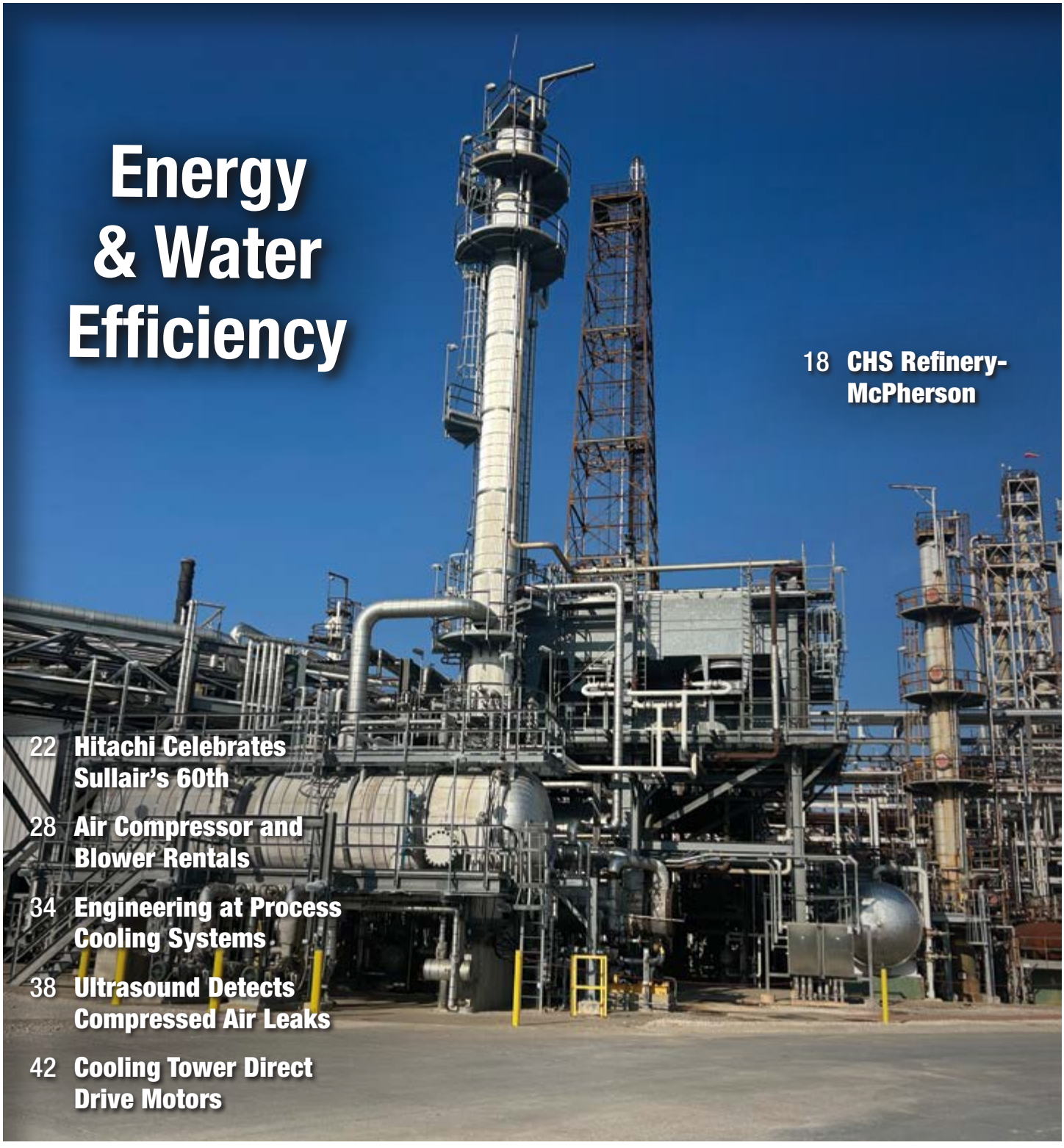

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Cover Image: Courtesy of CHS Refinery, McPherson, KS

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FROM THE EDITOR

Energy and Water Efficiency Is Smart Business

This month, we're pleased to bring you six energy- and water-saving features offering valuable information to all readers, no matter their experience level. Even small improvements can lead to big rewards.

Our cover story takes us to McPherson, KS, where a CHS oil refinery was able to repurpose discharge water from the city wastewater plant in its cooling towers and boilers. The project supplies over one million gallons of water per day, reducing demand on the local aquifer. Thanks to the water treatment plant the refinery built, it was able to increase its cooling tower cycles of concentration from six to 10 and decrease blowdown by 119,520 gallons per day.

The Sullair brand is 60 years old, and that's something to celebrate. We spoke to Hitachi Global Air Power President and CEO Hideki Fujimoto and Vice President, Operations, Andy Fayyad, about the company's $30 million investment in a fabrication plant at its Michigan City, IN, headquarters and how Sullair is launching oil-free rotary screw air compressors in the U.S.

Owning and maintaining an air compressor, blower or vacuum pump system isn't the right choice for every company. Matt Piedmonte, Vice President and General Manager, Americas, Aerzen Rental Solutions, explains when purchasing is the right move and when renting or air-over-the-fence is a more prudent option.

Process Cooling Systems of Leominster, MA, provides custom application engineering solutions for a variety of industries. We enjoyed speaking to Engineering Manager Shane Dandy about his work with injection molding, heat treating, food processing and chemical production. Plants that can rely on free cooling for part of the year see big financial savings.

UE Systems offers a tremendous feature on using ultrasound to detect leaks in compressed air systems. BioKyowa's animal feed supplement plant in Missouri was able to save $86,324 per year thanks to leak detection.

Finally, ABB discusses how cooling tower direct drive technology saves energy. Facilities upgrading older cooling towers with permanent magnet direct drive motors and variable speed drives see energy savings of 30-60%.

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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!

Arkansas Industrial Machinery is an Atlas Copco distributor with three locations in Arkansas, Tennessee and Louisiana. It's part of the Tavaron portfolio of companies. Its technicians and sales professionals deliver innovative industrial solutions and are driven by a strong, family-oriented culture that's kept the company thriving for decades. Pictured here are Dillon Darrach, Tamara Johnston and Nate Carpenter (left to right). Visit https://aimcompanies.com.

The employees at Hitachi Global Air Power have a lot to smile about. Turn to page 22 for our feature on the Sullair brand's 60-year history, its many innovations and how parent company Hitachi is investing in midwestern manufacturing. Pictured here are Sawyer Kelsoe, Pradeep Murthy, Corey Bartow, Vishakha Patel, Jayla Mitchell and Kyle Oscarson (left to right). Visit https://www.hitachiglobalairpower.com.

IMEG is a national full-service engineering, planning and consulting firm with over 90 offices around the globe. It serves a variety of vertical markets, including industrial manufacturing and wastewater. In 2026, we'll present a case study on work the firm did providing dry coolers to cool diesel engines at a water utility. Shown here is Luke Streit, PC, CCASS, Project Executive at the Des Moines, IA, office. Visit https://imegcorp.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.

Our Sales Director, Erik Klingerman, was pleased to pay a call on Delta T Systems of Richfield, WI, this month, and get to know its operations. The company manufactures variable speed chillers, modular chillers, dry coolers and industrial temperature control equipment. It supplies the automotive, die casting, injection molding and pharmaceutical industries. Shown here is Jochen Naujokat, President. Visit https://deltatsys.com.

Thermal Care has been manufacturing industrial water chillers and process cooling systems since it was founded in 1969. Its products include central chillers, portable chillers, cooling towers and temperature control units. Its many industries served include heat treating, plastics, dairy and breweries. The company's headquarters are in Niles, IL. Pictured here is Chad Stover, Manager, Marketing Services. Visit https://www.thermalcare.com.

NEWS Compressed Air Industry & Technology

Maverick Compressor Group Opens in Greater Houston Region

Maverick Compressor Group, a veteran-owned business based in Houston, TX, announced it's now providing top-tier service, advanced compressed air equipment sales and comprehensive aftermarket support tailored to industries across the Greater Houston area, including Bryan-College Station, extending into Dallas and San Antonio.

The company offers a range of equipment, including reciprocating, rotary screw and oil-free air compressors, along with air treatment systems including refrigerated and desiccant compressed air dryers, condensate management and distribution systems. In addition to equipment, Maverick provides 24/7 emergency service, preventative maintenance programs, diagnostics and repairs and installation support. The company also supplies OEM and OEM-equivalent parts, as well as aftermarket services including cooler descaling, shaft alignment services and control system repairs.

"With decades of experience in compressed air systems, we founded Maverick Compressor Group to deliver unmatched reliability and support," said Chase Parchman, Owner and Co-Founder, Maverick Compressor Group. "Our mission is simple: to exceed expectations in every interaction and keep businesses running efficiently, 24/7."

Maverick Compressor Group serves a wide range of industries, including manufacturing, medical, food and beverage, blasting and coating, petrochemical, transportation and construction. For more information, visit https://maverickcompressorgroup.com.

Francisco Figueroa and Chase Parchman, Co-Founders, Maverick Compressor Group (left to right)

Bobcat Company Expands Industrial Air Compressor Lineup and Introduces Tank-Mounted Series

Bobcat Company is expanding its industrial air compressor lineup with the introduction of its tank-mounted series. Bobcat's new tank-mounted, rotary screw air compressors are efficient, built for reliable performance in light-to-medium-duty applications and capable of continuous-duty operation.

Bobcat Company's SA15TD industrial air compressor

The six new air compressors include the SA10TD, SA10T, SA15TD, SA15T, SA20TD and SA20T. These products are available now through Bobcat industrial air distributors.

"Bobcat tank-mounted industrial air units deliver dependable performance and long-term value," said Patrick Jakeway, General Manager, Bobcat Company. "Their rugged construction, energy efficiency and low maintenance make them an ideal choice for users who prioritize reliability and a low total cost of ownership."

Bobcat's tank-mounted air compressors offer a tri-voltage, plug-and-play package with connectivity to one other machine. The standard 120-gallon tank is available with and without a compressed air dryer and prefilter, and comes standard with 125 psi, with 100, 150 and 175 psi options available to match facility demands. They are useful in a variety of applications, including automotive aftermarket, woodworking and metal fabrication.

These cost-effective air compressors minimize downtime and consume less energy while powering facilities, thanks to high-quality components including IP55 electric motors, Star-Delta motor starter systems and high-efficiency airends.

Owners benefit from rugged reliability backed by a five-year, bumper-to-bumper warranty and U.S.-based parts and service support. For more information, visit https://www.bobcat.com.

Gardner Denver Launches Hydraulic Trunk Accessory for GD70 Air Compressor

Gardner Denver announced the availability of a new hydraulic trunk accessory for its widely adopted GD70 oil-lubricated, piston air compressor. This new offering allows customers to purchase the GD70 preassembled with a hydraulic trunk, enabling hydraulic drive capability for liquid bulk off-loading applications.

The one-piece, cast-iron trunk is engineered for durability and ease of use, featuring a removable guard with air ventilation openings, an SAE "A" two-bolt flange and optional coupler configurations. Developed in close collaboration with Gardner Denver's distributor partners, the hydraulic trunk is designed to simplify installation, improve maintenance access, and support more efficient operations.

"The GD70 Hydraulic Trunk is a game-changer for operators in the liquid bulk transport industry," said Carl Kruthoff, Product Manager, Gardner Denver Transport. "It combines rugged construction with thoughtful design to simplify maintenance and improve operational efficiency."

Gardner Denver hydraulic trunk accessory for the GD70 Air Compressor

The GD70 air compressor, originally launched in 2021, is a two-cylinder, single-stage, oil-lubricated, piston compressor designed for pressure off-loading of bulk liquids such as solvents and resins. Its in-line design offers a compact footprint, allowing room for additional equipment on mobile units. The GD70 continues to be available as a standalone unit or with the hydraulic trunk preassembled. For more information, visit https://www.gardnerdenver.com.

FS-Elliott Expands U.S. Channel Network with Appointment of ROCHA in Arizona and New Mexico

FS-Elliott is pleased to announce the appointment of ROCHA as its newest factory-authorized channel partner. Based in Phoenix, AZ, ROCHA will represent FS-Elliott across Arizona and New Mexico, enhancing access to local sales and service support for industrial users in the region.

ROCHA brings a strong background in compressed air system design, deep technical expertise and a reputation for outstanding customer service. As an FS-Elliott partner, it will offer the full range of centrifugal air compressors, along with comprehensive aftermarket support, including both warranty and non-warranty services.

The partnership was solidified following ROCHA's participation in the FS-Elliott University Channel Partner Training Program at the company's global headquarters in Export, PA. These in-person sessions provided a valuable opportunity to align on strategy, expectations and shared goals focused on delivering exceptional customer outcomes.

"We are excited to welcome ROCHA as the newest member of our channel partner network," said Mark McCarthy, Manager of Channel Development Sales, FS-Elliott. "Their expertise and service-driven approach align perfectly with our values. We're confident this partnership will deliver strong performance and long-term value to customers throughout Arizona and New Mexico, supported by American-made air compressor technology and trusted local support." For more information, visit https://www.rochacorp.com and https://www.fs-elliott.com.

Mark McCarthy, Matt Ferri and Kevin Walker of FS-Elliott, Cameron Scott of ROCHA and Nicholas Durazo of FS-Elliott (left to right)

NEWS Compressed Air Industry & Technology

Sauer Compressors USA Expands Rentals Division with Three Key Business Development Manager Appointments

Sauer Compressors USA announced the strategic expansion of its rapidly growing Rentals Division with the appointment of three experienced Business Development Managers. This move reinforces Sauer Compressors USA's commitment to providing comprehensive and responsive rental solutions across critical regions of the United States.

Chuck Westhofen, Jeff Swearingen and Kyle Ricks of Sauer Compressors USA (left to right)

The new appointments are Chuck Westhofen, Business Development Manager, East; Jeff Swearingen, Business Development Manager, Gulf Coast and Kyle Ricks, Business Development Manager, West.

Each manager brings a wealth of industry knowledge and a proven track record in sales and business development, further strengthening Sauer Compressors USA's ability to serve its diverse customer base with specialized rental solutions.

"The new additions to our business development team reflect our continued commitment to delivering the optimal air compressor solutions when our customers need them most," said Don Eaton, President and CEO, Sauer Compressors USA. "As our rental division grows, so does our ability to respond quickly and effectively to urgent demands across industries. We are proud to expand our team with talented professionals who share our passion for service and are ready to support our customers every step of the way. Our mission is to be the most responsive and reliable partner in the high-pressure air compressor space."

Chuck Westhofen, based in the East Coast region, will leverage his extensive experience to cultivate new opportunities and strengthen existing relationships across the East Coast and Midwest territories.

Jeff Swearingen will focus on the vital Gulf Coast market, a key region for Sauer Compressors USA's offshore and industrial clients. His deep understanding of the local landscape will ensure tailored rental solutions for the unique demands of this area.

Kyle Ricks will lead business development efforts in the western region of the country, bringing Sauer's trusted rental capabilities closer to customers in this dynamic and expanding market.

Sauer Compressors USA's Rentals Division offers a diverse fleet of medium and high-pressure air and gas compressors, boosters and integrated systems designed for continuous duty and demanding applications. This expansion underscores the company's dedication to supporting customers with agile and efficient solutions for short-term projects, emergency needs or specialized applications. For more information, visit https://www.sauerusa.com.

Tsunami's 75 cfm Refrigerated Compressed Air Dryer

Tsunami Launches a Line of Premium Refrigerated Compressed Air Dryers

Tsunami Compressed Air Solutions expands its product offering with the launch of premium refrigerated compressed air dryers. This addition rounds out Tsunami's line of compressed air solutions and offers customers a reliable, cost-effective option for managing moisture in compressed air systems.

With dew points between 38-50°F (3-10°C) and flow capacities from 15-300 cfm, these refrigerated compressed air dryers are a dependable solution for maintaining clean, dry air. The non-cycling design, integrated moisture drains and compact footprint make them a great fit for a wide range of industrial applications.

"Refrigerated compressed air dryers are a cost-effective technology to reduce the impact of moisture and should be considered a minimum requirement in all compressed air systems," said Troy Robins, Product Manager, Tsunami. "By themselves, they are a positive addition to at least 60% of compressed air applications where water should not be present."

