Sustainable, Safe & Reliable On-Site Utilities Powering Automation

COMPRESSED AIR | CHILLER & COOLING

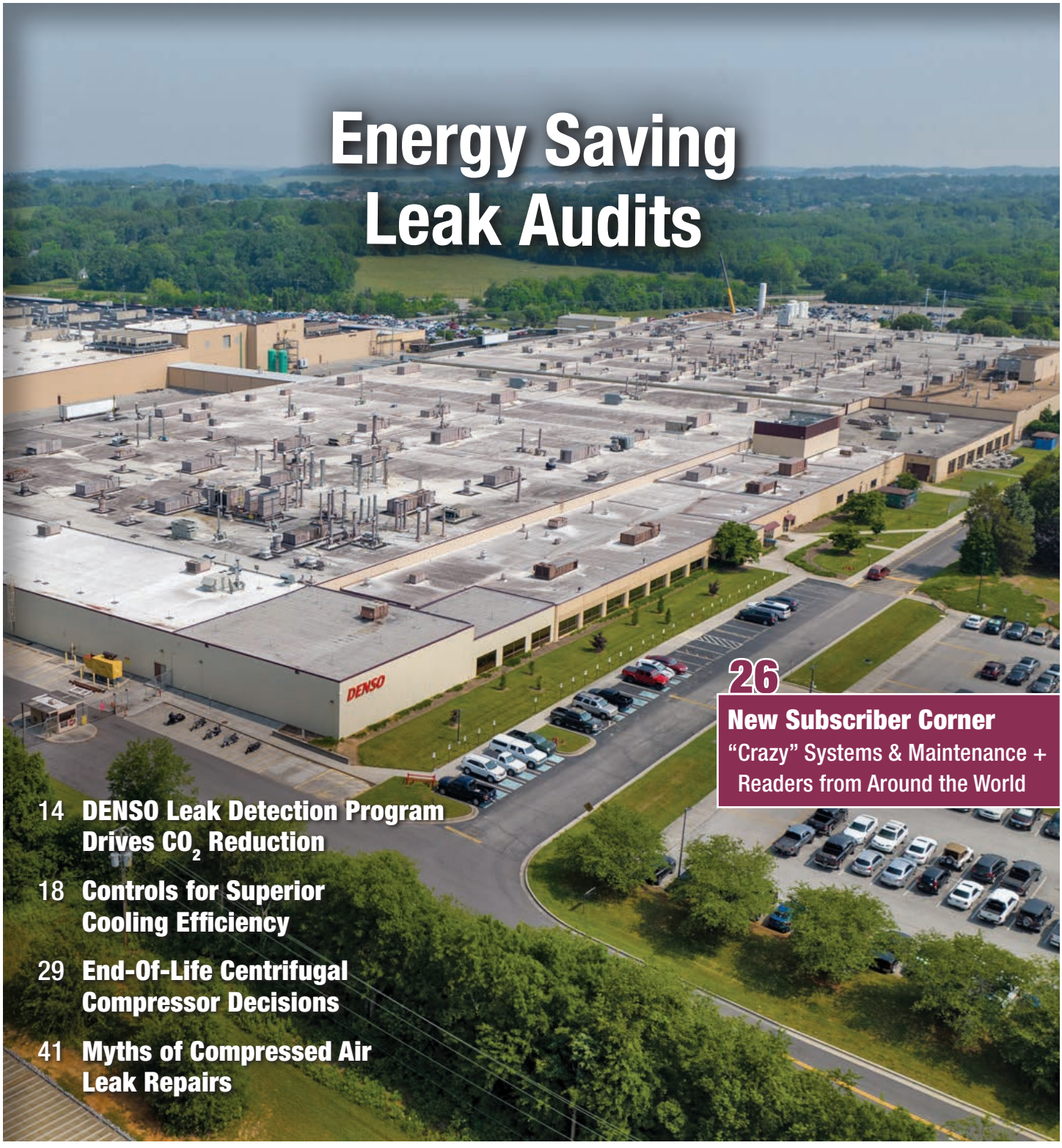
BEST PRACTICES®

airbestpractices.com

coolingbestpractices.com

January/February 2024

Energy Saving Leak Audits



FLX Your Energy Savings

The GA FLX is an entirely new, dual-speed compressor designed to get you on the road to double-digit energy savings. With innovative pressure setting flexibility and optimal flow at any pressure, the GA FLX brings efficiency and resiliency to your operations.

What's more? If your production demands a VSD compressor, this can be done via a simple software upgrade, giving you complete flexibility.

atlascopco.com/flx

COMPRESSED AIR SYSTEM FEATURES

COOLING SYSTEM FEATURES

EVERY ISSUE

COVER IMAGE provided courtesy of DENSO.

Compressed Air Best Practices® (USPS# 17130) is published monthly except January-February combined by Smith Onandia Communications LLC, 37 McMurray Rd., Suite 104, Pittsburgh, PA 15241. Periodicals postage paid at Pittsburgh, PA and additional mailing offices. POSTMASTER: Send address changes to: Compressed Air Best Practices®, 37 McMurray Rd, Suite 104, Pittsburgh, PA 15241.

FROM THE EDITOR

Energy Conservation in Compressed Air and Cooling Systems

As we begin 2024, I'd like to let the entire compressed air, cooling and vacuum industries know how grateful we are for their support. I wouldn't have a job pursuing my lifelong interest, if it wasn't for the support of the countless individuals and companies who share their "Best Practices" with the manufacturing world.

DENSO is a great example of this. I'd like to thank our subscribers, John Spears and Terry R. Jones II, from their Maryville, Tennessee campus for calling and offering to share their success with their compressed air leak detection program. Please read Mike Grennier's feature article on how they have formalized leak detection and made it a key contributor to their corporate energy and carbon reduction goals.

"The Myth of Leak Repairs" is an excellent article from Tyler Costa, ALD Compressed Air Energy Solutions, where he not only provides a successful case study but also provides a checklist to ensure energy savings are indeed realized.

Often consuming more energy than compressed air, process cooling systems are made complex by their linked sub-systems. Clayton Penhallegon Jr. has sent us Part 1 of a very interesting article titled, "Holistic Controls for Superior Cooling System Performance."

We are very excited to invite subscribers to contribute photos and comments to support our new monthly section titled, "Subscriber Corner" featuring two sections!

1) "Crazy" Systems & Maintenance (2) Readers from Around the World

What is more sustainable than refurbishing an old air compressor? We'd like to thank the Compressed Air & Gas Institute (CAGI) for their article titled, "End-Of-Life Centrifugal Air Compressor Decisions."

Cooling towers and pumps provide critical cooling water to support energy-efficient chillers and air compressors. Thanks go to Steve Kline, from Baltimore Aircoil, and to our new regular contributor, the Hydraulic Institute, for their articles on these two critical technologies.

Thank you for investing your time
and efforts into ***Compressed Air and Chiller & Cooling Best Practices.***

RODERICK M. SMITH
Editor
tel: 412-980-9901
rod@airbestpractices.com

WHEN OIL FREE AIR IS CRITICAL

Count on the Sullair legacy of reliability and durability

SULLAIR

Hitachi Global Air Power US, LLC

HitachiGlobalAirPower.com/OilFree

Compressed Air Technology & Industry News

Atlas Copco Group Launches New Identity

Atlas Copco Group launched a new identity, including a new Group logo, a new visual identity, and a new Group message: Technology that transforms the future.

The current blue and white Atlas Copco brand and logo will continue to be used on products and services, in the same way as other brands in the Group use their respective logos. This includes around 50 brands such as Edwards, Isra, Leybold, LEWA and Chicago Pneumatic, which all have their distinct identity and unique value proposition.

"We have many strong brands driving the success of our business, and decentralization remains an important part of our strategy," said Mats Rahmström, President and CEO of the Atlas Copco Group. "Going forward, the new Atlas Copco Group brand becomes the umbrella for all brands in the Group, including Atlas Copco. This will enable our brands to maintain their individuality, while we at the same time can increase the focus on the power of being part of something bigger."

The new Group message: "Technology that transforms the future," is there to reflect the Group's contribution to society at large.

"Our customers are often at the forefront of transforming their industries and driving development forward, and we support them by increasing their productivity, safety, quality, and energy efficiency," said Mats Rahmström. "It is our technology and people who make the difference in the Atlas Copco Group."

About Atlas Copco Group

Atlas Copco Group enables technology that transforms the future. We innovate to develop products, services and solutions that are key to our customers' success. Our 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 2022, the Group had revenues of BSEK 141 and 49,000 employees. For more information, visit www.atlascopcogroup.com.

The new Atlas Copco Group logo.

ELGi North America Appoints Brian Pahl as New President

ELGi North America (ELGi), a subsidiary of ELGi Equipments Limited and one of the world's leading air compressor manufacturers, is pleased to announce the appointment of Brian Pahl as its new President. This strategic move aligns with ELGi Equipments' global goal to become one of the top three air compressor manufacturers worldwide within the next decade. As North America becomes a central focus in this ambitious journey, Pahl's leadership will be key in reaching this milestone.

"I'm incredibly excited to join the dynamic team at ELGi North America, especially at a time when the company is gearing up for significant growth and transformation," Pahl said. "I look forward to leveraging my experiences to drive innovation, operational excellence and sustainable growth, all in support of ELGi's global objective."

Pahl brings an impressive professional background to ELGi. With an MBA degree from the University of Findlay in Ohio, he most recently served as the President of North America at Pfeiffer Vacuum. Before that, he occupied several strategic, commercial and operational leadership roles at well-known firms including Denios and Mann & Hummel. Outside of his professional endeavors, Pahl enjoys traveling, golf, and spending quality time with his wife and four children.

Since entering the U.S. in 2012, ELGi has significantly expanded its presence in the country. The company celebrated its 10-year anniversary in November 2022, marking a decade during which more than 10,000 air compressors were installed in facilities across North America. As ELGi looks to the future, the emphasis will be on continued U.S. expansion, job creation and attracting top talent. The company will also invest in new technologies and enhance existing ones. Pahl's leadership will be vital as ELGi plans for the next 10 years, building on its North American success.

About ELGi North America

ELGi North America, headquartered in Charlotte, NC, is a subsidiary of ELGi Equipments Limited, a leader in compressed air solutions for over 60 years. Established in 2012, ELGi North America, in conjunction with its subsidiaries, Pattons, Pattons Medical, and Michigan Air Solutions, offers a comprehensive range of compressed air products

ELGi North America is pleased to announce the appointment of Brian Pahl as its new President.

and services. Our product offering includes oil-lubricated and oil-free rotary screw and reciprocating compressors, dryers, filters, and ancillary accessories. ELGi and its subsidiaries serve multiple industry verticals spanning medical applications, pharmaceuticals, food & beverage, construction, manufacturing, and infrastructure. For further information, please visit https://www.elgi.com/us/

Hitachi Global Air Power Acquires General Air Compressors North

Hitachi Global Air Power US, LLC, an industry leader in innovative compressed air solutions since 1965, announced the purchase of General Air Compressors North located in Modesto, California. General Air Compressors North provides sales and service of air compressors, air treatment products, accessories, and related equipment. The company serves the Northern California region and will transition to a Sullair exclusive distributorship effective immediately.

"Northern California is an important, strategic region for Hitachi Global Air Power," said John Randall, Hitachi Global Air Power President and CEO. "Adding General Air Compressors North to the Sullair distribution network complements our recent acquisition of California Compression and CDA Systems earlier this year. We want to ensure all of our customers as well as potential customers have access to quality Sullair products, sales and service and the addition of General Air Compressors North helps us to better meet our customers' growing needs in the region."

General Air Compressors North was founded in 2008 and provides sales and service of compressed air systems in California's central valley and parts of Nevada. All General Air Compressors North employees will remain in their positions and the company will operate under its current name for the time being to help ensure uninterrupted service to customers. The company will continue to service a variety of compressed air systems and will exclusively sell Sullair brand air compressors and related equipment.

"We started our business 15 years ago with two technicians," said Steve Gunzenhauser, President of General Air Compressors North. "We always knew if we provided premium service to our customers, our business would grow. Here

Compressed Air Technology & Industry News

we are 15 years later partnering with a company that has the same strong service beliefs as ours and also offers great products. We are excited about the future with Hitachi for our customers and the added benefits for our employees who have stuck with us all of these years."

Hitachi Global Air Power US purchased General Air Compressors North located in Modesto, California.

About Hitachi Global Air Power US

We build the machines that power industry. We are Hitachi Global Air Power, a leading global industrial compressed air manufacturer. Headquartered in Michigan City, Indiana, our compressed air solutions power manufacturing operations all around the globe; from food and 2 beverage, to pharmaceuticals and computer chips. Our portable compressors provide the air power to build roads and bridges, lay pipelines and aid in oil and gas mining and production. As part of Hitachi Industrial Equipment Systems Co., Ltd., Hitachi Global Air Power operates ISO 9001 certified factories in Michigan City, Indiana and Suzhou, China, and sales offices strategically located in Europe, Australia, Southeast Asia, and South and Latin America. Through brands Hitachi, Sullair, and Champion (Australia), our machines have provided legendary reliability, durability, and performance for more than 57 years. Our global network of engineering and quality experts are building next generation, highly efficient and environment-forward compressed air solutions in direct response to customer need. For more information, visit www.sullair.com.

Atlas Machine & Supply Appoints Andy Poplin as Senior VP

Atlas Machine & Supply, Inc., a pioneering fourth-generation family business in the industrial services industry and compressed air solutions, is proud to announce this strategic executive change to accommodate its exceptional growth trajectory for its compressed air division. This transformative change signals a new chapter for the company as it continues to set the standard in industrial air compressor service, parts, rentals, and more in the region.

The Compressed Air Division within The Industrial Products Group (IPG) has been a driving force behind the company's record growth since 2020, achieving unparalleled success in sales and bookings. With a remarkable three-year average growth rate

of 25% since 2020, the need for restructuring became apparent. In response to this growth, Atlas Machine & Supply is excited to introduce Andy Poplin as the new Senior Vice President of IPG, effective immediately.

Andy Poplin's journey with Atlas Machine & Supply began in November 2012, and his impact has been nothing short of transformational. He has been instrumental in driving change, fostering substantial sales growth, and leading the division to new heights. Under his stewardship, the IPG has achieved unprecedented success, effectively tripling its business since Andy began 12 years ago. His product expertise, remarkable sales skills, and likable disposition have made him an invaluable asset to the team, earning him the respect and admiration of colleagues, associates, and customers.

Commenting on Andy's promotion, Dave Sullivan, President of the Industrial Products Group, said, "Andy was one of the first key hires I made when put in charge of this group and has been driving change and sales for us since November of 2012. His combination of technical acumen, salesmanship, and unique personality makes him one of a kind. This position is well deserved, and I'm excited to see him in this new role and what that means for Atlas IPG over the next several years."

Andy Poplin, Senior Vice President of the Industrial Products Group, Compressed Air Division, Atlas Machine & Supply.

About Atlas Machine & Supply

Established in 1907, Atlas Machine & Supply, Inc. is a fourth-generation family business known for its commitment to excellence in complex industrial equipment services and compressed air solutions. As an official distributor of Sullair, Atlas Machine & Supply's Compressed Air Division is an expert in all compressed air services, products, rentals, repairs, and more, for the region. For more information, visit www.atlasmachine.com.

Sahara Air Products Expanding Production Facility

Sahara Air Products is planning another significant production facility expansion. The company is adding an additional 17,000+ square feet (5,181+ meters) to their production facility. The groundbreaking for the expansion began in November 2023 with expected completion to be in June/July 2024. The new expansion will add significant production capacity which will improve shipment lead times and will create approximately 30+ new jobs.

The new 2023 addition will mirror the production facility expansion completed in 2015, adding another 17,000+ square feet of production space equipped with new state-of-

Compressed Air Technology & Industry News

Sahara Air Products is adding an additional 17,000+ square feet to their production facility.

the-art equipment which includes two 30-ton overhead cranes, additional welding areas, and a paint booth featuring heat cure and makeup.

"Our industry experience enables us to manufacture reliable, custom dryers, products, and services through continuous process improvement," said Terry Henderson, President of Henderson Engineering Co., Inc. "This expansion will enable our company to continue to meet and exceed our customers' expectations."

Sahara's 2015 production facility expansion doubled the existing production area and provided the floor space and height necessary to more easily accommodate the production of the large custom-designed air dryers that the company provides to customers around the world.

About Sahara Air Products

Sahara Air Products, a Division of Henderson Engineering Co., Inc., was founded in 1957 by Joe Henderson to provide engineered solutions for air system problems. Mr. Henderson's philosophy was to thoroughly examine the unique requirements of each customer and to develop the most economical and reliable system solution for that application. Sahara's reputation for high quality, innovative products, and customer loyalty quickly grew. This trademark of engineered solutions exists at Sahara today, as the third generation of Hendersons continue the tradition of product excellence and customer service. "Our father taught us the importance of customer service," said Terry Henderson, President. "As a family business, we understand the needs of our customers and can respond quickly with the best solution for each individual application." In 1974, Sahara patented the heat-of-compression air dryer, after nearly 10 years of development. The heat-of-compression air dryer is considered by many in the industry to be the most significant development ever made in the design of equipment for drying compressed air. The heart of the company has always been engineering; finding novel solutions to their customers' unique applications, with over 65 years of expertise to review customers' plant air systems and design the optimum engineered solution. For more information, visit www.saharahenderson.com.

