Reliable, Safe and Energy/Water-Efficient Systems Powering Automation

COMPRESSED AIR | CHILLER & COOLING BEST PRACTICES

airbestpractices.com

coolingbestpractices.com

September 2021

Transportation

6 Corporate GHG-Reduction News

14 The Gentex Journey to Reliable Energy Conservation

24 Sullivan-Palatek's Passion Drives Success

40 Remote Monitoring Takes Off for Aerospace Firm

56 Cooling System Pillars at Röchling Automotive

FOOD & BEVERAGE PROCESSING & PACKAGING MONTHLY FEATURE

34 Compressed Air Dryer Key Performance Indicators

SUPPLEMENT INSIDE!

Ready for 100% Quality Air?

You've spent years developing the perfect product and we bet oil or microorganisms were not part of the plan. Without putting the right equipment and testing in place, potentially harmful microorganisms can thrive in your compressed air system and damage the integrity of your products and processes. That's why we've developed a two-fold solution. First, a range of audits based around air quality that can be performed on any system. Second, prevention always beats cure! Our multi-level product and service offering guarantees dry, oil-free air that's matched to your budget and efficiency goals.

It's not just about your compressor – it's about the entire compressed air system working together to keep your production safe. Peace-of-mind is only a call or click away.

866-472-1013

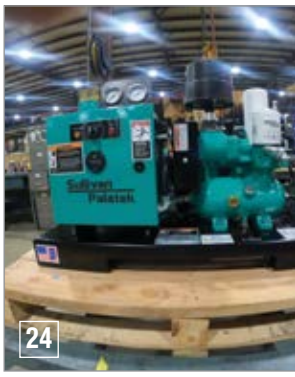
www.atlascopco.com/air-usa

QUALITY, SAFETY & RELIABILITY FEATURES

24 **Sullivan-Palatek's Passion Drives Continued Success**
By Mike Grennier, Compressed Air Best Practices® Magazine

30 **HAUG Oxygen Compressors for Efficient Gold Extraction**
By Paul Frank, Sauer Compressors USA

34 **Compressed Air Dryer Key Performance Indicators**
By Chris Beals, Air System Management



SUSTAINABILITY & ENERGY/WATER EFFICIENCY FEATURES

14 **The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems**
By John Bilsky, Gentex Corporation

40 **Remote Monitoring Takes Off for Aerospace Manufacturer**
By Nicolas De Deken, ENERGAIR

50 **The Benefits of Variable Speed Drives for High-Load Chiller Operations**
By Kiran Kishor Waghmare, Johnson Controls

56 **Efficiency and Redundancy: Cooling System Pillars at Röchling Automotive**
By Tom Stone, Thermal Care

SUPPLEMENT ON PAGE 47!

SUSTAINABILITY & EFFICIENT TECHNOLOGY NEWS

6 **Corporate GHG-Reduction News**
Featuring: Magna, Röchling Group, Stellantis, Daimler, Crown, McDermott, Bosch

61 **Compressed Air Technology**

63 **Chiller & Cooling Technology**

EVERY ISSUE

4 **From the Editor**

64 **Advertiser Index**

64 **The Marketplace** | Jobs and Technology

COVER PHOTO. Photo provided courtesy of GENTEX Corporation.

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

We are investing more than ever in bringing quality educational content to the market. Recent content includes the seven (7) feature articles in this September 2021 print magazine issue, e-newsletters delivering press releases and articles, an August Webinar attended by 700+ people or our upcoming Best Practices 2021 Expo & Conference in November.

This note is to thank all of our content contributors and more than 16,000 readers for your support and interest in "Best Practices" as they relate to compressed air, blower, vacuum, chillers and cooling systems.

I'd like to personally ask all our readers to consider attending our Best Practices 2021 Expo & Conference taking place November 2-4, 2021 – at the Schaumburg Convention Center located in the Chicago outskirts near O'Hare International Airport. Please mark your calendars and register at https://cabpexpo.com.

There are different ways and budgets to visit the Best Practices 2021 Expo & Conference:

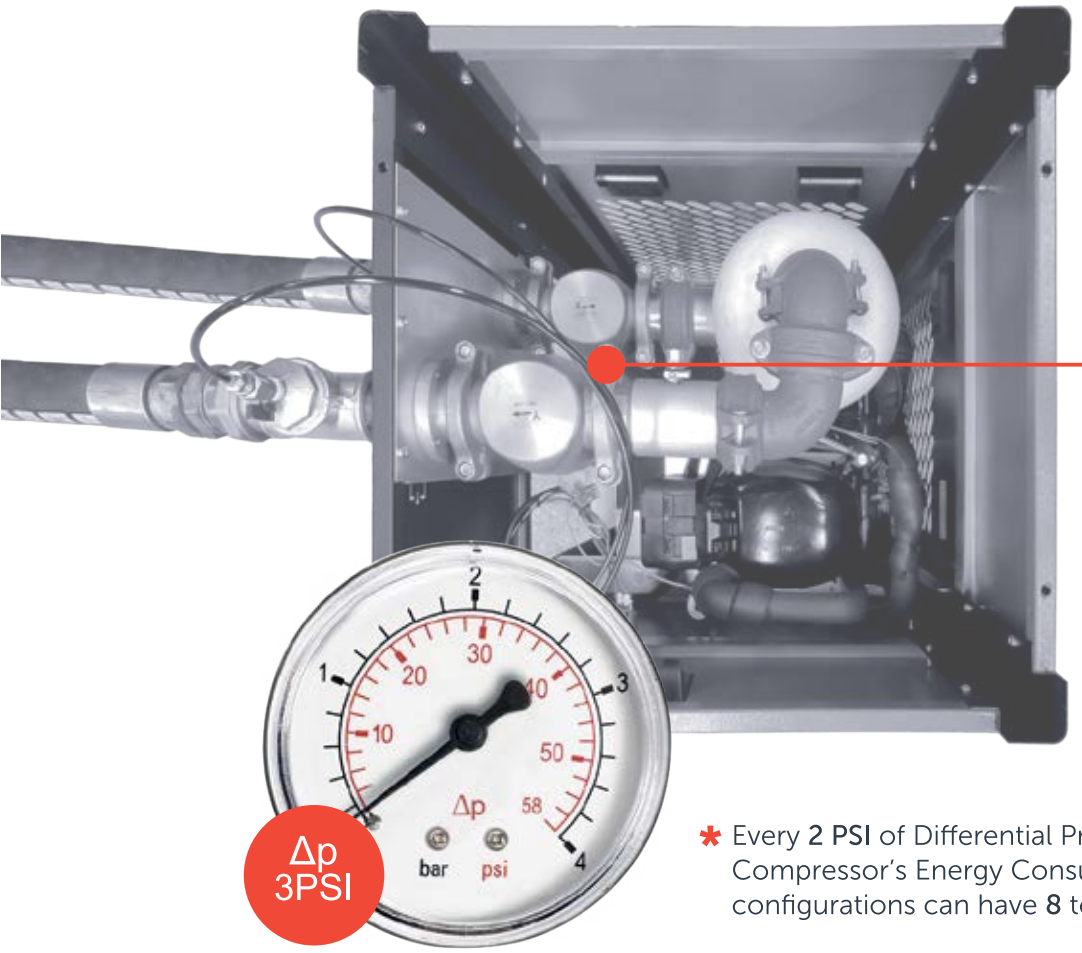
- Visit the EXPO show floor, for $15, to see 80+ exhibitors of compressed air, chiller, blower/vacuum, measurement/automation and motor technologies. Attend the Technology & Maintenance Classroom to learn to maintain and operate this equipment.
- Visit the EXPO show floor, for $15, and sign up to take the Certified Compressed Air System Specialist (CCASS) Exam administered by the Compressed Air & Gas Institute (CAGI). Cost is $450.
- Receive Level 1 Compressed Air Challenge training and attend the full Conference and EXPO (cost is $475 before September 22, 2021).

We hope to see you in November and 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

mikropor
Manufacturing Forward

Save up to *5% Power from the Feed Air Compressor



Engineered and integrated Pre/Post Filtration with greater media surface

* Every **2 PSI** of Differential Pressure equals to **1%** of Feed Air Compressor's Energy Consumption. Other Filters and Dryer configurations can have **8** to **12 PSID** or more.

- Complete Air Treatment (less than 3 PSID differential - CAGI Verified)
- Engineered Pre/Post Filtration with greater media surface
- Highly Efficient, Ultra Low Pressure Differential Heat Exchanger
- Air Quality Class 1.4.1 as per ISO 8573

MEMBER OF CAGI Compressed Air & Gas Institute

MK-US & MCY-US
Air Treatment Packages

Please contact us for a Complimentary Consultation
support@mikroporamerica.com

4921 Ohio Street, Michigan City, IN 46360

www.mikroporamerica.com

CORPORATE GHG-REDUCTION NEWS*

Featuring: Magna, Röchling Group, Stellantis, Daimler, Crown, McDermott, Bosch

* Scope 1 and 2 GHG Emissions from Direct Operations

Magna Commits to Carbon Neutrality in Global Operations by 2030

AURORA, Ontario, April 22, 2021 – Magna enters a new era in the company's sustainability journey with its announcement to achieve carbon neutrality in its operations by 2025 in Europe and by 2030 globally.

"While sustainability has long been ingrained in Magna's culture, this decade will be our most decisive yet as we accelerate our efforts to protect the planet for future generations," said Magna CEO Swamy Kotagiri. "We believe achieving carbon neutrality is both a social responsibility and a business imperative in the fight against climate change. This ambitious – and achievable – goal is rooted in a science-based approach that aligns with the Paris Climate Accord and places us among industry leaders in Europe and North America."

In 2020, 12% of Magna's global energy buy was from renewable energy sources, and plans are in place to transition all operations globally to renewable energy sources. In addition, over 91% of total waste outputs last year from operations were recycled or otherwise diverted from landfills.

At the same time, the company remains focused on delivering products that help customers achieve their own sustainability goals, including reaching a zero-emissions future and improving fuel economy. Such products include a suite of e-powertrain solutions, active-aerodynamics, and lightweight structures and exterior components.

"Delivering a sustainable, safer and more accessible future for all who share the road and the world drives our business decisions and fuels our innovations. Importantly, we are working alongside our customers, suppliers and employees throughout this journey," added Kotagiri.

As further evidence of the company's commitment, Magna has also signed on as the founding sponsor of the XPrize Abundant Energy Alliance, a global coalition of public, private, nonprofit and academic leaders and organizations that are advancing progress toward a net zero future.

Magna's dedication to sustainability can been seen through the creative and impactful efforts of its operations around the world, and the company looks forward to accelerating progress in the coming years.

For further information visit https://magna.com

The Röchling Group Sets Ambitious Sustainability Goals

May 2021: The Röchling Group presented its second sustainability report in May. For the first time, the Mannheim-based plastics specialist formulates the first steps towards a comprehensive sustainable business approach and a comprehensive sustainability strategy, which is to be concretized this year. For example, the company aims to offer an alternative made from bioplastics or recycled materials for each of its plastics by 2035.

"We have formulated an ambitious target with this, but we want to already have these plastics in our portfolio when they are requested by our customers. We want to become the leading supplier of bioplastics and recycled materials by 2035. To achieve this, we are prepared to invest a mid to high single-digit million euro amount in the coming years," explains Prof. Dr. Hanns-Peter Knaebel, Chairman of the Executive Board of the Röchling Group.

Therefore, the company wants to consistently integrate sustainability into its value chain. On more than 90 pages, the Röchling Group's second sustainability report looks primarily at the areas of people, locations, partnerships, and products and assigns them to various sustainable development goals of the United Nations. For the first time, the Company has given itself a "Vision & Mission" in terms of sustainability and formulated the approach for a sustainability guideline. Thus, the Röchling Group once again emphasizes the principle that social and economic progress can only go hand in hand with the simultaneous protection of the environment.

"Sustainability, with all its many facets, is the megatopic of the future. We have to adapt to the changing framework conditions and requirements, break new ground and find even better solutions for our customers, but also for our employees," says Prof. Dr. Knaebel.

The company has already taken the first operational steps toward greater sustainability. For example, in March 2021, Röchling Industrial opened a recycling plant with an area of 6,300 square meters in Geeste-Dalum, Lower Saxony, to close the material loop between Röchling and its customers (for more info, see the published press release). In addition, Röchling Automotive already presented Röchling-BioBoom, a new

sustainable bioplastic, last year. This means that the division – as the first supplier on the market ever – has a patented polylactide (PLA)-based biopolymer that consists of at least 90 percent renewable raw materials and thus represents an ecological and economical alternative to most conventional materials such as polyester (PC, PET, PBT), but also polystyrene (ABS), polyolefins (such as PP) and polyamides (PA6) (for more info, see the Röchling BioBoom page).