Backed by the Tsunami name, these refrigerated compressed air dryers deliver consistent performance, long-term value and easy integration into existing systems. For more information, visit https://www.tsunami.us.com.

FLIR Introduces Si2x-Series with ATEX and IECEx Certification

FLIR, a Teledyne Technologies company, has announced an IECEx-certified version of the Si2x, an advanced industrial acoustic imaging camera purpose-built for professional inspectors who need fast, accurate compressed air and gas leak detection in hazardous environments. Now certified to both ATEX and IECEx standards, the FLIR Si2x is engineered for safe operation in explosive atmospheres while delivering industry-leading performance and usability.

The FLIR Si2x-Series features a highly sensitive microphone array that delivers pinpoint accuracy for fault detection up to 200 meters away, making it ideal for high ceilings, hard-to-reach assets and noisy plant floors. Users can instantly view leak size and estimated annual cost, as well as partial discharge severity, enabling prioritization of repairs and fast ROI. Data can be used to support ESG and sustainability reporting initiatives. A customizable bandpass filter allows users to target specific ultrasonic frequencies, cutting through noisy environments to detect the most subtle leaks with clarity.

The Si2x has an integrated 12 MP visual camera with 8× digital zoom. Built-in LED lighting helps users capture detailed contextual images for reports and maintenance workflows. It's built for demanding field conditions, and is lightweight, compact and easily operated with one hand. A large touch-screen interface and intuitive UI reduce training time and increase inspection throughput. Use Wi-Fi, USB or the secure data transfer cable to move images and analytics to FLIR Thermal Studio or FLIR Acoustic Viewer. Support for over-the-air firmware updates ensures continuous improvement and compatibility.

FLIR Si2x-Series enables reliable detection of pressurized gas leaks, mechanical faults and partial discharge in explosive vapor and dust environments.

"The Si2x is a breakthrough for inspectors who need high-performance acoustic imaging in the most safety-critical environments," said Darrell Taylor, Global Acoustic Business Development Manager, FLIR. "It empowers teams to work safely and efficiently, detect leaks faster and reduce energy waste – all while meeting the industry's most demanding standards. With its rugged design, precision performance and intuitive operation, the Si2x is built to handle real-world challenges." For more information, visit https://www.flir.com.

Atlas Copco Group Acquires Itsab

Itsab, a Swedish air compressor and power equipment distributor, has become part of Atlas Copco Group. Itsab was founded in 1985 and is located in northern Sweden. The company has its headquarters in Luleå and two additional branches in Gällivare and Kiruna.

The company sells and services equipment to supply compressed air, nitrogen, oxygen, vacuum, backup power, pumps, piping systems and rental solutions for customers in mining, construction and general industry.

As part of the acquisition, 21 employees have joined Atlas Copco Group. The company has become part of the service divisions within the Compressor Technique and Power Technique Business Areas. The purchase price is not disclosed.

Atlas Copco Group's four business areas offer compressed air and vacuum solutions, energy solutions, dewatering and industrial pumps, industrial power tools and assembly and machine vision solutions. In 2024, the group had revenues of BSEK 177 and, at year end, about 55,000 employees. For more information, visit https://www.atlascopcogroup.com.

NEWS Chiller & Cooling Industry & Technology

Trane Announces Arizona Plant Expansion, Creating Jobs and Adding Production Capacity to Support Business Growth

Trane® – by Trane Technologies announced plans to expand operations at its manufacturing facility in Fort Smith, AR. The expansion project supports the production of thermal management solutions and provides the opportunity to increase the full-time workforce in Fort Smith by about 20% over the next year.

The facility has been an integral part of the Trane business and a member of the Fort Smith community for nearly 30 years. The site showcases Trane's commitment to sustainability, with upgraded HVAC, lighting and water systems to help substantially reduce energy and water use, while creating a more comfortable, efficient environment, and eliminating wood waste to landfill in 2021.

Trane's manufacturing facility in Fort Smith, AR

It also has a long track record of providing a safe and uplifting work environment for its workforce. In February 2024, the facility celebrated 12 consecutive years – more than 5,000,000 hours – without a lost time safety incident, and is on track to reach 6 million hours without a lost time incident by October 2025. Trane employees continue to actively support the Fort Smith community through volunteerism, already more than doubling recorded volunteer hours in 2025, compared with 2024.

"We're excited to expand our operations in Fort Smith, strengthening our manufacturing capacity in support of our customers and their sustainable business growth," said Holly Paeper, President, Commercial HVAC Americas, Trane Technologies. "We appreciate the longstanding collaboration with the Arkansas Economic Development Commission, Fort Smith Chamber of Commerce and thank the leaders of Sebastian County and the city of Fort Smith. Their support has been instrumental in making this expansion a reality and underscores our commitment to innovation, sustainability and the creation of high-quality jobs within the community." For more information, visit https://www.trane.com.

Carrier Launches High-Efficiency Modular, Reversible Heat Pump

Carrier has introduced the high-efficiency AquaSnap® 30RQM Modular Air-Sourced Reversible Heat Pump with a compact footprint and scalable design for greater efficiency.

The 30RQM can be tailored to the unique size and demands of any building, with reliable performance at low ambient temperatures to reduce the need for traditional boiler systems, helping to reduce environmental impact while advancing sustainability and electrification goals. The heat pump can generate up to 140°F (60°C) hot water and operate at ambient temperatures below 0°F (-18°C). It is designed to use lower GWP R-454B, also known as Puron Advance™.

The modular design allows for greater flexibility for individual building needs, with the ability to link up to 16 units for a total capacity of 320 tons of cooling capacity or 4,222 MBH of heating capacity.

The 30RQM also features easy-to-use SmartVu controls, a variable speed refrigerant compressor and low-noise fans.

"The modular design of the 30RQM increases redundancy, reliability and flexibility to operate on either cooling or heating mode depending on your needs and the season," said Frank Silva, Senior Manager, Chiller Product Marketing, Carrier. "Carrier is introducing new solutions to help buildings meet sustainability goals without sacrificing performance." For more information, visit https://www.corporate.carrier.com.

Carrier's AquaSnap® 30RQM Modular Air-Sourced Reversible Heat Pump

AIR Control Concepts Acquires Fluid Equipment Solutions of New England

AIR Control Concepts announced the acquisition of Fluid Equipment Solutions of New England (FES), a manufacturer representative of commercial and industrial HVAC products throughout Massachusetts and the growing New England market.

"We're always looking for new partnerships with local companies that share similar goals and core values," said Hayden Bland, Chief Operating Officer, AIR Control Concepts. "The team at FES has had a passion for understanding their products, investing in better service and developing more meaningful relationships for well over a decade. Priorities we share here at AIR Control Concepts."

This latest acquisition represents AIR Control Concepts' continued investment in the Northeast, strategically expanding into the growing Massachusetts market.

"We couldn't be any more excited to partner with the team at AIR," said Ben McLaughlin, Sales Engineer, Fluid Equipment Solutions of New England. "By combining our local industry experience here in New England with other AIR operating companies across the country and in Canada, there's no limit to what we can accomplish working together." For more information, visit https://www.aircontrolconcepts.com and https://www.fesone.com.

Copeland Unveils YAW and YAV Refrigerant Compressor Platforms to Enable the Electrification of Heating

Copeland is launching two refrigerant compressor platforms, enabling electrification across a wide range of heating applications. Copeland's YAW and YAV variable-speed refrigerant compressor platforms help heat pump manufacturers overcome heating capacity challenges in cold climate applications down to -25°F (-32°C), supporting the acceleration of sustainable heat pump adoption.

The Copeland YAW and YAV variable-speed, scroll refrigerant compressor platforms are engineered to deliver the heating capacities and efficiencies required to meet the U.S. Department of Energy's strict cold climate heat pump (CCHP) standard, which calls on original equipment manufacturers and researchers to partner, develop and commercialize the next generation of CCHPs.

Copeland's YAV variable-speed, scroll refrigerant compressor platform extends heat pump capacity ranges to help maintain comfort in ambient temperatures as low as -25°F (-32°C) for residential and commercial applications. In part-load conditions, YAV variable-speed, scroll refrigerant compressors modulate to match lower-capacity requirements, avoiding costly stops and starts, which can consume excess energy.

Available in tonnage ranges for both residential and commercial applications, the YAW platform features a multitude of innovations, including scroll enhancements for lower-global warming potential (GWP) A2L refrigerant optimization, a new scroll design to improve heating and cooling efficiencies and an injection port on the refrigerant compressor for an enhanced vapor injection (EVI) loop.

"Through partnerships with leading OEMs, grants from the DOE and significant investments in research and development, Copeland is playing an integral role in the development of the next generation of heat pump technologies," said Mark Bills, Vice President and General Manager of Commercial HVAC, Copeland. "In doing so, we can help OEMs not only meet the DOE's CCHP technology challenges, but also define the future of sustainable, reliable and economically viable space and water heating technologies." For more information, visit https://www.copeland.com.

The Copeland YAW variable-speed, scroll, refrigerant compressor is designed to support HVAC decarbonization by addressing the heating capacity challenges found in commercial cold climate heat pump and water heating applications.

NEWS Industrial Energy & Water Conservation

Beko Publishes 2024 Sustainability Report, Scaling Up Climate Action with Green Electricity and Refurbishment

Beko, a leader in home appliances, launched its 2024 integrated report. In a world in flux – at a time when sustainability is losing priority in boardrooms – Beko remains steadfast. Its purpose is clear: to inspire sustainable living in every home. This purpose is backed by concrete actions, including a pathway to 100% green electricity by 2030 and a global refurbishment network that extended the life of over 114,000 appliances in 2024.

"Securing a net-zero future requires absolute focus and concrete action. We are committed to 100% green electricity in manufacturing by 2030 and have dramatically scaled our refurbishment program. But that's only part of the story. We're continuously working to improve water and waste management, drive down emissions across our supply chain and design products that do more with less," said Hakan Bulgurlu, CEO, Beko.

Celebrating 70 years of innovation, Beko continues to lead with purpose and consistency, keeping sustainability at its core. Beko is on a path to net zero by 2050, with bold interim targets including using 100% green electricity in all manufacturing facilities by 2030. The company's climate strategy addresses Scope 3 emissions – which account for 99% of its total footprint, with approximately 80% arising during product use phase.

Beko has embedded sustainability into its leadership DNA by linking executive compensation indirectly to environmental performance. Targets for reducing Scope 1, 2 and 3 emissions, along with supply chain sustainability integration, are included in the scorecards of key C-suite leaders. For more information, visit https://www.beko.com.

Beko's Everfresh+ refrigeration technology

JELD-WEN Holding Releases 2024 Sustainability Report

JELD-WEN Holding, a leading global manufacturer of building products, announced the release of its 2024 sustainability report, highlighting significant progress toward its environmental, social and governance goals.

"Sustainability is not just a responsibility – it is a business driver," said William J. Christensen, CEO, JELD-WEN. "We are proud of the strides we have made in reducing our environmental footprint and investing in our people with a continued focus on creating lasting value."

The company is dedicated to achieving net-zero Scope 1 and 2 greenhouse gas emissions as well as sending zero manufacturing waste to landfills by 2050. The 2024 sustainability report shares JELD-WEN has achieved a 10% reduction in Scope 1 and 2 greenhouse gas emissions since 2021 and a 7% reduction in energy consumption year-over-year.

"We are embedding sustainability in every part of our business – from how we design products to how we operate our facilities," said Carolyn Payne, Director of Global ESG, JELD-WEN. "As we lead the way in building a more sustainable future for our industry, we are proud of the momentum we have created and look forward to the continued progress ahead." For more information, visit https://www.jeld-wen.com.

JELD-WEN's headquarters in Charlotte, NC

Crown Holdings Receives Validation of Net-Zero Target Through SBTI

Crown Holdings, a leading global packaging supplier, announced its updated near-term and new net-zero targets have been officially validated by the Science Based Targets initiative (SBTi), formalizing the ambition to reach net-zero greenhouse gas emissions across the value chain by 2050.

Crown has made an ambitious commitment to reduce its Scope 1 and 2 GHG emissions by 50% and its Scope 3 emissions by 27.5% by 2030 (using a 2019 baseline). The company is among 6,000 organizations that have adopted science-based targets and serves as one in only 1,000 that have set net-zero targets.

"Crown is in a unique position to play a key role in industry sustainability by reducing our own greenhouse gas emissions while simultaneously providing infinitely recyclable products to consumers," said Tim Donahue, Chairman, President and CEO, Crown Holdings. "Our bold Twentyby30™ sustainability initiative is built on science, and SBTi validation of our new net-zero target reinforces our commitment to measurable progress."

Crown's latest alignment with SBTi follows previously validated near-term targets established with the launch of the company's Twentyby30 program in 2020. Five years later, Crown remains on track to meet those goals and has elevated its commitment. For more information, visit https://crowncork.com.

DuPont Publishes 2025 Sustainability Report Sharing Progress Toward Its 2030 Sustainability Goals

DuPont, an American multinational chemical company, published its 2025 sustainability report detailing the progress made toward achieving its 2030 Sustainability Goals.

"At DuPont, innovation and sustainability are deeply interconnected – and that's reflected in the strong results we've delivered," said Lori Koch, CEO, DuPont. "This past year, our teams advanced breakthrough technologies, reduced our environmental footprint and deepened our commitment to employee well-being and thriving communities. From earning global recognition for product innovation to achieving record safety performance and climate milestones, this progress underscores how our teams are creating value for our customers, shareholders and communities."

DuPont reported a 55% reduction of total Scope 1, 2 and 3 emissions from the respective baselines (2019 for Scope 1 and 2 and 2020 for Scope 3). 61% of electric power to the company's operations is from renewable sources, including purchased renewable energy credits – 41 sites operate on 100% renewable electricity.

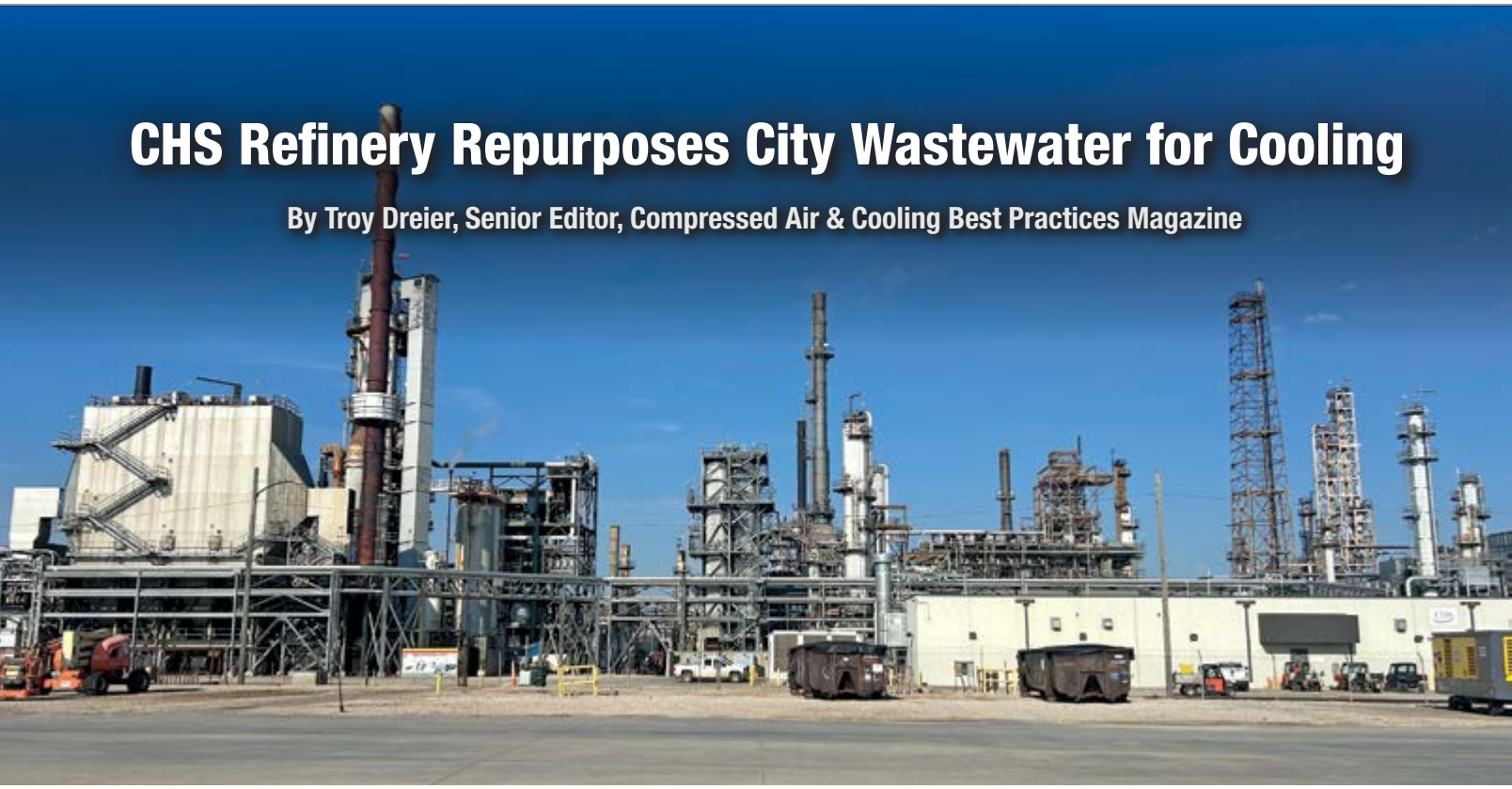
"Sustainability is at the heart of everything we do and a strategic growth driver for DuPont," said Alexa Dembek, Chief Technology and Sustainability Officer, DuPont. "By embedding sustainability into our innovation pipeline, we can unlock new market opportunities, enhance operational efficiency and create long-term value for our stakeholders."