Solberg Manufacturing Introduces CAM Series Air Compressor Mufflers

SOLBERG Manufacturing, a leader in industrial filtration, separation, and silencing solutions, introduces its CAM Series Compressed Air Mufflers. These mufflers are a significant

The patent-pending CAM Series Air Compressor Mufflers are engineered for performance.

advancement in noise reduction technology, making them the perfect choice for environments where noise reduction is critical.

The patent-pending CAM Series Air Compressor Mufflers are engineered for performance and combine cutting-edge reactive and absorptive silencing technologies to achieve noise reduction. These air mufflers deliver rapid depressurization times, making them an excellent solution for desiccant air dryers and other pressure swing adsorption applications.

The CAM Series is compact, lightweight, and easy to service. Solberg's unwavering commitment to quality and longevity is evident in the CAM Series, crafted from durable materials designed to withstand even the most demanding industrial environments, ensuring reliability and long-term performance.

"Solberg's new CAM Series establishes a new standard for advanced noise reduction and serviceability. This innovative silencer platform is a game-changer for manufacturers and service companies looking to provide improved safety and serviceability to their customers," said Clint Browning, Vice President of Sales and Marketing at Solberg Manufacturing.

About Solberg Manufacturing

Solberg Manufacturing is a globally recognized leader in industrial filtration, separation, and silencing solutions. With a rich history of innovation and excellence, Solberg serves a diverse range of industries to protect their machinery and surrounding work environment. As a Certified B Corp, Solberg sees business as a force for good, embracing growth and innovation while advocating and promoting sustainable business practices. For more information about Solberg's CAM Series Air Compressor Mufflers, visit www.solbergmfg.com.

Kaishan USA Launches New Oil-Free Rotary Screw Compressor

Kaishan USA, a leading worldwide manufacturer of industrial air compressors, has introduced a new series of industrial, oil-free rotary screw air compressors, the KROF at CABP Expo 2023.

Plant managers and operators seeking to stay ahead of the ever-changing innovation that supports the food and beverage industry will find unrivaled value in the technical depth of the KROF. The KROF is a two-stage oil-free rotary screw air compressor that provides high-quality, ISO 8573-1 Class 0 oil-free, compressed air. By utilizing two sequential compression stages, intercooling and aftercooling, users will receive high-quality air that is suitable for sensitive applications where purity is paramount.

Attendees of CABP Expo 2023 enjoyed an immersive experience at Kaishan USA's booth that included augmented reality to explore firsthand the capabilities of the new KROF.

"Our engineers have done it again," said John Schmitt, product manager, Kaishan USA. "We feel the KROF is in a league of its own, having been expertly designed and manufactured right here in the United States. With stellar efficiency and performance, the KROF will enable end users who have strict air requirements to meet and exceed their demands, encapsulating the spirit and quality of American manufacturing."

Compressed Air Technology & Industry News

The KROF is a two-stage oil-free rotary screw air compressor that provides high-quality, ISO 8573-1 Class 0 oil-free, compressed air.

About Kaishan USA

Kaishan USA engineers the highest quality rotary screw air compressors that enable us to build a better, more efficient future. We streamline our operations by taking direct ownership of 85% of our product content. This process enables us to vigorously control the cost and caliber of our equipment while improving its energy efficiency and safe use. Our solutions range from 5-600 horsepower and are used in a variety of industries. Based in Loxley, Alabama, our new 65,000-square-foot, state-of-the-art manufacturing facility fully stocks over 300 finished units and aftermarket parts that serve customers around the world. We are a proud American manufacturer, with military veterans comprising more than 20% of our staff. To learn more, please visit www.kaishanusa.com.

UE Systems Introduces the New Ultraprobe 15,000

The Ultraprobe 15,000 boasts UE Systems' most advanced processor and next-generation camera ever.

UE Systems, the global pioneer in ultrasonic instruments and training solutions for predictive maintenance, reliability, condition monitoring, and energy saving programs, announced the release of the Ultraprobe 15,000 Reimagined. The latest iteration of the Ultraprobe 15,000 includes plenty of new features designed to increase both speed and reliability.

Seamlessly powerful, the Ultraprobe 15,000 boasts UE Systems' most advanced processor and next-generation camera ever, making reliability in your facility faster and easier than ever. This instrument also adds Wi-Fi compatibility, completely transforming data collection and onboard analysis for even greater convenience and efficiency.

Blair Fraser, Vice President at UE Systems, emphasizing the company's commitment to facilitating safety, efficiency, and innovation, said, "At UE Systems, we believe that everyone deserves a safe, reliable, and efficient plant. With our reimagined Ultraprobe 15,000, we're putting that capability in the palm of your hands."

The Ultraprobe 15,000 is available starting at just $21,995, making it an affordable investment to guarantee the safe and optimal operation of your facility. More specifically, newly added Wi-Fi communication allows users to instantly sync data back and forth to their computer and eventually the Cloud, ensuring relevant data is being transferred, saved, and stored properly. This instrument features an enhanced, higher resolution 5.0 Mega Pixel camera, allowing for HD quality images, while Bluetooth connectivity is readily available out of the box.

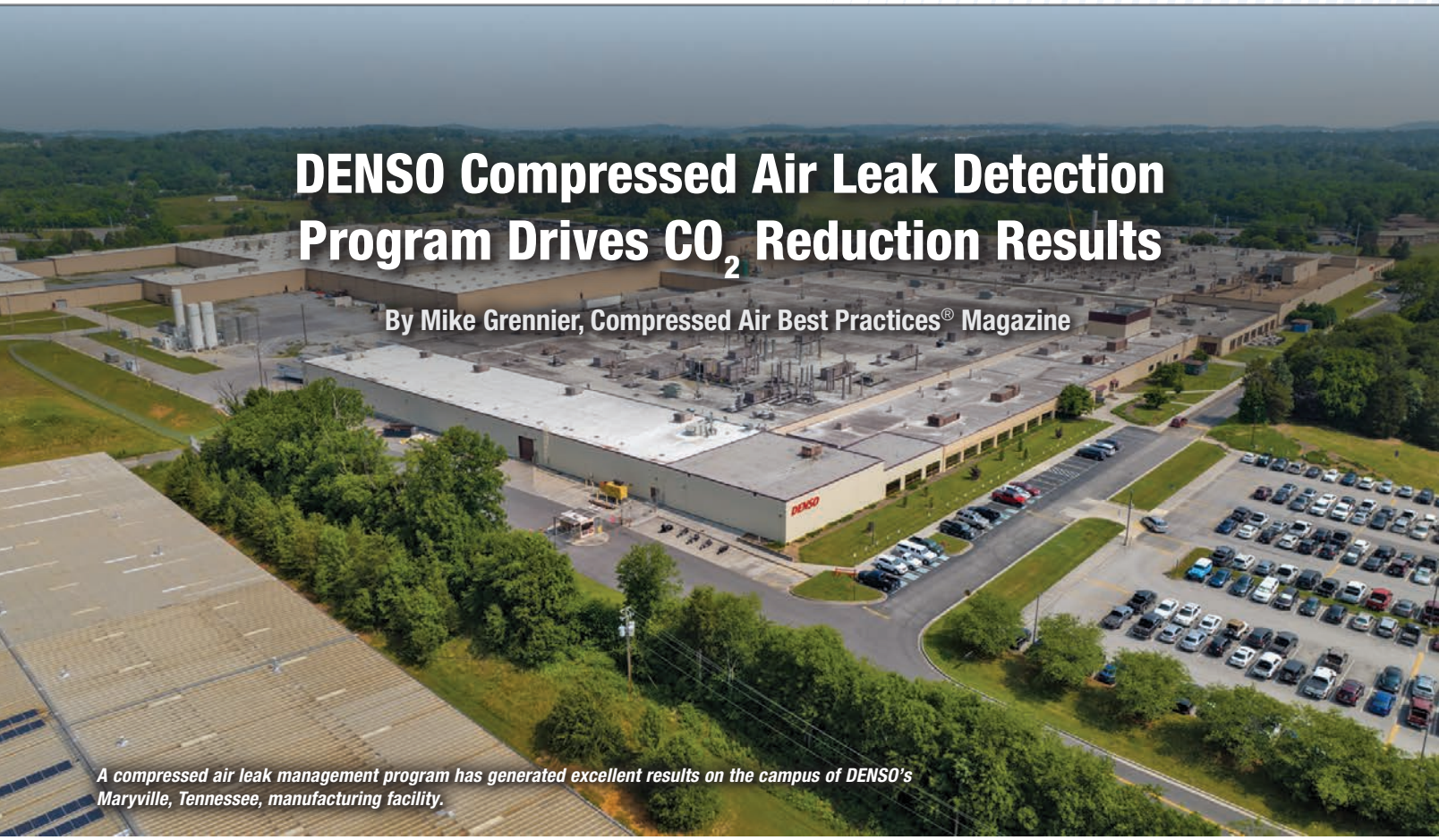
The Ultraprobe 15,000 is the perfect instrument for any facility looking to jumpstart their reliability program or for a facility looking to expand their existing program. UE System's unwavering, 24/7 customer support helps ensure that your facility is in the best position to introduce condition-based lubrication, bearing condition monitoring, ultrasonic leak detection, steam trap and valve inspection, and or partial discharge detection.

About UE Systems

At UE Systems, we believe that every person regardless of their industry, company size, experience, and budget should have the tools and support to help their facilities operate more efficiently, reliably, and safer. We do this by providing a portfolio of ultrasound solutions designed to be versatile and simple to use. Since 1973, we've helped thousands of customers across the world prevent equipment failures, identify energy losses, and return home safely to their families and we are just getting started. To learn more about UE Systems and the Ultraprobe 15,000, please visit www.uesystems.com or www.uesystems.com/product/ultraprobe-15000.

DENSO Compressed Air Leak Detection Program Drives CO_2 Reduction Results

By Mike Grennier, Compressed Air Best Practices® Magazine



A compressed air leak management program has generated excellent results on the campus of DENSO's Maryville, Tennessee, manufacturing facility.

➤ Given that compressed air leak management programs are meant to save energy, reduce CO_2 emissions, and generate ROI, DENSO's Maryville, Tennessee, manufacturing facility can definitively say it has scored a trifecta when it comes to results – and reaped benefits beyond hard numbers alone.

Thanks to a robust leak management program combined with other energy-saving initiatives implemented at its massive plant, the company has reduced annual energy consumption by three percent annually and cut carbon emissions by over 15% since 2019.

In addition to helping with reductions in energy and CO_2 emissions, the leak management program has generated enhanced production, since maintenance teams can now prioritize upkeep and repairs on equipment rather than fixing compressed air leaks. Production employees can also communicate more effectively on the job since ambient noise caused by air leaks is greatly diminished.

Setting Carbon Neutral Goals

The DENSO Maryville facility, which began operation in 1988, encompasses 2.7 million-square-feet under roof at its 238-acre campus. In all, the operation is comprised of five major facilities and 14 buildings. In addition to Maryville, DENSO operates production facilities in nearby Athens, Tennessee, and Statesville, North Carolina, as well as other locations throughout North America.

The Maryville operation produces a broad mix of vehicle electrification and safety products, including instrument clusters, inverters, body electronics and advanced driver assistance systems. In all, the facility employs nearly 5,000 employees.

DENSO, a leading mobility supplier and one of the largest in the world (www.denso.com/us-ca/en/), aims to be carbon neutral by 2035. To get there its teams are working cross-functionally and cross-regionally to help the company achieve its environmental goals. To date, the company has implemented multiple initiatives at its Maryville operation and around the globe.

In 2019, the team evaluated energy usage at Maryville and determined compressed air was an excellent candidate for energy savings since it makes up a significant portion of the campuses' total energy consumption. A full-fledged leak management program became an obvious choice.

Dedicated Air Leak Technician

Initially, the Maryville team determined a production maintenance person was best suited to identify, tag and fix compressed air leaks. Eventually, however, the team decided to create role that primarily focused on leak management, said Terry R. Jones II, Facilities Energy Engineer, IV, Facilities Engineering, at DENSO in Maryville.

"We achieved good results by mid-2020, but we saw an opportunity to designate someone other than a maintenance person to the job of really

looking at some of these systems," said Jones regarding compressed air leaks. The decision, Jones said, resulted in adding John Spears as the company's Lead Air Leak Technician. Spears had the right background for the job, not to mention the passion.

"I have a pipefitting and HVAC background," said Spears, noting the job of an air leak technician is an entire skillset of its own and worth the investment. "It's a trade within itself. If you have a plant this size and you don't have a leak management program in place, you're likely missing opportunities to conserve energy."

Having a dedicated person for leak management in Maryville became especially important after the team realized some leaks were not fully addressed, Spears said.

"They needed a dedicated person to come in and both identify and repair these leaks," he said. "That's when they brought me in."

In addition to putting Spears on the job of leak detection and repair, the Maryville team also implemented new leak management technology, such as sonic industrial imagers that could locate leaks in real time and estimate the energy savings of addressing them.

Tags are used to identify compressed air leaks at DENSO's Maryville facility.

Approach Ensures Sustained Success

To implement the leak management program, Jones and Spears developed an approach that follows the best path for sustained success.

The approach starts when Spears meets each week with the maintenance team to determine when production lines will not be operational, allowing Spears to use the sonic industrial imager to identify and tag leaks without disrupting production.

Spears subsequently fixes leaks when compressed air is at a lower demand, taking responsibility for fixing leaks that occur in

Compressed air leaks can occur at connection points of compressed air lines.

DENSO Compressed Air Leak Detection Program Drives CO_2 Reduction Results

compressed air lines and drops that feed production lines. He issues work orders for the maintenance team to fix previously identified leaks within production equipment given their expertise with the machines.

According to Spears, the most common leaks are found in the connection points of the plant's compressed air lines. The largest leaks, he said, are typically found on couplings on compressed air piping. Other leaks can be found in plastic tubing used to feed compressed air to machinery in the diecasting area.

Spears said he often fixes leaks at connection points by loosening the connection and placing pipe leak tape or sealant on the threads and tightening the connection. He will also often simply replace original coupling with stronger couplings that are more likely to hold a seal for longer periods. To fix leaks on tubes in the diecasting area, Spears cuts out the section of tubing with holes and replaces it with a connecting piece of tubing, installing a flexible heat shield when necessary.

The leak management program has Spears rotating from building to building on campus. He said the work is similar, but unique at each, and that it becomes increasingly complex as the facility incorporate new manufacturing approaches, like automation and cleanroom techniques.

"In these environments, you're looking for different types of leaks, such as loose connection points in air manifolds," Spears said. "The issue in this situation is often that people can't get all the way in there with a wrench to get them tight, or they don't have the knowhow. But I've turned enough wrenches in my life to know how to get in there and tighten those a little better."

Eyeing Other Operations for Energy Savings

Across the Maryville campus, the leak management program is clearly working, said Jones.

"This single program accounted for 26.5% of the total energy savings we achieved overall for 2022," he said. "It's pretty astounding that one program accounted for one quarter of our total campus goal for the year."

Jones said the program, combined with other initiatives, such as better methods of compressed air control and shutting down production equipment when not needed, has contributed to the team's ability to lower

Leaks are routinely repaired on plastic tubing that supplies compressed air to machines in the diecasting areas.

overall plant pressure and reduce the cfm required to maintain production.

Energy-saving compressed air initiatives like a leak management program have also had a positive impact on the operation's air compressors. The system in Maryville consists of several 1,000-horsepower (hp) and 500-hp air compressors. Originally, the system was designed to have multiple running within a building to meet production demand, and as a result of the program, it now only requires one.

Jones and Spears said the team – and company leadership – could not be happier with the results, which the team is reviewing to see how it could inform approaches at DENSO's other plants.

Spears said the maintenance teams appreciate being able to work on equipment and not air leaks. Anyone working in production also appreciates the program since it led to a quieter work environment, he said, noting one example in particular.

"After I plugged a leak, it went silent," said Spears, much to the delight of employees on the production line.