"We are aware that all these measures can only be the beginning," says Prof. Dr. Knaebel. He adds that the company must succeed in achieving benefits with its business model through guided transformation. It is not a matter of compensating for damage to nature with money or sponsorship, but of reconciling the requirements of nature conservation with the entrepreneurial pursuit of profit: "This is the only way to achieve a credible balance between business and nature conservation," emphasizes Prof. Dr. Knaebel.

The Röchling Group aims to achieve climate-neutral production by about 2030 and establish paperless production at all production sites. At the same time, all of the approximately 11,000 employees at the 90 locations in 25 countries are to be trained in sustainability at Röchling in order to consistently anchor this future topic in the workforce as well. In order to make its sustainable goals clear to the outside world as well, the Röchling Group joined the United Nations Global Compact this year, a voluntary pact between companies, organizations, and the United Nations to make globalization more socially and ecologically responsible. The position of Sustainability Officer for the Group was also created.

For more information visit https://www.roechling.com/newsroom

Corporate GHG-Reduction News

Fiat Chyrsler Automobiles and Peugeot Publish 2020 CSR Disclosures

Amsterdam, April 8, 2021 – Further to the creation of Stellantis N.V. through the closing of the cross-border legal merger between Fiat Chrysler Automobiles N.V. (FCA) and Peugeot S.A. (PSA) on January 16, 2021, the following documents are the CSR disclosures of the legacy operations of FCA and PSA for the year ended December 31, 2020.

The 2020 reports, released today, present how FCA and PSA addressed the societal challenges (including climate issues), to design sustainable business models that create shared and long-lasting value. Details provided for their stakeholders in these reports highlight the achievements of both companies, on the most relevant social, economic and environmental challenges.

The creation of Stellantis marks a new chapter powered by the combination of two automakers each contributing a rich heritage, its CSR ambitions will be defined within the release of the Stellantis strategic plan.

The Stellantis teams started converging on operations and monitoring tools. The Stellantis common CSR KPIs and targets, resulting from this roadmap, will be disclosed in Stellantis 2021 CSR Report, which is scheduled for publication in spring 2022.

Visit https://stellantis.com/en/news

Daimler Honors Steel Supplier Big River Steel for Sustainability

Stuttgart, July 16, 2021: Ola Källenius, Chairman of the Board of Management of Daimler AG and Mercedes-Benz AG, and Martin Daum, Member of the Board of Management of Daimler AG and Chairman of the Board of Management of Daimler Truck AG, have honored the American steel supplier Big River Steel (BRS) for the exceptionally sustainable production of steel.

By using recycled steel scrap and renewable energy, Big River Steel is able to reduce the CO_2 emissions for Mercedes-Benz products in steel manufacturing by more than 70% compared to the traditional blast furnace route. In addition, the partner has set up a closed cycle in which the sheet-steel offcuts generated during production are fully recycled. The Big River Steel plant in Osceola, Arkansas, is the first steel production facility to achieve LEED (Leadership in Energy and Environmental Design) certification. Steel is a core component in vehicle construction and is very energy-intensive to produce.

Ola Källenius: "We are well on track for executing our sustainable business strategy. In close cooperation with our suppliers, we sharpened our focus on sustainability along the entire supply chain. Together we want to keep exceeding the expectations of our customers by taking technology, quality, and sustainability to a new level."

Emission-free mobility is a corporate goal for Daimler. To this end, the company is pushing ahead vigorously with the process of transformation. Climate neutrality can only be achieved together with suppliers and other partners. The car manufacturer awards special achievements on the part of its suppliers in the interests of sustainability: https://www.daimler.com/company/news/daimler-sustainability-recognition-2021.html Other nominees were:

Pöppelmann – The medium-sized plastics processing company from Germany is working intensively on the development of a sustainable material loop and a 100% post-consumer recyclate that meets high quality standards. In addition, the molding technique saves 10% weight during production, making plastic more sustainable as a lightweight material.

Sansera – The Indian supplier achieved significant CO_2 savings through a partial switch to solar and wind energy. In addition, the company has carried out numerous projects to protect the environment at its site. This commitment is also particularly noteworthy because companies in India can take advantage of longer implementation periods with respect to the Paris Climate Agreement. Sansera is already working systematically towards early achievement of these goals.

To Daimler, sustainability means creating value for all stakeholders on a lasting basis: customers, employees, investors, business partners and society as a whole. The basis for this is Daimler's sustainable business strategy. In this, the company takes responsibility for the economic, ecological and social effects of its business activities and looks at the entire value chain.

Visit https://media.daimler.com

Finally, a better way to save on compressed air.

Leak detection simplified

At Fluke we believe that there is always a better way to do things.

Now you can avoid costly downtime with leak detection, control air leaks, and save on energy costs. The future of leak detection is here: Introducing the Fluke ii900 Industrial Acoustic Imager.

Find everything you need to know about the Fluke ii900.

See for yourself!
Learn more: www.fluke.com/ii900leak

FLUKE®

Infrared images are for illustration purposes and may not have been taken by the models shown.

Corporate GHG-Reduction News

Crown Publishes 2020 Interim Sustainability Report

June 15, 2021: As we mark the end of one chapter of sustainability and embark on another, we are eager to share the positive impact we have made to date in our industry through our 2020 Interim Sustainability Report. Titled, "Enduring Values, Continuous Progress," our latest report demonstrates the responsibilities and commitments we maintain with our environments, communities and stakeholders as we dig into a new decade of action.

Click into our report to understand more about this pivotal period for our business – a year in which we both concluded our first set of formal sustainability goals (surpassing our targets for reducing our greenhouse gas emissions levels and decreasing our energy consumption) and also elevated our efforts with the launch of our comprehensive Twentyby30 sustainability program.

In addition to crossing off our own operational goals and establishing new objectives, we are proud to share in this report the ways we have helped move the needle for our industry. In November 2020, for example, we became the first metal packaging manufacturer to operate 100% of its beverage can plants in the U.S. and Canada on renewable energy. In doing so, we contributed to the environmental impact equivalent of taking at least 67,000 passenger vehicles off of the road for one year. Moving forward, we have our sights set on additional markers that will enable our own Company and our sector continue to advance climate-centric initiatives that leave a lasting impact.

Still, in the same way metal cans are infinitely recyclable, Crown's sustainability journey is an endless process and will reflect constant evolution and adaptation to meet the needs of our planet and partners. We will continue to communicate these new goals – and progress against all targets – as we move forward along our roadmap and work to effect meaningful change.

In the meantime, as a first stop, find the complete 2020 Interim Sustainability Report here: https://www.crowncork.com/sites/default/files/crown_2020_interim_sustainability_report.pdf

Bosch Honors its Suppliers' Endeavors for Sustainability

Stuttgart, July 19, 2021 – As it continues to pursue its sustainability strategy, Bosch has decided to recognize commitment to sustainability among its roughly 23,000 suppliers worldwide. For the first time, this year's international Bosch Supplier Awards include an honor in this category. Announcing the award winners, Prof. Stefan Asenkerschbaumer, CFO and deputy chairman of the board of management of Robert Bosch GmbH, said: "With a current purchasing volume of 35 billion euros, Bosch's responsibility in the global supply chain extends far beyond the factory gates. Together with our suppliers, we assume social responsibility, which also means striving to achieve a high level of sustainability." For Bosch, the award is also an expression of partnership and long-term cooperation with its suppliers and service providers. Forty-six companies from 16 countries received one of the coveted Bosch Global Supplier Awards for their exceptional performance in various categories. The jury recognized Infineon, Salesforce, and Steelcase for their climate action programs.

With its 400 locations worldwide, Bosch has been climate neutral since the first quarter

of 2020. In close cooperation with its global supplier network, Bosch wants to go one step further, and aims for a 15 percent reduction in its upstream and downstream CO_2 emissions along its entire value chain by 2030. "Climate action is a collective task shared by industry, politics, and society," Asenkerschbaumer says. "Climate-conscious action is a common bond between Bosch and its suppliers." In the future, the company will make aspects such as CO_2 emissions or CO_2 ratings a criterion for awarding new contracts. "We plan to put some initial ideas into practice more broadly as of 2022," the CFO says.

Bosch is focusing above all on electrification and hydrogen technology, for example in mobility and heating, in order to turn technological and environmental upheaval into new business opportunities . "Global efforts to combat climate change are boosting electrification and green hydrogen," Asenkerschbaumer says. As for the associated business opportunities, he sees suppliers as important partners for Bosch: "Our suppliers and service providers play a crucial role in many technical innovations that ultimately help improve quality of life and conserve natural resources."

At Bosch, partnering with regional and local suppliers ensures a high degree of robustness and availability in the supply chain. According to Asenkerschbaumer, this strategy has once again proved invaluable in crises such as the coronavirus pandemic and the current market bottlenecks. Nevertheless, companies and their suppliers worldwide

Bosch places an emphasis on sustainable business practices. According to internal calculations, the supplier of technology and services marked a significant milestone as early as spring 2020 when, undeterred by the coronavirus pandemic, it achieved climate neutrality at its 400 locations worldwide. Bosch CEO Volkmar Denner (right) and CFO Stefan Asenkerschbaumer (left) announced this climate target for the first time in 2019. Bosch's next goal is a 15 percent reduction in CO_2 emissions along the value chain by 2030. Picture Credit: Bosch

Corporate GHG-Reduction News

need to prepare early for changes in the event of ongoing supply chain disruptions. "At Bosch, we're well prepared for this. We essentially take a decentralized approach by manufacturing locally in our customers' countries and relying on a standardized global manufacturing network." In light of the challenging business year, the CFO expects purchasing volumes in 2021 to be only slightly above the previous year's level.

Sustainability: award winners in the new category

In this new category, Bosch honors its suppliers' endeavors to promote sustainability. The criteria it applies are strict. "To kick things off, we focused on climate action programs," said Dr. Arne Flemming, head of supply chain management at Bosch. "To make the shortlist, our suppliers had to demonstrate excellent overall performance as well as an A or B rating in the prestigious Carbon Disclosure Project." Next, a jury of procurement and sustainability experts evaluated criteria such as the transparency of a company's carbon emissions, its reduction targets for the years up to 2030, and its contribution to Bosch's CO_2 targets.

This year, the semiconductor manufacturer Infineon, the software company Salesforce, and the office furniture manufacturer Steelcase are the recipients of the first-ever Bosch Sustainability Award. Infineon qualified through its many years of voluntary activities to reduce CO_2 in production as well as its comprehensive corporate strategy with ambitious sustainability goals. Salesforce impressed with its exclusive use of renewable energy starting in 2022 as well as with the CO_2 reduction targets it has set its own supplier base. Among other things, Steelcase won over the jury with its integrated approach to CO_2 reduction – from the selection of sustainable materials to their reuse.

17th Bosch Global Supplier Awards: honoring the best suppliers

Across the globe, some 37,000 Bosch associates work in purchasing and logistics; they keep around 240 manufacturing plants supplied with parts and raw materials every day. The supplier of technology and services regularly honors the best of its suppliers from around the world with the Bosch Global Supplier Award. Award winners are recognized for outstanding performance in the manufacture and supply of raw materials, products, and services. A panel of judges evaluated the finalists in the categories of Purchasing of indirect materials and services, Raw materials and components, Purchasing of direct materials (by business sector), and a special Sustainability category. Bosch has been presenting these awards to honor supplier excellence every two years since 1987, and they are highly regarded in the industry. This year, due to the pandemic, the awards will be given individually. A complete list of the winners is available here.

Visit https://www.bosch.com

McDermott Announces 2030 GHG Emission Reduction Targets

HOUSTON, Aug. 2, 2021 /PRNewswire/ – McDermott International, Ltd will accelerate its contributions to a low-carbon economy through its sustainability targets, which are outlined in the company's latest sustainability report, released today. The company's targets include:

- 50 percent reduction in scope 1 and 2 greenhouse gas (GHG) emissions by 2030

- 35 percent reduction in scope 3 GHG emissions for ten key supply chain categories by 2030
- Zero office waste-to-landfill by 2025
- 50 percent reduction in waste generation by 2030
- Specific milestones for advancing social investment, local content and human rights

The targets leverage years of analysis and the company's long history of delivering – and continuously improving – responsible energy infrastructure across the energy value chain.