The report was developed with reference to the Global Reporting Initiative (GRI) standards, the Sustainability Accounting Standards Board (SASB) standards and the recommendations outlined by the Task Force on Climate-Related Financial Disclosures (TCFD). For more information, visit https://www.dupont.com.

DuPont's corporate headquarters in Wilmington, DE

CHS Refinery Repurposes City Wastewater for Cooling

By Troy Dreier, Senior Editor, Compressed Air & Cooling Best Practices Magazine



The CHS oil refinery in McPherson, KS, is a 550-acre facility that processes 100,000 barrels of crude oil per day, consisting of an even mix of sweet crude oil and sour crude oil. Crude is brought in through pipelines and fractionated into gasoline, diesel and a few other products. The refinery also houses a sulfur plant where it produces a liquid agricultural fertilizer called ATS or ammonium thiosulfate, which uses sulfur removed primarily through a process called hydrotreating.

In fractionation, crude oil is heated so its components can be separated. Heaters and steam heat the crude oil, which is distilled into components. Cool water removes the heat from the distillation process. Once distilled, the components need to be cooled so they can be stored for further processing or sent out as finished products. The refinery has three large cooling towers at the oil refinery and two smaller cooling towers at the sulfur plant. They include a crossflow induced draft cooling tower that cools 35,000 gallons per minute (gpm), an induced draft cooling tower that cools 10,000 gpm, and two factory assembled, induced draft counterflow cooling towers that cool 5,000 and 4,200 gpm. The oldest cooling tower was purchased in 1959 and cools 2,375 gpm. It's been refurbished and upgraded a few times, but still works well. The fractionation cooling towers are connected to shell-and-tube heat exchangers, while the sulfur plant uses mostly plate-and-frame heat exchangers.

Above: The CHS refinery in McPherson, KS, processes 100,000 barrels per day.

The refinery's largest cooling tower cools 35,000 gpm.

Refinery Needs 2.9 Million Gallons per Day in Makeup Water

While the refinery's makeup water needs fluctuate by the season, it averages 2,000 gpm

Alan Burghart, Supervisor, Process Engineering, CHS

for its cooling towers and boilers 365 days per year. That's 2.9 million gallons every day. Makeup water is water added to cooling towers to replace the water lost to evaporation and blowdown. Until recently, the refinery used a mix of city water and groundwater as makeup water for its evaporative cooling towers and boilers. Both water sources came from the same place, the Equus Beds Aquifer. At the time, the refinery's cooling towers maintained six cycles of concentration, a measurement showing the degree that total dissolved solids are concentrated in an evaporative system's recirculating water. The cooling towers average a return temperature of 90°F (32°C) and a supply temperature of 70°F (21°C), with an average delta T of 20°F (11°C).

The region's water demand was split evenly between agriculture, industry and the city. The long-term success of that model seemed to be in jeopardy, as micrographs showed the aquifer's water level dropping around a foot-and-a-half per year. The refinery estimated that by 2042, it would have to make difficult decisions about sourcing water or reducing demand.

In 2009, Alan Burghart, Supervisor, Process Engineering, had an idea, one that would allow roughly a third of the refinery's makeup water to come from the city's wastewater treatment plant. He realized the refinery was roughly a half-mile from the water treatment plant and owned most of the land in between. If the refinery could create a pipeline between them, it could use some of the city's treated wastewater for its cooling towers and boilers, and reduce demand on the aquifer. At the time, treated city wastewater was being discharged to a creek called Turkey Creek.

By 2012, the project had received the needed approval from the refinery and the city and was ready to move forward. The refinery would receive approximately 700 gpm from the city wastewater plant. This would let the refinery reduce aquifer demand by over one million gallons per day. The first step was creating a collection basin and equalization basin at the treatment plant. The basin has a capacity of five million gallons. By 2014, the refinery began bringing water over from the city wastewater plant. The treated city wastewater, while meeting all NPDES requirements, didn't meet several specific water quality parameters needed for the refinery's purposes, so it created its own water treatment plant.

The five-million-gallon collection basin.

"It was difficult justifying this project using conventional return on investment," Burghart said. "Using the cost of water savings as a justification did not offset the capital investment to build the infrastructure necessary to reliably reclaim and treat the secondary effluent to the necessary contaminant levels for cooling makeup and boiler feed water. In the end, we felt the projects were worth it for what the outcome is, and that is saving the aquifer."

The city wastewater plant removes organic contaminants, as well as nitrogen and phosphorus, lowering their levels so they don't cause ill effects to the environment. For the refinery, inorganic contaminants are the real problem, as they limit the cycles of concentration available to the cooling towers. When heated in heat exchangers, inorganic contaminants turn to scale and reduce heat transfer. This will eventually require taking a

CHS Refinery Repurposes City Wastewater for Cooling

The water treatment plant uses two levels of filtration. The first is a microfiltration system that removes total suspended solids.

The first step is using ultraviolet lamps for disinfection.

heat exchanger and/or other equipment out of service to clean it.

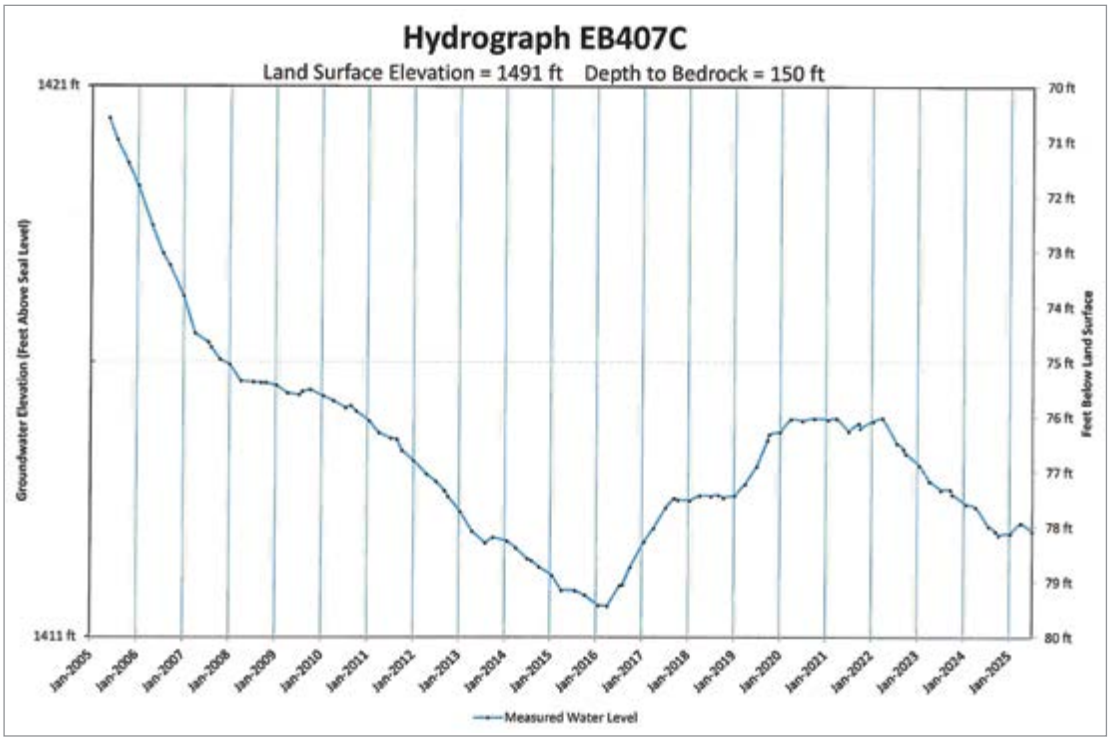
Refinery Cooling Water Demand Reduced by 119,520 Gallons per Day

The refinery's water treatment plant uses microfiltration to remove the total suspended solids (those that can be seen with the naked eye) and nano filtration. Water is pushed in at 150 lbs. of pressure, where it's filtered through a membrane that removes 92% of the contaminants. If the wastewater has 350 ppm contaminants entering the narrow filtration, it will have under 20 ppm coming out. A small stream of rejected water carries away calcium, magnesium, silica and chlorides. The Pall microfiltration system looks like a bundle of fine straws.

"One of the first things our water does is it goes on the outside of where these straws are," Burghart said. "These straws are 0.1 micron, so they're really, really small. Basically, the water molecule goes to the inside of this straw, and then it leaves and the solids stay on the outside. Every 20 to 30 minutes, we reverse flow. Once you reverse the flow, we stick air in the bottom and it vibrates these little straws and removes the solids. You can throw anything at these things. You can clean them from a pH of 2 to 14. They don't like organics, but other than that, they do a really good job of removing solids. It's cutting-edge technology.

"One downside about municipal wastewater is the chlorides tend to be a little higher from all the softeners in the city. We've got probably 550 to 600 ppm of chlorides. Chlorides don't cause scaling, but they do cause corrosion, especially in stainless steel. They will cause corrosion, primarily cracking. We have to limit the amount of chlorides in our circulated cooling water. That's one of the things that limits our cycles of concentration."

Thanks to the new water treatment plant, the refinery was able to increase its cooling tower



Despite some recent dry years, the Equus Beds Aquifer seems to be improving.

cycles of concentration from six to 10. Blowdown decreased from 165 gpm to 82 gpm, reducing demand by 119,520 gallons per day.

"Right now, we're trialing a non-phosphate or a non-conventional precipitating all-organic program," Burghart said. "The advantage of that is you don't have the scaling potential, and it also allows us to go up in pH. We're operating at about an 8.4 or 8.5 pH, which really lowers your corrosion potential. The problem is if you have that calcium and phosphate and minerals in there, your scaling potential is way too high. Therefore, we had to have some sulfuric acid for pH control. We use a patented technology that provides a microscopic layer to protect the metal.

"We were able to get away from the sulfuric acid, which removes a safety risk. The handling of concentrated sulfuric acid is a big deal. Some people will plan to reuse secondary effluent or secondary treatment in wastewater. They'll take that straight to their cooling tower. But being a traditional water treater, if you will, I understand that if you want that tower to be reliable and your equipment to be reliable, you can't be sticking stuff – contaminants, whether it's solids or total dissolved solids – into your cooling tower and not getting more efficient. You could maybe bring that water in, but if your blowdown increases and your cycles go down, then you're not getting more efficient. You're not saving water.

"I wanted to make sure that we cleaned up the water, and that was one of the pieces. If we were able to reuse this water, then we were able to build the plant to clean up the water."

A Healthier Aquifer for the Entire McPherson Community

The refinery's treatment plant became operational in 2015. The final price tag for the project was $60 million. Roughly 60% of the treated water is used for the refinery's cooling towers and 40% used for steam heating. Since the project began operation, the aquifer's level seems to have improved. A few dry years have clouded the situation, but the wells seem better than before.

Creating this solution meant working closely with the McPherson Water Treatment Plant, headed by Michael Wagner, Superintendent of Wastewater. If the city plant experiences an upset with more contaminants than usual moving through, Wagner calls Burghart and gives him advanced warning.

"We built a robust treatment plan that I'm pretty sure can handle any upset," Burghart said. "I've never turned down city wastewater. We have the latitude to not take the water. The contract we made specifies that. The city commits its wastewater to other uses primary to that of the refinery. Once it has satisfied those commitments, we can have whatever is left over. Our peak cooling season is the summer when the golf course needs water, too.

"In our industry, when it's time to make gasoline and diesel, you've got to make gasoline and diesel. If you're shut down due to a reliability issue or a mechanical problem, that's not good. If we experience leaks or something because we get too hot, it can get to be a pretty bad day pretty quickly.

"If you can imagine trying to spend $60 million on a solution to a problem that nobody thought existed, it was a little tricky, but I don't think anybody's unhappy that we did it. We know that when we need water, we've got it and we've got good water. Water shouldn't be a concern for anybody. Not everybody can say that." BP

All images courtesy of Alan Burghart.

About CHS

CHS is a global agribusiness owned by farmers, ranchers and cooperatives across the United States. Diversified in energy, agronomy, grains and foods, the company operates petroleum refineries and pipelines, and manufactures, markets and distributes Cenex® brand refined fuels, lubricants, propane and renewable energy products.

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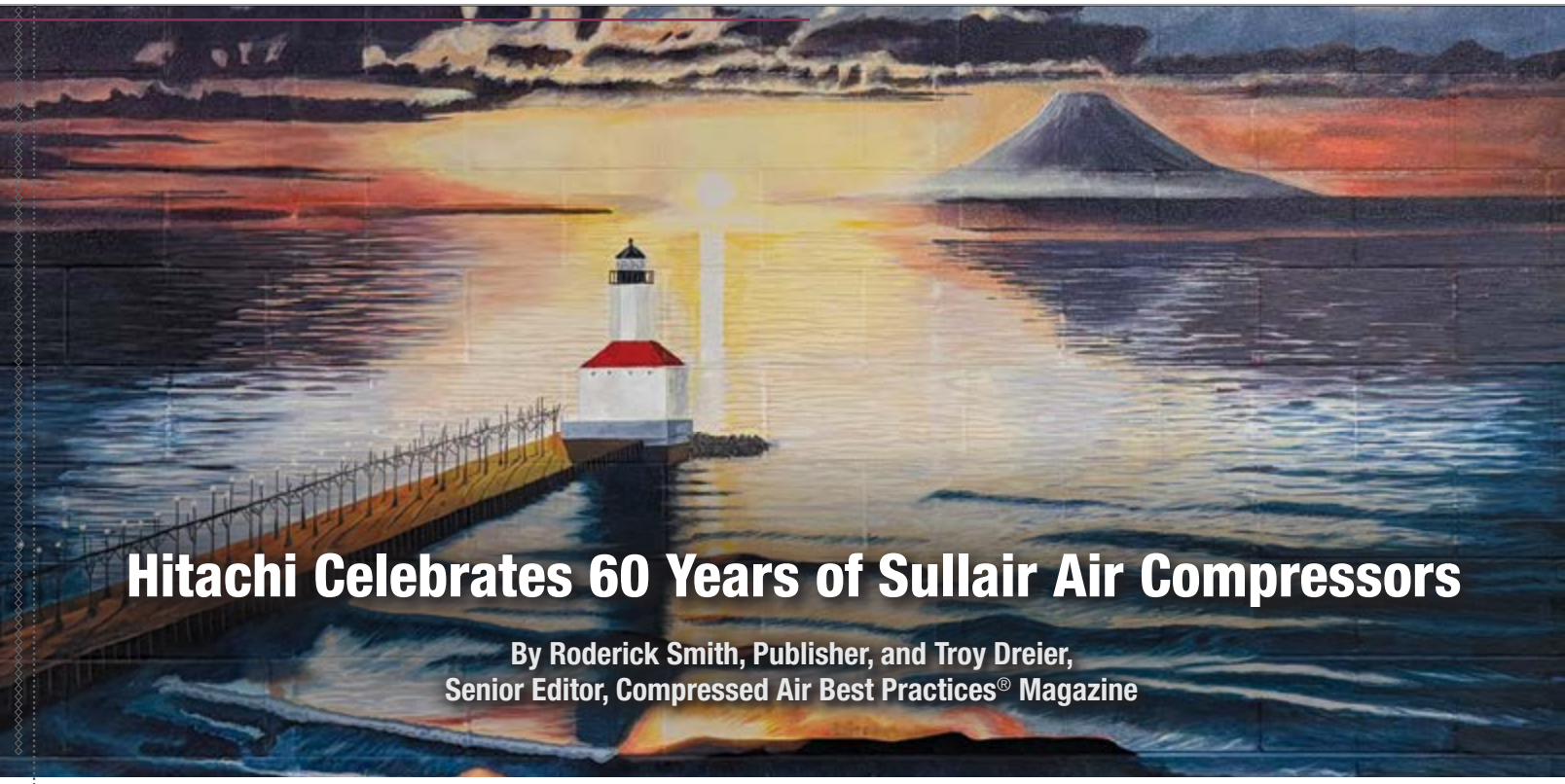

Hitachi Celebrates 60 Years of Sullair Air Compressors

By Roderick Smith, Publisher, and Troy Dreier,
Senior Editor, Compressed Air Best Practices® Magazine

Sullair began manufacturing air compressors in Michigan City, IN, in 1965, making this year the brand's 60 anniversary. Hitachi purchased Sullair in 2017, and in 2023 it took on the name Hitachi Global Air Power. The new owner has brought fresh investment to the Sullair brand. Michigan City is the company's hub for oil-flooded rotary screw air compressor design and manufacturing. It now fabricates many of its parts, thanks to a $30 million investment in 2021. Sullair has also benefited from the introduction of oil-free rotary screw technology from Japan. *Compressed Air Best Practices® Magazine* sat down with Hideki Fujimoto – who was named President and CEO of Hitachi Global Air Power effective April 1, 2025 – to learn more about his experience and plans for the U.S. market.