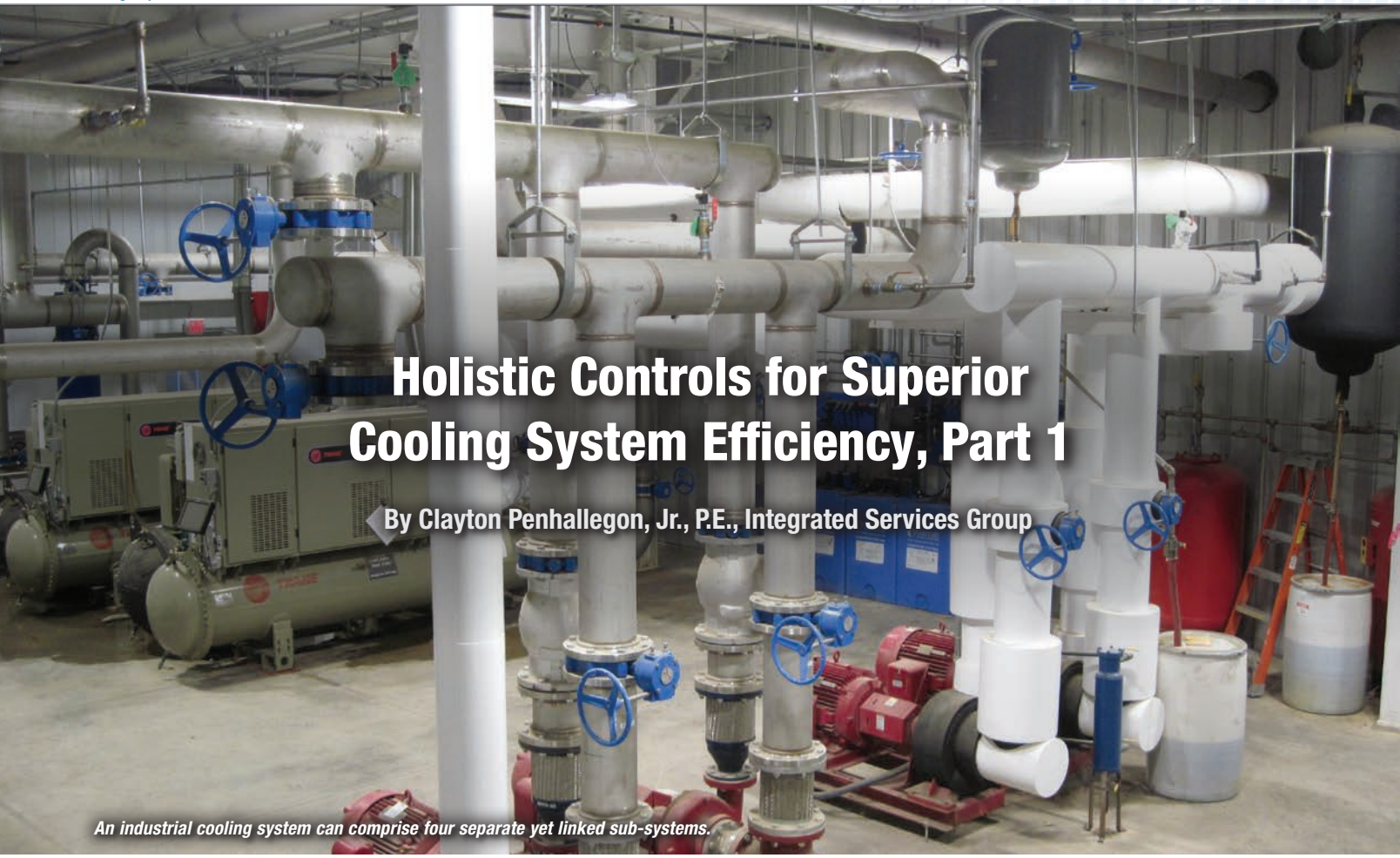
A leak management program with dedicated technicians is something Spears said he could see happening at many other companies and plants almost everywhere.

"There's a lot of room for growth in this field for big operations that are running compressed air. I don't think they understand how much air they could be losing. I didn't," he said. BP

All images courtesy of DENSO.

To read articles on ***Compressed Air Leak System Assessments,*** visit www.airbestpractices.com/system-assessments/leaks.

For expert presentations, visit our Webinar Archive Section dedicated to ***Compressed Air Measurement*** at www.airbestpractices.com/webinars.



Holistic Controls for Superior Cooling System Efficiency, Part 1

By Clayton Penhallegon, Jr., P.E., Integrated Services Group

An industrial cooling system can comprise four separate yet linked sub-systems.

NOTE: This article in two parts will present the inescapable importance of holistic system controls in providing superior cooling systems operating efficiency. Part 1 will present an introduction to why controls play such a critical role in cooling system operation and will review general control definitions and applications, as well as common deficiencies found in many systems. Part 2 will describe holistic system controls and give examples of advanced control system functions and benefits; this part will also provide tips on to assess your existing controls.

Process cooling systems are mandatory components of the production infrastructure in many plants. System efficiency is second only to operational performance (i.e. meeting the process requirements) in the design and operation of these systems[1], and many companies go to great lengths to attain system efficiency. Many times, unfortunately, the actual system performance is well below the hoped for efficiency target.

This is in part because cooling systems are uniquely complicated compared to most other plant utilities. Other systems like compressed air and vacuum typically have a single variable that is controlled (PSI or inches of vacuum, respectively)[2]; some other systems are only controlled on or off as long as they perform adequately (for example, resin conveying systems, trim scrap blower systems, etc.).

It is widely recognized by cooling systems efficiency engineers that cooling systems consist of a series of linked sub-systems. Consequently, controlling the sub-systems' operation in a manner that effectively leverages the different aspects is crucial to realizing the highest potential efficiency. "Holistic" system controls, i.e. controls that incorporate the interaction effects of the linked sub-systems, are the critical ingredient in realizing the highest system efficiencies.

Cooling Systems Complexity Distinctions

For many users who are not cooling system experts, the idea of linked, interconnected sub-systems may be unfamiliar. As an example of these connected sub-systems, consider a water-cooled system with a cooling tower, tower water pumps, chiller, and chilled water pumps. This system comprises at least four separate processes:

- Tower water heat rejection to atmosphere
- Tower water cooling of the chiller
- Internal refrigerant flow within the chiller
- Chilled water cooling of the process[3]

If the cooling system uses hot well / cold well tanks on both tower and chilled water, then there are six loops (i.e., tower water ([TW] cooling of the chiller becomes TW to the tower, TW to the chiller, chilled water cooling becomes

two loops, etc.). If there are other separate applications the list grows even further, such as tower water for machine cooling like air compressors, etc. separate from the chiller condenser cooling.

Even a "simple" air-cooled chiller system has several loops (condenser coil heat rejection to atmosphere, refrigerant flow within the chiller, chilled water to process, and possibly hot well / cold well loops). Even in this simple application there are efficiency impacts of condenser fan control strategy[4] , compressor design and operation (compressor type, compressors quantity, and other design characteristics), and chilled water flow design and control.

Simply put, cooling systems are different. And while this is daunting, leading many system operators to simply throw up their hands and say something like "screw it, we'll get what we get", the truth is **this is the heart of the opportunity.**

This very complexity provides the potential for significant differences in system efficiency. Done correctly, implemented across a company's multiple facilities, and maintained intentionally, cooling system efficiency can be a significant competitive advantage for organizations that seize the opportunity to set themselves apart from their competitors.

"…cooling system efficiency can be a significant competitive advantage for organizations that seize the opportunity…"

Three Factors of High Efficiency

Achieving high efficiency in cooling systems requires a combination of factors that include both physical and logical aspects. These broadly fall into three categories: Equipment Selection, System Implementation, and System Operation.

Equipment Selection, meaning technology type, single or multiple units, etc., is the most straightforward aspect. When considering purchases, buyers can readily determine the most efficient options for their particular

Holistic Controls for Superior Cooling System Efficiency, Part 1

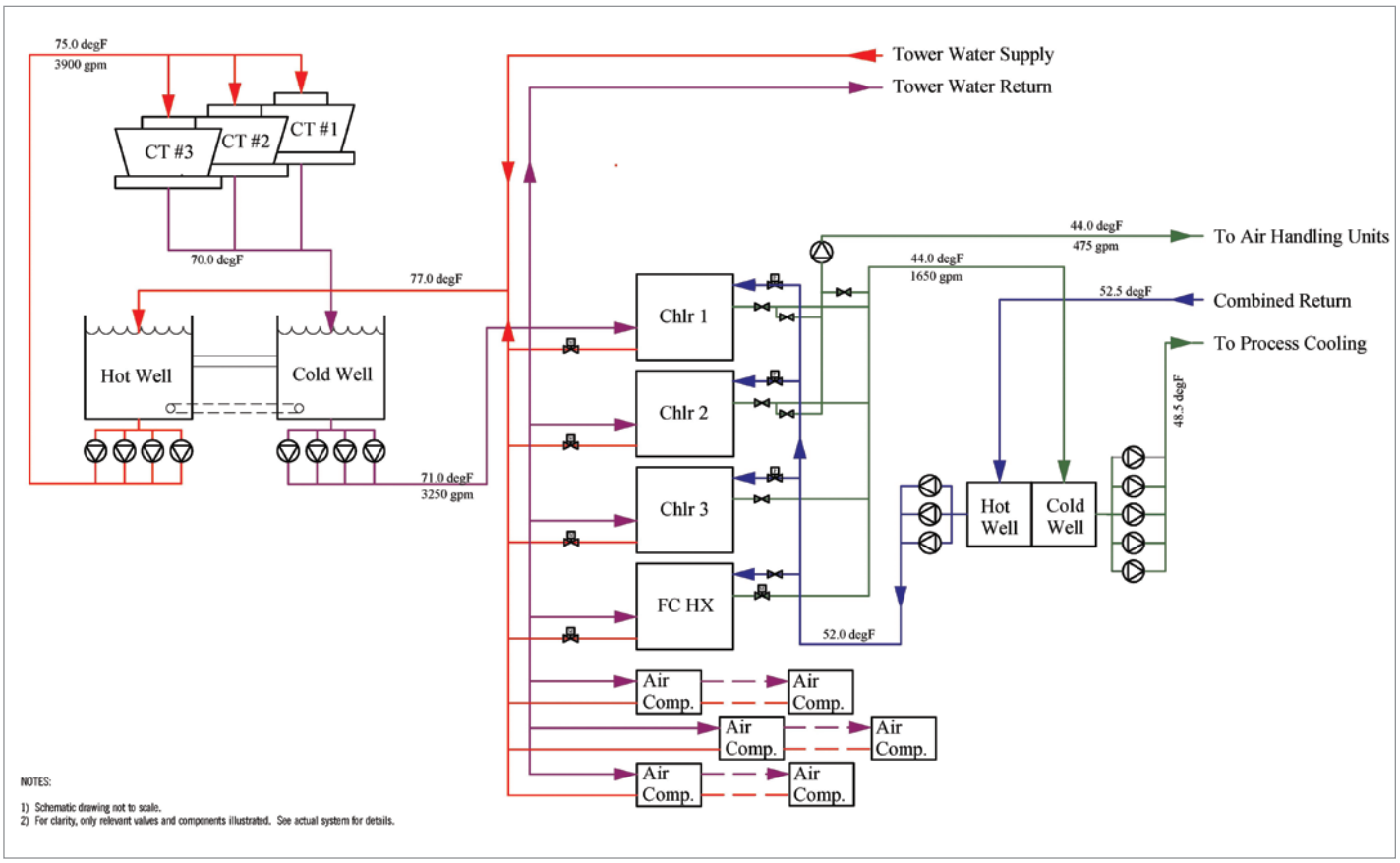
situation and then acquire the components they need. Obviously, these analyses are made in the appropriate context – how big is the load, what temperatures are required, etc. – and the application specifics point users to these types of chillers, those styles of pumps, and so on. Once the general parameters are set, the exact equipment selection (manufacturer, model, options, etc.) becomes the typical cost-benefit decision with the efficiency being just one of the factors in the final purchasing decision.

System Implementation comprises both the conceptual design and the physical installation. For example, a chilled water system may be a process and recirculation design with hot well and cold well tanks, a single loop variable-flow design, or some other flow pattern. For any given conceptual design, there is then the actual built system installed in the plant. This physical realization of the design may schematically match the intended concept while having installation details that differ from the plans and unfortunately negatively impact the operating performance[6].

Pumps choked both in and out.

Furthermore, the plant is already built in many cases when operators are seeking to improve system efficiency. There may be component replacements that provide an opportunity to increase overall efficiency but the underlying design may limit the potential ultimate performance. Even with specific high efficiency components added over time, the system can only be so efficient.

System Operation is the final component of the efficiency triad. Operation is a combination of the system controls and the operating practices of the plant. Operating practices include such activities as system maintenance, plant specific practices and habits (such as always running multiple pumps, etc.), and setpoint selection for cooling towers and chillers.



How many loops are in this system? Did you include the tower-to-atmosphere linkage and the chillers' internal refrigerant flows (as a single loop type)? Answer provided at endnote[5].

System controls are the keystone element of the operation component. These can range from systems with no overarching controls (i.e., controls on individual pieces of equipment but no system-integrating controls) to comprehensive functions that operate the full plant. It must be recognized that controls serve a range of operational functions which are important but they are also pivotal to the efficiency of the plant.

To fully understand the impact controls have on efficiency, it is necessary to review the types of controls available, their capabilities, and features required for good performance.

Controls Basics Review

Cooling *system* controls generally fall into three broad categories – No Controls, Standalone Controls, and Standard System Controls. These articles will present a 4th category: holistic system controls.

No systems truly have no controls as even in the cases where there are no overall system controls, as there are still unit controls or device controls such as motor starters and individual chiller on-board controls. These are referred to as **"No Controls"** systems in that there are no system level controls – plant operators start and stop individual components either using manual MCC start and stop buttons or pressing soft key buttons on chillers.

The next step is isolated or focused controls which are very common in plant cooling systems. These are characterized by limited functional spans such as dedicated cooling tower controls that stage several cooling towers or a pump skid controller controlling several pumps to maintain discharge pressure from the pump package. These are **Standalone Controls** that are not tied into any other control aspects of the cooling system. These systems are typical in small to mid-sized manufacturing plants with medium sized cooling systems.

Standard System Controls are controls that functionally span the entire system with a traditional range of control. This commonly includes starting and stopping pumps, tower fans, and chillers, speed control for secondary chilled water differential pressure control, and some reliability and maintenance support functions such as rotating lead / lag equipment and staging chillers. These systems are usually found in larger plants that warranted an overarching control system when the cooling system was installed, and they are often supplied by familiar cooling equipment manufacturers like Carrier or Trane as well as building controls vendors such as Delta Controls, Johnson Controls, or many others.

Typical standalone control examples.

Holistic Controls for Superior Cooling System Efficiency, Part 1

Unsurprisingly, these common control system types have limitations that make them less than ideal.

No Controls or Standalone systems both generally have these characteristics:

- high operator workloads to run and manage equipment, such as manual on / off operation, manual restarts after power events, and other operating requirements
- relatively poor efficiency due to system design and limited operator knowledge of efficient practices
- little leverage of adjacent process efficiency opportunities

Standard System Controls, while reducing the operator workload, still have shortfalls:

- vendors oriented toward commercial building systems vs. process cooling applications and requirements
- generally constrained in control design by typical commercial system control approaches that are not optimal for process cooling
- system costs are as much as more capable systems while leaving untapped potential savings

Why Have System Controls?

Occasionally someone will ask why system controls are necessary since the cooling equipment can operate without them. Tower fans can run with a set point controller, chillers can run with their front panel setpoints, and everything else can be turned on and off by hand. No confusion, no complexity, all good, right?

In fact, having a complete cooling system control capability offers a variety of benefits for plants. Proper controls will provide more stable process conditions, reduced equipment wear, improved equipment reliability, automated fault response, and significant energy efficiency over running a system without overarching controls. These advantages will be covered in some detail later

Non-Industrial Controls Specialist Limitations

Standard System Controls are very often provided by companies who primarily work in commercial facilities such as offices, hotels, municipal and institutional facilities, and other non-industrial systems. While the components used in these systems are often identical to those in an industrial cooling plant, the actual operation of the different system types is quite different.

Commercial systems are significantly characterized by widely varying loads from daily operating schedules typical of office and retail facilities, and seasonal weather-based loading factors affect even 24 hour systems like hotels, dormitories, hospitals, etc. Traditional control practices that are quite reasonable in these applications do not translate well to industrial cooling. Most process loads are essentially unaffected by outdoor conditions and cooling system loads often change more rapidly due to lines turning on and off than would be typical in daily weather-based building load swings. Consequently many commercial-grounded vendors fail to appreciate benefits of control approaches normally discounted in commercial cooling when the load is high year round.

Moreover, industrial systems include various requirements such as multiple pressures, intentionally low delta-T processes (which correlates to high flow for the net tons load), different temperature processes, etc. that exceed the normal scope of commercial system requirements. Unfortunately, the building control contractors and technicians who end up tasked with implementing systems in these environments are unfamiliar with these aspects and consequently either limit the control approaches applied to those they know, which leaves opportunities unfulfilled, or they attempt to implement measures with which they have no experience and must learn while implementing the job. Neither of these are good outcomes for the plant hosting the system.

Experienced industrial systems controls contractors will bring control methods and strategies to the user and will challenge and encourage users to implement more advanced approaches that provide opportunities for higher efficiency along with other benefits such as improved process conditions and reduced equipment maintenance costs.

One other unfortunate consideration with non-industrial controls vendors is the long-term support of systems. Even if a commercial vendor is able to staff an initial installation with a technician who quickly grasps the opportunities inherent in the industrial application, typical staff turnover makes it likely that person will leave and not be available to support the system long term. Dedicated industrial cooling controls vendors are good partners who will provide knowledgeable and consistent support through the years due to their business focus, notwithstanding the inevitable evolution of personnel.

in this article series but for now, it is enough to say that they are significantly beneficial for cooling system operations.

When reviewing cooling systems in a range of roughly 200 to 2000+ refrigeration tons, it is our experience that the system control types break down appropriately as shown in Table 1.

No Controls installations are usually small systems, typically around 350 – 400 total nameplate tons and below, with only integral device controls like on-board chiller panels. Pumps are started manually and filter blowdowns and other operations are done by operators when problems occur or other events trigger a response.

Table 1 – System Control Types Break Down

TYPE	DESCRIPTION	APPLICATIONS
"No Controls"	Unit / Device Only	25% - Air-cooled & simple
"Standalone Controls"	Isolated / Focused Controls	55% - Typical
"Standard System Controls"	Typical Function Systems	20% - Larger plants

Standalone Controls are typical of many medium size systems (roughly 400 – 1200 total tons) where there are multiples of key components like cooling towers and parallel pumps on separate loops such as recirculation loops to chillers and separately to the process. A staging controller is often found for multiple tower cells while pumps in a group may be staged on pressure or controlled by VFDs from a single pressure input.