"McDermott is a trusted business partner helping our clients energize the world," said Rachel Clingman, McDermott's Executive Vice President, Sustainability and Governance. "Our talented global workforce is proactively partnering with clients to design and deliver critical infrastructure with lower environmental impact throughout every phase of development and beyond."

McDermott supports the global energy transition and has delivered award-winning work, studies and developments to expand possibilities in net-zero construction, carbon capture, hydrogen storage solutions, net-zero liquified natural gas and offshore wind. The company has the same aspirations for its own operations as reflected in the sustainability program and proactive targets. The result is an integrated sustainability strategy with a governance framework applied globally across all aspects of the business.

"Our sustainability report identifies the progress we have already made," Clingman said. "And it confirms our commitment to reducing GHG emissions, managing water use, reducing waste-to-landfill and improving socially responsible investments that support the communities where we operate."

Learn more about McDermott's Sustainability Targets or visit www.mcdermott.com.

The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems

By John Bilsky, Facilities Maintenance, Gentex Corporation

"We Can Never Shutdown Production." That was the first lesson I learned when I began my career in compressed air in 2003. At that time, Gentex Corporation consisted of three buildings which housed three separate air compressor systems. Now, more than 17 years later, we have ten buildings with air compressor systems. Understanding the importance of compressed air and how to maintain and improve the systems that produce it; helps a company's bottom line.

Compressor systems often times are left to run themselves but are not set up to do so. Some operators find they are only able to do the bare minimum in maintenance and planning because of time, money, or both. The information contained in this article, will help the operator to assess his/her systems,

One air compressor as standby/backup. This unit is 100% oil free, with very low maintenance and variable speed drive.

and identify where these systems fall within a three-level category. There are many ways, and opportunities to make a compressed air system produce reliable and good quality air. The three levels discussed here could also be characterized as a "continuous improvement plan" which can be achieved over the course of time, and with the occasional investment of money.

The Three Levels build upon each other, and as each step is taken, more opportunity for improvement, monitoring, and finally cost saving can be achieved. It all starts with recognizing the necessity to be responsive and have answers to abnormalities within the air compressor system which produce frequent production downtime. This is a fundamental step for companies who want to control their air compressor systems. Second, once a decision is made to address these abnormalities/problems, the company will begin to implement Level Two – this is the beginning of a continuous improvement strategy. Finally, when reaching Level 3, the data collected can save time, money and make a system easier to manage.

Level One: The necessity to be responsive (this is the beginning of improving reliability). Identifying problems within the system and production issues at the end use point.

Step 1 Goal: Always have compressed air. When we had an air compressor fail, the problem at hand was usually obvious, the air compressor was down, and it needed fixing. If this was the only air compressor to support production, production would soon run out of air. This is the beginning of level one – Keep a dedicated air compressor for backup purposes only. I am not saying to keep it in standby and never run it, just always have one air compressor in the rotation as a standby, and for use when shutting down individual air compressors for scheduled maintenance. When management approached me with the cost figures for downtime it was easy to ask for the backup "standby" air compressor.

Step 2 Goal: Improve air quality. One way to greatly improve compressed air quality is to dry it after compression. For Gentex, dry air became very important as we grew. Just as adding a standby air compressor helped ensure that production would always have compressed air; we added a redundant air dryer into the system so production would have dry air if a breakdown occurred. This also allowed for

The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems

Compressed air flow meter on the main supply header to production.

maintenance to occur when needed, and not just on Holidays, when production was off, which are few and far between.

Step 3 Goal: Maintain air pressure at the end use points to reduce problems for machine operators. The tricky part came when production would say they have low air pressure; the pressure swings too much; and/or sometimes they would say they have no pressure at all. Troubleshooting these situations should have been easy, but I could not tell where the root cause was in the system. PSI gauges on the supply header were only sometimes working. There were very few, if any, pressure gauges at the point of use and often were in the wrong spot. One observation I noticed early on was that machine operators would watch the small gauge that comes with

the regulator on the outlet side that is attached to the machine (that is if I was lucky to have a regulator), but of course there was never a gauge positioned before the regulator. As a result I would end up first troubleshooting the supply side of the system, and then the end use equipment. Operators usually did not believe the issue was the result of the regulator or internal to the unit using the air until I had psi gauges in the correct locations.

Step 4 Goal: Keep ahead of flow needs. Adding a flow meter in the main header to production gave me a quicker response time in troubleshooting the entire system. A flow meter can indicate if all the air compressors are putting out the rated flow. In instances where all air compressors are working, and we have low PSI on the plant floor, we would expect a

Level One

1. Increase production uptime.
   a. Reserve a backup air compressor.
      i. No downtime to complete maintenance.
      ii. No down time if main air compressor faults.
2. Improve air quality.
   a. Install a redundant compressed air dryer.
   b. No downtime to complete maintenance.
3. Pressure gauges.
   a. On wet side.
   b. Dry side.
   c. Various header locations.
   d. Point of use.
4. Flow meter on header to production.
   a. Flow meter on each air compressor (optional).
   b. Flow meter on individual production lines.

This is where step 1 comes from – *"The necessity to be responsive and have answers to pressure issues when they arise".*

The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems

Rust and particle fallout from black pipe in air compressor system.

high flow reading. Adding a flow meter in the main header will also help an air compressor operator know when the company is growing (adding production equipment) and can monitor when that growth will require an additional backup compressor to be added to the system.

Level Two

After completing the goals for Level 1, it's time to begin looking at system plumbing and air quality improvements. In managing the air compressor systems at Gentex, I have found areas for improvement within the systems. These improvements became evident whether it was a result of a breakdown, a flow supply problem, pressure, or quality issue. Many times, the root cause of a problem would inherently require a change anyway. There are things in the system that I believe are important to better your chances of having a reliable system. (Continued reliability, increase quality)

Step 1 Goal: Improve System Plumbing. In level one, we mentioned shutting down an air compressor for scheduled maintenance. Prior to installing isolation and bypass valves on the main header loops, and supply lines to production, the only way to complete the task was to shut down the

whole system to get the job done. We had to fix the problem on Sundays, provided no production department needed the compressed air, or on a Holiday. The opportunities available to shut the whole system off was very limited. Adding bypass and isolation valves where possible, aided in our ability to maintain our machines while suppling flow to production.

As we made valve improvements, we discovered that our system was plumbed using black pipe, which appeared to be the standard for air compressor systems when I started in 2003 at Gentex Corporation. Much of

Using zero loss air drains for all condensates will save money. We have over 190 zero loss drains in operation. Some are plumbed in parallel for redundancy. Both have alarm contacts for email and text notification.

Level 2

1. Improving system plumbing.
   a. Reducing downtime – install isolation and bypass valves.
   b. Reducing pressure loss – up size pipe where needed, use non rustable pipe and slow sweeping elbows.

2. Improve air quality.
   a. Dew point monitoring.
   b. Test air quality.
   c. Add mechanical oil and water indicators.

3. Implement money saving initiatives.
   a. Add Variable speed air compressors.
   b. Use flow controls.
   c. Install zero loss air drains.
   d. Utilize heat of compression.
   e. Complete leak audits.

The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems

the black pipe in our systems had flow issues due to under sizing, rust buildup and particle fallout.

Using best practice guidelines, we changed to non-rustable pipe. In addition we now use slow sweeping and 45-degree elbows when possible. Stainless steel valves aid in keeping our system top notch.

Step 2 Goal: To ease the burden on the dryers we added a wet tank, preferable smaller (never larger) than the dry tank or an inline centrifugal condensate separator. Additional drains for all air compressor outlets and drains on the wet side of the header was implemented. Removing condensate is very important to protect air compressors and downstream processes so many condensate sources have two drains hooked in parallel in the event one fails. Adding dew point probes in the dry side of the system was another huge improvement. We positioned dew point probes on each individual dryer outlet as well. These improvements and the right pre/post filters helped ensure our quality was at its best.

Adding mechanical oil and water indicators on the dry tanks added further assurance of air quality.

Building flow controller.

Testing our compressed air quality with an outside test lab has also become important. When production has a contamination issue one of the first places they will look is at the compressed air. Having documentation that the air is clean and dry will help production rule out the compressed air and speed up their root cause investigation. To protect production processes from contamination and reduce our carbon footprint we have gone to oil free air compressors in six buildings.

Step 3 Goal: Saving money. Saving money is very important so a variable speed drive (VSD) air compressor had to be in each system. In buildings without a VSD air compressor, flow controllers were installed to help smooth out pressure swings and to save money when lower pressure was used. As these changes were implemented, production stopped seeing pressure swings.

Saving money also came from using the heat of compression. Our water treatment processes used in production would get down to 35 degrees Fahrenheit in the wintertime and up to 65 Fahrenheit in the summer. By taking the heat from the air compressors, we could consistently deliver water 25 degrees above ambient water temperatures to production, saving on heating costs on the production floor. Approximately 95% of the production lines are suppled with water heated from the air compressors. We also use the heat for snow melt systems in the winter.

Compressed Air Leak Audits are the last step for level 2. Audits became an important cost savings practice starting in 2008. When compressed air leaks are found, they are documented for cost of cfm lost and then fixed. Many utility companies will give rebates to companies who have leak audits completed. Not to mention that leaks, unchecked, continuously cost the company money.

Level 3

Keeping the system dynamic – Our compressed air usage can change very rapidly. The largest changes occur when production starts and stops. Having the air compressors respond quickly and efficiently during these times is important. I wanted to be proactive by knowing when a change did occur in real time, and be able to anticipate when these and other changes might occur that would have an impact on production or the compressed air system and equipment.

Being alerted when changes occur, and ascertaining if it is normal, abnormal, efficient, or inefficient can save money and time. Setting the systems up to monitor themselves was the answer I needed. I was able to bring the system to the next level by adding an air compressor control system that could manage all the data and control the air compressors.

Step 1 Goal: Get the information. Install a central air compressor controller to manage air compressor output and make all air compressors in the system work together. At the company I was able to narrow my pressure band which allowed me to lower the plant pressure while still providing adequate pressure to each production line. This saved the company money. As an added incentive, many Power Companies offer rebates for installing and using a central controller. Another reason

Level 3

1. Get the information.
   a. Install the central air compressor controller.
2. Be on top of the Data.
   a. Data log.
3. Be Proactive.
   a. Benchmark, use alarm notifications, monitor wherever whenever.

The Gentex Journey to Reliable Energy Conservation – 3 Levels of Compressed Air Systems

to install a central air compressor controller is that the controller also gave us a place to gather information from.

Step 2 Goal: Be on top of the Data. Use central air compressor controller or building control program to monitor and data log in real time remote monitoring devices. I was able to view and monitor changes like pressure, dew point, KW, air compressor and dryer faults, which all are important to know in real time to keep the system dynamic.

Step 3 Goal: To be proactive. Begin Benchmarking. I then used the central controller to monitor hundreds of data points which we had installed in the air compressor systems and other processes. I needed this information in real time to expedite response time, to answer questions regarding the system, and to ensure system performance. Bench marking information became critical in the overall process. I was now able to respond quickly when a change has happened or can have a plan in place when informed a change will happen. Incidentally, the central controller needed to have Kw meters to run the air compressors, and by coupling this with flow meters and pressure transmitters, we had a continuous energy audit online 24/7.

Many flow controllers are now used in lieu of PSI regulators.

Heat of compression is recovered and effectively used to heat water.

The compressed air data points we watch are:

- Kw Meters.
- Various air compressor faults.
- Air dryer faults.
- Condensate drain faults.
- PSI transmitters are in wet tanks, prefilters, post filters, dry tanks, main headers, plus the production floor.
- Flow meters on all main headers going out to production, and on each individual production line. Planning to implement individual air compressor flow meters also.
- Dew point transmitters on dry tanks and each individual dryer. And on the plant floor.
- Compressor cooling water temperatures.
- Heat of compression processes (production) temperatures.
- Other data points for nitrogen and purified water processes.

In addition to Benchmarking, the central air compressor system notifies us when any part

of the system falls out of the norm. All the data inputs that monitor the quality and reliable of the system have alarm notifications. These alarms will be sent via email, text, or both for a quick response time. Many of these data inputs are set up so we can be proactive. Being proactive means for me that we are providing "system improvements" instead of "system repairs". And when air compressor managers make system improvements, I hope that for them, it means production has not yet seen a pressure issue.