A Sullair DS280 oil-free rotary screw air compressor

Hideki Fujimoto, President and CEO, Hitachi Global Air Power

You worked your way up at Hitachi. What roles have you held?

I joined Hitachi in 2003 as an engineer. I was an oil-free screw air compressor engineer for more than 20 years. In 2017, we acquired Sullair. As the first expats for the post-merger integration, I came here with the previous President, Charlie Takeuchi. For two years, I was in the project management office, and then I moved to the engineering team. First, I was the airend director for Sullair, and then I moved to the new product development group. The last two years, I was Vice President of Hitachi Global Air Power Engineering.

Can you talk about your experiences with the DSP and SRL oil-free air compressor lines? How has that prepared you to take the Sullair brand into the oil-free, rotary screw air compressor business?

I was the DSP mechanical engineer for the Hitachi-branded DSP oil-free air compressor. In my role, I designed everything for it, including the starter box and the enclosure, everything. My first product was the DSP-90/110 Next Series. We're still selling this DSP in the United States.

After that, I worked to develop the Hitachi oil-free business in the Chinese market. I set up production for our Hitachi Changshu factory. In 2011, we launched the oil-free DSP in China. Then, I worked with a Chinese joint venture company, and we produced OEM

Above: An employee-created mural at Hitachi Global Air Power depicts a lighthouse on Lake Michigan and Mount Fuji, representing the blending of two cultures.

oil-flooded air compressors in China and Southeast Asia.

Finally, I came to Michigan City. I led the design and development of our first collaboration product for the Sullair brand, the DS Series of oil-free rotary screw air compressors. We launched the DS45-75 here. Last December, we launched a large oil-free air compressor, the DS280-450, as well. I also started TS series development because I was an airend engineer team director.

Can you describe how Hitachi Global Air Power is organized?

John Randall, previously the CEO of Sullair, is the president of Hitachi Industrial Equipment Systems. Hitachi Global Air Power is a division of Hitachi Industrial Equipment Systems. Hideharu "Henry" Tanaka and I lead together. Henry Tanaka is responsible for the legacy Hitachi businesses. The Hitachi factories and Hitachi brand air compressors are managed by Henry. It's based in Japan, but also goes into Southeast Asia. Because we're now one company, we're starting to ask, "How do we introduce products that are Hitachi-branded, made in Japan, into other channels?" Where there used to be a wall between the Hitachi and Sullair brands, now we're asking, "What are the best opportunities for us to expand our business?" And all of that connects at John Randall.

John, Henry and I work closely together. The business in Japan has a significantly higher market share. We aspire to emulate its market share globally.

Give us a description of your business efforts in Europe.

We see an opportunity for expanding our European presence. We'll grow this market with mainly Sullair-branded products and also the oil-free line. That's why we invested in a venture company in U.K., not only focusing on the product itself. We're trying to expand the air compressor application. That company's name is Innovatium, a liquefied air storage technology company. This is the new approach to the European market.

The Sullair brand is strong in the United States, LATAM and China. We'll grow the Sullair brand distribution market. We try to avoid duplicating product development. That's why we first integrated the engineering divisions, so we have a speedy team. Here in the U.S., we have the Sullair engineering team, and in China, we have the Hitachi site engineering team and the Sullair team. We're slowly integrating our sales teams, also.

How will the U.S. market change in the next five years?

Meeting market changes with new product development is important to us. That's why we launched the TS Series, our two-stage, larger

The Sullair manufacturing campus in Michigan City, IN

Hitachi Celebrates 60 Years of Sullair Air Compressors

oil-flooded air compressor last year. It's also why we're focusing on our new spiral valve technology, because Americans appreciate durability. The U.S. market is shifting to green products, which means combining strong energy efficiency with oil-free operation. That's why we're developing new oil-free air compressors. Also, we're accelerating the localization of oil-free products in Michigan City. This is an extension of the DS45-75.

In the United States, a big part of your strategy is the spiral valve, which gives the customer more options: the spiral valve technology, plus VSD, plus fixed speed. How's that working for Sullair?

Of course, we need evaluation, but the United States market is unique. VSD and spiral valve sales are almost equal. Depending on the product, spiral valve sales can be much bigger than VSD sales. In Japan, VSD sales are nearly half the partial-load air compressor market, but here, spiral valves are used more often. It's a unique market. Only the Sullair brand provides electronic spiral valve technology to the market. That's a strong point.

What is Hitachi Global Air Power's philosophy for airend design?

In Japan, Hitachi focuses on oil-free airend design. Michigan City leads on oil-flooded airends, since we focus on oil-flooded air compressors in the U.S. We developed our original rotor profile here and we're using CFD technology. The TS Series' two-stage cooling method, for example, is important for airend performance. We have hundreds of simulations for TS air compressors. On the drivetrain, we're working closely with Japan because HIES also produces a VSD.

Timeline: Major Moments from Sullair's 60-Year Journey

1965 Company founders Don Hoodes, Borje Vagenius, CJ Joseph and Roger Gustafson sign a licensing agreement with Svenska Rotor Maskiner Aktiebolag (SRM) allowing the use of SRM rotary screw technology in air compressors.

1966 Sullair sells its first portable air compressor, a 150 cfm rotary screw air compressor powered by a Ford gasoline engine.

1969 The first employees move to 3700 East Michigan Boulevard, which remains the primary manufacturing campus.

1971 The company introduces industrial refrigeration compressors.

1973 The company begins in-house rotor manufacturing.

1975 The 24KT air compressor line is introduced. It includes a complete air treatment system with PureAire dryers and Sterling filters, 24KT lubricant and an industry-first 10-year warranty.

1977 The MCI factory expands to 300,000 square feet.

1978 Sullair Technology Subsidiary, a joint venture with SRM, is established in Stockholm.

1978 EPA-compliant Quiet Portable Compressors are introduced. Also, the 40 Series industrial air compressor, which goes up to 1,000 horsepower (hp) is introduced.

1979 The Sully 2-20 hp reciprocal air compressor is launched. It's likely the first non-rotary-screw compressor in the Sullair portfolio. The company introduces DSC dry screw air compressors, using airends supplied by GHH, West Germany, and liquid ring vacuum pumps.

1981 The company begins trading on the New York Stock Exchange. Its trading symbol is SUL. The 3200 cfm Portable Compressor is introduced. It's believed to be the world's largest single-engine air compressor.

1982 Respirable air source, instrument air source and nitrogen replacement systems are introduced.

1985 Spiral valve technology is introduced to stationary products.

1986 Sullair discontinues direct sales operations and moves to independent distributors for stationary products.

1990 The company acquires Maco Meudon, which becomes Sullair Europe.

1992 The DS product line is launched

1993 The company achieves ISO 90001 certification.

2004 An IHI-Sullair joint venture is formed to produce centrifugal air compressors.

2017 The Sullair LS Series is launched. Also, the company is acquired by Hitachi. The official name is Sullair a Hitachi Group Company.

2018 Hitachi DSP and SRL air compressors are introduced to Sullair channels. Also, Michigan City renames 3700 East Michigan Boulevard to 1 Sullair Way.

2021 A factory expansion that includes an 80,000 square foot fabrication shop is completed. This $30 million capital expenditure is the largest in company history.

2023 The company changes its name to Hitachi Global Air Power.

2024 The TS190-260 is launched featuring two-stage performance.

2025 The company celebrates its 60th anniversary with a year of activities.

A heat of compression dryer installation

On the operations side, you made a record investment of $30 million in 2021 for an 80,000-square-foot fabrication shop. It was the largest investment in company history. What's next?

We brought fabrication in-house to better control pricing and ensure materials were made to our high standards. We'll expand insourcing to the casting side. We started with 25 parts, and now we're fabricating thousands of parts and components. Next, I'm considering air receiver insourcing.

What is the Sullair brand's approach in North America to reaching and servicing the customer?

We acquired some distributors in the last few years. We're focusing on both direct sales and distributor sales. The customer needs high-level maintenance choices. We focus on providing reliability and quality for the customer. That is the basic policy of the Sullair brand.

We expanded our direct sales and call it the Hitachi Air Center. We've created a one-company, direct sales group. But we try to expand because the voice of the customer (VOC) is important. Direct sales can understand VOC more easily. The simple answer is we'll approach a market in the best way to protect our install base and grow it.

How will new digital technologies contribute to Hitachi Global Air Power's offerings?

We're making significant investments in digital solutions – a space I find especially exciting because of the immense value digitally connected air compressors bring to manufacturing. Today, we offer Sullair AirLinx® connected services, and we're building on that foundation by expanding our digital portfolio with more advanced, predictive capabilities by tapping into Hitachi's deep expertise. The possibilities of digital connectivity are limitless, and we're excited to bring even more smart, connected solutions to our customers.

We're happy to invest in the air compressor business in North America. We were struggling to expand the North American market for a long time, but finally, we have a solid business here. We'll continue to invest in the U.S. market.

A TS series two-stage lubricated rotary screw air compressor

Hitachi Celebrates 60 Years of Sullair Air Compressors

Manufacturing in the Midwest: A Conversation with Andy Fayyad

Sullair chose Michigan City, IN, for its home in 1965 because it was already an industrial city. Due to its proximity to shipping and steel, several manufacturers were based there. Sullair's founder and three others came from Joy Global, which made heavy equipment for mining. They licensed rotary screw air compressor technology from SRM in Sweden, which owned the patent. On July 14, 1965, they signed a licensing agreement and started a company that's still thriving today. We spoke to Andy Fayyad, Vice President, Operations, about how the company's geography led to its success. Today, Michigan City has a population of 32,000, and Sullair is the largest manufacturing employer.

Andy Fayyad, Vice President, Operations, Hitachi Global Air Power

How many people do you employ in Michigan City?

The total is just under 1,000, with around 80% in manufacturing and operating. It's definitely a bit of a challenge to find the right resources that we need in the area. We're not Detroit. We're surrounded by a lot of tier one, tier two and OEM automotive suppliers. We're not Chicago. We're somewhere in the middle. The key is to hire individuals based on their behavior and if they have the right skill sets. You can train them, coach them, mentor them and mold them to become a valued asset to the company. To me, that's not a big deal. The key is finding the right attitude or the behavior that we can mold for the future.

How do you develop home-grown talent?

We started the Compressed Air Academy at Michigan City High School less than 10 years ago. We asked how do we can get people interested in this type of work, starting early with the high schools, and start making it cool again to get their hands dirty? We've started hiring people who went through the Compressed Air Academy. We're restarting our intern program: A lot of our interns come from Purdue or Purdue Northwest. We've tried to reach out to some of the local community colleges and high schools to find people who are interested in working in this type of industry and recognizing that there are cool things you can do. This isn't a sleepy community. This summer, we had four students who were part of the intern programs in Operations.

There's a trade school called Ivy Tech. We're going to be its preferred hiring company starting October of this year. We're working on several fronts to attract and develop talent.

Tell us about the Michigan City campus.

We have three buildings. Building one is where

A Picnic 60 Years in the Making

On August 12, 2025, Hitachi Global Air Power celebrated 60 years of manufacturing Sullair air compressors in Michigan City, IN, with a company picnic. It took place at the company's Michigan City campus, and featured food, games, music and entertainment for employees and their families. Special guests included Masashi Mizobuchi, Consul-General of Japan in Chicago, and Tetsuro Mitani, Executive Director of the Japan Chamber of Commerce and Industry of Chicago. The company also sponsored a mural by artist Felix Maldonado, Jr. on multiple city-owned retaining walls to celebrate the region's industrial heritage.

In January 2025, Hitachi Global Air Power donated a custom-designed 185 Series Tier 4 portable air compressor to the ARA Foundation's charity auction. The company also made a separate $10,000 donation to Wounded Warrior Project®.

we do portable and stationary machines. We assemble them. Building two is divided into two halves. One half is fabrication, where we make air compressor panels, control box panels, brackets, mounts and frames. The second half is the rotor and unit assembly, which is the brain of our machines. Building three, in a different location, is where we do value-added work: combining pieces of machinery, creating tank-mounted equipment, adding filters, that type of thing.

My operations department is close to 400 people, and our mission is simple: Build products safely, on time, with quality and under budget that meet and exceed customer expectations.

What plans does the company have for the Michigan City campus?

Building two is where a lot of the heavy-duty components are built, and we have been investing heavily there to upgrade our equipment. We have to invest around $7 million in it over the next three years. That means buying new machines or upgrading our existing machines that provide grinding, hard finishes, raw finishes and final finishes. We're favoring two different brands. One, Amada, a Japanese brand, is a partner of our parent company in Japan. That helps from a cost perspective and also from a knowledge base regarding service and warranty. The other is Holroyd, an English company Sullair has been using since 1970.

We're on a transformation journey. My background is automotive. I spent 30 years at General Motors, so my experience is automotive-centric. I joined the company in November of last year. My goal and mission are to transform our operation to be like an automotive plant. We will be KPI-driven. We'll have standard work, structure, discipline and execution. We will modernize and grow. We won't grow purely through investments, but through the labor force we have through training. To me, training is very important, as well as team and employee recognition. But I keep going back to engagement: Employee engagement is front and center in everything we do. An employee who cares will go not just the extra mile, but the extra 10 miles. BP

An LS110S single-stage lubricated rotary screw air compressor

To read articles about ***Air Compressor Technology,*** visit https://www.airbestpractices.com/technology.