Cooling systems with Standard System Controls have a unified control platform providing a range of control functions for the system, and these are typically found in plants with 1200-1500 tons and above. The onboard controls of major components such as chillers are still included, but the control of components such as pumps and cooling towers will be done by the control system. Other advanced functions like automatic lead / lag rotation and fault recovery are commonly also included, and these serve to reduce the operator workload for basic system operation.

Holistic Controls for Superior Cooling System Efficiency, Part 1

System Controls Cooling System Efficiency Implications

There are unsurprising correlations between the system sizes, their controls, and their typical efficiencies. This is partly due to the scale efficiency of larger systems but also to the inherent efficiency of the accompanying designs and operation practices. Table 2 illustrates typical system efficiency by control types and sizes.

Note that the ranges depend on system technology and design, e.g. air-cooled vs. water-cooled, recirculation loops vs., single variable flow, etc. Furthermore, the higher efficiency of Standard Controls systems is due mostly to equipment used and system scale rather than control functions in most common cases.

System Equipment Selection Impact on Efficiency

Many system owners work to choose efficient components for their systems, particularly in chiller selections. This matters as the chiller design and associated features (e.g., compressor type, heat exchanger design, capacity control method, etc.) define the potential operating envelope of the chiller, and a given design can only run so efficient and no more. However, as will be shown later, simply having a high efficiency design is not enough – it creates potential for high efficiency but does not guarantee it in operation.

In fact, optimal system controls may cut the energy use of a system by 35 – 50% versus the same major components without the benefit of advanced functional approaches. Unsurprisingly, the highest efficiency requires a combination of high efficiency equipment, efficient system design, and beneficial control operation.

Table 2 – Typical System Efficiency By Control Types And Sizes

TYPE	APPLICATIONS	TYPICAL SYSTEM EFFICIENCY
"No Controls"	25% - Air-cooled & simple	1.2 – 2.2 kW per ton
"Standalone Controls"	55% - Typical	1.1 – 1.5 kW per ton
"Standard System Controls"	20% - Larger plants	0.8 – 1.3 kW per ton

While efficient operation concepts will be discussed further in Part 2, an example of control function benefits would be operating pumps in parallel when a single pump could provide adequate flow. Accurate system analysis may show (assuming advantageous pump curves) that the total power required is less running two together versus a single pump in the same situation.

"…optimal system controls may cut the energy use of a system by 35 – 50% …"

Part 1 Conclusion

This article has stated the importance of system controls for highly efficient process cooling systems and has presented building blocks so those only generally familiar with the cooling controls can understand how this is true. We have reviewed why industrial cooling systems are different from other plant utilities and from commercial cooling applications, the types of cooling controls in use including minimal scope and more capable standard system controls, and the general range of sizes and efficiencies in typical process cooling systems.

The second part of this article will describe holistic cooling controls and will give examples of how their operation can yield significant savings versus conventional scope controls. It will also give tips for assessing the performance of existing controls and offer suggestions for leveraging installed system components for potential improvements. BP

For questions or more information about Integrated Services Group visit https://www.isg-energy.com, email: info@isg-energy.com, tel: 770.823.8235.

Endnotes

1. And as will be seen, systems capable of operating efficiently are also nearly always systems that are capable of maintaining the highest operating performance in terms of close temperature control, pressure stability, etc.
2. Compressed air also often has dew point control but that is a separate system control function (the air dryer vs. the compressor[s] and the pressure and dew point variables are only marginally connected.
3. These cooling loops could be broken down even more discretely depending on the specifics but the point is made.
4. Condenser fan control is integral to the chiller controls but potentially met with different efficiency effects by staging of fans, running them with partial VFDs, or running them in parallel with all on VFDs.
5. This system has at least seven separate loops, and could be construed as up to eleven depending on the operating mode. If interested, call or email the author to discuss.
6. It is exceedingly rare for design deviations made in the field to improve a system's performance as they are almost always made to benefit the installation process rather than make the design better.

For similar articles on ***Cooling Controls System Assessments*** please visit https://coolingbestpractices.com/system-assessments/cooling-controls.

Visit our Webinar Archives to listen to expert presentations on ***Cooling Technology*** at https://coolingbestpractices.com/magazine/webinars.

BLOWER & VACUUM BEST PRACTICES
blowervacuumbestpractices.com

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

CHILLER & COOLING BEST PRACTICES
coolingbestpractices.com

PROUDLY PRESENTING THE 2024 EXPERT WEBINAR SERIES

Mike Lenti
Senior Auditor, Compressed Air Consultants

Julie Gass
Lead Mechanical Process Engineer, Black & Veatch

Ron Marshall
Chief Auditor, Marshall Compressed Air Consulting

Tom Jenkins, P.E.
President, JenTech Inc.

Hiran de Mel
Senior Project Manager and Principal Technologist, Jacobs

Andrew Smith, P.E.
Co-Founder, SMARTCAir

Clayton Penhallegon, Jr., P.E.
Integrated Services Group

JAN 11
How to Boost the Energy Efficiency of Rotary Screw Air Compressors
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, January 11, 2024 – 2:00PM EST

JAN 25
ASME PTC13 in Action: Practical Approach to Blower System Performance Testing
Presenter Julie Gass, Lead Mechanical Process Engineer, Black & Veatch and Hiran de Mel, Senior Project Manager and Principal Technologist, Jacobs – *Sponsored by Inovair*
Thursday, Jan 25, 2024 – 2:00PM EST

FEB 08
Centrifugal vs Rotary Screw Air Compressor Performance: Full Load and Part Load Efficiency
Presenter Mike Lenti, Senior Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery*
Thursday, February 8, 2024 – 2:00PM EST

FEB 22
Storage Tank and Pipe Sizing for Large Plants: How to Meet CFM Needs
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Unipipe*
Thursday, February 22, 2024 – 2:00PM EST

MAR 07
Sizing Vacuum Pumps and Piping for Various Applications
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Busch Vacuum Solutions*
Thursday, March 7, 2024 – 2:00PM EST

MAR 21
Control of Distributed Systems with Multiple Air Compressor Rooms
Presenter Tim Dugan, P.E., President, Compression Engineering Corporation
Thursday, March 21, 2024 – 2:00PM EST

APR 04
Refrigerated vs Desiccant Dryers and Choosing the Right One
Presenter Don Van Ormer, Auditor, APEnergy – *Sponsored by Trace Analytics and BEKO Technologies*
Thursday, April 4, 2024 – 2:00PM EST

APR 18
CTI STD-201RS Thermal Certification for Cooling System Heat Rejection Equipment Part 2
Presenter Cooling Technology Institute
Thursday, April 18, 2024 – 2:00PM EST

MAY 09
How to Identify and Eliminate Artificial Demands
Presenter Tom Taranto, Owner, Data Power Services
Thursday, May 9, 2024 – 2:00PM EST

MAY 23
Sensors for Compressed Air Systems: Data Management and Analysis
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by VPInstruments and Kaeser Compressors*
Thursday, May 23, 2024 – 2:00PM EST

JUN 13
Advanced Aeration Control for Blowers
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by APG-Neuros*
Thursday, June 13, 2024 – 2:00PM EST

JUN 27
Heat Recovery from Chillers: How to Capture and Use Waste Heat
Presenter TBD
Thursday, June 27, 2024 – 2:00PM EST

JUL 18
How to Determine the Optimal Size of a Nitrogen Generator
Presenter Mike Flowe, President, Flowe Nitrogen Systems – *Sponsored by Pneutech*
Thursday, July 18, 2024 – 2:00PM EST

JUL 25
Instrumentation and Monitoring for Vacuum Systems
Presenter TBD – *Sponsored by Quincy Compressor*
Thursday, July 25, 2024 – 2:00PM EST

AUG 08
How to Diagnose and Fix Common Issues in Rotary Screw Air Compressors
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, August 8, 2024 – 2:00PM EST

AUG 22
Thermal Performance of Evaporative and Dry Cooling Systems
Presenter Clayton Penhallegon, Jr., PE, Integrated Services Group – *Sponsored by EVAPCO*
Thursday, August 22, 2024 – 2:00PM EST

SEP 12
Aeration Blower Sizing and Selection
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by Kaeser Compressors*
Thursday, September 12, 2024 – 2:00PM EST

SEP 26
Heat Recovery from Compressed Air Systems
Presenter Don Van Ormer, Auditor, APEnergy
Thursday, September 26, 2024 – 2:00PM EST

OCT 10
How to Interpret Audit Data and Improve Your Compressed Air System
Presenter Mauricio Uribe, Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery and BEKO Technologies*
Thursday, October 10, 2024 – 2:00PM EST

NOV 21
Power Consumption Curves for Vacuum Pumps: Fixed-Speed vs Variable-Speed
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Rogers Machinery*
Thursday, November 21, 2024 – 2:00PM EST

DEC 12
Compressed Air Leak Detection: Techniques, Methods, Tips, and Tools
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Rogers Machinery and Teledyne FLIR*
Thursday, December 12, 2024 – 2:00PM EST

DEC 19
Selection Criteria for Oil-Free Air Compressors
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, December 19, 2024 – 2:00PM EST

Missed a Webinar? Register to View from our Archives at https://www.airbestpractices.com/webinars

Register for Free Today at airbestpractices.com/webinars

SPONSORED BY

FS-CURTIS | FS-ELLIOTT | ROGERS MACHINERY COMPANY, INC. | KAESER COMPRESSORS Built for a lifetime. | unipipe ALUMINUM PIPING SYSTEM | BEKO | BUSCH VACUUM SOLUTIONS | PNEUTECH

VP INSTRUMENTS | evapco for LIFE | inovair Geared Centrifugal Blowers | TELEDYNE FLIR | APG Neuros | TRACE Analytics the compressed air testing experts | Quincy COMPRESSOR

SUBSCRIBER CORNER

In the real world, our subscribers (sales engineers, service technicians and facility maintenance personnel) regularly witness "crazy" on-site utility (compressed air, vacuum, blowers, chillers, cooling towers, pumps...) system designs and maintenance practices. This subscriber-driven monthly column hopes to raise awareness, provide a learning opportunity and have a bit of fun!

Crazy Receiver Tanks in Florida

Daniel Smayda is the Owner of Advance Air Compressor Sales & Repairs, based in the greater Tampa Bay, Florida, region. Visit https://advanceaircomp.com/.

He writes: "I was visiting a client who does metal fabrication. This picture shows two 120-gallon air receiver tanks in a crazy position. The top air receiver tank is hanging from 3/8" threaded rod from the roof truss, and the bottom air receiver tank is bolted to the floor. Not a "Best Practice!" The proper installation of any air receiver tank involves securing it to the floor (or deck) in a building or vessel. The ideal way to place these tanks is to have a wet tank after the air compressor unit and a dry tank after the dryer unit."

"There was also a safety issue with these air receiver tanks. They are stamped with an ASME tag showing they were built in 1965. These tanks are not only unsafe but should be turned into a barbecue smoker or a vacuum tank!"

"The customer has issues with low compressed air pressure being delivered to their newer CNC machines and to the sand blaster. They are unaware of what tip number they are using for their sand-blasting unit and therefore don't understand how much compressed air they are using. So, when they are sand blasting, they have issues with low-pressure compressed air and alarms go off on their CNC machines."

"A second reason they don't have enough compressed air pressure is an undersized piping and storage tank system. This customer has two-inch piping throughout the facility and does not have enough volume of compressed air on hand. This is causing their 75 horsepower VFD air compressor unit to load and unload at a rapid pace."

"In my opinion, the customer needs to remove the old tanks and install a 400-gallon air receiver tank in the compressor room and a second tank at the sand blaster. By the installation of the newer receiver tanks, this will help the air compressor by prolonging the life of the wearable parts on the unit, such as the inlet valve, solenoid(s), minimum pressure check valve and reduce the pressure drop throughout the compressed air system."

These stacked compressed air storage tanks presented a safety concern.

Photo credit: Daniel Smayda, Advance Air Compressor Sales & Repairs

The Toilet Paper Inlet Filter for an Air Compressor

Eric Pressley is a Service Technician, based in South Carolina, for Elevated Industrial Solutions. Visit https://elevatedindustrial.com/ (Editor's Note: Eric Pressley is also a First Sergeant with the United States Air Force and we'd like to thank him for his service!).

He wrote: "Every day in the field is different. This client found an "interesting" way to avoid installing a new inlet filter for their aging air compressor. One might say using toilet paper as filter media is not a "Best Practice". We installed a new, properly-sized inlet filter to assure a low pressure drop and proper air quality being ingested into the system."

Photo credit: Eric Pressley, Elevated Industrial Solutions

Submission Guidelines

We invite our subscribers to send their observed "Crazy" Systems & Maintenance to Roderick Smith at rod@airbestpractices.com. Please send a high-resolution picture as a JPG or PDF file and a note describing the installation, what was wrong and what the solution should be. We will edit the text and remove equipment brand names and references from all materials.

SUBSCRIBER CORNER

Readers From Around the World

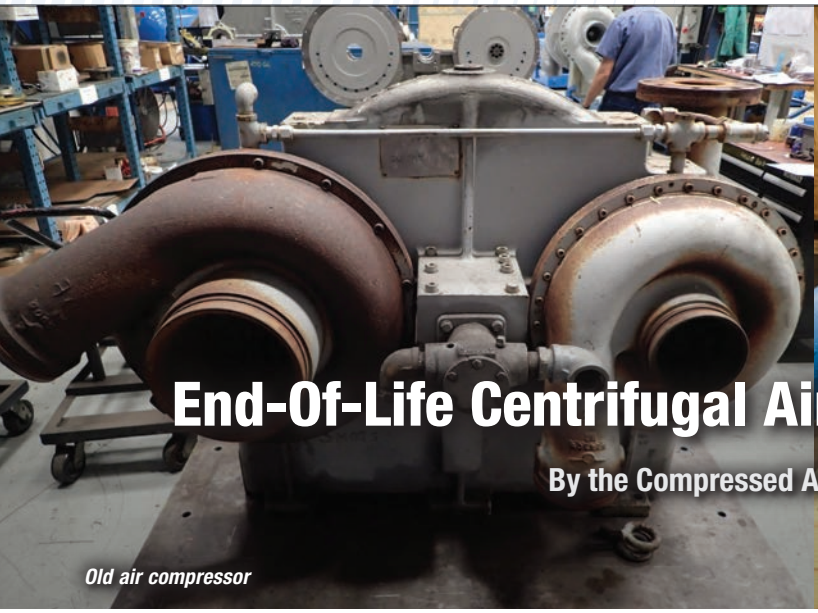
We salute all Best Practices Magazine Subscribers, from around the world, who own, operate, maintain, engineer and provide expertise for the on-site utilities (compressed air, nitrogen generation, vacuum, blowers, chillers, cooling towers, pumps) powering modern plant automation. This subscriber-driven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

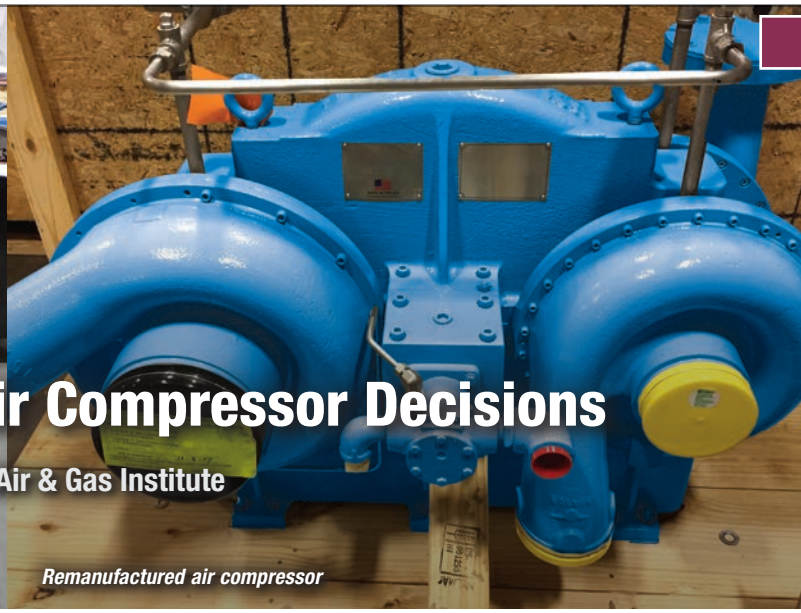
Pump Engineering Corporation was established in Southern California in 1953 and it formed the QAir California Division in 1998. They offer expert service, sales and engineering for pumps, compressed air and vacuum systems. Pictured are Rick Walsh and Jimmy Hamilton at their Santa Fe Springs headquarters (left to right). Visit https://www.qair.net/ and https://www.pumpengineering.net/

CASEI has been providing, for over three decades, expert compressed air and vacuum system service, sales and engineering to Southern California and Northern Mexico. Pictured are Co-Owners Mike Marsh and Chris Canipe at their San Diego headquarters (left to right). Visit https://casei.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 or PDF file and a note describing the team and company to Roderick Smith at rod@airbestpractices.com.





End-Of-Life Centrifugal Air Compressor Decisions

By the Compressed Air & Gas Institute

Old air compressor

Remanufactured air compressor

Centrifugal air compressors are known for reliable longevity, but at some point, end- of-serviceable- life decisions must be made. Your centrifugal compressor has been the lifeblood of the factory for upwards of twenty-five years, or longer, but it is finally showing signs of giving up the ghost. Much like when the aging family automobile continues to rack up increasingly more expensive repair bills, operators of aging centrifugal compressors face the decision to repair or replace the machine when the maintenance costs reach a certain threshold.