The data monitoring that our central controller performs, enabled me to move to a proactive approach for air compressor system management. Now I plan for preventive maintenance and system improvements which has increased our production up-time. And since as stated before, pressure, flow, and air compressor amperage is monitored; we have a 24/7 air compressor audit at our fingertips. Basically, I can manage our air compressor systems from my desk or anywhere in the world using the internet.

Conclusion

In closing, there are many ways, and opportunities to make a compressed air system produce reliable and good quality air. The need to be responsive because of production problems with the compressed air will make a company reach Level 1 quickly. Completing level one will put a compressed air system in a position to be more dependable and allow time to make improvements for reaching Level 2. When operators have worked in Level 2 for a period of time, we begin thinking of what we can do to be proactive (Level 3), and to make the system truly run itself while saving money.

Today I am looking forward to level 4, "The Cloud"! BP

About Gentex

Gentex supplies automakers with advanced electronic features that enhance driver vision and safety. Since its inception, Gentex has managed the evolution of rear vision, using the rearview mirror as a delivery mechanism for innovative features that help automakers deliver sophisticated, revenue-producing electronic content to the car. As vehicle electrification and autonomous driving trends progress, Gentex technologies are converging to yield products that provide unprecedented advances in digital vision, car connectivity and dimmable glass. To learn more visit www.gentex.com

About the Author

John Bilsky is experienced in engineering design/improvements and maintenance for compressed air, nitrogen, and water purification systems, including those involving reverse osmosis and deionized water. He also has in-depth knowledge of production, as well as management of capital projects. Bilsky serves as the Facilities Specialist at Gentex Corporation for Compressed Air, Nitrogen, and Purified Water, email: john.bilsky@gentex.com, LinkedIn: https://www.linkedin.com/in/john-e-bilsky-24715b10/.

To read similar ***Compressed Air System Assessment*** articles visit https://www.airbestpractices.com.

Visit our Webinar Archives to listen to expert presentations on ***Compressed Air System Reliability*** at https://www.airbestpractices.com/magazine/webinars

Sullivan-Palatek's Passion Drives Continued Success

By Mike Grennier, Compressed Air Best Practices® Magazine

There are more than a few reasons why Sullivan-Palatek Inc. continues to achieve success and leadership in the compressed air industry, but one stands above the rest: passion.

A prime example of the company's passion is seen in the engineering, design, and manufacturing of high-quality airends, which are at the heart of Sullivan-Palatek's electric and portable rotary screw air compressors. The company also provides its airends to a number of original equipment manufacturers for use in air compressors.

"Our teams do a phenomenal job," said Sullivan-Palatek Director of Sales Larry Colley, pointing to a recent a call that came into the service department regarding an issue with a

At its manufacturing plant in Michigan City, Indiana, Sullivan-Palatek uses high-precision CNC machines for milling and grinding blanks and converting them into male and female rotors for airends.

Sullivan-Palatek air compressor installed in 1992. "That's a machine that's been running since then with the original airend," Colley said. "Our airends are pretty bulletproof. We're very proud about things like that."

Stationary and Portable Air Compressors

Founded in 1984, Sullivan-Palatek (www.sullivan-palatek.com) has steadily evolved into a company that today offers a wide range of electric and portable rotary screw air compressors. It employs 140 people, most of whom work at Sullivan-Palatek's 160,000-square-foot headquarters and manufacturing facility in Michigan City, Indiana.

The manufacturing plant, built in 2008, is equipped with advanced technology that includes multi-million dollar, high-precision CNC machines for milling and grinding blanks and converting them into male and female rotors for airends. Experienced and highly skilled employees are also found throughout the plant, whether they're designing new models, operating CNC machines for airends, or assembling air compressors and thoroughly testing them.

Sullivan-Palatek's products include electric air compressors from a five horsepower (hp) unit that delivers 22 scfm at 125 psi up to a 450-hp machine rated to provide 1,770 scfm at 125 psi. It also manufactures Variable Frequency Drive (VFD) air compressors from 15 to 450 hp, which can deliver anywhere from 43 to 1,910 scfm at pressures ranging from 100 and 125 psi.

Its line of electric driven, portable air compressors is offered in models from 50 to 450 hp in machines that deliver 210 to 1,600 scfm at 150 psi. Its extensive line of diesel portable air compressors starts with a 24.3-hp unit able to provide 110 scfm at 100 psi and extends to a 540-hp model engineered to provide 1,600 scfm at 150 psi. Additionally, Sullivan-Palatek offers refrigerated and desiccant air dryers, as well as filters and oil/water separators.

To further complement its offer, Sullivan-Palatek manufactures two-stage, reciprocating air compressors from 1.5 to 30 horsepower (HP) at its sister company, Saylor-Beall in nearby Saint John's, Michigan.

"There's a tremendous amount of overlap with customers in the engineering, technology, and marketing functions of Sullivan-Palatek and Saylor-Beall and that gives us the ability to do more. It's a good blend," said Bruce McFee, Chief Executive Officer/President of Sullivan-Palatek. McFee transitioned from Chairman to his new role in December 2020 after Steve Van Loan retired as Sullivan-Palatek's President. Van Loan played a key role in the success of Sullivan-Palatek during his 36-year career with the company.

The Manufacturer's Perspective

Aside from making quality products, Sullivan-Palatek prides itself on the reliability of its products. Reliability, said Colley, is about seeing things from the perspective of manufacturers who rely on compressed air for production.

"Manufacturing plants need compressed air," Colley said. "The higher the reliability of our products the better customers are going to feel

Sullivan-Palatek's Passion Drives Continued Success

Sullivan-Palatek offers an extensive line of stationary air compressors.

about them because they're not going to lose money with downtime. We want to make sure you're going to be happy for a very long time if you buy one of our air compressors."

The ability to produce reliable products, said McFee, stems from a dedication to continuous improvement in addition to a skilled and knowledgeable workforce.

"We are heavily focused on the quality of our core products. We just think we can make them better and better. Continuous improvement never ends," McFee said.

According to McFee, introducing initiatives designed to further boost the reliability and

overall quality of products is always a priority. He points to monthly warranty review meetings as an example.

"We have 15 people from various functions who attend these meetings where we talk about anything we're seeing that is troublesome," he said. "It's a way for us to focus on things that need to be addressed. Since we started the reviews, we've seen a substantial reduction in warranty issues. That means we're achieving better customer satisfaction."

No Stone Unturned with Product Upgrades

Quality and reliability are front and center as Sullivan-Palatek continues to upgrade many of its compressor models. It recently introduced significant upgrades to its D185PKR (180 scfm), D210PHKR (210 cfm) and D260PDKR (260 cfm) models. Currently, it's working on its D375PHJD4 (375 cfm) portable air compressor and plans are underway for upgrades to several models in the industrial fleet.

Colley said the company left no stone unturned when considering improvements. Take something as seemingly minor as cooling hoses found on portable units, he said.

"We could've used rubber like you see with average radiator hoses, but instead, we decided metal would be better since it's less susceptible to abrasion and things like that. It's not going to rupture. When you open the canopy and you see that you say, 'Wow. They really went the extra mile here.' It's something that makes us different. So far, the feedback has been great," Colley said.

Quality efforts, said Colley, are supported by employees in every area of the company and every step of the production process.

"We empower our production staff to let a problem be known if they see one," Colley said. "If they're assembling something and they see a problem, they'll stop and call one of the supervisors to discuss it. The supervisor will then get engineering involved if needed to take care of it. We're always working as a team to determine the best way for moving forward."

Relationships Truly Matter

The team at Sullivan-Palatek also includes distributors. McFee describes Sullivan-Palatek's relationship with distributors as a partnership and said the importance of the manufacturer-distributor relationship cannot be understated.

"Compressed air systems are complex. The variation of air compressors and the products themselves are complex. It's why compressed air users need to do more than just get a good product. They need to get the right product, the right system. And they need to operate it properly," McFee said.

He said meeting the needs of compressed air users requires Sullivan-Palatek to provide distributors with high-quality products and an equal level of high-quality training on its products and systems. He also said it's essential to make it easy for knowledgeable distributors to get what they need when they need it.

"We've developed an incredible amount of skill and knowledge throughout our company

Sullivan-Palatek's Passion Drives Continued Success

Sullivan-Palatek's upgraded portable air compressor line includes the D185PKR portable air compressor powered by 185 49-hp Kohler engine.

Sullivan-Palatek places a heavy emphasis on distributor training to help meet the needs of compressed air users.

to support all of the things distributors need to serve customers," McFee said. "If our inside salespeople can't provide an answer for something, they've got the full resources of the people who engineer, test, and assemble the products. That's value to them and that's value-add to the customer."

Stepping Up to the Plate

While focusing on distributors and compressed air users is paramount, Sullivan-Palatek's carves out time to work on changes impacting the compressed air industry, particularly when it comes to government regulations. Toward that end, McFee has stepped up to the plate throughout the years to affect change for the better.

A prime example is its work with the Compressed Air and Gas Institute and other air compressor manufacturers to shape Department of Energy (DOE) regulations concerning energy standards for air compressors. The DOE has published a Federal Register notice of final rule pertaining to energy efficiency standards for air compressors. The effective date of the rule was March 10, 2020. Compliance with the new standards in the final rule will be required on and after January 10, 2025. (For more, visit https://www.regulations.gov/document/EERE-2013-BT-STD-0040-0095.)

"We were able to get a basic definition in place of a compressed air machine and also modify the eventual rules," McFee said, all of which is valuable for manufacturers and end-users alike. "It meant fewer products needed to be pulled from the market. It also gave more flexibility to manufacturers to continue to successfully do business."

Another example of Sullivan-Palatek's foresight in addressing industry regulations involves the U.S. Environmental Protection Agency's Tier 4 Final emissions standards for diesel engines, which took full effect in 2017. Tier 4 compliant engines significantly reduce emissions of particulate matter and oxides of nitrogen (NOX) to near zero levels.

Sullivan-Palatek worked closely with engine manufacturers and made the necessary investments to ensure its diesel-driven air compressors were compliant long before the Tier 4 Final standard took effect.

"Tier 4 Final diesel engines was the most complex mandate over put on the construction industry by a long shot," McFee said. "But we built them way ahead of others and within a few years we had 17 products that we're Tier 4 compliant." Today, all Sullivan-Palatek's diesel-driven, portable air compressors are Tier 4 compliant.

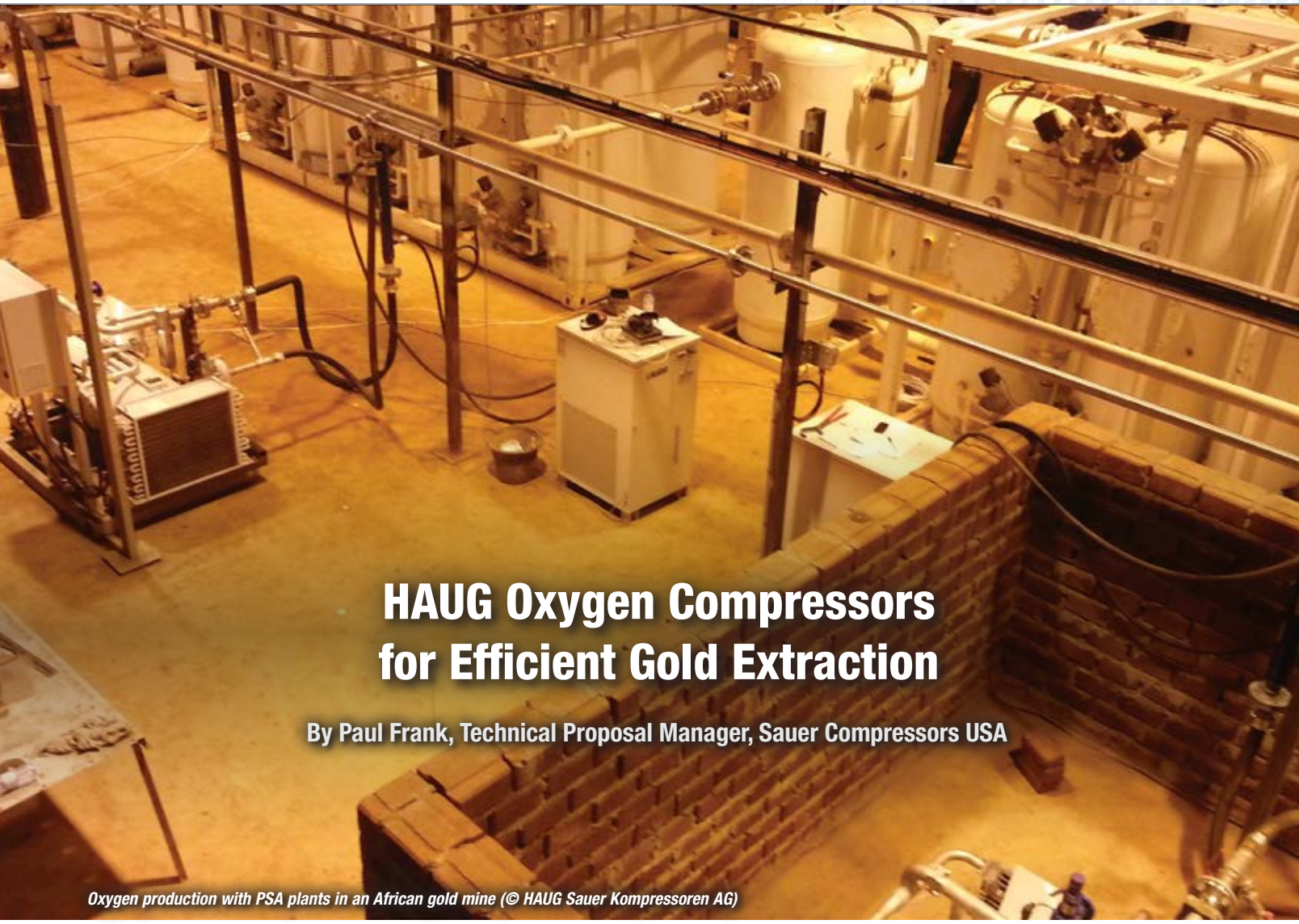
A Formula that Works

Active industry involvement, strong distributor relationships, and an ongoing dedication to quality and continuous improvement points to even more success for Sullivan-Palatek.