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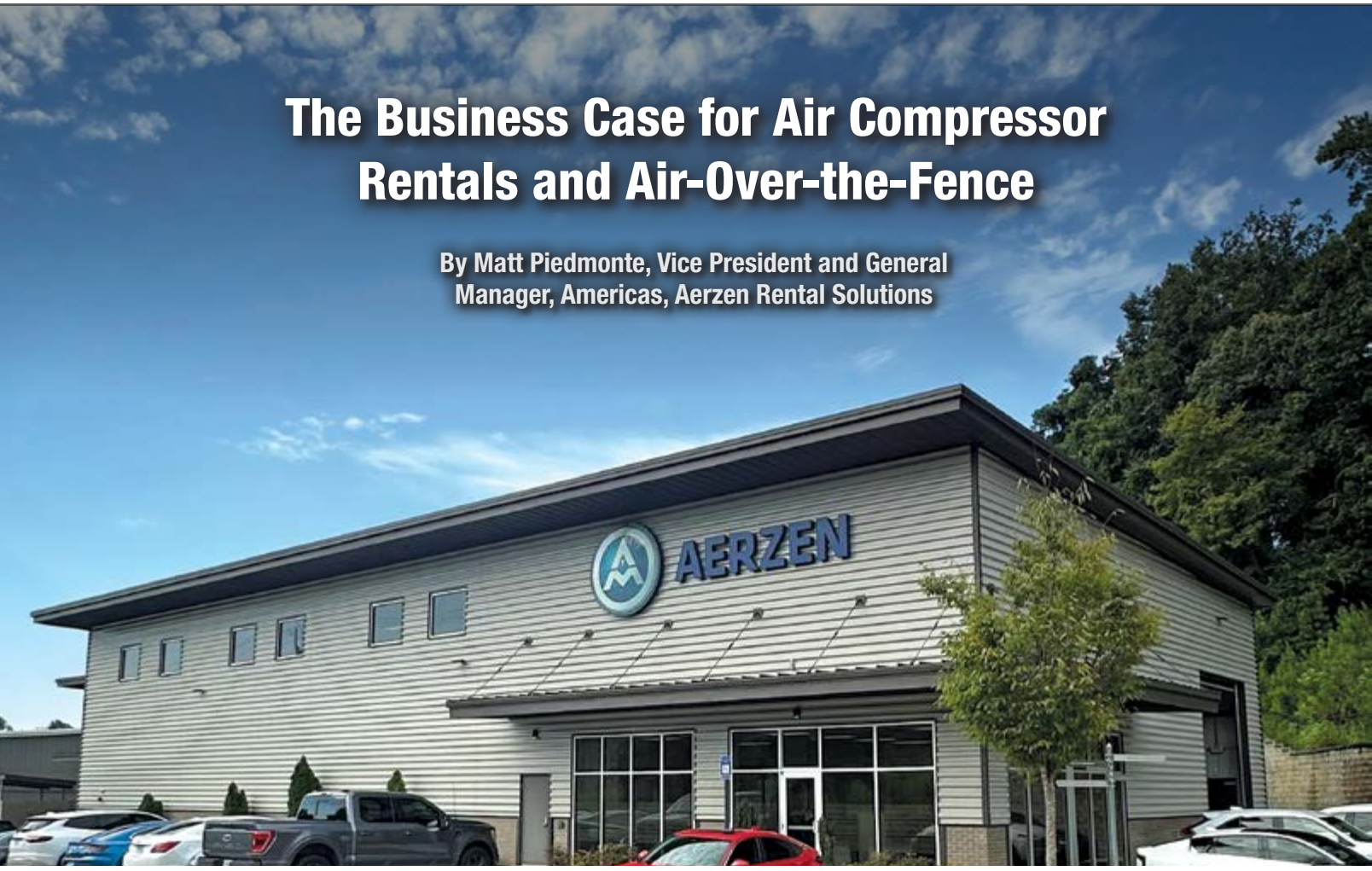
The Business Case for Air Compressor Rentals and Air-Over-the-Fence

By Matt Piedmonte, Vice President and General Manager, Americas, Aerzen Rental Solutions



Above: Aerzen Rental Solutions' U.S. headquarters in Atlanta, GA

Whatever kind of plant you operate, you likely have varying needs for air at different pressure levels and flow rates to support multiple industrial processes. What businesses really care about is getting air into the pipe reliably and, in most cases, at the lowest possible total cost to the business. As blower, vacuum pump and compressed air technologies have evolved, so too have the business models surrounding these products. Historically, companies used capital dollars to acquire the blowers, vacuum pumps and air compressors required by their plants, and then established a maintenance strategy.

Today, business models around getting air in the pipe have evolved such that plants no longer need to use budgeted capital dollars to meet their air needs. They can rent the assets they need or enter into long-term supply contracts to receive air as if it were a subscription service or a paid utility like electricity, natural gas or water. Long-term supply contracts are often referred to as "air-over-the-fence." Each of these approaches has its own pros and cons. This article aims to explore those business approaches to getting air in the pipe reliably, and explore some of the pros and cons associated with each method.

Purchase the Required Blower and Compressed Air Assets

Companies purchase the blower, vacuum pump or compressed air assets they need and establish a preventative maintenance plan, either using in-house personnel or third parties.

Pros	Cons
Has the potential to be the lowest cost option available to plants	Uses capital dollars
New assets can be added, transferred to other plants, or sold off as usage needs change over time	Plant must accrue and be ready for large spend events both planned and unplanned
100% availability of air in the pipe can be achieved with proper investments in redundancy, planned maintenance and stocking of long lead time spares	Process/manufacturing interruptions can be incurred if the plant has not invested in adequate equipment redundancy and/or has poor maintenance practices
Tax benefit of bonus depreciation on acquired assets	Plant personnel must spend their time focusing on managing and maintaining assets that don't directly make the company money

These multi-stage centrifugal blowers are permanently installed and owned by a water treatment plant in Texas.

Renting Required Blower and Compressed Air Assets

Rental companies invest in the same type of blower and compressed air assets that companies purchase. Reputable rental companies have these assets tested, staged and ready for immediate shipment 24/7. Rental is most often used to supplement a purchased asset strategy where the air provided by a rental asset is needed for a short period of time. In some cases, plants rely entirely on rented assets to meet their air needs.

Pros	Cons
Quickest option available to put air in the pipe when needed. Assets are available 24/7 with staged assets that are ready to support plant needs	From a cost standpoint, this would likely be the highest direct spend option if a plant were to rely solely on rented assets vs purchased assets
Assets can be easily scaled up or down based on business needs; contracts are not rigid	Under this model, when a company rents a blower or air compressor, performance or availability is typically not contractually guaranteed
No capital dollars spent	Less reputable rental companies provide equipment that is not tested and not standardized, making it hard to support; their rental assets are sourced from a pool of surplus used assets with unknown maintenance or operational history; they also may not establish reserved spare assets to be able to swap out a failed rental asset in a timely manner
Plant personnel do not need to worry about maintenance or repairs	
Reliability issues with rented equipment can typically be resolved in under 24 hours by swapping a failed asset with one from the "ready line," as reputable rental companies have established operating nodes with spares to support current customers	
Contracts are short term, which keeps the rental supplier on its game; an underperforming rental company can be replaced on short notice	

The Business Case for Air Compressor Rentals and Air-Over-the-Fence

A cement plant in Texas relied on a rented industrial blower to replace a rented diesel air compressor while awaiting permanently installed units.

Air-Over-the-Fence (AOF) for Air Subscriptions

With AOF, third-party companies own and maintain their own assets to deliver air to industrial plants on a subscription basis (a flat rate per month) or a pay-per-use basis (typically a minimum base charge plus a per cfm usage charge). Air in the pipe availability is typically guaranteed with liquidated damages if the specified air cannot be provided. Although these liquidated damages are not based on the cost of lost production in the plant, they are steep enough to motivate the AOF provider to respond with urgency if their equipment is not operable. Liquidated damages are typically not immediate; most AOF providers are afforded a timeframe within which they must remedy any issues – typically, 24 hours.

Pros	Cons
• No capital dollars spent	• Typically not an overnight solution for a multi-machine system: Between contract negotiations (which can be protracted due to the rigid nature of the contracts), system design, and procurement and installation, AOF contracts can take years from idea to implementation
• Plant personnel do not need to worry about maintenance or repairs	• Rigid, long-term contracts do not account for changes in business needs over time
• Efficiency and availability guarantees are standard	• Documenting and proving performance deficiencies to collect on liquidated damages may be complicated and time consuming
• Typically lower direct cost than rental, but considerably more cost to an industrial plant than purchasing and maintaining its own assets	• AOF supplier complacency or underperformance cannot be addressed easily due to the rigid and long-term nature of the contracts

Most plants that rent do so for a short term to get through a transition period with their purchased assets. Renting can allow for a faster production ramp-up or provide air during a planned or unplanned outage with a purchased asset.

Looking Beyond the Price Tag for Blowers and Air Compressors

If purchasing blowers or air compressors is likely the cheapest option, why would businesses consider rentals or AOF?

Availability of capital dollars. Many companies prioritize their capital investments based on those projects that carry the largest ROI. Capital projects to add production equipment or debottleneck processes lead to increased plant throughput and a direct top-line revenue impact. These projects are ranked as a much better way to invest available resources, leaving funds for rentals or AOF to be considered batch costs that are accounted for in the company's gross margins. With only so much money available to be invested in a business, prioritizing projects with a tangible ROI may be a better use of company funds than spending on critical infrastructure assets.

Rental as a supplement. Most plants that rent do so for a short term to get through a transition period with their purchased assets. Renting can allow for a faster production ramp-up or provide air during a planned or unplanned outage with a purchased asset.

Headcount and focus. Some companies view a long-term rental or AOF strategy as a means of minimizing the number of employees needed to maintain the assets, allowing employees to focus on production equipment directly related to achieving production goals and improving plant throughput. These companies value having their employees develop expertise and maintain their focus on those assets most directly related

A gypsum plant in Saudi Arabia used a rental air compressor while waiting on purchased air compressors that would be permanently installed.

to their products while outsourcing commodity infrastructure needs like the air flow provided by blowers, vacuum pumps and air compressors.

Case Study: Auto Manufacturer Makes a Badly Timed Decision

An automotive manufacturing plant in the Midwest transitioned from owning and maintaining assets to a 15-year AOF contract. This plant employed several thousand people at its peak and operated with a high cost of downtime. It preferred to completely outsource its air needs to an AOF supplier.

The scope of the AOF contract included a dedicated compressed air building, all electrical switchgear infrastructure designed with n+1 redundancy (including automatic power transfer with independent power feeds from separate 11 kV substations), liquidated damages for inability to meet the contracted compressed air guarantee, efficiency guarantees on measured compressed air delivered vs electricity consumed and air quality guarantees around dewpoint and oil carryover. The contract required a guaranteed compressed air flow of over 32,000 scfm at a dewpoint of -40° F (-40°C) and at class 0 quality. The AOF supplier designed the facility to include centrifugal air compressors and heated blower purge desiccant compressed air dryers with n+1 redundancy at the peak contractual guarantee point.

Approximately two years into the 15-year agreement, the plant's production needs changed drastically due to changes in technology that allowed it to produce products using far less compressed air. Its compressed air needs dropped from a daily average of 30,000 scfm to only 8,000 scfm. The plant attempted to renegotiate the AOF supply contract, but, given the rigid nature of the contract and the large capital investment the AOF supplier made to build the facility, the AOF supplier politely declined to consider a renegotiated price. The plant was stuck with the contract for the remaining 13 years with no ability to reduce costs. What the plant paid to the AOF supplier over that 13-year period was estimated to be about six times the cost of purchasing and maintaining the assets needed to maintain the reduced production needs.

The takeaway: Rigid AOF contracts are not advisable if business conditions may change through the life of the contract.

Case Study: Water Services Provider Switches from Rentals to AOF

A water services provider in the Southeast relied on approximately 25,000 scfm of air at 10-12 psi (0.7-0.8 barg) for its diffused aeration system. However, the facility was understaffed and overwhelmed with maintenance demands across its various process components. The facility frequently experienced major failures with its seven permanently installed tri-lobe aeration blowers, often resorting to cannibalizing parts from one machine to keep another operational. Eventually, it became impossible to maintain

These vacuum blowers were rented while permanently installed vacuum blowers were on order.

The Business Case for Air Compressor Rentals and Air-Over-the-Fence

Due to protracted negotiations, a water services provider in the Southeast used these rental air compressors for two years while negotiating an AOF contract.

enough functioning aeration blowers to support the required production levels.

To address the shortfall, rental aeration blowers were brought in. After observing the reliability of the aeration blowers and responsiveness of the rental provider, the facility decided to remove its permanently installed aeration blowers and replace the full 35,000 scfm capacity with seven 5,000 scfm rental aeration blowers.

As time passed and the facility realized the benefits of improved reliability and reduced maintenance time spent on the aeration blower system, it decided this strategy of an outsourced aeration blower system aligned with its long-term needs. It sought opportunities to reduce its costs. This led it to explore AOF. Implementing a five-year AOF contract took about two years from idea to implementation due to protracted contract negotiations and long equipment sourcing and installation lead times from the AOF supplier.

In the end, the facility not only reduced its monthly third-party vendor spending but also gained a liquidated damage-backed delivery guarantee. In addition, it was able to realize energy savings as the AOF supplier provided rotary screw aeration blower technology instead of the tri-lobe aeration blowers offered by the rental company. The new aeration blower system is projected to save the facility over $1 million during the five-year contract.

These rental air compressors were used temporarily while permanently installed air compressors were on order.

The takeaway: An AOF provider will do the same work that a reputable rental company will do, but at a lower price and with contractual performance guarantees for companies with long-term stability in their process needs and a willingness to enter into a rigid contract.

Case Study: Building Materials Plant Pays for Artificial Load

A building materials plant in the Southwest transitioned its compressed air system to an AOF system with five 400 hp oil-flooded air compressors, plus desiccant compressed air dryers able to deliver 7500 scfm of compressed air at -40°F (-40°C) dewpoint. The commercial terms had the plant paying for compressed air usage through a continuous measurement of air compressor energy consumption. The underlying premise was that the energy consumption of an air compressor is directly related to the volume of compressed air it produces when loaded.

An independent study of the supply and demand side of the compressed air within the plant found several AOF air compressors with compressed air filters near fully plugged and with little to no compressed air actually delivered, yet pulling full load current. Because the plant was paying for usage based on current

draw, it paid for artificial air compressor load. After changing the compressed air filters, one of the five units was able to be turned off. This saved the plant $23,000 per month in energy, and removed the usage expense paid to the AOF supplier.

Rental blowers and air compressors can be a viable avenue to provide air needs to a plant when the production needs are unpredictable and there is a desire to protect capital expenditures while avoiding long-term contractual commitments.

The takeaway: Budgeting for the use of an independent auditor is a best practice to ensure conflicts of interest are avoided with AOF providers.

Case Study: Insulation Products Plant Rents Blowers as Needed

An insulation products plant in the Southeast suffered from a lack of reliability and high maintenance costs due to frequent major component failures in its purchased industrial blower assets. Its business also experienced a period of considerable volatility around product demand, causing it to be protective of capital expenditures even when needing to maintain product delivery schedule targets. To supplement its immediate needs, the plant rented two variable frequency drive (VFD) blowers capable of operating between 700 and 1800 scfm, while controlling to maintain a header pressure of 15 psi. Over the years, it added blowers when demand was high, eventually reaching a peak of six rental blower units. It scaled back to as few as two blowers when demand was low.

The takeaway: Rental blowers and air compressors can be a viable avenue to provide air needs to a plant when the production needs are unpredictable and there is a desire to protect capital expenditures while avoiding long-term contractual commitments.

Conclusion

This author happens to have a career's worth of experience in the blower, vacuum and compressed air spaces but this article could just as easily have been written about chilled water, steam, nitrogen or any of the other industrial utilities that are provided by assets a plant purchases with capital dollars to support its needs.

There is no single right approach to putting the necessary volume and pressure of air in the pipe to meet production needs. There is a place for purchasing assets, there is a place for renting assets and there is a place for an AOF contract. Just as the business models around these assets change, so do the needs of an industrial plant. What may have worked for the last 10 years may not work for the next 10. Only the plants themselves can evaluate the pros and cons of each option while weighing the goals and financial metrics of the organization to determine what is best for their businesses going forward. BP

About the Author

Matt Piedmonte is the Vice President and General Manager of Aerzen Rental Solutions in the Americas.

About Aerzen Rental Solutions

Aerzen Rental Solutions was founded in 2018 and specializes in temporary blower and air compressor solutions under 50 psig. With locations in Phoenix, AZ, and Atlanta, GA, it's positioned to deliver rental solutions within one day to any location in the continental United States. Its rental blower and air compressor solutions use technology developed and advanced over 160 years by Aerzener Maschinenfabrik GmbH, based in Aerzen, Germany. It also specializes in Rental Retrievable Diffused Aeration Grids, which were developed in partnership with affiliate company Aquarius Technologies, based in Saukville, WI. For more information, visit https://www.aerzen.com/us/rental-solutions/about-us.