As the "old reliable" workhorse reaches the end of its utility, the pending loss has severe consequences to the productivity and profitability of the operation. Fortunately, the centrifugal compressor usually broadcasts its pending demise long before it delivers its last cfm. This allows the operator sufficient time to consider the multiple options he or she has for securing their company's supply of compressed air.

Replace Or Overhaul?

All Centrifugal compressors require regular maintenance and monitoring to keep them operating reliably, efficiently, and safely. In addition to standard maintenance procedures, there are numerous tests and diagnostic procedures that can be performed to reveal the true health of the compressor. Oil analysis, monitoring bearing and impeller vibration, and trending bearing and cooling water temperatures will accurately reveal pending issues with the mechanical operation of the centrifugal compressor. A field test can be performed by a qualified service provider to determine the actual capacity of the compressor and its efficiency compared to as-built performance. Despite all the love and care that a predictive preventative maintenance program can render to extend the useful life of a centrifugal compressor, there comes a time when rising maintenance costs and increased down time force the decision to be made of whether to replace the unit or overhaul the unit. The urgency of action is dictated by the frequency of these unscheduled issues and the productivity costs that these issues create.

Arguments For A New Purchase

There are several reasons why replacing an aging centrifugal with a new unit makes good business sense. A new unit allows for a significant change in the capacity and performance within the system. Although overhauling a centrifugal compressor can include some impeller design changes that increase performance of the old unit, major modifications are precluded. Another new purchase benefit is being able to take advantage of technology updates, especially if the compressor is 10 years old or older. Analog gages, indicator lights, switches, and push buttons have evolved into microprocessor controls with touch screen LCD and PLCs. These updated digital control systems often provide significantly more information and control than their analog predecessors. Such updated systems can provide historical analysis of operational data and can communicate with customer DCS systems allowing for remote monitoring and control of the equipment from a control room.

Technology improvements and design innovations can also mean that new units will have lower operating costs than older existing installed units. This is especially true in the case of electricity. The electricity consumed by an industrial motor over its operating life represents roughly 95% of its total cost of ownership. Large capacity centrifugal compressors often consume hundreds to thousands of kilowatt hours of power consumption PER HOUR of operation. Accordingly, a new more efficient machine that consumes less electricity than the old unit will deliver a breakeven point where the

End-Of-Life Centrifugal Air Compressor Decisions

Old air compressor

Remanufactured air compressor

electrical power savings will outweigh the cost of replacing the current unit, especially if the current unit is more than 10 years old.

Other Options To Replacing An Aging Centrifugal Compressor With A New Compressor

Because centrifugal compressors are such mechanically simple and rugged machines, the option to overhaul an aging centrifugal is often very viable and should be considered versus the investment of a new centrifugal compressor. There are two basic overhaul approaches; rebuild or remanufacture.

The **rebuild** approach to overhauling a centrifugal air compressor typically takes place in situ at the customer site, being performed either by the Original Equipment Manufacturer (OEM) or by a non-OEM service entity. Depending upon the selected service provider, replacement parts can be factory genuine OEM parts or generic, aftermarket components. Product testing after the rebuild is also done in the field, but is often limited to simple mechanical run testing, testing for leaks (air, cooling water, oil), verifying discharge pressure, and measuring vibration.

A key consideration in the decision to overhaul or replace is the time the facility will be without the compressor in question. An extensive repair, complete with coolers, bearings, impeller and shaft inspection and rebalancing, inspections of various components, and possibly even main drive motor maintenance can take several weeks. However, a new compressor often has an extended lead time, often stretching out many months. This makes the overhaul option desirable, especially if the current unit cannot be expected to last through the quoted manufacturing lead time for a new unit.

Remanufactured centrifugal compressors are available in two options. One solution is for the customer to remove the aging or failed compressor and ship it to the OEM factory. There it is overhauled with new or OEM-certified parts and components. Since the OEM has all of the original design drawings and unit specifications for that specific serial numbered compressor, they can restore the compressor back to its original factory specifications and performance. They will also conduct in depth mechanical run and performance tests on the entire compressor package before the unit leaves the factory, assuring that the remanufactured compressor meets or exceeds all customer expectations. Once remanufactured and tested, the remanufactured unit is shipped to the customer and reinstalled for operation.

Another option is to purchase a remanufactured compressor. Several OEMs retain complete, remanufactured compressors in industry-standard capacities and pressures, and these are readily available. If one of these remanufactured units satisfies your capacity and pressure requirements, this option presents a great opportunity to receive a quality remanufactured and factory tested compressor on short notice. Remanufactured inventory is possible due to the large number of standard industry performance machines that have been retired throughout the industry. Normal practice is for the customer to return the failed machine to the OEM for credit once the remanufactured machine has been installed. The "core", the basic, heavy castings that comprise the bulk of the compressor, is then remanufactured, tested, and put back into OEM inventory.

System Assessment for Justification

Since both the replace and overhaul options for centrifugal compressors involve significant capital expense, there are many cost considerations that must be reviewed when deciding which option is best for the organization. The actual replacement or overhaul cost, downtime costs, production curtailment penalties, rental costs, removal/reinstallation, and freight costs all must be factored into the final decision. Now that a major expense is imminent, it makes good business sense to gain a thorough and factual understanding of the role that the suspect compressor plays within the entire compressed air system. Although a capability study can provide valuable insight into the actual capacity of the compressor and its performance, significantly more useful information can be obtained by performing a system assessment that looks closely at the supply side, the demand side, and the distribution network of the system. Such an audit will clearly determine the current and future role of the suspect compressor in the overall efficiency of the system. Is it really needed? Is it sized properly? From the system assessment data,

the company can formulate accurate decisions with actual payback justification for the chosen solution. The goal of the system assessment is to allow decisions, that affect the efficiency and longevity of the compressed air system, to be made upon facts and data, rather than upon guesses and subjectivity.

Considerations When Choosing An Overhaul Option

The bid for a repair overhaul often starts with a base, initial cost that includes basic parts and services. Customers should be cautioned about making a vendor decision just on the basis of the basic cost since as the disassembly and inspection process gets underway, additional components are often found to be worn or broken. The cost and scope of the repair can, and often does, increase significantly with the addition of each discovered repair item. Unless the initial bid includes a fixed-cost guarantee, these additional parts and labor can quickly inflate the low, base cost well beyond the cost of other overhaul bids or even a new replacement compressor.

Another repair overhaul concern is the form-fit-function of the parts used in the repair process. The quality of both the work and parts used by service providers has a direct impact on the longevity of the repair and the ability of the compressor to perform efficiently. Non-OEM service providers often rely on rebuilt or aftermarket, will-fit parts. Accordingly, the premature failure of an inferior part or the out-of-specification performance of a key component can adversely affect compressor reliability and performance, which adversely affect production and profitability.

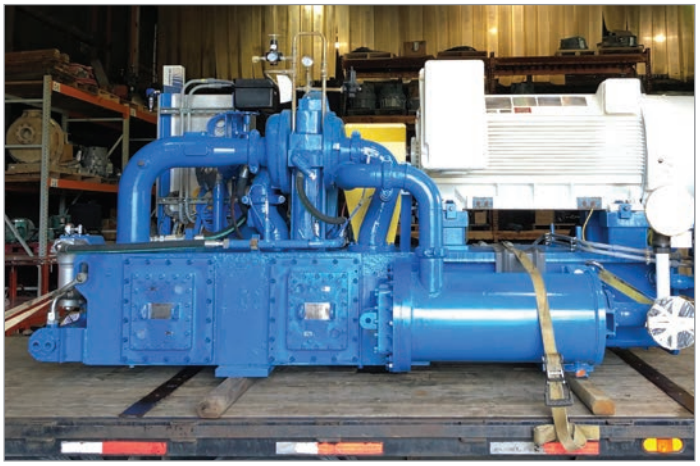
Recent tests conducted on compressor coolers supplied by an aftermarket part supplier found many deficiencies in the product design and performance. Most notable was a significant degradation of the cooler performance from OEM specifications. Reduced cooler performance results in both significant capacity and efficiency reductions of the compressor. It's important to remember that OEMs manufacture, design and test their own coolers to ensure the performance and integrity of this key compressor component. Product quality or adherence to OEM specifications and tolerances cannot be assured when a service provider installs third-party, aftermarket coolers into a rebuild. Below are some questions that should be asked of the service provider when reviewing their bid for a centrifugal compressor repair overhaul:

- Do they use refurbished or aftermarket parts and components?
- Do they use new and OEM certified parts?
- Are they installing completely new bearings, seals, gasket kit, probes, pump, and coupling hub?
- How do they ensure the parts and components are within the manufacturer's tolerances and specifications?

The remanufactured overhaul bid is normally significantly higher than the initial base-bid for a repair overhaul. However, the remanufactured bid is a known entity. There are no cost overruns or unforeseen issues or delays that are only exposed after the on-site repair is underway. With the remanufactured solution, downtime can be predicted and minimized. The cost of extended, unforeseen downtime due to a repair delay can easily erase the cost difference between the repair bid and the remanufactured bid. Also, with a fixed cost remanufactured solution, there is no need to go back and forth with purchase order revisions or additional purchase order requests, as is frequently the case with the repair option.

Although the remanufactured overhaul option eliminates the downtime that is inherent

Old air compressor



Remanufactured air compressor

End-Of-Life Centrifugal Air Compressor Decisions

with a repair, a major consideration when evaluating a remanufactured bid is the work involved in the removal of the current unit and installation of the remanufactured machine. If the machines are exact drop-in replacements of each other, the task is somewhat simplified, but depending on the size, configuration, and location of the machine, this can be a monumental task requiring extensive equipment and time.

Both repair and remanufactured overhaul options are viable solutions, and both have their pros and cons. The decision whether to repair or remanufacture must be made after conducting a comparative analysis between the two solutions based upon the specific logistics and concerns of the facility.

Testing Overhauled Centrifugal Air Compressors Is Critical

Centrifugal compressors utilize precisely machined components that operate at extremely high speeds to deliver compressed air at a specific pressure at a required power consumption. Overhauls, whether repair or remanufacture, are expensive and the expectation is that the overhaul will significantly extend the useful life of the compressor. Accordingly, it is important to measure the efficiency, reliability, and performance of the centrifugal compressor after it has undergone an overhaul to be certain the work was done properly, the unit meets the original quality benchmarks, and the overhaul provides the payback that the customer expected.

No matter whether the decision is to repair or remanufacture, it is important that the finished product be tested before start-up at the customer site. Without such testing, it is impossible to know if the compressor meets new equipment performance standards regarding capacity, discharge pressure, and efficiency. The benefits from testing overhauled centrifugal compressors include:

- Validation of the mechanical integrity of the machine
- Proof that the machine was returned to like-new efficiency
- Minimization of uncertainties and field issues

In depth testing is a particular challenge when a repair is completed at the customer site, as the service provider may not have the necessary testing equipment or expertise to ensure the unit is returned back to the as-designed and as-manufactured specifications, tolerances, and performance. Testing is where a remanufactured overhaul provides a benefit over the in-the-field repair overhaul. At the factory, the compressor can be tested thoroughly to assure that it is mechanically sound, free of oil-air-water leaks, vibration levels are within new equipment specifications, heat exchanger performance is within specification, the remanufactured unit delivers the rated capacity at the specified discharge pressure with "as new" efficiency, and the surge pressure meets new equipment standards.

The following example illustrates the importance of testing. A large U.S. based equipment manufacturer had an air compressor overhauled by a company that did a field repair. The customer was curious to see if the repaired unit met the original capacity and efficiency performance, so they contracted a testing company to test the unit. The testing revealed that the throttling capacity of this trim compressor had decreased by over 80 percent from factory specifications. This resulted in unwanted compressed air bypass and significant energy waste. Based on the test findings, the customer had the OEM overhaul the compressor back to its original performance capabilities, significantly reducing their energy consumption and operating costs.

A Contingency Plan Will Help Avoid Fire Drill Emergencies

Establishing a compressed air contingency plan is paramount to minimizing the risk associated with the unanticipated failure of a critical centrifugal air compressor. The contingency plan should identify all of the critical operations of the facility that would be

The Compressed Air and Gas Institute (CAGI)

The Compressed Air and Gas Institute (CAGI) is the united voice of the compressed air industry, serving as the unbiased authority on technical, educational, promotional, and other matters that affect compressed air and gas equipment suppliers and their customers. CAGI educational resources include e-learning coursework, selection guides, videos, and the *Compressed Air & Gas Handbook*.

The Centrifugal Compressor Section consists of the following member companies:

- Atlas Copco Compressors
- FS-Elliott
- Hanwha Power Systems
- Ingersoll Rand
- Sullair, LLC

For more information, visit the CAGI web site at www.cagi.org, and follow CAGI on LinkedIn.

negatively affected by the loss of a centrifugal compressor. It includes a financial risk analysis that ranks these critical operations according to their probability of occurrence, cost of downtime, and lost production costs. This risk analysis can predict the financial impact of such a failure. The contingency plan should also identify the weaknesses within the compressed air system and provide a plan for performing scheduled maintenance and new equipment installation. With this knowledge, steps can be taken to proactively prepare for the unexpected event to lessen its impact financially and on productivity.

One major aspect of a contingency plan is the pre-arranged contract between a customer and a service provider to provide emergency rental air on quick notice. The contingency plan should establish a schedule for making all of the piping and utility preparations that are required for a quick rental compressor solution prior to the need for rental air. Your compressed air service provider should be able to help you in developing a contingency plan specifically tailored to your facility. The benefits of a compressed air contingency plan are as follows:

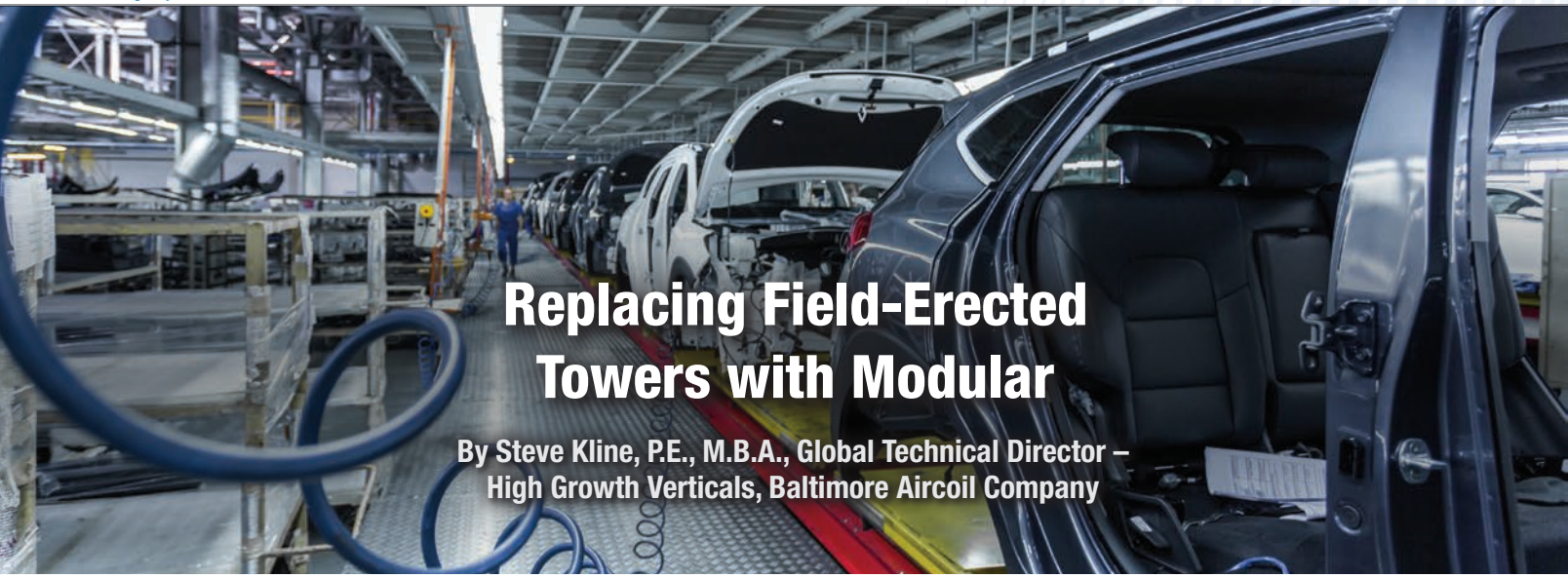
- Minimize reaction time when an event occurs
- Minimize production downtime and financial loss
- Reduce delivery time by completing paperwork ahead of time
- Increase employee awareness as to their roles in maximizing productivity

Summary

How to deal with an aging centrifugal compressor, that is exhibiting signs of unreliability, inefficiency, and increased maintenance costs, is a delicate balance between managing risk and minimizing cost. Although purchasing a new compressor is always an option, overhauling or remanufacturing your aging centrifugal air compressor are both viable solutions to improving the reliability, efficiency, and productivity of your compressed air system. When choosing between repairing or remanufacturing a centrifugal compressor, there are many factors to consider and as with all financial decisions, the more information there is, the easier and more accurate the decision. The best way to gather the information needed for a wise, air compressor decision is to perform a system assessment on the existing compressed air system. Armed with the system knowledge and understanding provided by the audit, the user will have the mechanical and financial information necessary to make the best decisions for the facility. Testing the overhauled compressor, whether it be repaired or remanufactured, is a critical step in assuring that the compressor delivers the capacity, efficiency, and reliability as promised by the service provider. As always, a well thought out contingency plan, that anticipates failure events and provides a path for risk minimization, should be created to provide assurance that system integrity is maintained at its highest level while resolving the issue. BP

To read more ***Air Compressor Technology*** articles, visit https://www.airbestpractices.com/technology/air-compressors.