"The demand we're seeing for our air compressors is very, very high," McFee said. "It shows us our strategy is working. I'm really excited about the future." BP

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

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



HAUG Oxygen Compressors for Efficient Gold Extraction

By Paul Frank, Technical Proposal Manager, Sauer Compressors USA

Oxygen production with PSA plants in an African gold mine (© HAUG Sauer Kompressoren AG)

In many gold mines in Africa, oxygen is essential for the extraction of the precious metal. The self-sufficient supply of the gas is achieved by using a process that generates oxygen from air by means of pressure swing adsorption. Sauer Compressors' oil-free compressors from the HAUG product line make an important contribution here. The sophisticated boosting of the generated oxygen is handled by the piston compressors of the HAUG.Sirius series, which are developed and manufactured by the long-established Swiss company HAUG Sauer Kompressoren AG.

Logistics and supply problems are widespread on the African continent. Lack of infrastructure as well as capacity and efficiency deficiencies can affect supply chains and make them more

Oxygen production with PSA plants in an African gold mine, on the left in the picture a HAUG.Sirius oxygen compressor. (© HAUG Sauer Kompressoren AG)

expensive. Gold mines, which are often located in secluded areas, therefore seek to provide their entire infrastructure themselves. Even the oxygen required for efficient gold extraction by cyanide leaching is therefore not delivered but generated on site.

Oxygen as a Key Element

The extraction of gold from rock by using cyanide relies on oxygen as a key element. Its use provides several important benefits. For example, a higher dissolved oxygen content increases the gold extraction rate, and increased ore throughput shortens the leaching time by up to 50 percent. In addition, less cyanide is consumed, which lowers costs and reduces environmental risks.

The hermetically gas-tight oxygen compressor HAUG.Sirius with water cooling can be operated reliably at high ambient temperatures. (© HAUG Sauer Compressors AG)

HAUG Oxygen Compressors for Efficient Gold Extraction

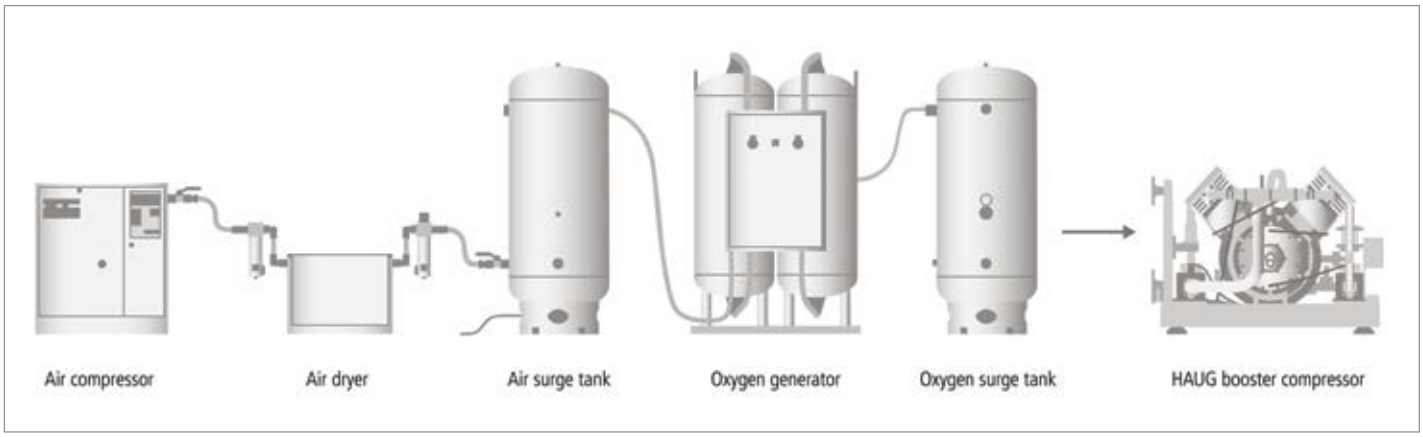


Diagram of an oxygen generating system. It is important to note that HAUG is supplying only the booster for the pressure increase after the oxygen generating system. HAUG only provides the compressor not a full oxygen generating system. (© HAUG Sauer Kompressoren AG)

The gold mines produce the oxygen with oxygen generators based on PSA technology (Pressure Swing Adsorption). They produce oxygen of up to 95 percent purity and an outlet pressure between 44 and 73 psig (3 to 5 bar(g)). Afterwards, the oxygen produced by the PSA plants must be boosted to a final pressure of 118 to 191 psig (8 to 13 bar(g)).

Risky Oxygen Compression

The compression of oxygen is technically demanding. Since the gas is a strong oxidant and highly reactive, the compressor must not allow high temperatures and friction. The same applies to contamination by foreign substances, oils and greases, which could ignite the oxygen and inevitably set the compressor on fire. There are very few compressors in the world that can cope with such high demands. HAUG compressors have been among the safest machines on the market for decades and are used in the PSA plants of the leading suppliers and by the gas suppliers of the gold mines. In African mines alone, more than 30 compressors of the HAUG.Sirius series are in service today.

The unit is a completely oil-free, dry-running piston compressor. Thanks to the magnetic coupling drive used, the machine is hermetically gas-tight during operation and standstill. This hermetically sealed and absolutely wear-free drive was first used in a HAUG piston compressor in 1989 and can be used for suction pressures up to 441 psig (30 bar(g)). From its construction, instrumentation, operation and maintenance, the compressor is designed to efficiently dissipate heat and minimize friction. Special oxygen-compatible materials of the components in contact with the medium

Paul Frank, Technical Proposal Manager, Sauer Compressors USA

ensure safe operation. The modular compressor concept allows individual adaptation of the configuration to the respective customer requirements. In addition, the robust compressor is designed for continuous operation.

The high ambient temperatures of up to 113°F (45°C) typical in Africa are no problem. The HAUG.Sirius offers the option of water cooling including a water after-cooling system for autonomous operation. Cooling water temperature requirements are compressor inlet 5-25°C (41-77°F), and cooling water pressure 3-10 barg (43-145 psig). Temperature sensors on each cylinder ensure safety. A specially designed intake filter protects against contaminants from the PSA system. BP

About HAUG Sauer Kompressoren

The development and manufacture of compressors in the HAUG product line are the core competences of the long-established Swiss company HAUG Sauer Kompressoren AG based in St. Gallen. Founded in 1896, the company has been part of the Sauer Compressors Group since 2016, where it forms the global center for oil-free compression technologies. Sauer Compressors is a medium-sized German group of companies with 14 international subsidiaries. The company looks back on more than 135 years of history and over 85 years of experience in compressed air and gas technology. These days, the focus is on the development, manufacture and sale of oil-lubricated and oil-free medium- and high-pressure compressors for applications in commercial shipping, industry, petro industry and the defense sector. The four product lines SAUER, HAUG, GIRODIN and EK focus on specific fields of application. The SAUER line comprises oil-lubricated high-pressure compressors for a wide variety of applications, while HAUG stands for oil-free and hermetically gas-tight compressors. The GIRODIN and EK lines offer special compressors for the naval market. The modern reciprocating compressors for compressing air as well as a variety of gases reach pressures of 20 to 500 bar(g). In addition to standard products, customized solutions are offered for every type of application for individual customers, OEMs and globally active companies. With a worldwide network of representatives and partners, Sauer is always close to its customers. By supplementing the compressor range with high-quality accessories, engineering services, assembly and service concepts, Sauer provides complete system solutions right up to complete turnkey installations.

Further information at: www.sauercompressors.com and www.haug.ch.

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

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

FOOD & BEVERAGE PROCESSING & PACKAGING MONTHLY FEATURE

Compressed Air Dryer Key Performance Indicators

By Chris Beals, President, Air System Management

➤ The purpose of this article is to point out the key performance indicators (KPI's) that can assist in maintaining the performance and troubleshooting of compressed air dryers.

Pressure Dew Point

The most important KPI to monitor is the pressure dew point (PDP) of the compressed air exiting the dryer(s). The PDP of the compressed air should be monitored at the discharge of each dryer and downstream of where the compressed air from multiple dryers converges. The combined PDP measurement of multiple dryers is important for a couple of reasons. First, it only takes a small of wet air to ruin the PDP of the air exiting the other dryers and secondly, the dew point spikes from multiple heated desiccant dryers may occur one after the other; thereby producing a poor PDP even though the dryers are operating correctly. The effect of the dew point spikes can be minimized by operating all the dryers in fixed mode and synchronizing them so they switch towers at the same time. The PDP alarm for heated desiccant dryers should have a sufficient delay to allow time for the dew point spike to go away. For more on heated dryer dew point spikes visit https://airbestpractices.com/system-assessments/air-treatmentn2/auditor%E2%80%99s-notes-compressed-air-dryer-installations-%E2%80%94-part-i

KPI's for All Dryer Types

The following items can affect the performance of all types of compressed air dryers.

- Liquid Oil and Water (Condensate)
- Inlet Flow
- Inlet Air Temperature
- Inlet Pressure
- Ambient Temperature
- Inlet Water Temperature and Flow
- Dirty/Fouled Coolers
- Failed Auto Drains and Plugged Drain Lines

Liquid Oil and Water (Condensate)

Typically, after the compressed air is cooled in the compressor's aftercooler it is 100 percent

saturated and as it flows through the piping between the compressor and the dryer it cools and moisture and oil condense in the piping. The amount of moisture and oil that condenses depends upon the temperature differential between the compressed air in the piping and the ambient temperature and the distance between the compressor and the dryer.

Many refrigerated dryers are installed without pre- or after-filters so the condensed moisture and oil can slug the dryer and its internal separator preventing the dryer from drying the air and the separator from removing it from the system.

Regenerative desiccant dryers normally have a pre-filter installed upstream of the dryer, but that does not prevent moisture and oil from passing through the filter element nor does it prevent moisture and oil from condensing downstream of the pre-filter. For example, a coalescing filter's flow rating is typically based upon a maximum of 50 PPM w/w that includes water, oil, aerosols, and solids. Any air contaminates above 50 PPM w/w reduces the filters rated capacity and when they exceed 200 PPM w/w moisture and oil could be bypassing the filter element. If liquid moisture reaches the desiccant it reduces the dryer's ability to maintain the required PDP; however, if liquid oil reaches the desiccant it ruins the desiccant. Installing a Mist Eliminator or NL Module or a properly sized wet air receiver as close to the dryer pre-filter as possible can prevent overloading of the pre-filter. In addition, if the ambient temperature is low enough the piping between the wet air receiver and the pre-filter and the pre-filter and the dryer inlet should be insulated.

The issue with condensate has been observed in both indoor and outdoor installation. Issues with condensate typically occur indoors when the compressor is air-cooled and there is a substantial differential between the compressor discharge temperature and the ambient temperature. For example, in an indoor location where a large amount of condensate occurred in the piping upstream of the dryer, the air-cooled compressor discharge temperature was 110°F and the ambient temperature was 87°F. The distance between the compressor and the dryer was approximately 50 feet.