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Process Cooling Systems Engineers for Industrial Applications

By Troy Dreier, Senior Editor, Compressed Air & Cooling Best Practices Magazine

Process Cooling Systems is a systems integrator providing engineering support for process water systems. Founded in 1963, it now has an office and manufacturing center in Leominster, MA, and a second office in Greenville, SC. It works in all industrial applications, with a focus on plastics and heat treating processes, food processing and medical and pharmaceutical production. The company prides itself on providing custom engineering for all customers.

"One of the key components for us as applications engineers working with customers is we have to keep an open mind," said Shane Dandy, Engineering Manager. "We don't want to be walking into a site with a set design or a set system in hand. We're definitely open-minded. When I'm sitting with a customer, I want to hear what they're expecting and listen to the problems they've experienced. I want to hear what works best for them and what doesn't work for them. Because we are an integrator, we don't have a particular product we have to put on the table. We get customers the best efficient system solution possible."

Capacity is the biggest determiner when selecting a chiller, Dandy said. When starting with a new customer, his company creates a machine list of what's currently installed at the facility and what needs to be cooled. That list prompts a series of questions about the customer's goals. Usually, the goal is to improve process efficiency and speed to drive greater throughput.

Above: Process Cooling Systems headquarters in Leominster, MA

Cooling for High-Speed Injection Plastic Molding

With injection plastic molding jobs, the conversation starts with throughput and how much plastic the customer wants to move through its processes. For a high-speed facility with high-capacity molds, the company wants to move as much water through the mold as the mold will allow. Understanding how much throughput the client needs and how much material is moving through the mold will justify changes to the process water flow rate. The challenge Dandy often sees is when the process flow rate is high compared to what a chiller can handle for a temperature difference.

Shane Dandy, Engineering Manager, Process Cooling Systems

High-speed molds prefer a two-degree temperature difference. However, a two-degree difference is a problem for chillers. Chillers want to operate in a six to 10 degree temperature range, and can't react fast enough for a two-degree change. Most chiller manufacturers won't allow engineers to select a chiller with a faster flow rate than six degrees. In that case, the company decouples the chiller from the process by creating one piping network that goes to and from the chiller and a second piping network that goes to and from the process.

"Whether that's a closed loop or an open loop depends on what the customer's looking for," Dandy said. "Typically, it would be an open tank with one set of pumps to and from a process, and one set of pumps to and from a chiller. That way, we can operate the chiller at its best efficiency while producing a high flow rate for the process so it can produce more product."

In that scenario, one set of pumps pulls from the open tank and delivers to the process. Heated process water comes back to the tank, but enters on the other side. Water from the warmest side of the tank goes to the chiller, which cools the water and delivers it to pumps going out to the process. The coolest water goes to process and the warmest water goes to the chillers. A blending occurs in the tank because the process is operating at a low temperature difference. The chiller needs to operate slightly colder than the process temperature requirement.

This chilled water pump and tank assembly at a plastic injection molding facility in Arizona has a 5,300-gallon capacity with provisions for pump expansion in the future.

"I've had requests for less than a two-degree temperature difference, but to go from a two-degree temperature difference to a one-degree temperature difference is literally twice the flow rate," Dandy said. "There's not that big of a gain in how much product and how much throughput that they could possibly put through that machine to change it from a two-degree temperature difference to one degree. But there is a huge impact on the system design to go from two to one because of the flow rate literally doubled to gain just a one-degree temperature difference."

Free Cooling Results in Massive Energy Savings

Most plastic molds operate around 50°F (10°C). Some processes, such as for medical parts and nylon, operate at higher temperatures. Hydraulic or electric machines can use fluid in the 77-85°F (25-29°C) range, although they can also take cooler temperatures.

Temperatures are heavily considered for injection molding processes, with the goal of improving the flow rate. The company gains the most efficiency when it introduces a free cooling program. If the temperatures at the plant's location allow, the company might be able to shut off the chillers for a significant portion of the year. That offers huge energy savings. The company has created free cooling systems as far south as South Carolina. If process requirements are within 10-15°F (6-8°C) of ambient conditions, then it's possible to capture free cooling hours. If so, the company needs to calculate the cost of introducing a free cooling system and compare it to the expected energy savings to determine whether or not it's worth doing. If the expected ROI is over seven to 10 years, the customer will pass on it. Introducing variable frequency drives on pumps and varying process flow rates through the chillers can also boost efficiency.

"When working with older systems, we're good at working with a hodgepodge of existing equipment," Dandy said. "There's no line for us in that matter. If there's existing equipment and we feel it's probably usable, we'll use it. There's no point replacing it. But if it's really old, if the refrigerant is outdated, if we see there may be serviceability issues with older equipment, then we'll recommend replacements."

For some operators of high-volume plastic molds with multiple cavities, the answer to improving throughput is adding more production machinery. But improving cycle priming on production machinery can drive great enough throughput gains that the customer chooses not to add new equipment.

"One of the things I challenge a lot of process engineers with is how warm can we allow water temperature to go to an injection molder, because that's going to result in the highest savings available," Dandy said. "A lot of manufacturers say, 'We need 50°F (10°C) water' or 'We need 45°F (7°C) water." But for customers who are open to entertaining how warm they can go, we stretch those limitations. We've had customers that were running at 50°F (10°C), and we have them all the way up to 67°F (19°C). That results in a better, more efficient chiller, but from a free cooling perspective, that's opening up 17 more degrees of an ambient temperature that we could possibly get more hours out of. That is huge. To use 67°F (19°C) in that process, we might be able to get a free cooling system when the ambience is 57°F (14°C) outside. We could possibly shut the chillers off completely. If, say, that was in New England, 57°F (14°C) and colder is almost half the year, maybe even more than half the year. That is a tremendous amount of savings. We definitely try to push that envelope with a lot of our customers, asking how high can we actually operate with temperatures."

When it's time to switch from mechanical cooling to free cooling, Dandy tells customers, "I don't want you to know what happens." The customer shouldn't have to worry about it. The transition is automated using a PLC system that monitors ambient conditions and switches between free cooling and mechanical cooling automatically.

Located at an asphalt shingle facility in Minnesota, these air-cooled chillers each provide 60 tons of cooling.

Process Cooling Systems Engineers for Industrial Applications

This closed-loop assembly was built for a heat treating facility in New Hampshire. It includes plate and frame heat exchangers and a tank with a nitrogen blanket. A nitrogen-driven pump offers security in case of power loss.

Heat Treating Processes Require Cooling to Prevent Furnace Overheating

Heat treating processes use heat to change the cell structure of metal to make it more durable. The role of cooling is far different in heat treating. In injection molding, getting high flow rates to the molds is crucial. With heat treating, the temperatures are higher and flow isn't as important. Lower temperatures generally aren't required, as the plant is simply trying to prevent its furnaces from overheating. The internal temperatures are in the thousands of degrees, so all the plant needs to do is keep the outside of the furnace from getting too warm.

"Picture an oven that is thousands of degrees where the plant is bringing up that metal to almost a molten state," Dandy said. "The object is to keep the outside of the oven from deforming. The outside of that oven may have jacketed cooling throughout it. We're providing water to keep a uniform temperature on the outside of the vessel. Pretty large power supplies would be required to bring that temperature up, so we also have to cool the power supplies. These are not loads that would require really cold water for cooling, so we can handle that with different types of cooling that would not be a mechanical chiller."

As with injection cooling, heat treatment cooling starts with a pumping network to deliver fluid to and from the furnace. A second set of pumps connects to a cooling tower or adiabatic cooler to reject heat. The goal for the engineer is getting the heat outside. If the plant uses water evaporation for cooling, the engineer looks at the wet bulb design; if the plant uses dry cooling, the engineer looks at the dry bulb design. In either case, the engineer uses programs that provide collected averages of weather data for the geographical area to determine the best equipment. For evaporative systems, a wet bulb of 78°F (26°C) is typical, and a cooling tower would operate within a 7°F (4°C) approach of that. That means providing process with 85°F (29°C) fluid from the cooling tower. For most heat treating processes, the return temperature is 10-15°F (6-8°C) higher, so if the cooling tower sends out 85°F (29°C) fluid, it gets 95-100°F (35-38°C) fluid coming back.

For heat treating processes, infrastructure support might be the limiting factor in how hot return water can be. Whether the system uses PVC or steel pipe, for example, determines how far the engineer can push the temperature range. Fluid that's too hot could also damage the plastic fill inside a cooling tower. Heat treating facilities often have a backup water system to provide cooling in case of a power failure. When a plant loses power, its pumps stop, but there's still significant heat in its furnaces that needs to be removed. Diaphragm pumps use a nitrogen or argon system to drive the pump, to keep fluid flowing through the furnace. The furnace manufacturers might use a city water backup, as well, where a valve opens during a power failure.

This central cooling tower system was built for an all-outdoor installation in North Carolina.

This modular mechanical room with cooling towers built into the structure was built for a heat treating application in New York.

Food Processing Cooling Needs Vary by the Specific Process

The company sees a lot of cold water requirements in food processing. For example, a dough process might involve setting up boiling water with a variety of additives used to make dough. The plant typically wants to drive down the temperature in the mixing vat, as colder temperatures help the dough to set. In this scenario, the company relies on closed-loop mechanical chillers and a glycol solution. Going colder reduces the options for free cooling. Achieving 32°F (0°C) or colder could mean free cooling isn't a consideration because the limited available hours won't justify the payback period.

Specifying equipment begins with understanding the customer's needs, studying ambient conditions and comparing options and prices from different chiller manufacturers. If the customer has equipment all or mostly from one manufacturer, Dandy tries to stick with that. As a systems integrator, his company has the flexibility to work with any manufacturer.

"Food processing is process-specific," Dandy said. "If somebody is mixing and there's not any other reaction taking place within the vessel, that mixing process is specific to the horsepower being driven on the mix. That's how much heat we're bringing in. If an auger is mixing the product, we want to know what the auger's horsepower is because that tells us how much heat is going into that mix. If there's no other chemical reaction within the product, that's all we're worried about. Those vessels are typically jacketed. We're trying to cool that jacket similar to the heat treating industry."

Chemical Plants Need Ultra-Cold Conditions

Chemical plants have extreme cooling needs. The company just started working on a plant that needs -10°F (-23°C) cooling. The customer works with chemicals that evaporate at higher temperatures, so they need to be cooled back down. For chemical plants, the company needs to understand the efficiencies of different glycol solutions. Propylene glycol might be too thick in a pump when it gets cold, for example. The company might move to other glycols that are thinner at colder temperatures and are easier to move. Dynaline is one type that doesn't freeze and also doesn't change its viscosity at cold extremes. While it's a favorite of Dandy's, chemical production customers can be extremely choosy about which products they allow.

For chemical producers, Dandy looks to single-stage closed-loop mechanical chillers, or those with cascading refrigerant compressors to drive down fluid temperatures. For these processes, freezing is a concern. The entire piping network needs to be insulated. That can be difficult when space constraints are an issue.

"There are multiple types of insulation available when we're talking about those temperatures," said Dandy. "We generally go towards a closed-cell rubber insulation that has mold resistance and resistance to a lot of the elements that it will come into contact with. The industry standard is either fiberglass or close-cell rubber. Space has to be calculated in the planning phase. If you know you have a system running low temperatures, you have to have the proper supports with the proper saddles, and then take into account all the bends and transitions needed to get from point A to point B, just to make sure there's enough clearance. That's especially important when it comes down to maintenance and working on the equipment after the initial installation. There needs to be forethought as to how can we maintain this equipment and keep it running." BP

About Process Cooling Systems

Founded in 1963, Process Cooling Systems has grown into a trusted partner for industrial manufacturers across a wide variety of sectors, including plastics, heat treatment, food and chemical processing. The company specializes in designing, installing and servicing custom process water systems that combine energy efficiency, performance and long-term reliability.

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Ultrasound Saves Energy by Detecting Compressed Air System Leaks

By Robin Marcinkus, Global Content Marketing Specialist, UE Systems

Ultrasound refers to sound pressure waves with frequencies above 20 kHz, which are beyond the range of human hearing. These waves can only be detected using specialized ultrasound technology, allowing inspectors to identify the earliest signs of asset failure.

One of the primary applications of ultrasound is detecting and repairing compressed air system leaks. These leaks not only waste money, but also reduce equipment efficiency, increase wear and pose safety risks for employees. However, with a simple point-and-scan approach, maintenance teams can quickly locate leaks. This helps lower energy costs, improve safety and keep industrial operations running at peak efficiency.

With energy prices high, detecting and repairing compressed air system leaks has become a top priority. Rising electricity costs make compressed air generation more expensive. Leak detection has become essential for controlling energy spending.

Above: The Ultraprobe 15,000 uses ultrasound to analyze everything from bearings and electrical systems to steam traps and compressed air system leaks. With an intuitive, built-in touch screen, this handheld tool can easily test and report on a variety of industrial equipment.

Ultrasound tools, such as UE Systems' Ultraprobes and FLIR's acoustic imaging cameras, make it easy to identify leaks quickly and accurately, delivering both immediate cost savings and long-term efficiency gains. In addition to energy savings, detecting and fixing compressed air system leaks helps ensure optimal equipment performance.

Nearly every industrial facility has compressed air system leaks. It's not a question of whether or not they exist, but rather how many exist.

Leak Detection Methods for Compressed Air Systems

U.S. Department of Energy studies of industrial plants found that only 50% of all compressed air produced in plants is used wisely, with approximately 30% lost due to leaks. These inefficiencies result in significant economic and environmental costs. For example, a single 3mm leak in a 73 psi (5 barg) compressed air system can waste as much as $574 annually. Multiply this loss by dozens or even hundreds of leaks within an industrial facility, and the financial waste becomes substantial. Addressing compressed air system leaks not only leads to considerable energy and financial savings, but also enhances overall operation.

Multiple methods are used to detect compressed air system leaks, each with its own advantages and disadvantages:

Traditional Soap and Water Method. The traditional soap and water method for detecting compressed air system leaks is time-consuming and labor-intensive, requiring technicians to manually inspect each potential compressed air system leak up close. This approach is not only inefficient, but also poses risks in industrial environments: Introducing moisture can be hazardous to sensitive industrial equipment.

Ultrasound Inspection Instruments. A more advanced and efficient method for compressed

BioKyowa discovered $86,324 in annual compressed air leaks throughout its plants.

air system leak detection involves the use of ultrasound technology. There are two primary types of ultrasound-based compressed air system leak detection tools: listen-only ultrasonic instruments, which allow users to hear the high-frequency sounds produced by escaping compressed air; and acoustic imaging cameras, which provide real-time visual imaging of compressed air system leaks, enhancing detection accuracy and efficiency.

Why Use Ultrasound for Compressed Air System Leak Detection?

Ultrasound technology offers numerous benefits for compressed air system leak detection. Its directional sound waves help pinpoint the exact location of compressed air leaks with precision, while the intensity of the detected signal increases as the instrument moves closer to the compressed air leak source, making localization more accurate.

Because ultrasound operates at a fixed frequency, it remains effective even in noisy industrial environments. Additionally, ultrasound technology is versatile and can be used to detect leaks across a variety of gases, including oxygen, nitrogen, helium and argon.

When scanning an area, ultrasonic instruments, such as select UE Systems Ultraprobes, detect high-frequency turbulence created by compressed air escaping through a leak. This is perceived as a distinctive rushing sound through a headset or visually represented on a display. If ambient noise is problematic, rubber focusing probes and frequency tuning features help shield and isolate the compressed air leak's sound from background noise.

One of the most common and valuable applications for ultrasound technology is conducting comprehensive compressed air system leak surveys. By using an Ultraprobe coupled with software such as UE Systems' DMS or the Leak Survey SideKick app, users can quickly and efficiently locate compressed air system leaks, tag their locations while digitally recording data, generate reports detailing estimated energy losses and cost savings and document repairs and track unrepaired compressed air system leaks for quality assurance.