Visit our Webinar Archives to listen to expert presentations on ***Air Compressor Technology*** at https://www.airbestpractices.com/webinars.



Replacing Field-Erected Towers with Modular

By Steve Kline, P.E., M.B.A., Global Technical Director – High Growth Verticals, Baltimore Aircoil Company

How do you replace aging cooling towers without risking disruption to a plant's continuous high-volume operation? That was the challenge at a major Midwest automotive manufacturing facility. Automobiles began rolling off the production line in the late 90s and the existing cooling towers were due to be replaced.

The cooling tower replacement was part of a plant modernization project that included retooling, new equipment, and advanced manufacturing technologies, expanding capacity to 420,000 vehicles annually to meet strong demand primarily for the company's popular vehicles.

The Challenge

Replacement of the enormous field-erected cooling towers was no small task, and it needed to be completed within the limited period when cooling was not required to avoid causing any downtime of plant operations. The demolition could not begin until December and the site preparation, installation, and commissioning of the new cooling system had to be completed by April.

The automotive company worked with ElitAire LLC. to evaluate the technology alternatives and develop a plan. The first decision to be made was the construction method – whether to replace the existing non-BAC field-erected towers with a similar site-built system or to install a modular system built offsite in BAC's factory. The second decision was the drive technology for the fans – whether to continue using a gear drive system or shift to direct drive technology.

The customer's main goal was to control risk, the risk of delays in the installation process that could cause production downtime, and the risk to worker safety, which was of paramount importance. The procurement team was also looking for a solution that was energy efficient and low maintenance to reduce costs and environmental impact.

Modular System Lowers Risk

After an evaluation of the lifecycle costs and weighing the risks of various alternatives, the company selected BAC's modular Series 3000 Cooling Tower with the direct drive ENDURADRIVE Fan System.

Before: Existing field-erected towers needing to be replaced.

After: The BAC Series 3000 modules were installed in only 4 days, compared to the 2-3 months required to assemble field-erected cooling towers.

Although the company had previously installed two Series 3000 modules at a different plant location, this project was different in two respects. First, this project was significantly larger in scale. Second, whereas the previous project was a new installation, the current one involved replacement units that utilized the existing concrete cold-water basin. These differences coupled with the time constraints added complexity and risks.

Taking these factors into account, BAC's Series 3000 Cooling Tower was the ideal solution. The automotive plant was able to replace its existing (6) field-erected towers with (12) modular Series 3000 Cooling Towers while reusing the existing concrete cold-water basin.

A key factor in the company's decision was the installation time. Remarkably, the mechanical construction firm was able to install the full array of the Series 3000 modules in only four days, compared to the more than 60 days that would have been required to assemble a field-erected system of the same size and capacity.

As noted by Hassan Alhashim, the lead project engineer at ElitAire, "Instead of taking 2-3 months to erect site-built towers, the modules were each installed in about 3 hours, and the entire process from demolition to completion was accomplished well within the four-month window."

Moreover, the company was able to perform visual inspections and factory acceptance testing of the Series 3000 modules prior to their leaving BAC's factory, rather than relying on the more difficult and time-consuming process of performing these tests on site.

Compressing the schedule and reducing the risks of delays inherent in field construction projects was critically important to the automotive company, but so was reducing safety risks, a central component of their corporate culture. BAC's modular cooling towers are built offsite in BAC's factories under strict quality control and EHS standards. The modular towers are shipped to the job site when complete in upper and lower sections with minimal field assembly time. Using factory-built modular cooling towers reduced safety risks for the customer since the plant was not an active construction site for multiple months as it would have been with field-erected towers.

Learn more about BAC's Environmental Health and Safety (EHS) program by reading the company's Environmental, Social, and Governance (ESG) Report at www.baltimoreaircoil.com/sustainability.

The BAC Series 3000 modules were installed on the existing concrete cold-water basin.

ENDURADRIVE® Fan System motor.

Direct Drive Lowers Costs and Environmental Impact

In their old equipment, the customer had been using gear drive systems but decided to take advantage of BAC's direct drive ENDURADRIVE Fan System in the new cooling towers. Direct drive designs remove mechanical losses and thereby save energy compared to gear and belt drive systems, reducing costs and carbon footprint. Direct drive motors

Replacing Field-Erected Towers with Modular

ENDURADRIVE® Fan System Yearly Maintenance Savings vs. Gear Drive: 46 Hours/Year

Gear Drive	Monthly	Quarterly	Semi-Annually	Annually	Labor Hours	QTY/YR	HRs/YR
Inspect and tighten all fasteners, including oil plug			✓		1.5	2	3
Check for and repair oil leaks	✓				1.5	12	18
Check oil level	✓				1	12	12
Change gear oil			✓		3	2	6
Ensure gear vent is open			✓		0.5	2	1
Check driveshaft or coupling alignment			✓		2	2	4
Inspect and tighten driveshaft or couupling fasteners				✓	1	1	1
Oil Quality Testing		✓			1	4	4
Check driveshaft or coupling bushing/flex elements for unusual wear				✓	0.5	1	0.5
Total							49.5

ENDURADRIVE® Fan System	Monthly	Quarterly	Semi-Annually	Annually	Labor Hours	QTY/YR	HRs/YR
Inspect motor		✓			0.5	4	2
Grease bearing				✓	1.5	1	1.5
Total							3.5

Preventative Maintenance Schedules

employ efficient and reliable permanent-magnet technology and eliminate the expense and environmental impact of oil changes.

Gear drive systems require much more maintenance, including gear oil inspections and regular oil changes. For manufacturing plants that factor OSHA rules for work in confined spaces into purchasing decisions, direct drive fans require significantly less frequent entry for maintenance. This customer conducts their own maintenance in-house and by switching to the ENDURADRIVE Fan System, will realize an average annual operational savings of $95,664 and significantly reduced planned maintenance hours as shown in the Preventative Maintenance Schedules chart.

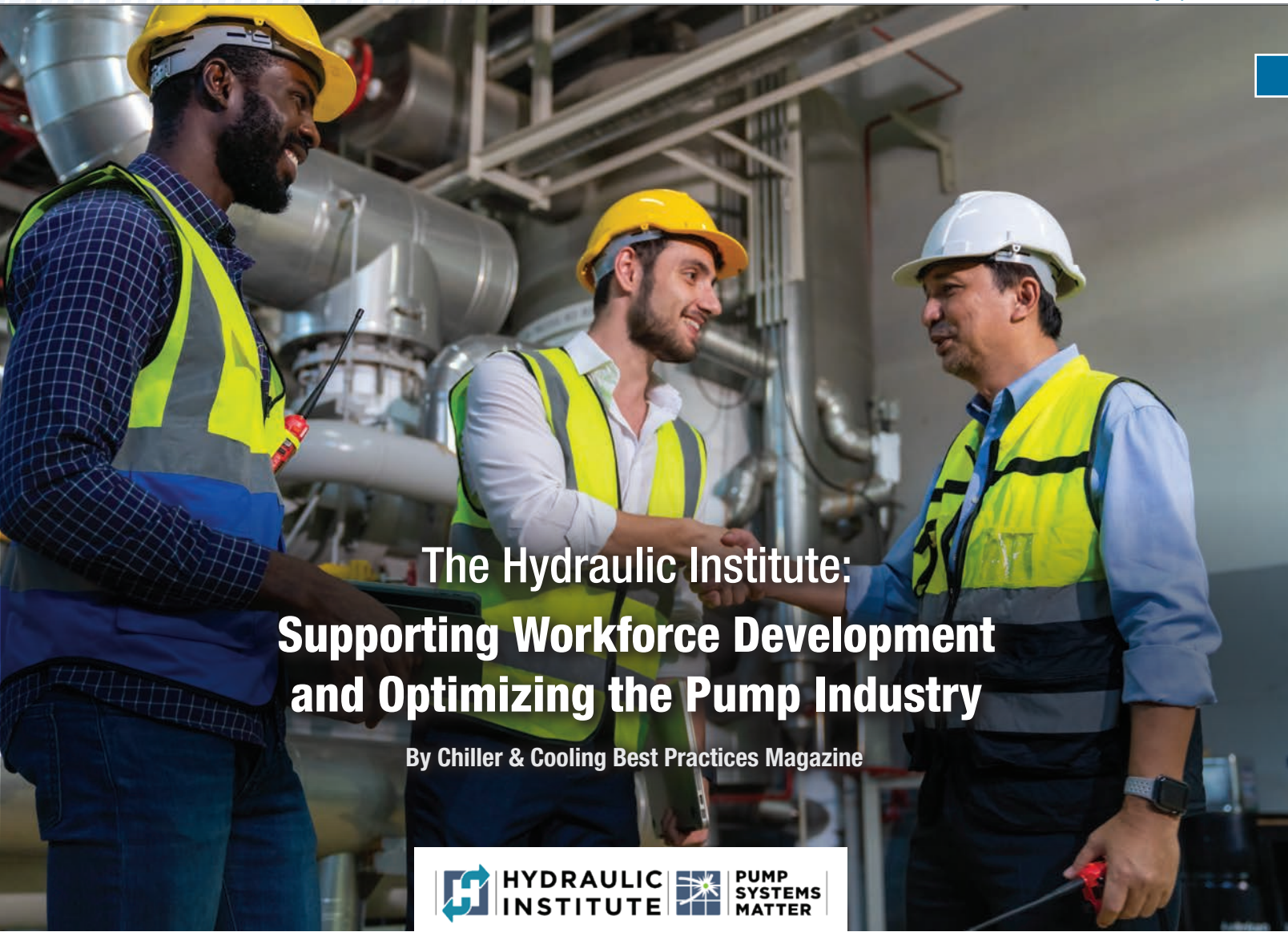
Conclusion

The Midwest automotive manufacturer's modular cooling towers from BAC equipped with the ENDURADRIVE Fan System were installed on time and on budget and have operated reliably while significantly reducing maintenance. Since this installation, the customer has continued to install modular Series 3000 units at other U.S. locations and choose BAC to meet its cooling needs. BP

For more information visit Baltimore Aircoil Company at https://baltimoreaircoil.com/home.

For similar articles on ***Cooling Towers*** please visit https://coolingbestpractices.com/index.php/technology/cooling-towers.

Visit our Webinar Archives to listen to expert presentations on ***Cooling Technology*** at https://coolingbestpractices.com/index.php/magazine/webinars.



The Hydraulic Institute: Supporting Workforce Development and Optimizing the Pump Industry

By Chiller & Cooling Best Practices Magazine

The Hydraulic Institute (HI) is a member-based trade association group that brings together the manufacturers of pumps, motors, drives, and other pumping equipment to create standards and improve the state of the industry. In this interview, Executive Director Michael Michaud tells us more about HI's work in the pump industry, workforce development resources and support of pump efficiency driven by the Department of Energy regulations.

Best Practices: Please tell us about HI.

Michael Michaud: HI was founded in 1917 by a group of pump manufacturers interested in standardizing how pumps were commercialized. The first standard that HI developed was the pump test standard, which provides a basis to compare different pumps' performance towards meeting the specified performance criteria. Today, HI maintains 36 ANSI/ HI Standards and a variety of guidebooks for various applications, including pump applications in commercial building services, pump system optimization and variable speed pumping, among many other topics as well as free white papers. Membership has grown as well, HI has over 120 members, including pump manufacturers but also suppliers of critical components for pumping systems, such as motors, drives, seals, bearings, and so on. In addition, HI has a growing group of partners who are not manufacturers but align with our core interests. Standards partners include

Michael Michaud, Executive Director, The Hydraulic Institute

The Hydraulic Institute: Supporting Workforce Development and Optimizing the Pump Industry

engineering firms that design and specify pumping systems and end-users like municipal water and wastewater or chemical processing facilities. Training partners include end-users and other organizations which both contribute to and consume training through Pump Systems Matter., Pump Systems Matter (PSM) was established as a subsidiary educational organization dedicated to training people on pumps and pumping systems. Over the years, HI's activities have also expanded into the certification of people, products, and processes as well as training.

Best Practices: Tell us more about PSM.

Michael Michaud: Pump Systems Matter (PSM), HI's educational foundation, supports the industry regarding strategic, broad-based energy management and pump system performance optimization by providing the marketplace with training, tools, and collaborative opportunities that progress sustainability practices into normal business operations. PSM provides product neutral training on energy efficiency, reliability, and effective applications of pump systems through an extensive catalog of live, virtual, and on-demand courses and webinars.

Best Practices: As executive director, what is your role within the Hydraulic Institute?

Michael Michaud: When I joined HI eight years ago, HI was in build mode. We built and launched several programs to prepare the market for changes in the regulatory environment. These include the HI Energy Rating Label, for commercial and industrial pumps, and public database so utilities can incentivize the purchase of more efficient equipment; the Pump Test Lab Approval Program to ensure pump testing meets the standard, and Pump System Assessment Professional (PSAP) certification for individuals who want to demonstrate their understanding of systems. HI also expanded the suite of web-based tools, calculators, and resources for pump users. Part of my role is to identify the types of programs that will benefit the industry and line-up the resources to make them happen. HI is very fortunate to have a strong team that includes staff and industry volunteers to do this. The other big

responsibility is to advocate for the industry. Everything from regulatory discussions to championing pumps – on Capitol Hill, in the upcoming legislative agenda, with other trade groups and by reaching out to universities and technical schools.

Best Practices: Can you expand on the DOE regulations?

Michael Michaud: The U.S. Department of Energy (DOE) started moving down the pump efficiency path when it began regulating certain commercial and industrial pumps in 2020. This effectively removed the least-energy-efficient pumps from the market – about 25 percent of the total. It is a good start, but real change will not be achieved unless we start replacing the installed base with more efficient pumps. The state revolving fund (SRF) programs have a green set-aside of 10 percent of their funds that must be spent on carbon-reduction initiatives. Most facilities have already identified the bad actors – equipment that often breaks down or requires maintenance. Starting with these usually provides the biggest payback and is also helpful when rolling out additional improvement programs.

Best Practices: What programs does HI have to support the DOE regulations?

Michael Michaud: From an assessment standpoint, HI's Pump System Assessment and Optimization courses teach operators how to look at their systems from an energy efficiency perspective and identify bad actors. HI's Pump Test Lab Approval Program and the HI Energy Rating Label help users calculate the real savings provided by actual pumps and determine the payback period. This is helpful information when selecting a replacement unit. Two major programs recognizing the HI Energy Rating are the U.S. Department of Energy (DOE) Extended Product Systems (EPS) Rebate Program and California's Statewide Water Infrastructure and System Efficiency™ (SW WISE™) Program.

Best Practices: What are the biggest challenges that the North American pump industry is currently dealing with?

Michael Michaud: HI conducts a quarterly CEO poll, and a top concern consistently revolves around workforce issues. Recruiting, training, and retaining top talent is the biggest long-term challenge our industry faces. When it comes to recruiting engineers and technical talent we are up against some strong competitors with dotcoms and start-ups. Increasingly, however, people want to work for companies – and industries –that contribute to society and make a difference. We started the World Without Pumps campaign to shine a spotlight on just how important our industry is today. We wanted to bring pumps out from behind the scenes and get folks thinking about the real role pumps play in modern life. We hope to attract young people who may never have considered it before as a career choice.

HI is also working closely with schools and universities to encourage more pumping in the curriculum and is expanding our suite of programs through PSM to help those looking to transition into the industry. Specifically, PSM has supported the U.S. Department of Energy (DOE) Industrial Assessment Center (IAC) program, is a federal initiative that provides no-cost energy efficiency assessments to small and medium-sized manufacturing facilities in the United States. PSM has supported students and faculty with training to help them identify pumping system savings opportunities while conducting their audits and developed a checklist to use as a prescreening tool during assessments.

I think the diversity of opportunities in our industry is hard to match in any other. When you think about it, pumps are not only used in virtually every industry, but they are also used in virtually every geography. This means that people seeking a career that is compatible with a particular lifestyle will likely find the perfect opportunity in our industry.

Best Practices: Many industries are grappling with shortages of specialized labor and supply chain issues. Are these also pressing concerns for Hydraulic Institute members?

Michael Michaud: Absolutely. On the labor front, HI is focused on expanding our supply of qualified technical workers. Our industry needs a range spanning from knowledgeable operators to seasoned engineers with everything in between. HI launched a career center this year profiling different job types in the industry with pointers to the different knowledge areas required for that job. On the supply chain side, this will continue to be a focus for a while as industry repositions its supply chains globally. Factors such as tariffs and different international trade policies will play a big part and HI will continue to track these for the industry and try to influence them when possible.

Best Practices: What resources does HI/PSM have to help attract and retain employees with limited resources?

Michael Michaud: This year we launched the Introduction to Pump Fundamentals Training, and the Pump and Systems Fundamentals Training which are training resources designed

The Hydraulic Institute: Supporting Workforce Development and Optimizing the Pump Industry

to provide convenient methods for learning, which can be easily adopted and integrated into companywide onboarding and training programs.

Free to all the employees of Hydraulic Institute Members, and Standards and Training Partners, the Introduction to Pump Fundamentals Training is delivered on a modern platform and includes videos with 3D images and animations to improve the learning experience. The content is broken out into six easily digestible 10-minute modules that cover pumps, drivers, fluid properties, system and pump curves, basic operating theory, and pump selection and data. Following completion of each module there are integrated quizzes that ensure the attendee knows the common industry language, pump types, components and the basics of operation and selection. These topics were developed at the introductory level so that it is beneficial for everyone entering or who are interested in the fluid handling industry.