Inlet Conditions (Flow, Temperature, Pressure, Ambient/Cooling Water Temperature)

A dryer's capacity is directly related to its inlet pressure and indirectly to its inlet air and ambient/cooling water temperatures; therefore, its capacity varies constantly as these items change. Monitoring the dryer's inlet pressure, inlet temperature, and if applicable the ambient/cooling water temperature allows one to calculate its present capacity and then compare it to the dryer's monitored inlet flow. By using the monitored values the dryer's capacity could be formulated in a computer so the comparison could be shown in real time. *Note: A dryer's inlet pressure and temperature should be monitored downstream of any prefilters and as close the dryer/towers as possible.*

While an inlet flow in excess of the dryer's capacity prevents it from maintaining an acceptable pressure dew point (PDP), too low of a flow can reduce the efficiency of some moisture separators contained in some refrigerated dryers and regenerative desiccant dryers containing a cooler. The reduced

Compressed Air Dryer Key Performance Indicators

efficiency of the moisture separator can result in moisture and/or oil being carried over into the compressed air system or into the regenerative desiccant dryer's desiccant. In addition, split-stream and some heat-of-compression regenerative desiccant dryers require a minimum flow to ensure regeneration of the desiccant.

Cooling Water Temperature, Flow & Cooler Outlet Air Temperature

Monitoring the cooling water temperature is particularly important on split-stream and heat-of-compression regenerative desiccant dryers because the hot air used to regenerate the desiccant should be cooled to 100°F for the dryer to maintain a -40°F PDP. Because most shell and tube heat exchangers used have a 15°F approach temperature they require a cooling water temperature of 85°F or less so in those installations where the cooling water temperature exceeds 85°F split-stream and heat-of-compression regenerative desiccant dryers probably won't maintain a -40°F PDP.

Dirty/Fouled Coolers

A dirty condenser in refrigerated dryers is a common problem that results in a poor PDP. In the case of shell and tube heat exchangers, monitoring the cooler's outlet air temperature notifies you of a problem and monitoring the cooling water temperature and flow lets you know if the cooler needs to be cleaned or if there is a problem with the water supply.

Failed Auto Drains & Plugged Drain Lines

Auto drains are normally installed at the moisture separator downstream of the air compressor's aftercooler, the wet air receiver, the dryer prefilter, and the moisture separator installed inside refrigerated dryers and some types of regenerative desiccant dryers. Auto drains can fail open or closed. When auto drains fail open they waste compressed air, but when they fail closed or the drain line becomes plugged moisture and/or oil will flow out into the compressed air system or into the desiccant. Plugged drain lines typically occur in "oil-free" compressed air systems so the drain lines should be stainless steel. Some electrically-operated "No-Air Loss" auto drains offer local

or remote alarms, while some pneumatically-operated ones offer local or remote counters.

Additional KPI's for Regenerative Desiccant Dryers

The following items are specific to the performance of regenerative desiccant dryers.

- Purge Flow
- Backpressure in the Offline Tower of Desiccant Dryers
- Valve Failures
- Regeneration Temperature on Heated Desiccant Dryers
- Dirty Filters or Backpressure on the Blowers of Heated Blower Purge Dryers

Purge Flow

The formula, shown below, is for the purge flow required by a "Heatless" dryer. The formula shows that the required purge flow varies directly with inlet flow and indirectly with inlet pressure. This means if the inlet flow is the same as the dryer's rated flow and the inlet pressure falls below 100-psig then the purge flow must be increased.

$$Qp = (Q \times 1.15) / ((P + 14.7) / 14.7)$$

Qp = Purge Flow (scfm)
Q = Inlet Flow (scfm)
P = Inlet Pressure (psig)

Correctly setting the purge flow is normally addressed by initially setting it for the lowest expected pressure and the peak flow so monitoring the purge flow is not necessary; however, because we cannot trust the dryer's purge pressure gauge, monitoring the purge pressure is recommended. In order to reduce energy and recover compressor capacity some recommend reducing the purge flow if the peak flow is below the dryer's corrected flow rating; however, doing has resulted in poor system reliability so it not recommended.

Backpressure in the Offline Tower of Desiccant Dryers

Backpressure in the offline tower prevents the purge air from fully expanding; thereby, reducing the purge air flow, which in turn reduces the dryer's ability to regenerate the desiccant. The dryer's two towers are equipped with pressure gauges; however, they can't always be trusted so installing pressure transducers and monitoring the pressure is recommended.

Desiccant Dryer Valve Failures

When a desiccant dryer's valves fail compressed air from the online tower can flow into the offline tower and then out the purge exhaust valve. Depending upon the purge exhaust valve's Cv a valve failure can dump the full capacity of the upstream compressor(s) resulting in a plant outage. Also, when a dryer's valve fails, but sufficient compressor capacity exists to maintain the system pressure, the reason for the increased demand and poor dryer performance is often hidden from the end user. Therefore, monitoring the regenerative dryer's inlet and outlet flows, along with installing a trip valve in the purge exhaust line that trips and alarms on low system pressure is recommend. Some manufacturers' dryer controls close the dryer's purge exhaust valve(s) on low pressure; however, because these valves fail as often as the other dryer valves, installing a trip valve is preferred. The problem with installing a check valve downstream of the dryer is twofold. Firstly, the purge exhaust valve may be able to exhaust the capacity of more than one compressor, which means that a backup compressor located

Compressed Air Dryer Key Performance Indicators

upstream of the dryer may not be able to maintain the system pressure. Secondly, when the check valve closes the compressor capacity installed upstream of the dryer is effectively removed from the system; whereas, installing a trip valve maintains its capacity.

Regeneration Temperature

The regeneration temperature of heated desiccant dryers should be monitored because they require a minimum regeneration temperature to maintain a -40°F PDP. Also, monitoring the heater kW is recommended, particularly on internally heated dryers.

Dirty Filters or Backpressure on the Blowers of Heated Blower Purge Dryers

As the pressure drop increases across the blower's inlet filter the purge flow reduces so the pressure drop should be monitored. Also a failed check valve can create backpressure on the blower; thereby, reducing its flow, so the blowers discharge pressure should be monitored.

Other Items That Can Affect the Performance of Regenerative Desiccant Dryers

Using Energy Saving Controls on Desiccant Dryers – Operating a regenerative desiccant dryer in its Energy Savings mode saves energy and can increase the life of the desiccant; however, it does reduce the system's PDP.

Failed Dew Point Monitors on Desiccant Dryers – Dew point monitors fail low so when they fail they can prevent a dryer that is operating in its Energy Savings mode from switching towers; therefore, it's important to maintain the dew point monitor on a regular basis.

Failing to shut off a Dedicated Desiccant Dryer when its Compressor is Shut Off – This issue only occurs in system where the dryers are dedicated to the compressors, the system contains oil-flooded air compressors, and there is oil in the main header downstream of the dryers. In this situation if the regenerative dryer isn't shut off the purge air will pull oil out of the main header as it flows backward through the dryer's afterfilter into the desiccant and out the purge exhaust muffler. The oil will ruin the desiccant along with the dryer's dew point monitor. Installing a check valve downstream of the dryer can resolve this issue.

Worn-out Desiccant – The life of the desiccant in regenerative desiccant dryers depends upon how the dryer is integrated into the system, the quality of the desiccant, and how the dryer is operated and maintained. The following are manufacturer's estimated desiccant life for the different types of regenerative desiccant dryers.

- "Heatless" dryers – 3 to 5 years
- Heated dryers – 2 to 3 years
- Heat-of-Compression dryers – 1-2 years BP

About the Author

Chris has be conducting compressed air system review throughout North America and Europe for 22 years. Chris can be reached at 303-881-8870 or via email at cbeals@earthlink.net.

To read similar ***Compressed Air Purification*** articles visit https://www.airbestpractices.com/technology/air-treatment.

Visit our Webinar Archives to listen to expert presentations on ***Compressed Air Purification & Piping*** at https://www.airbestpractices.com/magazine/webinars

weftec®
the water quality event™

where the

WATER

community comes to connect

Learn, explore, network, grow professionally, and strengthen your connection to the water community at WEFTEC 2021.

#WEFTEC **2021**

In Person + Online

October 16–20 I **Conference**
October 18–20 I **Exhibition**
McCormick Place, Chicago, IL
November 16–18 I **Online**

REGISTER NOW at weftec.org

Remote Monitoring Takes Off for Aerospace Manufacturer

By Nicolas De Deken, President, ENERGAIR

When air compressor-related inefficiencies, mechanical breakdowns and constant repair work began to significantly impact a Fortune 100 company responsible for producing military and passenger aerospace parts, the firm decided to take its compressed air system out of a nosedive.

To manage the repeated breakdown of four of the plant's fixed speed water-cooled compressors, which range from 125 HP to 250 HP, the manufacturer was regularly arranging on-site repair work and paying large air compressor rental fees in order to avoid downtime and keep the plant operational. However, this was not always achievable; at one stage, downtime was so high that some machines were only able to deliver three days of production in a month.

In order to gain better control of their assets' repair and preventative maintenance schedules, the firm's facilities supervisor decided it was time for a change from their current provider, so he called I&M Industrials. I&M Industrials was able to step in and quickly service and rebuild all existing equipment so that all compressors and dryers were properly functioning. However, this did not solve the energy and manual monitoring issues.

Whilst the compressed air asset base was of a high standard, in the absence of a system

controller with the ability to optimize all assets when running together, the compressed air system was wholly reliant on manual analysis and intervention. To compound the issue, the compressors are located several hundred feet from the site's offices, which made manual intervention a time and physically intensive exercise.

In-between repairs, and following a compressed air audit, it was established that in addition to the air compressors being of different ages, all of which offered varying degrees of efficiency, they were not sequencing in a unified way. In fact, the audit revealed that this inconsistency was quite often consuming approximately 30 per cent more energy to power the compressors than required, at huge cost to the business.

Hall Todd, Upstate Region Territory Manager for I&M Industrials said, "Our audit was extensive. We installed flow meters to measure the exact amount of scfm the plant demanded versus a calculated flow from simple amperage clamps. We measured consumed power to determine dynamic efficiency. We also placed pressure sensors throughout the plant to identity where the system was losing pressure. The results were staggering and revealed the amount of energy wasted along with the potential savings for the manufacturer."

Upgrading the System *Without* Upgrading the Air Compressors

Following the compressed air audit, I&M Industrials consulted ENERGAIR, the sustainable compressed air specialists. As part of CMC, the experts in compressed air control, performance and monitoring solutions, it was able to draw on AIRMATICS™ – a cloud-based air compressor monitoring, performance and control solution that provides real time data, analytics and insight at the push of a button. Working together the decision was made to install:

- **AIRMATICS™ Aero** to efficiently and uniformly control all air compressors, regardless of each of compressor's power variance and age
- **IoT remote monitoring platform** covering:
  - System flow, pressure, pressure differential over air treatment equipment, dewpoint and cooling water temperature monitoring
  - Compressor health and performance monitoring functionality spanning status and alarms, delivery pressure, sump pressure, separator differential, cooling water IN/OUT and discharge temperature monitoring

Remote monitoring not only supported automatic optimization of the plant's four key compressed air assets, but also negated the need for engineers to walk the several hundred feet to the air compressor room to manually make any adjustments. The manufacturer's engineers can now view a real-time visual depiction of their system from a screen located in their offices at all times.

Remote Monitoring Takes Off for Aerospace Manufacturer

Likewise, the team at I&M Industrials can remotely access and view the firm's compressed air system 24/7 from their offices and intervene when required, or when automatically alerted of any anomalies.

Like Night and Day

To assess their investment and explore the savings afforded by installing AIRMATICS™, the manufacturer agreed to run a trial in which the newly installed remote monitoring platform was turned off for one week to provide a comparative analysis. The results demonstrate a clear jump in performance.

During 12–19 February, the Aero control system was switched off to allow the 125 HP air compressor to run continuously loaded with the larger 250 HP air compressor loading and unloading. During this period, non-productive and productive energy stood at 37 percent and 63 percent respectively.

It was then switched back on again on for the period 19–26 February, during which time non-productive energy decreased to 23 percent whilst productive energy increased to 77 percent. The average efficiency level reached when switched off amounted to 25.8kW/100CFM compared to the 20.1kW achieved with it switched on.