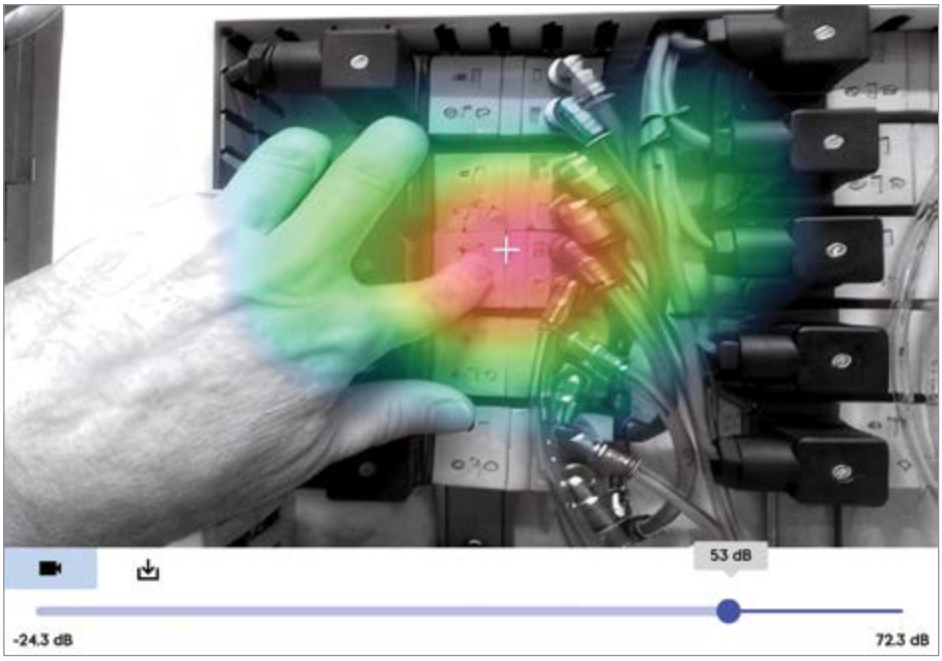
BioKyowa Saved Over $86,000 Annually in Compressed Air Leaks Alone

BioKyowa represents the first major industrial plant investment by a Japanese company in the state of Missouri. It began construction in 1982. In 1984, when production began, it produced feed supplements for the swine and poultry markets. It was the first commercial plant to produce lysine in the United States.

Over the past 30 years, BioKyowa has evolved from a feed-grade facility that produces a single

This acoustic imaging camera lets technicians detect and reduce compressed air leaks in industrial facilities, thereby cutting costs.

Ultrasound Saves Energy by Detecting Compressed Air System Leaks



Acoustic imaging cameras provide a high level of detail about detected compressed air leaks.

product to a multiple-plant industrial campus that produces high-quality amino acids, including glutamine, arginine, threonine and valine using advanced biotechnology with strict quality control standards. Its amino acids are used in nutritional food supplements, cosmetics and precursors for pharmaceuticals.

Semi-Annual Audits Turn Data into Dollars Saved

Technicians knew the company's plants contained compressed air leaks, but they didn't have the tools required to efficiently perform compressed air leak surveys. As a result, their maintenance program was largely reactive. This led to costly compressed air leaks and unexpected downtime. Eventually, the technicians discovered UE Systems' Ultraprobe 15,000, an all-in-one instrument that uses ultrasound to analyze everything from bearings and electrical systems to steam traps and leaks.

After using the Ultraprobe 15,000 for a year, BioKyowa had discovered multiple energy-saving opportunities. Its transition from a reactive maintenance program to a proactive predictive maintenance program has been substantial. BioKyowa implemented a semi-annual compressed air system leak survey. It discovered an annual loss of $86,324 from compressed air system leaks throughout the plant. After a few months, the compressed air leak detector paid for itself through savings it helped generate.

Moving forward, BioKyowa is committed to the continued use of advanced technologies in plant maintenance. This approach enables it to closely monitor its equipment. The implementation of a comprehensive reliability program positions it to better predict future problems and proactively address them before they lead to equipment failure.

Acoustic Imaging Cameras for Compressed Air Leak Detection

While traditional ultrasonic instruments rely on sound detection, recent advancements in ultrasound technology have led to acoustic imaging cameras for a more intuitive and efficient approach. These cameras, such as FLIR's Si1-LD Camera and Si2-Camera Series, provide a real-time visual representation of compressed air leaks on a screen, allowing maintenance professionals to quickly scan large areas without extensive manual searching, identify multiple compressed air leaks simultaneously from a safe distance and increase the speed and accuracy of compressed air leak detection compared to traditional compressed air leak inspection methods.

With these advantages, facilities can significantly reduce their energy costs, enhance maintenance efficiency and minimize energy waste.

Rousselot Dubuque Increases Compressed Air Leak Detection by 400%

Established in France in 1891 by Edward Rousselot, Rousselot is now part of Darling Ingredients International and is committed to producing high-quality, safe gelatin and collagen products. Today, Rousselot offers a wide range of gelatins and collagens.

Rousselot's operational teams, located in 17 state-of-the-art facilities, have also developed outstanding know-how in manufacturing products from collagen-rich sources. Rousselot's Dubuque site produces food, pharmaceutical, medical and fuel ingredients.

Rousselot Dubuque was experiencing unplanned downtime, and its facilities weren't running at optimal efficiency. They encountered frequent issues with compressed air leaks, but lacked an efficient strategy to address the problem.

Locating and repairing compressed air system leaks is critical for improving energy efficiency, reducing operational costs and extending equipment life. As energy prices continue to rise, having a reliable and well-executed ultrasound program is more important than ever for maintaining optimal industrial facility performance.

Although introducing an ultrasound compressed air leak detection program in its facility could help remedy compressed air leaks, the maintenance team was aware that incorporating new technology, even if it's intended to save a company money and improve efficiency, can be tricky to justify and adopt.

Fortunately for Rousselot, the maintenance team knew it could sell ultrasound technology to management because of its fast payback and early detection capabilities. Although it's made with high-quality tools and offers thousands in annual savings, ultrasound is a relatively low-cost technology to introduce, and it allowed Rousselot Dubuque's in-house reliability program to evolve quickly.

The Dubuque site introduced its ultrasound program in 2013, focusing primarily on using ultrasound for compressed air system leaks. After training technicians to use ultrasound equipment and develop consistent leak auditing routes, it started experiencing significant savings due to compressed air leak system repairs. Not only did repairs quickly pay off the cost of the ultrasound equipment, but they also provided concrete data to justify the use of ultrasound throughout their facilities.

Taking Ultrasound to the Next Level with an Acoustic Imaging Camera

From 2018 to 2022, Rousselot Dubuque used the Ultraprobe 15,000 and DMS software to detect, measure and repair 284 compressed air system leaks. This resulted in a cost avoidance estimate of $160,572 in total or $40,134 annually. This was accomplished by performing only seven compressed air system leak audit routes each quarter, ensuring the plant had a consistent and efficient compressed air leak detection process in place.

In December of 2022, the plant took its ultrasound compressed air system leak detection program to the next level by adding an acoustic imaging camera to its toolkit. This upgrade proved to be a game-changer because it eliminated interference from competing ultrasound sources, including cavitation in pumps, vacuum transfer systems and proportional valves that leak compressed air intentionally. Since purchasing the acoustic imaging camera, the average number of compressed air system leaks discovered per route has increased by over 400%.

It has now been 12 years since Rousselot Dubuque began its ultrasound compressed air system leak detection program, and it continues to expand the use of ultrasound technology across its global sites. It plans to use ultrasound in all its facilities. Its ultrasound compressed air system leak detection program has come a long way since 2013. The company is in continuous communication with UE Systems to learn about new products and services.

Conclusion

Locating and repairing compressed air system leaks is critical for improving energy efficiency, reducing operational costs and extending equipment life. As energy prices continue to rise, having a reliable and well-executed ultrasound program is more important than ever for maintaining optimal industrial facility performance.

While tools like the Ultraprobe 15,000 have proven to be highly effective for conducting thorough and reliable compressed air system leak detection surveys, the addition of acoustic imaging cameras takes ultrasound technology to the next level. With real-time visual detection and faster identification of even the most challenging compressed air system leaks, these cameras streamline inspections and increase detection rates, making them a powerful upgrade for any industrial facility committed to minimizing waste and maximizing performance. BP

About the Author

First joining the ultrasound industry in 2020, Robin Marcinkus earned his Level I Certification and has enjoyed learning about the power of ultrasound technology and its capabilities daily.

About UE Systems

UE Systems believes every person, regardless of their industry, company size, experience or budget, should have the tools and support to help their facilities operate efficiently, reliably and safely. It provides a portfolio of ultrasound solutions designed for versatility and ease of use. Since 1973, it's helped thousands of customers worldwide prevent equipment failures, identify energy losses and return home safely to their families.

To read more ***Compressed Air Leak System Assessment*** articles, visit https://www.airbestpractices.com/system-assessments/leaks.

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PREMIUM OEM COMPONENTS

Cooling Tower Direct Drive Motors Lead to Energy Efficiency Gains

By Sean Mullins, Product Manager – Laminated Frame Motors, ABB

Cooling towers are essential for regulating process and equipment temperatures in a wide range of industrial and commercial HVACR systems. In power plants, manufacturing facilities, hospitals, universities and large-scale HVACR systems, they serve as the final stage in removing heat from critical operations. While their function has remained constant for decades, the technology driving their fans is undergoing a significant transition.

Across industries, operators are adopting cooling tower direct drive (CTDD) motor technology. In particular, permanent magnet (PM) direct drive motors are delivering measurable improvements in efficiency, cleanliness and maintenance reduction. The change is more than a component swap; it represents a new approach to cooling tower design that reduces operating costs, supports environmental goals and improves reliability.

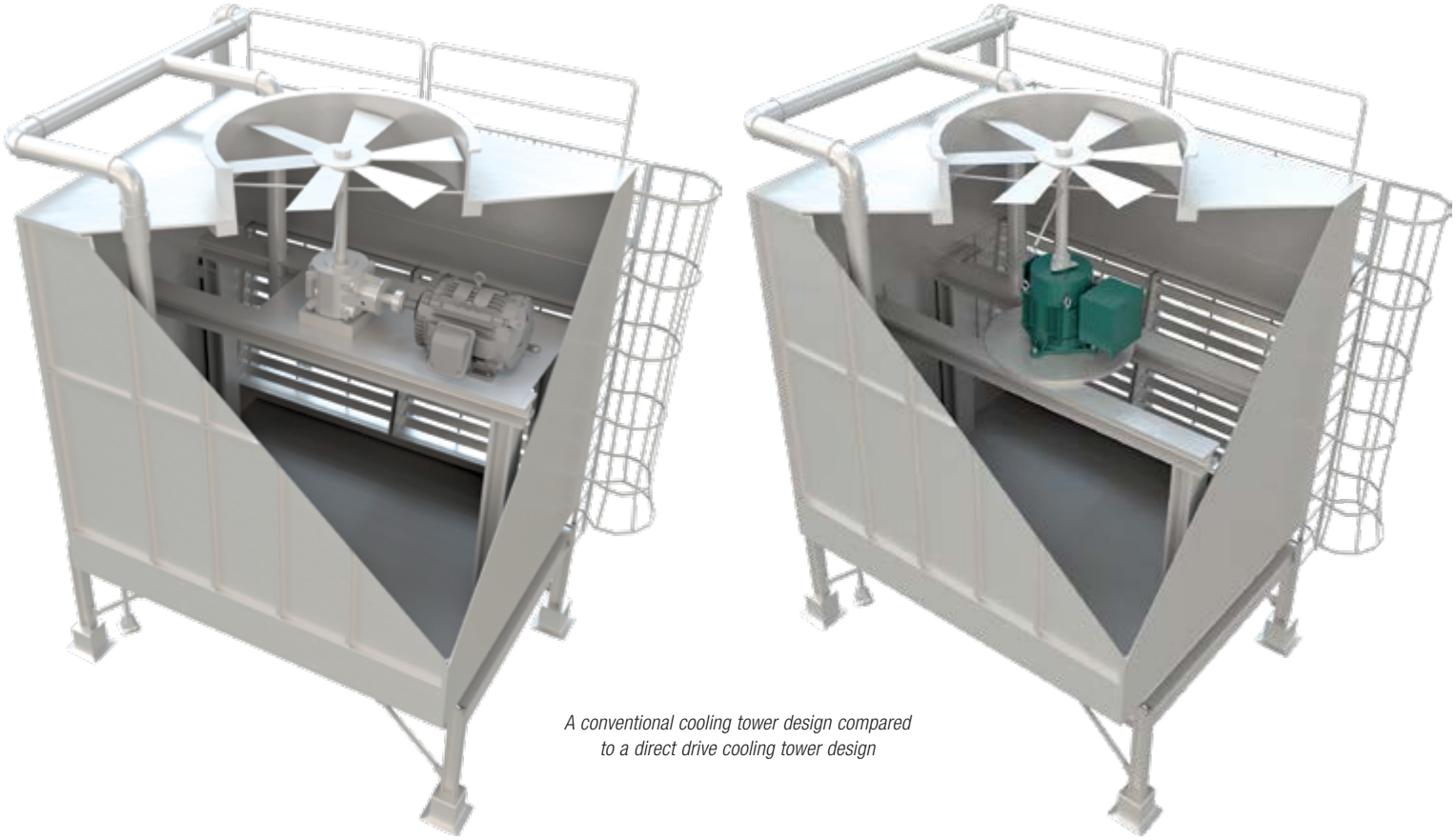
Above: A conventional cooling tower fan drive arrangement uses a gearbox and drive shaft mounted under the fan.

Cooling Towers Move from Mechanical Drives to Direct Drives

For decades, most cooling tower fans have been powered by high-speed induction motors connected to gearboxes, which transfer torque through drive shafts and couplings. This arrangement has been reliable but carries inherent inefficiencies. Mechanical power transition introduces energy losses at each stage, and gearboxes require lubrication, inspection and alignment to remain in working order. These components also present multiple points of potential failure, and repairs can be costly.

Direct drive systems replace this complexity with a simpler configuration. A PM motor is coupled directly to the fan, eliminating the need for a gearbox, shaft and couplings. The motor itself is designed to operate at low rotational speeds while producing the high torque required to move

Cooling tower direct drive motors need to be matched with variable speed drives.



A conventional cooling tower design compared to a direct drive cooling tower design

large volumes of air. By removing the gearbox, shaft and couplings, direct drive motors reduce energy loss, minimize maintenance needs and simplify the overall system design.

Energy Efficiency Gains as High as 60%

Energy efficiency is one of the strongest drivers behind the shift to direct drive technology. In a documented case at a major U.S. university, replacing a gear-driven system with a PM motor resulted in a 10.8% increase in system efficiency[1]. The PM motor consumed 33.6 kilowatts (kW) for the same fan load that previously consumed 38.[1] kW with an induction motor and gearbox.

These savings become significant when achieved across multiple cooling towers and continuous operation. Operations can experience reduced energy costs each year.

Variable speed drives (VSDs) amplify these benefits. Cooling tower fans rarely operate at full capacity. During cooler periods or reduced load conditions, fan speed can be lowered without sacrificing performance. Fan affinity laws show that horsepower requirements change with the cube of the fan speed, meaning a 50% speed reduction results in using just 12.5% of the power draw at full speed[1]. This exponential energy savings is where direct drive systems paired with VSDs deliver their greatest value.

Data from retrofits and new installations consistently reflect these results. Facilities upgrading older towers with PM direct drive motors and matched VSDs have reported energy savings in the range of 30-60%, particularly when replacing inefficient gear-and-motor combinations. Even newer cooling towers benefit, with efficiency gains from 5-12% commonly achieved.

Cleaner Operation and Environmental Advantages with Direct Drive Motors

Beyond energy savings, direct drive motors contribute to cleaner operations and reduced environmental impact. Gearboxes in traditional cooling tower systems typically contain significant volumes of lubricating oil, often up to 25 gallons in larger units. This oil must be replaced every three to six months[3], generating both ongoing material and labor costs, as well as the need for proper waste oil disposal.

Oil leaks are another concern. Even small leaks can contaminate the cooling tower basin, creating environmental hazards and compliance challenges. Regulatory penalties and cleanup costs can be substantial, especially in environmentally sensitive areas.