For technical, sales or customer facing employees the Pump and Systems Fundamentals Training is the next step. This includes 13 topics at the fundamental level training, ranging in topics from Pump Power & Efficiency, Pump Selection, and Variable Speed Pumping with each topic lasting about 1 hour. Presented in a convenient on-demand format, each training topic is broken down into short modules with integrated quizzes to ensure understanding. The training topics can be taken individually as needed or as a full bundle. The goal is that upon completion, the attendee will have the core knowledge related to pump and system design so that they can evaluate application considerations and provide solutions.

The final piece of our workforce development initiative will be two levels of fundamental pump and system certification. The program guidelines for both certifications are nearly complete, which outline the body of knowledge and certification requirements. In early 2024 the certification committees will begin the examination development process with a goal of launching the level 1 certification exam in mid-year of 2024, with the level 2 certification exam following later in 2024. Level 1 certification indicates that an individual understands the purpose, function, and operating characteristics of positive displacement and rotodynamic pumps and systems. Level 2 certification indicates that an individual has applied knowledge of the purpose, function, and operating characteristics of positive displacement and rotodynamic pumps and systems. These certifications provide a standardized path for employees new to the industry, and individuals can leverage the fundamental training offerings to prepare. The fundamental nature of these certifications compliments the more specialized PSAP certification that is already in place and any other future job specific or specialized certifications that are developed.

Best Practices: How do you see pump technology developing over the next 5–10 years?

Michael Michaud: Pumps have been around since Archimedes, but there is still a lot of room for innovation. Some of the biggest improvements are on the intelligent side of things. Pumps today are much smarter than they used to be. Many have integrated sensors and controls which can adjust the speed of the pump automatically as the system requirements change and enable pumps to operate closer to the best efficiency point (BEP). Data feeds can send information to owners who can monitor their systems and track performance and energy use. For owners of large or complex systems, there is a clear case to hire specialists to monitor and conduct formal assessments of their pumping systems to ensure they are optimized – this is one reason HI developed the PSAP certification.

Best Practices: What is your vision for the future?

Michael Michaud: HI will continue to develop valuable programs for the industry and to drive more awareness of energy efficient pumps in new markets. The vision of PSM is getting pumping systems to operate at their best efficiency point (BEP). Perhaps it is more of a journey than an actual destination, as every system will have different needs, and these needs will change over time. If HI and PSM can help raise awareness of the BEP and what it means to a pumping system, its reliability, and its energy efficiency, then we are well on our way. The good news is that pump systems are everywhere, so the work will never end!

Michael Michaud is the executive director of the Hydraulic Institute. He can be contacted at mmichaud@pumps.org

To read similar ***Chilled Water Technology*** articles visit https://coolingbestpractices.com/technology.

Visit our Webinar Archives to listen to expert presentations on ***Cooling Technology*** at https://coolingbestpractices.com/magazine/webinars.

The Myth of Leak Repairs

By Tyler Costa, ALD Compressed Air Energy Solutions

A new compressed air system was able to translate lower demand into energy savings.

Is compressed air leak detection worth the effort? The question is regularly debated, and the answer is: it depends. There is no definitive answer, but compressed air leak detection should be carefully considered when evaluating a facility's maintenance plan. When discussing compressed air leaks, energy managers should follow this maintenance focused question checklist:

Compressed Air Leak Checklist

- Has a comprehensive leak survey ever been conducted?
- Are we controlling system pressure to ensure artificial demand doesn't creep back in after leaks have been repaired?
- For single air compressor systems, does our compressor have adequate controls to translate lower flow rates to actual energy saved (VSD, variable displacement, etc.)?
- For multiple air compressor systems, do we have a robust automation platform to translate lower flow rates to fewer air compressors online?
- Does our utility company offer rebates or incentives to help offset the costs of this effort?
- Once leaks have been identified, do we have an actionable plan and resources to repair the leaks?

If these questions are honestly addressed, and the answers point to actual savings that can be realized, then many times it does pay to have a leak detection and repair program. Consider it a demand side preventative maintenance (PM) plan to keep compressed air system efficiency in check, just like many facilities have PM plans for air compressors and ancillary equipment to keep them operating at peak efficiencies.

Success Story: Machine Shop in Hampton, Virginia

Recently, a facility followed these steps to evaluate their compressed air system, which led to great results for their operation. The facility is a large machine shop in Hampton, VA that provides service to the Department of Defense (DoD) and uses compressed air to run presses, lathes, sandblasting, paint booths among other processes. The facility had not been concerned with energy efficiency until a new maintenance manager prioritized reducing energy consumption.

The new manager discovered that the facility's 200 HP modulating air compressor was only fully utilized during brief periods of peak demand when sandblasting and painting operations were underway. The bulk of the time the compressor wasted energy when running highly modulated while underutilized. Identifying the problem, the maintenance manager reached out to his local Kaeser Compressor sales engineer to design a stronger compressed air system. With the help of the local Kaeser sales engineer, the maintenance manager installed an efficient system consisting of three BSD-60 air compressors that were staged to come online as needed by the Kaeser Sigma Air Manager 4.0 controller.

Improving the Process Side of the Compressed Air System

These changes marked a fresh, energy-efficient reset of the compressed air system at this facility, but the process side of the compressed air system had been neglected longer than the air compressors themselves. The hissing of

The Myth of Leak Repairs

"Before and After" pictures of a compressed air leak at the plant.

compressed air leaks had become the norm in this facility. The leaks came from old valves that could only be rebuilt using parts from valves scavenged from other parts of the facility, along with air hoses with so many holes that they would be better suited as irrigation lines.

To further improve the facility, the facilities manager took advantage of Dominion Energy's energy efficiency incentives offered through their Compressed Air program. Designed to help customers reduce energy, Dominion Energy's Compressed Air program offers a wide range of incentives that help offset the costs for facilities making energy efficient improvements to the demand side of compressed air systems. Leak detection and repair are eligible program measures and the facilities manager hired ALD to implement leak detection and repair measures.

ALD focuses on optimizing the efficiency of compressed air systems and specifically on demand side opportunities. Since the firm is not an air compressor distributor, it can work alongside compressor companies to offer value-add services to increase compressed air system efficiency for end users, which ends up being a win-win situation for all parties.

ALD's Demand Side Specialist team can rapidly address compressed air leaks through a "find & repair" method. With a knowledge of demand side operations and a box full of common consumables, specialists can fix most leaks without the need for a plant-wide shutdown.

The team identified 60 compressed air leaks at the Hampton, VA facility, wasting approximately 193 CFM. By the end of the weeklong project, the Demand Side Specialists repaired 42 leaks, saving 143 CFM and an estimated $17,307 in annual energy costs, as calculated by ALD.

With the help of the incentive from Dominion Energy and Honeywell, the payback on this project was less than four months and did not require the customer to expend any internal resources, leaving the maintenance team free to focus on keeping production running. After the "find & repair" effort, the facility operates only one of the air compressors, rather than the two compressors that were normally operated to satisfy demand. This allows for redundancy in their system and saves on maintenance costs.

Fundamentals are fundamental for a reason. When fundamentals like leak detection are neglected, best practices begin to slip. Inefficiency does not happen instantaneously, but slowly becomes the new norm as leaks or open blows are overlooked. Maintaining peak compressed air system efficiency is essential to streamlined operations. Better yet: it doesn't need to be complicated. A clear, concise, and actionable plan will prevent negligence and keep your operation up-to-date on energy efficiency and cost savings. BP

For more information contact ALD, Inc. at www.airleakdetection.net.

About ALD, Inc.

ALD, Inc. is the largest independent compressed air and vacuum auditing and professional services company on the West Coast. We specialize in industrial concierge services including, but not limited to, compressed air system assessments and design and have the capability to manage turnkey project implementations with guaranteed energy savings. ALD is also a major supplier for robust industrial automation platforms, ultrasonic leak detection equipment/services and many other energy efficient demand side compressed air parts and equipment. ALD administers the Industrial Compressed Air System Efficiency (ICASE) Program in northern and central California and is also a certified third party implementor for many utility companies across the U.S.

To read articles on ***Compressed Air Leak System Assessments,*** visit www.airbestpractices.com/system-assessments/leaks.

For expert presentations, visit our Webinar Archive Section dedicated to ***Compressed Air Measurement*** at www.airbestpractices.com/webinars.

Chiller & Cooling System Technology & Industry News

AHRI Presents Awards, Names 2024 Leadership

At its 2023 Leadership Forum in Miami, Fla., the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) recognized several HVACR industry leaders for their contributions to the HVACR and water heating industry. Awards were given in three categories: the Richard C. Schulze Award, which recognizes the industry-wide achievements of individuals also pursuing AHRI goals; the AHRI Public Service Award, for deserving individuals or organizations making a significant contribution to the HVACR industry and in furthering AHRI goals; and the AHRI Distinguished Service Award, the association's highest honor, recognizing industry leaders who have made considerable contributions throughout their careers.

Richard C. Schulze Award winners include:

- Bob Brown, WaterFurnace International
- David Calabrese, Daikin U.S. Corporation
- Shawn Hern, Climate Master
- Todd Michael, Trane Technologies

Bob Brown, Vice President for Engineering and Research at WaterFurnace, is the current chair of the Water Source and Geothermal Heat Pumps Standards Technical Committee. He's been an active participant in AHRI for many years, including in his recent work as a key developer of the new AHRI 600 test standard. Brown's efforts were instrumental in advancing the standard to better align with the requirements of the Department of Energy.

David Calabrese, Senior Vice President of Government Affairs and Deputy General Manager at Daikin U.S. Corporation, has been active with AHRI since 2008. He's served as a leader in the industry at critical times, becoming the Chair of the Safe Refrigerant Transition Task Force and the Vice Chairman of the Board of the Alliance for Responsible Atmospheric Policy. His international, legal, regulatory, and legislative expertise will continue to benefit U.S. manufacturing for years to come.

Shawn Hern, Engineering Director for New Product Development at Climate Master, is an active member of the Water Source and Geothermal Heat Pump Standard Technical Committees as well as some Standard Working Groups. His work has been key to developing tools and testing standard language for the brand-new IEER test standard for geothermal and water source heat pumps. In addition, his efforts during and outside of working group meetings were instrumental in finalizing the AHRI 600 standard.

Todd Michael, Heat Transfer Engineer at Trane Technologies, brings more than three decades of experience to AHRI as an expert in heat exchange coiler design and standards development. He has been the driving force for updates to Standard 410, which will soon be submitted to the AHRI Standards committee. His work ensures that the standard will detail the design and rating of air coils that are not included in other standards, further promoting energy efficiency, sustainability, and the overall value of AHRI standards.

The Public Service Award was presented to Ralph Suppa, formerly President and General Manager of AHRI partner organization the Canadian Institute of Plumbing and Heating (CIPH). During his time at CIPH, Ralph cultivated key relationships with both AHRI and U.S. HVACR and water heating manufacturers. His expertise was a key factor in the Canadian Government's decision to accept AHRI equipment as meeting Canadian regulations. The move enabled AHRI member companies to ship products across the Northern border without performing additional efficiency testing. His relationships within federal and provincial Canadian governments have proven invaluable to AHRI's policy team and members to achieve policy goals and share industry knowledge.

Gary Bedard, 2024 AHRI Chairman.

Distinguished Service Awards were presented to two past AHRI chairmen for their contributions to the industry:

- Keith Coursin, Desert Aire
- Doug Young, Lennox International

Keith Coursin has served as President of Desert Aire for 33 years, and recently announced his retirement effective at the end of 2023. Coursin has been extremely involved in AHRI, having served as Dehumidifiers Product Section Chair, AHRI Treasurer, and as Chairman of the AHRI Board of Directors. He has also served on – and chaired – multiple committees, including Budget & Investment, Compensation, Nominating, and Strategic Planning. He also was the longest serving member of the AHRI Expo Policy Committee. During his time, he helped oversee the exponential growth of the event as it became one of the largest and best-attended HVACR and water heating shows in the world. He was honored by his colleagues and AHRI staff with a lengthy standing ovation during the award presentation at the 2023 Leadership Forum.

Doug Young joined Lennox International in 1999 as Vice President and General Manager

Chiller & Cooling System Technology & Industry News

of Lennox North American Residential Sales, Marketing and Distribution, as well as serving as the President and CEO of Lennox's residential heating and cooling segment. Prior to his work with Lennox, he held several leadership roles in the appliance division of General Electric. Before his retirement, Young was very active in AHRI. He served as the 2016 Chairman of the AHRI Board of Directors, a member of the Rees Scholarship Foundation Board of Directors, a member of the Audit Committee, and Chairman of the Budget & Investment, Strategic Planning, Compensation, and Nominating Committees. His knowledge and experience spanned all four of AHRI's industry sectors, providing valuable insight to his colleagues and AHRI staff.

"It is especially important to recognize the leaders who drive growth and success in the HVACR and water heating industry, as they serve as positive examples for others," said Stephen Yurke, AHRI President and CEO. "AHRI congratulates this year's award recipients, and we are very appreciative for their dedication and hard work, which has helped make life better for Americans and people all across the globe."

The AHRI Nominating Committee also named the association's Board of Directors and officers for 2024:

Officers:

- Gary Bedard, Lennox International, Chairman
- Brent Schroeder, Copeland, Vice Chair
- Megan Fellinger, Morrison Products, Vice Chair
- Kevin Beckett, R.W. Beckett, Treasurer
- Kevin Wheeler, A.O. Smith, Immediate Past Chairman

The AHRI Board of Directors selected Gary Bedard, Executive Vice President, President, and COO at Lennox, to serve as the 2024 Chairman. Bedard has been involved in AHRI's mission for years, bringing decades of experience in refrigeration and residential systems. He currently chairs the Budget and Investment Committee and is a member of the Compensation, Nominating, and Strategic Planning committees.

Board of Directors:

- Mike Branson, Rheem Manufacturing
- David Budzinski, Johnson Controls
- Bruce Carnevale, Bradford White
- Tim Figge, Hussman
- John Kramer, Cambridge Air Solutions
- Donny Simmons, Trane Technologies
- John Thomas, WaterFurnace International
- Yogi Uemura, Daikin U.S. Corporation
- Philip Windham, Nortek Global HVAC

About AHRI

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) is the trade association representing manufacturers of air conditioning, heating, and commercial refrigeration, and water heating equipment. An internationally recognized advocate for the industry, AHRI develops standards for and certifies the performance of many of these products. AHRI's 300+ member companies manufacture quality, efficient, and innovative residential and commercial air conditioning, space heating, water heating, and commercial refrigeration equipment and components for sale in North America and around the world. For more information, visit www.ahri.org.

The new three-year agreement covers the production and distribution of sustainable refrigeration solutions in a global scale.

Embraco and Beijer Ref Renew Global Partnership

Embraco, a global provider of refrigeration technology and a portfolio brand of Nidec Global Appliance, and Beijer Ref, a leading wholesaler of cooling technologies and air conditioning, announced a new three-year partnership renewal. First established in 2015, the long-lasting alliance aims to strengthen their position in the wholesaling business and boost the distribution of a complete refrigeration portfolio at a global level.

Embraco's brand solutions for commercial and residential refrigeration are sold in 90 countries and the Beijer Ref Group has 150+ subsidiaries and 500+ branches spread across 45 countries.

"Since the beginning of the agreement, Embraco and Beijer Ref have had expressive business growth, across all the regions they cover. With the partnership renewal, it will be possible to keep combining our high quality, sustainable refrigeration solutions with the advantage of a distributor with a high level of capillarity," said Daniel Campos, Commercial Appliance Vice President at Nidec Global Appliance.

"We are pleased to renew our long-established endeavor and expertise with Embraco and satisfied with the agreement's growing potential. This fruitful teamwork makes it possible to fortify our position worldwide and provide refrigeration technicians, installers and small OEMs with an extensive set of products," said Christopher Norbye, CEO, Beijer Ref.

The most recent action of both companies is the widening offer of a complete portfolio of condensing units, including unhoused, housed and silenced options for installers and manufacturers, which can be used in indoor contexts such as supermarkets and professional kitchens and outdoor ones, such as gas stations.

"Our task ahead is to expand our product offering and consolidate our leadership as a company which foresees the trends of the refrigeration market, while offering our customers the most complete product portfolio and serving them best," said Campos.

For more information, visit www.embraco.com.

Frigel Introduces 4DK Adiabatic Cooler

Leveraging its extensive experience in process cooling and utilizing the latest technologies available today, Frigel introduces a brand-new range of adiabatic coolers: 4DK. This marks another step towards expanding the proven Ecodry platform's success into new sectors and applications.

"We are now introducing the new 4DK range, which is very close to our hearts at Frigel," said Massimiliano Dall'Armellina, head of marketing. "Our goals were focused on sustainability. We have created a solution to help future customers keep up with their competitors through increased operational efficiency: more water savings, more energy savings, or both. We already had a strong foundation to build upon, but we raised the bar even higher: improved materials for a product capable of meeting even the most demanding industrial environments, better compliance with national anti-legionella regulations, all while reducing investment costs in €/kW for our customers."

Adiabatic cooling plays a key role in technological advancement, especially in relation to the replacement of evaporative cooling towers. This is driven by many factors, including strategies to enhance overall efficiency, the growing industrial community's desire to embrace "green" solutions, and products that are environmentally hygienic and safe.

"The operational parameters of the new 4DK provide a significant advantage over other solutions," said Dall'Armellina. "Its modular design seamlessly adapts to a wide range of demands in both traditional sectors and emerging areas. We take pride in designing a more efficient and sustainable industry."