The Deciding Factor

In the absence of the control system, the air compressors were loading and unloading according to pre-set pressure bands, which forced the system to operate at higher pressures and run inefficient combinations of compressors in order to effectively match air demand. When switched on, irrespective of air demand, the control system was able to control all compressors on a single, tight pressure band and efficiently match output with demand.

With a continuous saving of 5.7kW/100CFM, it is now expected to save the business 500,721 kWh a year and reduce the annual compressed air energy bill at the plant by $35,050, delivering a return on investment in only one year.

The AERO command and control unit is locally installed and digitally connected via the cloud.

BEST PRACTICES

2021 EXPO NOVEMBER 2-4 CHICAGO, IL

COMPRESSED AIR / VACUUM / COOLING

OPTIMIZE
ON-SITE UTILITIES
Powering Automation

Opening Session Tuesday, November 2, 10:15AM – 12:00PM

CAGI Remarks
Chad Larrabee, Education Committee Chair, Compressed Air & Gas Institute

Chiller Right-Sizing Projects – A Look at Perceived Demand vs. Actual Demand
Rob Kirts, Global Energy Manager, Stanley Black & Decker

Innovations in Process Cooling Design
Bert J. Wesley, P.E., Sr. Principal, Industrial Plant Engineering Practice Leader, Woodard & Curran

Digital Innovation for Smart Water, Air and Energy Management
Meredith Englund, VP Water Partnerships, Ecolab & Aviran Yaacov, CEO, Ecoplant

Plenary Session Wednesday, November 3, 10:15AM – 12:00PM

What's Your Energy Mix and Energy/Water/GHG Reduction Strategy?
Rod Smith, Publisher, Best Practices Magazines & EXPO

Collaborative Artificial Intelligence Drives Energy Conservation to Save California Dairies
Elhay Farkash, CEO, Zira Group

Commitment to a Collaborative Culture Key to Exceeding Sustainability Goals,
Nancy McDonell, CEO, Value of the Person

Three Levels of Compressed Air Systems
John Bilsky, Facilities Specialist for Compressed Air, Purified Water and N2 Systems, Gentex Corporation

Super Early Bird Rates End on September 22!

REGISTER NOW AND SAVE!

cabpexpo.com

Remote Monitoring Takes Off for Aerospace Manufacturer

The manufacturer agreed to run a trial in which the newly installed remote monitoring platform was turned off for one week to provide a comparative analysis.

Nicolas De Deken, President at ENERGAIR said, "The beauty of a system like AIRMATICS™ is that it continually monitors a business's compressed air system every minute of every day. By using the system, the manufacturer now has the equivalent of a full-time engineer optimizing its system's performance around the clock, which is something that simply cannot be achieved through human intervention alone." BP

About I&M Industrials

Founded in 1967, I&M Industrials has built a business on providing engineered compressed air solutions and products throughout South Carolina and Augusta, GA. Tailoring its services for any customer, no matter the size, I&M can design and install a completely new system, provide consulting for current system improvements, and/or simply service the existing equipment. Over fifty years since it was established, I&M Industrials remains a privately-owned firm that includes a team of 30 compressed air specialists. I&M continues to build upon its customer base, which includes multiple Fortune 100 companies.

About ENERGAIR

ENERGAIR is the sustainable compressed air management arm of CMC – the global experts in compressed air control, performance and monitoring solutions. Harnessing over three decades of knowledge and experience, and tapping into CMC's growing range of brands, products and technologies, ENERGAIR provides a fully integrated compressed air management service that includes independent expert advice from compressed air specialists, brand agnostic compressed air monitoring and auditing tools, and the latest in IoT-applied air compressor management platforms

For more information on ENERGAIR and I&M Industrials visit www.energair.com and www.iandmindustrials.com.

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

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

Vegas®

ASHRAE AHRI

2022 AHR® EXPO

THE PREMIER EVENT FOR HVACR

January 31 - February 2

Recharged. Renewed. Ready to Rock.

The Magazine for QUALITY & RELIABILITY in ENERGY & WATER-EFFICIENT Chiller & Cooling Systems

CHILLER & COOLING BEST PRACTICES

coolingbestpractices.com

September 2021

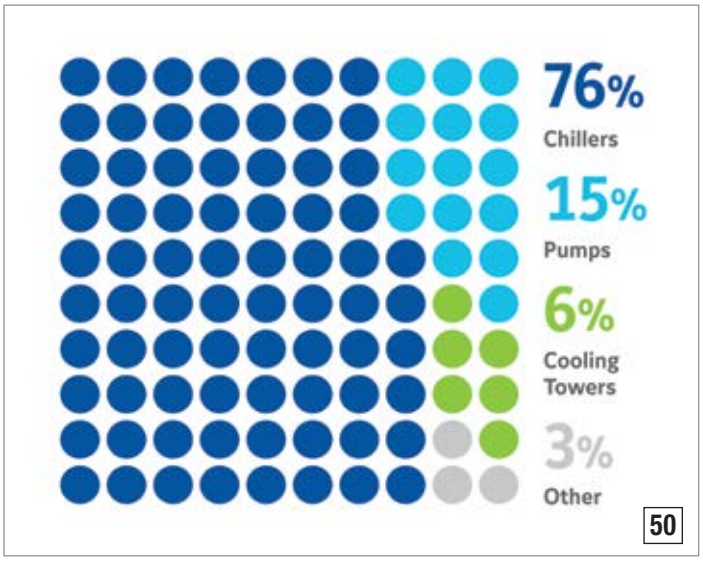
Transportation

COOLING TOWERS & CHILLERS

50 The Benefits of Variable Speed Drives for High-Load Chiller Operations

WATER TREATMENT & COOLING SYSTEM ASSESSMENTS

56 Efficiency and Redundancy: Cooling System Pillars at Röchling Automotive



COOLING TOWER & CHILLER FEATURE

50 **The Benefits of Variable Speed Drives for High-Load Chiller Operations**
By Kiran Kishor Waghmare, Johnson Controls

WATER TREATMENT & COOLING SYSTEM ASSESSMENT FEATURE

56 **Efficiency and Redundancy: Cooling System Pillars at Röchling Automotive**
By Tom Stone, Thermal Care

SUSTAINABILITY & EFFICIENT TECHNOLOGY NEWS

6 **Corporate GHG-Reduction News**
Featuring: Magna, Röchling Group, Stellantis, Daimler, Crown, McDermott, Bosch

62 **Chiller & Cooling Technology**

EVERY ISSUE

4 **From the Editor**

64 **Advertiser Index**

64 **The Marketplace** | Jobs and Technology

SMC®

#1 Manufacturer of Automation Components

For Industrial Automation

High precision temperature control for every industry

Temperature Control Equipment

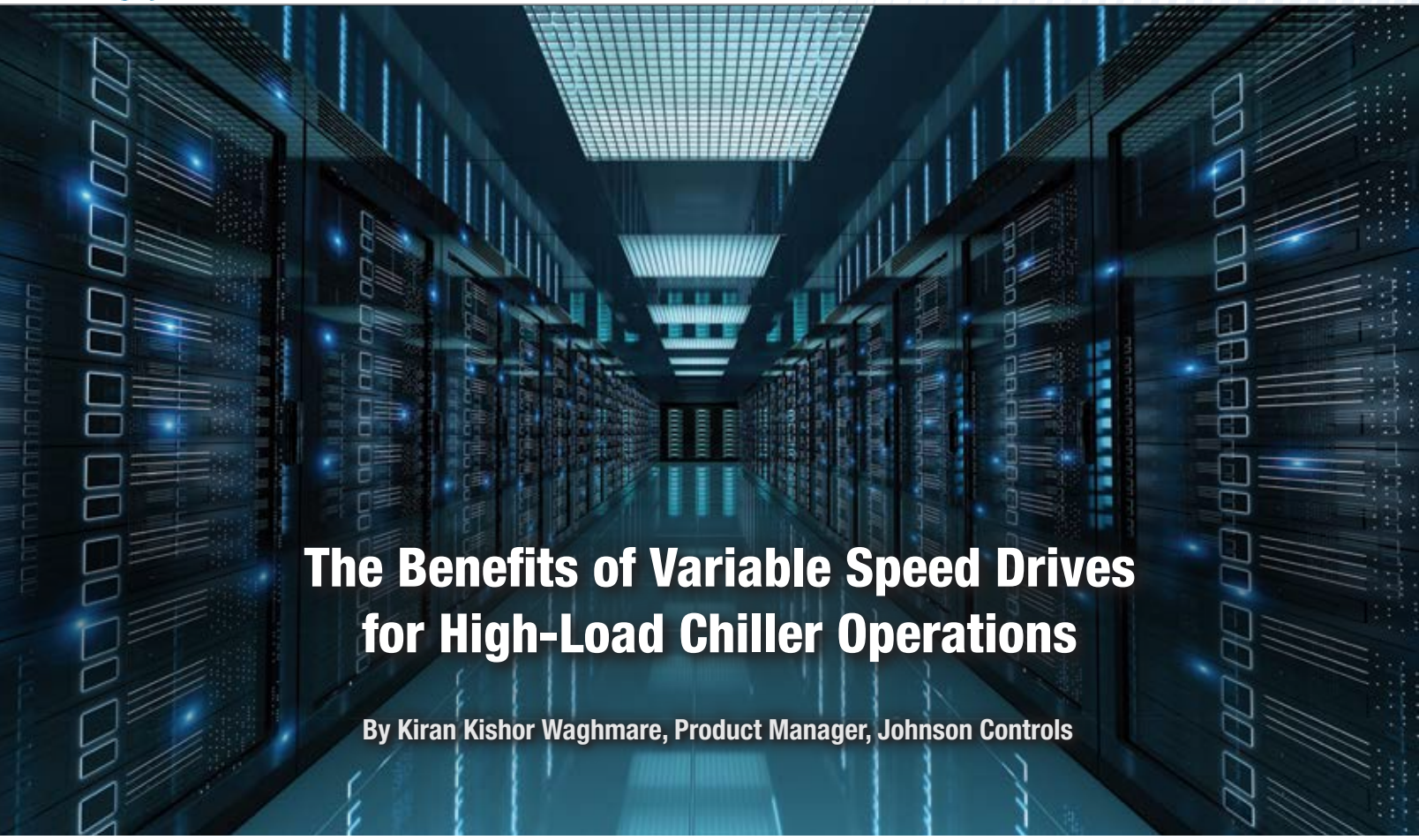
- Floor mount and Rack mount styles
- Refrigerant and Peltier models
- Temperature Stability: ±0.01°C to ±0.1°C
- Air cooled / Water cooled
- Voltages: 110VAC / 230VAC / 460 VAC
- Cooling Capacity: 200W to 28KW

Providing Sustainable, Energy Efficient and CO_2, Reducing Components for Industrial Automation

SMC Corporation of America **800-762-7621**
SMC Automation Canada Ltd. **800-762-7621**
Email: sales2smcusa.com

www.smcusa.com
www.smcautomation.ca

Energize Your Efficiency



The Benefits of Variable Speed Drives for High-Load Chiller Operations

By Kiran Kishor Waghmare, Product Manager, Johnson Controls

➤ Overview

Water-cooled chiller plants have three major components that consume electricity: the chiller, the condenser and evaporator pumps, and the cooling tower fan. The chiller consumes the highest amount of total plant room energy. In certain applications, the energy consumption of a chiller is very significant. For example, in district energy applications, chillers may consume more than 75 percent of the facility's total energy.

For the designers, owners, and operators of chiller plants, it is important to understand what causes a chiller to consume power and what strategies can be implemented to optimize power consumption during high loads. This is particularly true for district cooling plants, where chillers generally operate at higher loads to achieve their objectives.

It is important to establish the metrics to accurately illustrate the correct way to optimize the efficiency of chilled water systems. These metrics inform all recommendations about the evaluation of the impact of off-design operation.

A common misconception in chiller performance evaluation is that design full-load kW/Ton is directly indicative of chiller efficiency. Reducing the chiller selection process to full-load efficiency does not account for a more representative and impactful metric: off-design energy efficiency or annual energy efficiency.

If owners and operators of chiller plants only consider full loads, it can result in unexpected energy use consequences. One of the best ways to improve annual efficiency levels is to employ a VSD for the chiller compressor motor. VSDs are powered devices, which means they negatively impact the full-load performance of chillers, but they are an excellent way to reduce operating costs and improve annual efficiency. VSDs reduce the energy consumption of chillers, especially compared to CSDs, even in applications where chillers run at continuously high loads. To prove this, a new metric is proposed. This metric is a more accurate alignment of specific power input to expected annual energy consumption.