Cooling tower fans rarely operate at full capacity. During cooler periods or reduced load conditions, fan speed can be lowered without sacrificing performance. Fan affinity laws show that horsepower requirements change with the cube of the fan speed, meaning a 50% speed reduction results in using just 12.5% of the power draw at full speed.

By eliminating gearboxes, direct drive motors remove oil from the equation altogether. Many PM direct drive motors feature sealed housings with IP66 ingress protection, internal lip seals and condensation drains. These design elements prevent water ingress, resist dust and protect internal components even in harsh outdoor environments. The absence of rotating shafts and couplings improves safety by reducing the need for protective guards and simplifying compliance with safety standards.

Cooling Tower Direct Drive Motors Lead to Energy Efficiency Gains

Strong Reliability Leads to Over a Decade of Continuous Service

Gear-driven cooling tower operators typically perform daily leak inspections, weekly oil level checks, monthly shaft alignments and oil changes several times a year.

Direct drive motors eliminate the gearbox and associated components entirely, reducing the number of points of failure in the system. Bearings in certain models require lubrication only once a year. Many PM motors are built for longevity, incorporating ductile iron brackets, Class H insulation and permanent magnet rotors designed for an L-10 life of 100,000 hours[2]. This translates to more than a decade of continuous service for most cooling towers.

Moreover, direct drive systems improve uptime and reliability. With fewer moving parts, there are fewer points of failure. Installation data has demonstrated reduced noise, vibration and mechanical stress, contributing to longer motor life and more consistent performance[3].

Even Minor Energy Gains Lead to Significant Financial Savings

The adoption of direct drive cooling tower motors spans a range of industries. In power generation, reliability is critical; even short periods of downtime can yield significant operational and financial consequences.

Modern CTDD motors are engineered specifically for the demands of cooling tower service. Available in a range of frame sizes to meet the power and speed requirements of applications from small towers to high-rise buildings, these motors feature integrated steel fins for enhanced heat dissipation, oversized terminal boxes for easier wiring access and extreme-duty paint systems for long-term corrosion resistance.

For example, in a Texas-based case study, a 100 horsepower (hp) direct drive motor replaced a 125 hp gear-driven system. Adjusted for differences in blade pitch, the direct drive system required 80 kW to perform the same work that the mechanical setup accomplished using 87.25 kW. While the difference may appear minor, in a facility operating year-round, the energy and cost savings accumulate[4].

Design Features Offer Cooling Tower Improvements Beyond Energy Costs

Modern CTDD motors are engineered specifically for the demands of cooling tower service. Available in a range of frame sizes to meet the power and speed requirements of applications from small towers to high-rise buildings, these motors feature integrated steel fins for enhanced heat dissipation, oversized terminal boxes for easier wiring access and extreme-duty paint systems for long-term corrosion resistance.

When paired with matched drives designed for cooling tower applications, CTDD systems offer additional performance advantages, including sensorless control, anti-windmilling torque, trickle heating to prevent condensation and soft-start capabilities. These features simplify installation and commissioning, while providing precise operational control.

In air-cooled condensers (ACCs), which face similar challenges as wet cooling towers, vertical shaft-down direct drive motors eliminate the need for large, double-reduction gearboxes. This reduces parasitic load, improves heat rate and can shorten installation time by up to 75%[3].

Direct drive motors improve cooling tower energy efficiency and system cleanliness, while reducing maintenance.

Direct Drive Motors Support Corporate Sustainability Goals

The total cost of ownership (TCO) for direct drive systems is significantly lower than the cost for traditional mechanical setups. Although the initial purchase price may be higher, the long-term savings in energy consumption, maintenance labor and unplanned downtime typically outweigh the upfront cost. Downtime during peak operating periods due to gearbox failures can cost plants thousands of dollars per day[3]. By eliminating these failures, direct drive motors not only reduce operating expenses but also help maintain consistent cooling performance during critical demand periods.

From an environmental perspective, direct drive motors support corporate sustainability goals by reducing greenhouse gas emissions, eliminating oil waste and lowering noise pollution. Their high efficiency and clean, leak-free operation aligns with environmental, social and governance (ESG) initiatives and increasing regulatory standards[4].

Challenges and Considerations When Selecting a Cooling Tower Motor

Despite their advantages, direct drive motors come with certain trade-offs that plant operators need to think about ahead of time. Direct drive motors are heavier than traditional motors; a 200 hp direct drive motor can weigh 8,300 pounds, compared to 6,500 pounds for a conventional motor-and-gearbox configuration[3]. As a result, structural analysis may be required before retrofitting, especially in older towers constructed from wood or fiberglass.

Direct drive motors also require variable speed drives for operation, and due to the characteristics of permanent magnet technology, bypassing the drive in the event of a drive failure is not possible. This makes contingency planning essential. Facilities should ensure maintenance teams are trained to safely and effectively handle permanent magnet motors.

Even with these considerations, the transition to direct drive motors in cooling towers represents a significant advancement in HVACR technology. By eliminating mechanical components, direct drive systems offer superior energy efficiency, cleaner operation and dramatically reduced maintenance. Real-world data confirms the reliability and performance of direct drive solutions across diverse applications.

As industries continue to focus on operational efficiency and sustainability targets, direct drive motors provide a compelling alternative to traditional gear-driven systems. With proven benefits in efficiency, cleanliness and reliability, these motors are positioned to become the standard in cooling tower design. BP

About the Author

Sean Mullins leads the strategic direction and go-to-market strategy for the laminated frame product portfolio, and collaborates closely with engineering, design, marketing and sales teams to drive product development and sales growth. He brings over 15 years of industry experience, and builds strong business relationships through regular customer engagement to support sustainable revenue and EBITA gains.

About ABB

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.

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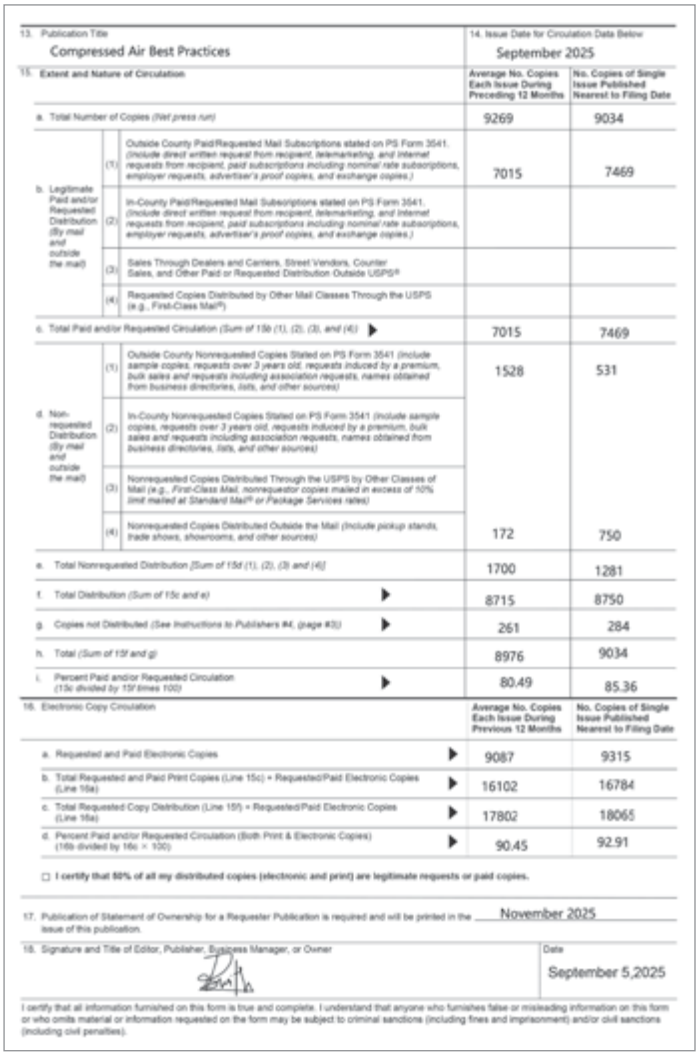

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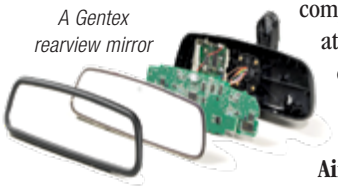
FACILITY MAINTENANCE

The Value of In-person Compressed Air System Inspections

By John Bilsky, Facilities Specialist, Gentex Corporation

Gentex relies heavily on compressed air to run production lines. Even though our compressed air systems are monitored 24/7 for pressure, dew point, power and flow (just to name a few specs), we still complete in-person compressed air system inspections. These are done in the air compressor room at a minimum once a week. We like Mondays.



A Gentex rearview mirror

Air compressors. Check the control panel for any errors or faults that did not page out as they should. Compare the output pressure with the dry tank pressure for any unexpected pressure differential. Remove one or two air compressor side panels to look for oil leaks (if the air compressors use oil) and air leaks.

Note the noise the air compressor is making. Does the motor sound normal? Are the motor bearings making a new noise? Listen for air leaks. If the air compressor is unloaded, does it sound normal? Is the pressure high? Is there a control or cooling issue? The most important check is the operation of the condensate drains. Many are internal, but we add condensate drains to the vertical air outlet line, as well. Check the outside of the air compressor cabinet for dust and debris, and clean accordingly.

Wet side components (before the compressed air dryer). Moving downstream from the air compressors, inspect the compressed air piping and wet tank. Look for rust and pinhole air leaks. Most importantly, test the condensate drains. We always have two drains on a wet tank.

This oil-free centrifugal compressed air system is one of Gentex's 15 compressed air systems.

Compressed air dryer. On a refrigerated compressed air dryer, the quick way to see if it's malfunctioning is to check the inlet and outlet for a temperature differential. Next, check the controller for faults and warnings. Test all condensate drains. Look for internal air and water leaks. For a desiccant compressed air dryer, note the dew point, tower regeneration cycle positions and pressures.

NRC Compressor Weekly

Technician		Date		
System	Test all tank and filter drains	Which compressors running?	System pressure?	Log into manager check system.
MA system dewpoint	MA system air pressure			
N.Tam Turbo PW: 268419	Run hours	Load hours in past week?	Air inlet temp	Air discharge temp
Test all drains	Any odd noises?	Any coolant leaks?	Air filter DP	Any alarms?
% Load	MBC 1 VW13	MBC 1 VW24	MBC 1 ZH1VIB	MBC 2 VW13
MBC 2 VW24	MBC 2 ZH1VIB	Incoming Water Temp	Outgoing Water Temp	
S.Tam Turbo PW: 268419	Run hours	Load hours in past week?	Air inlet temp	Air discharge temp
Test all drains	Any odd noises?	Any coolant leaks?	Air filter DP	Any alarms?
% Load	MBC 1 VW13	MBC 1 VW24	MBC 1 ZH1VIB	MBC 2 VW13
MBC 2 VW24	MBC 2 ZH1VIB	Incoming Water Temp	Outgoing Water Temp	
Dryers	Any alarms?	D1 Temp	D1 Cumulative comp hours	D2 Temp
D2 Cumulative comp hours	D3 Temp	D3 Cumulative comp hours	Test all dryer drains	

An inspection sheet for an oil-free compressed air system

Dry side components (after the compressed air dryer). Inspect the compressed air piping to the dry tank, the dry tank itself and the compressed air piping to the production header for leaks. Test the dry tank condensate drain, and note the dry tank pressure. Compare gauge pressure to the pressure transmitter reading. Make note of the dew point.

Condensate oil-water separator system. Check if the drain water is clear and the floor is clean. Replace remediation filters according to factory specifications.

We created inspection sheets to log the data for each compressed air system. We have oil-free centrifugal, oil-free dry screw and oil-flooded rotary screw air compressors. We also have refrigerated and desiccant compressed air dryers. Every inspection sheet is slightly different.

In-person compressed air system inspections are crucial. Design an inspection sheet to fit your compressed system. It will save you time and money!

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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SALES ENGINEERING SKILLS

Ask Qualifying Questions to Improve Sales Close Rates

By Mark Allen Roberts, CEO, OTB Solutions

Time is one of an industrial sales engineer's most precious assets. We need more selling time with customers who want to buy. I've found sales engineers often spend time following up with customers who haven't been qualified. This robs them of time they could have spent closing sales with customers ready to buy.

Based on my own coaching data, I find sales engineers today only spend 22% of their time with customers. The rest of their time is taken up with internal meetings, previously sold project installations and shipment updates. An assessment of the skills of over three million salespeople shows that only 27% can determine a closeable sale from a never-ending conversation that doesn't deliver revenue.

If a sales engineer asks the right questions, they can quickly determine whether or not a customer is qualified and likely to close. In our industry, the most popular framework used by sales engineers to qualify customers is BANT. What does BANT stand for?

Mark Allen Roberts conducted a Sales Engineering Workshop at the Best Practices 2025 EXPO & Conference in Kansas City.

Budget: Has the customer allocated money to solve the issue?
Authority: Are you speaking with the decision-maker?
Need: Is there a clear business problem or opportunity with a clear outcome?
Timeline: When are they planning to buy?

Sales engineers remember the four letters of BANT and easily apply them to qualify sales opportunities. After training, I've seen close rates and total revenue significantly increase. Salespeople trained in qualifying skills outperform transactional salespeople, who are quick to quote and overly optimistic that every quote in their pipeline will close.

I recently assessed the qualifying skills of a compressed air distributor's sales team. They shared 40 quotes in the sales pipeline they felt would close within the next few months. After training this team in qualifying skills and having them call every deal in their sales pipeline, I found only 11 quotes had enough information to positively predict sales that would close.

Get Started with BANT Questions

Below are questions I've used and trained sales engineers to use. I hope they help you qualify opportunities and increase your close rates.

Budget

Do you have a budget for this project or am I helping you build one?

Authority

There are often several people involved in the purchase decision. Is that the case with your company or is this your decision alone?

Need

Based on our discussions, you said you want our solution to [insert goal]. Is there anything I missed?

Timeline

I believe we've designed the perfect solution for what we've discussed. When do you need this installed and running?

Before starting, rewrite their questions in your own language so they feel more authentic. Asking qualifying questions helps sales engineers devote more time to closeable opportunities. If one of your goals is to increase your close rates and forecast accuracy, implement the BANT qualifying framework.

About the Author

Mark Allen Roberts is the CEO of OTB Solutions, which provides professional training and coaching. Visit https://www.nosmokeandmirrors.com.

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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 Piece of Air Compressor History at a Maritime Museum

The Hope Group is a reseller for Kaeser Compressors in Massachusetts, Rhode Island and Connecticut, and a distributor for Champion and Becker compressed air and vacuum equipment throughout New England. It's New England's largest authorized Parker Hannifin distributor, as well, specializing in supply chain optimization and technical assistance with hydraulic, pneumatic, compressed air, fluid conveyance and sealing applications. Visit https://www.thehopegroup.com.

Mike Grybko, Product Sales Manager, spotted this early-generation portable, tank-mounted, 10 horsepower piston air compressor while visiting Maritime Gloucester, a maritime museum in Gloucester, MA. There was no manufacturer visible. Since the tires were full and the belt fairly new, he guessed it was still operational. "While most people are busy admiring the vintage schooners out in the harbor, I can't help but spot the air compressor," he said.

For compressed air professionals, the highlight of a museum might not be the main exhibit.

Dusty Ambient Air Leads to High-Temperature Shutdowns

Maverick Compressor Group was founded in May of this year, but its team has 30 years of experience. This Katy, TX-based, veteran-owned business serves the Greater Houston area and specializes in compressed air system service and aftermarket solutions. It aims to help customers save money by repairing, rather than replacing, faulty equipment. Visit https://maverickcompressorgroup.com.

Chase Parchman, Owner, took these before-and-after pictures at a specialty chemical plant in Katy, TX. The air compressor frequently suffered from high-temperature shutdowns. Its compressed air enclosure was located outside near a well-used dirt road and lacked pre-filters. Solving the problem took a lot of cleaning, including removing the dust from the aftercooler with a brush and pressure washer. Before he left, Parchman instructed the owners on how to perform daily, weekly and monthly inspections, and recommended monthly blow-offs of the aftercooler to avoid dust buildup.

This aftercooler required deep cleaning, thanks to a dusty road nearby and a lack of filtration.

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.

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