About Frigel Group

Frigel Group is an innovator in the field of process cooling and temperature control technologies related to many segments, including Plastic & Rubber, Food & Beverage and Industrial Process Cooling in general. The company is committed to creating a more sustainable industry and better living conditions for people, by focusing on water preservation and energy efficiency. Our installations can be found in more than 100 countries, contributing globally to a healthier environment.

Frigel 4DK adiabatic cooler.

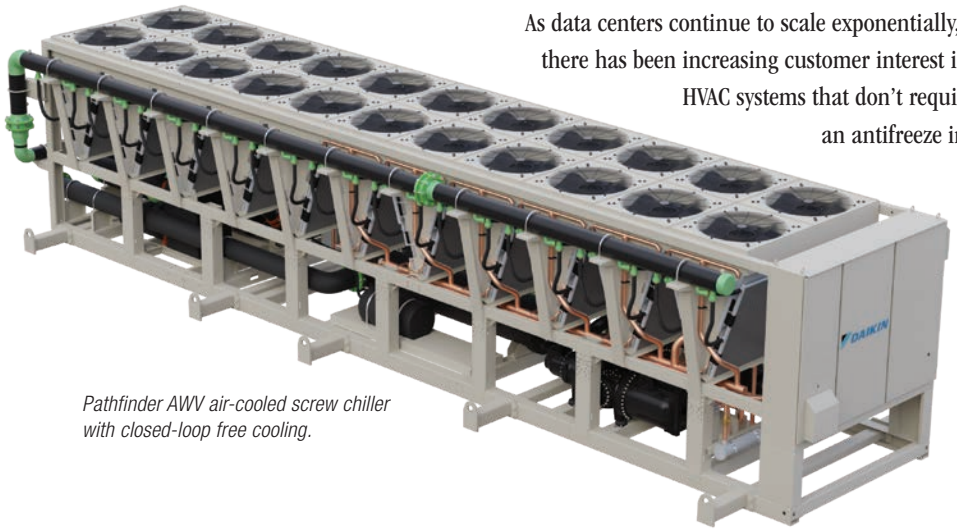
Frigel is headquartered in Florence, and has several manufacturing sites in Italy, Thailand, Brazil, and India. For more information, visit www.frigel.com.

Chiller & Cooling System Technology & Industry News

New Daikin Applied Air-Cooled Scroll & Screw Chillers

Daikin Applied announced two new products to its lineup of Trailblazer air-cooled scroll and Pathfinder air-cooled screw chillers, building on the company's commitment to helping customers decarbonize facilities. Daikin's new Trailblazer (model AGZ-F) is one of the first chillers available in North America with low-global warming potential (GWP) and highly efficient R-32 refrigerant. The company has also added a closed-loop version of the Pathfinder with Free Cooling (model AWV) to its portfolio. Ideal for data centers and other energy-intense applications, this chiller delivers the efficiency benefits of an integrated water-side economizer, while eliminating the need to use glycol in the building water loop as an antifreeze.

"There is no single path to reducing a facility's carbon emissions and climate impact. It takes a combination of low-GWP refrigerants and efficiency gains, along with electrification technologies, to make significant strides," said Jim Macosko, vice president of product and sustainability solutions at Daikin Applied. "The latest chillers are two additions to the extensive toolkit we have to help customers wherever they are on their decarbonization journey."



Pathfinder AWV air-cooled screw chiller with closed-loop free cooling.

While there are other low-GWP refrigerants on the market, the low-GWP plus high capacity and efficiency of R-32 is a leading combination for decarbonization. With R-32, Trailblazer AGZ-F delivers 10% greater capacity and efficiency versus previous models, with the potential to provide cost savings and reduce carbon emissions. Also, with a 33% reduced footprint and 10% reduced weight, AGZ-F presents a more compact solution for engineers, contractors, and building owners and operators cognizant of limited space.

With a 30- to 240-ton range, AGZ-F features composite condenser fan blades for a simpler mechanical design with less potential for part failures and related maintenance spend.

The use of R-32 proactively addresses federal legislation to phase out higher-GWP refrigerants such as R-410A. Along with the new Trailblazer chiller, Daikin is working to integrate R-32 into more of its applied offerings. R-32 requires a lower refrigerant charge per ton of cooling compared to popular alternatives, reducing the amount of refrigerant needed. Additionally, R-32 has a positive impact on unit efficiency, which trims the kilowatt-hour consumption and grid-level emissions associated with electricity grids that rely heavily on fossil fuels.

As data centers continue to scale exponentially, there has been increasing customer interest in HVAC systems that don't require an antifreeze in the facility water loop. The Pathfinder AWV with Closed-Looped Free Cooling eliminates the need to add glycol to the building's water loop to prevent freezing in colder climates. By pairing an intermediate heat exchanger with the chiller, glycol can be used outdoors in the chiller, but remains isolated from the building water loop.

Closed-loop free cooling uses outdoor air to naturally cool the fluid loop, reducing compressor work and increasing chiller efficiency.

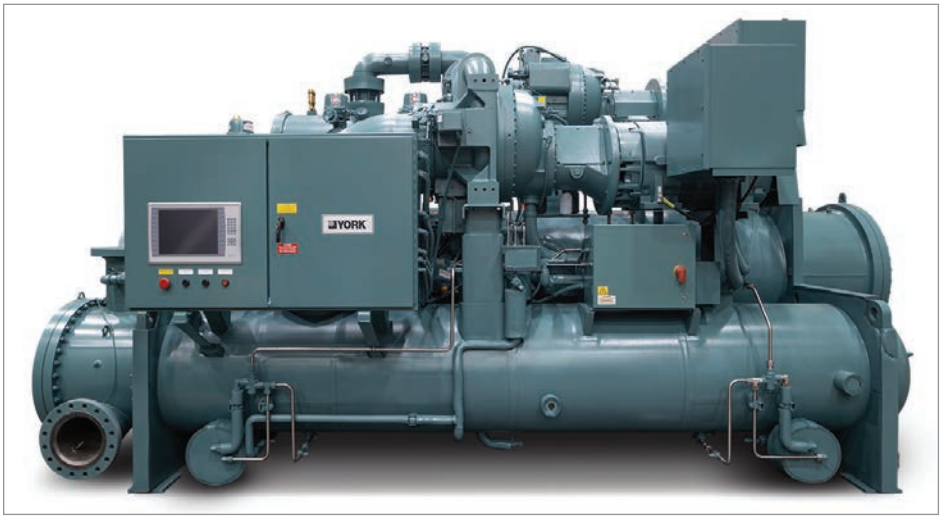
About Daikin Applied Americas

Daikin Applied, a member of Daikin Industries, Ltd., designs and manufactures advanced commercial and industrial HVAC systems for customers around the world. The company's technology and services play a vital role in creating comfortable, efficient and sustainable spaces to work and live – and in delivering quality air to workers, tenants and building owners. Daikin Applied solutions are sold through a global network of dedicated sales, service and parts offices. For more information, visit www.daikinapplied.com.

New YORK 400-ton CYK Centrifugal Heat Pump

Johnson Controls, the global leader for smart, healthy and sustainable buildings, has re-engineered the industry-leading YORK CYK Water-to-Water Compound Centrifugal Heat Pump to deliver superior operational savings and stringent sustainability standards. Now available in a smaller 400-ton capacity, the newly launched YORK CYK heat pump fills a North American market gap by providing a practical, right-sized decarbonization solution for use in existing commercial building applications.

"As part of our ongoing commitment to sustainability, we have evaluated our legacy equipment roster to develop future-ready



The smaller 400-ton CYK heat pump model joins the existing 600 – 2,000-ton product line to extend application to more commercial facilities.

solutions that meet the rapidly evolving sustainability requirements faced by today's building professionals," said Todd Grabowski, vice president and general manager of Applied Equipment at Johnson Controls. "The CYK is a prime example of this innovation and supports the brand message of YORK applied equipment that 'We're Not Waiting for the Future. We're Engineering It.' The base design surpasses ASHRAE 90.1 standards for energy efficiency and provides the flexibility to further enhance efficiencies based on the unique needs of each building."

The YORK CYK can reduce water and operational costs by as much as 50% when compared to traditional boiler and chiller applications. The YORK CYK heat pump is available with optional ultra-low GWP refrigerants, R-1234ze and R-515b, to further support decarbonization and net zero goals.

Additionally, the heat pump delivers high-temperature hot water up to 170°F by utilizing two electric motor-driven centrifugal compressors arranged in series. The design achieves simultaneous hot and chilled water cooling within the same equipment making it three-to-five-times more efficient than a traditional boiler and chiller combination. With the addition of an innovative double bundle condenser technology, the CYK can effectively manage unbalanced load conditions – high cooling load with low heating load – in a more compact footprint than alternative solutions.

In addition to reduced carbon emissions, the YORK CYK heat pump delivers significant savings through reduced annual water and operational costs, and a streamlined installation process. The innovative design is compatible with existing high-temperature hot water heating systems, eliminating the need to replace air handlers and terminal heating devices, which is often required to accommodate the lower water temperatures associated with other heat pump products. When these benefits are combined, building professionals can expect a short-term payback on the equipment investment.

The YORK CYK heat pump is ideal for medium to large commercial buildings, university campuses, hospitals, industrial processes and district energy applications and can be used in new building or retrofit applications.

Trane Awarded Gen4 IDIQ Contract with Department of Energy

Trane, by Trane Technologies, a global climate innovator, has been awarded the Department of Energy's (DOE's) Generation 4 (Gen4) Indefinite Delivery Indefinite Quantity (IDIQ) energy savings performance contract (ESPC). This government-wide vehicle allows Federal agencies to leverage private capital and utility cost savings to reduce energy consumption, decarbonize, and enhance the resilience of Federal facilities. Trane has held a DOE IDIQ contract for 25 years.

Trane is one of 20 DOE IDIQ contractors who can compete for individual ESPC programs to accelerate the deployment of third-party capital in support of efforts to achieve the ambitious goals of Executive Order 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability.

The Gen4 contract carries a $5B contract ceiling over 10 years. On the previous contracts, Trane has executed several ESPC projects at Federal Facilities, resulting in a:

- total energy savings of nearly $350 million;
- total fuel savings of 15,062,285 MBTU, or the annual energy use of 394 homes*;
- total water savings of 1,472,309 kGals of water, the equivalent of 3,004 Olympic swimming pools; and an
- average consumer baseline energy consumption reduction of 32.2%.

"Trane is ready to deepen our longstanding relationships and expand to additional Federal agencies to help them accelerate their transition to clean energy and assure their missions," said Jody Wilkens, Vice President, Federal, Trane. "This most recent IDIQ clears the way for projects through

Chiller & Cooling System Technology & Industry News

the end of the decade and further supports Trane Technologies' 2030 Sustainability Commitments."

*Calculated using the EPA's Greenhouse Gas Equivalencies Calculator

About Trane

Trane – by Trane Technologies, a global climate innovator – creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, visit www.trane.com.

New YORK Air-to-Water Inverter Scroll Modular Heat Pump

Johnson Controls announced the launch of the next-generation YORK YMAE Air-to-Water Inverter Scroll Modular Heat Pump – a high efficiency air-to-water heat pump for the North American market. The YORK YMAE is a sustainable, future-ready solution for offices and schools that want to minimize their environmental impact and electrify their heating and cooling. The YORK YMAE uses R-454B, a refrigerant that cuts climate impact by nearly 80% compared with R-410A refrigerant. The YMAE will be offered in single and packaged-module configuration.

"The YORK YMAE heat pump is a proven industry leader around the world, and we're proud to further optimize its design and make it available to a new market," said Andrew Graybill, director of product management for air-cooled chillers, Johnson Controls. "Its efficient performance and low-GWP refrigerant will empower customers in North America through a sustainable, future-ready heating and cooling solution."

By utilizing low-GWP R-454B, the YMAE is compliant with upcoming regulations by the U.S. Environmental Protection Agency (EPA) through the American Innovation and Manufacturing (AIM) Act. The AIM Act directs the EPA to phase down hydrofluorocarbon (HFC) production and use by 85% over the next 15 years, with the next major phasedown going into effect Jan. 1, 2024. In addition to the YMAE, YORK will use R-454B across all its scroll compressor products.

The advanced YORK YMAE features all new hardware, including new-to-market, electronic vapor injection (EVI) scroll compressors, updated heat exchangers and an optimized frame. EVI technology significantly improves system capacity and efficiency and allows the YMAE to provide high water temperatures at low ambient conditions.

Highly flexible, the modular YMAE features two-pipe and four-pipe versions and serves a wide range of applications. The four-pipe system makes it possible to simultaneously heat and cool different areas of a building by moving heat from one area to another, improving efficiency and occupant comfort. The heat pump's modular design makes it possible to multiply capacity with a minimal footprint. Up to four modules can be kitted together, factory-tested and shipped as a single unit, simplifying installation and speeding up commissioning. The YMAE joins the YORK family of heat pumps which serve applications that range from small commercial buildings to district heating.

YORK YMAE two-module configuration.

The YORK YMAE will be available on a short lead time. Units will be available to order and begin shipping this year. Product details can be found in Johnson Controls Solution Navigator.

About Johnson Controls

At Johnson Controls, we transform the environments where people live, work, learn and play. As the global leader in smart, healthy and sustainable buildings, our mission is to reimagine the performance of buildings to serve people, places and the planet. For more information, visit www.johnsoncontrols.com.

Kelvion Expands Production Capacities

Energy-efficient and cost-effective heating and cooling applications are booming. According to the German Heat Pump Association, heat pump sales in Germany alone increased by 53% in 2022 compared to the previous year. In view of this development, more heat exchangers are needed for the heat pump market. That is why Kelvion has expanded its production capacities in Sarstedt. The site can now produce an additional 150,000 heat exchangers per year. This is an important step towards sustainably strengthening the region and the mayor of Sarstedt Heike Brennecke and City Manager Andrea Satli took the opportunity to visit the plant to personally congratulate the local management on the successful expansion. Kelvion is currently looking for staff in various areas of production and administration.

During the factory tour, Heike Brennecke and Andrea Satli gained an insight into Kelvion's

Sarstedt's mayor Heike Brennecke (left) congratulates on the start-up.

production processes. "I am very pleased that Kelvion is investing further in our location with the expansion of the production halls," said Brennecke. "With state-of-the-art technologies and efficient heat exchangers, which are used in almost all buildings and machines these days, Kelvion makes a significant contribution to climate protection. Kelvion is one of the largest employers in Sarstedt. This strengthens our town and the region. The course for the future has been set."

Regardless of the short-term cooling in the market, the growth prospects for heat pumps remain positive. Kelvion has invested a total of 4.3 million euros in manufacturing capacity for brazed heat exchangers. "We have put all processes to the test and optimized them so that we can meet our customers' needs and achieve even shorter lead times. With two production lines, we can significantly increase our output as a result," said Christian Wendel, plant manager. "Until now, orders for the heat pump industry were primarily produced by our plant in Nobitz-Wilchwitz. We in Sarstedt are therefore very pleased to support our colleagues in Nobitz-Wilchwitz in the future and to continue to grow at the Sarstedt site."

For more information, visit www.kelvion.com

Advertising/Editorial Rod Smith • rod@airbestpractices.com • Tel: 412-980-9901
Subscriptions Administration Patricia Smith • patricia@airbestpractices.com • Tel: 412-980-9902
A Publication of Smith Onandia Communications LLC
37 McMurray Rd., Suite 104, Pittsburgh, PA 15241

THE MARKETPLACE

TECHNOLOGY & JOBS

Job & Product Marketplace Advertising Information

Reach 16,200+ readers of Compressed Air Best Practices® Magazine with Marketplace Ads every month! Job Marketplace ads are also placed for one month on www.airbestpractices.com and promoted in our three monthly e-newsletters.

Ad dimensions are 2.36" wide x 3.91" tall. We can help you design the ads. Send us your logo, product photo, and text to rod@airbestpractices.com. We recommend 20-50 total words of text.

Prices are $625 per Job or Product Marketplace Ad ($440 if 6 or more ads are placed). Contact Rod Smith at rod@airbestpractices.com to schedule your Marketplace Ads.

METPOINT®
Instrumentation

The precise measurement of humidity, hydrocarbons, flow, temperature, and pressure provide the foundation for various analyses, documentation, and decisions as they relate to compressed air systems. Potential overload (e.g. excessive air velocity) or malfunctions can be detected early, and quickly and reliably, which allows for the most precise and economical optimization of all plant components. The use of superior quality, industrial grade measurement equipment eliminates all the guesswork.

Accuracy and Quality

Accuracy and precision are both required for the best quality observations and to ensure you receive both, only the finest raw materials and most reliable sensing technologies are used.

Purpose Built

Designed specifically to monitor compressed air and provide you with the widest range of purpose built instrumentation without any additional noise.

Quality Assurance

Reliable, condition independent measurements, that require no adjustment, and provide long-term trends are how you validate your processes.

+1 (800) 235-6797

www.bekousa.com

Truth in Compressed Air

Reliable | Efficient | Innovative

Your equipment will only perform as good as the air you feed it.

Think of the detrimental effects of dirty, wet air going through your equipment day in, day out. The performance and life of your equipment depends on the quality of the compressed air powering them.

Trust KAESER for the most reliable compressed air systems engineered to deliver clean, dry air – exceeding the highest expectations for durability, energy-efficiency and performance year after year.

KAESER COMPRESSORS®

us.kaeser.com/cabp • 866-516-6888