The validity of the newly proposed metric is corroborated by the case study presented in this paper. Finally, this paper does not address the electrical design and topology of a VSD, but rather a VSD's impact on the compressor of a chiller and – by extension – overall energy performance.

VSD Impact on Chiller Power Consumption

System designers will specify that a chiller be designed to operate at the most severe condition (the design condition) to avoid insufficient cooling on the most important days. The design condition is used to calculate the maximum

instantaneous power consumption. This is then used to size critical electrical components, such as circuit breakers, wires, and generators.

However, chillers run at design conditions for less than 10 percent of the year. Therefore, off-design performance is more important to the overall evaluation of a chilled water system. This is particularly true for applications where chillers run at high loads throughout the year – for example, plant rooms in data centers and other facilities that require process cooling. In these facilities, the chilling duty does not change.

A water-cooled chiller's instantaneous power consumption varies because of two dynamics. The first is the variation in the capacity required by the system, and the second is the amount of compression required. This is illustrated in Figure 2.

Figure 2 is a graph that gives the example of a 2,500 Ton of Refrigeration (TR) water-cooled centrifugal chiller. Figure 2 isolates and compares the impact of changing loads and varying condenser water inlet temperature on a chiller's power consumption. The solid lines represent the performance of the VSD. The dashed lines denote the performance of the CSD.

At the design point, the full load kW/Ton is greater for the VSD chiller than the CSD chiller because of the losses from the electronics in the VSD. However, as conditions change, the improvement of the VSD chiller offsets the losses at the full load and delivers a net improvement over the life cycle of the chiller.

The key insight from the graph is that specific input power consumption is reduced as the Entering Condenser Water Temperature (ECWT) goes down. However, two important observations must also be made.

1. At a given ECWT for a chiller using a CSD, the specific consumption is at its optimum closer to full-load (100 percent) conditions. However, for a chiller using a VSD, the specific consumption improves as the load is reduced.

2. Even at full-load conditions, the specific consumption of a chiller using a VSD is superior to a chiller using a CSD. This yields a net reduction in power consumption and operating costs for the chiller using a VSD.

These results prompt an interesting question: how and why does a VSD improve the performance of a chiller?

To understand how VSDs improve the performance of chillers when they are not at peak capacity and design ECWT, one must continue with the same example of a 2,500 TR centrifugal chiller (see Table 1a and 1b). By analyzing the two dynamics that determine power consumption in a chiller, one can assign measurable units to these dynamics.

The first unit in each table, Tonnage, denotes the amount of refrigerant that a compressor needs to complete its work, which is directly related to a cooling load in tons (see column 1). The second unit, ECWT, denotes the amount of work that must be done to a refrigerant, which is directly related to the differential in evaporator and condenser pressure – this is denoted as lift (column 3 and 4).

As the load drops from 2,500 TR to 750 TR, power consumption drops to nearly 40 percent of peak power. However, in both cases, the specific input power of the chiller deteriorates from 0.698kW/Ton to 0.861 kW/Ton. In this case, the changing load reduces energy consumption.

The Benefits of Variable Speed Drives for High-Load Chiller Operations

When one compares chillers using CSDs with those using VSDs, the key driver for the difference in specific power input is that the VSD reduces a chiller's load by reducing the impeller revolutions per minute (RPM) by nine percent, while the chiller using a CSD uses its inlet guide vanes to throttle the refrigerant flow entering the compressor. This translates to reduced efficiency in the performance of a chiller using a CSD because throttling imparts frictional losses.

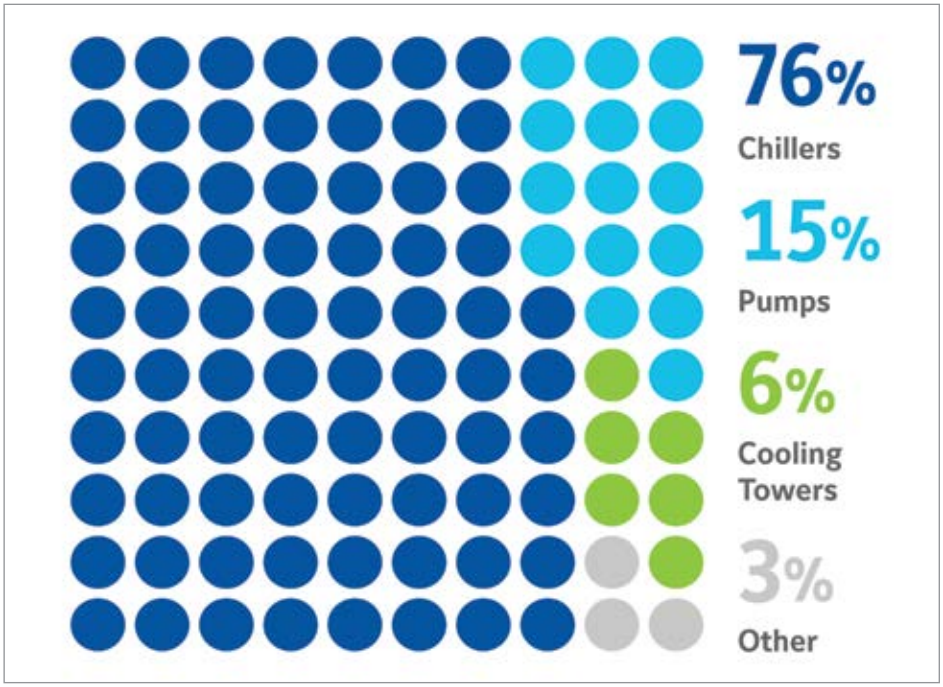


Figure 1.

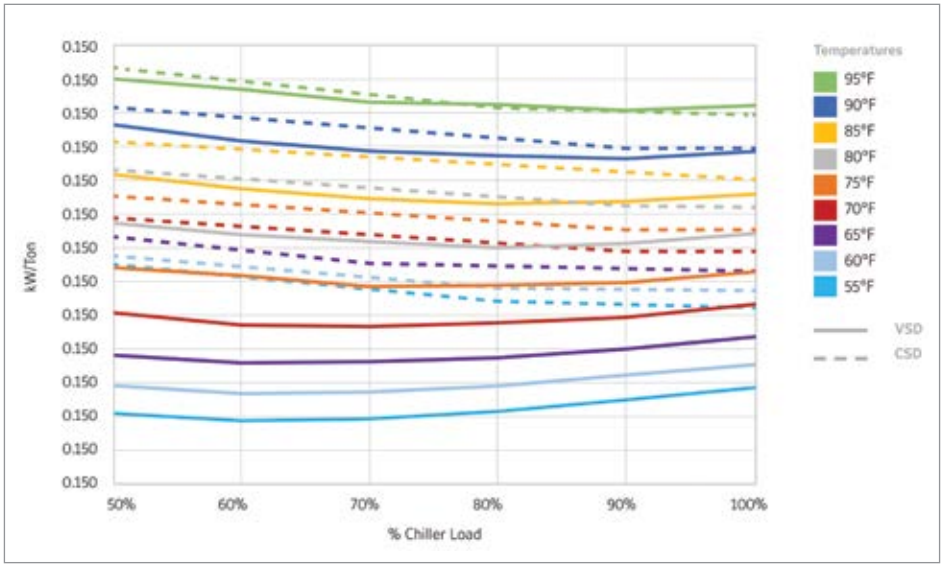


Figure 2.

This loss of efficiency relates to the performance of the inlet condenser water temperature.

When the inlet condenser water temperature drops, lift – expressed in pounds per square inch differential – is significantly reduced, even at a constant load.

In a centrifugal compressor, the compressor's ability to develop lift depends directly on the tip speed of the impeller. However, as the demand for lift increases, the required tip speed of the impeller decreases, which allows for a reduction in motor speed.

It is important to note that, even at a constant load, the impeller RPM in a chiller using a VSD is reduced by 18 percent. This results in a specific power input reduction of almost 55 percent. This is considerably better than a chiller that uses a CSD, which can only achieve a 38 percent reduction.

The affinity laws for centrifugal equipment prove that changes in the amount of power drawn by a compressor are proportional to the cube of the impeller's speed. As the VSD reduces the speed of the compressor's impeller by 18 percent, rotating at 82 percent of RPM, the power consumption would theoretically be 823 percent. This equates to approximately 55 percent of design power, which aligns closely with the observed results.

For a chiller using a CSD, impeller speed does not vary and is constant for all the load conditions. This necessitates throttling, which gives rise to the observed 17 percent loss in specific power consumption, along with the specific power input improvements for full-load cooling from an ECWT of 85°F (29.4°C) and lower. This amounts to a significant number of operational hours for facilities with large, chilled water systems.

Annual Specific Power Input (ASPI)

Reducing lift, as opposed to the load, reduces the specific power consumption of a chiller. Once this is clearly understood, the question is simple: how do system designers accurately evaluate the performance of different equipment against each other?

To answer this question correctly, the performance data of the equipment must be converted into a metric that will consider real-world annual energy consumption.

It is very important that the system designer specifies a chiller at its peak condition. This ensures that the chiller delivers cooling on the hottest day in a given facility, especially when downtime or missed capacity is not an option – in district cooling plants, for example.

However, the majority of other days in a given facility allow for cooler ECWTs because of the variation in ambient temperature or, more specifically, the wet-bulb temperature. Although the maximum capacity at this point is critical to system design to avoid a shortage of cooling during peak demand, the specific power input does not give an accurate representation of energy consumption by the chiller as it operates throughout the year.

Therefore, to effectively compare the energy consumption of two chillers that are expected to operate at nearly full loads for the majority of their operating hours, it is also important to analyze the performance of the chillers at conditions of reduced entering condenser water temperatures. These reflect actual weather patterns.

The ASPI is a weighted average of a chiller's specific power input at peak power with off-design, full-load operating points where the ECWT is lower.

Tonnage	ECWT	Lift in psid		Job kW		kW/Ton		Impeller RPM	
2,500	95	100.49	100.48	1,778	1,745	0.711	0.698	11,497	11,539
2,500	90	89.22	89.33	1,608	1,616	0.646	0.6465	11,215	11,539
2,500	85	78.63	78.79	1,447	1,501	0.579	0.6004	20,852	11,539
2,500	80	68.69	68.89	1,306	1,401	0.511	0.5605	10,496	11,539
2,500	75	59.33	59.58	1,159	1,312	0.464	0.5248	10,220	11,539
2,500	70	50.54	50.85	1,034	1,231	0.414	0.4925	9,941	11,539
2,500	65	42.31	42.66	917	1,157	0.367	0.4628	9,651	11,539
2,500	60	34.61	34.99	814	1,088	0.325	0.4351	9,348	11,539

Table 1a: Varying Entering Condenser Water Temperature Impacts

Table 1a.

Tonnage	ECWT	Lift in psid		Job kW		kW/Ton		Impeller RPM	
2,500	95	100.49	100.48	1,778	1,745	0.711	0.698	11,497	11,539
2,250	95	97.66	97.75	1,584	1,571	0.704	0.698	11,194	11,539
2,000	95	94.6	94.71	1,424	1,405	0.712	0.703	10,854	11,539
1,750	95	92.04	92.17	1,253	1,264	0.716	0.722	10,775	11,539
1,500	95	89.56	89.68	1,103	1,111	0.735	0.741	10,599	11,539
1,250	95	87.1	87.23	939	958	0.751	0.766	10,526	11,539
1,000	95	84.57	84.67	807	803	0.807	0.803	10,456	11,539
750	95	82.23	82.32	656	646	0.874	0.861	10,424	11,539

Table 1b: Constant Entering Condenser Water Temperature Impacts

Table 1b.

The ASPI of a chiller is defined as the weighted average of the full-load efficiency of that chiller for one year.

Figure 3 can be explained in the following way: 8,760 is the total number of hours in a year. The table refers to the tabulated values used in the definition of the ASPI. The weighted average of specific power input should be taken by considering the variation of ECWT throughout the year. The weighted average yields the final average efficiency number to reflect the relative importance of variation in ECWT.

Comparison of ASPI Using a Fixed Speed Versus a Variable Speed Chiller

The same example of a 2,500 TR centrifugal chiller can be used to demonstrate the variation in the full-load efficiency of a variable speed centrifugal chiller and a constant speed centrifugal chiller. The design conditions for the selection of these chillers are an Evaporator Inlet/Outlet of 56/30°F (13.3/-1.1°C), an ECWT of 95°F (35°C), and the capacity requirement at these conditions, which is 2,500 TR.

By considering continuous full load operations all year round, the chiller is rated for a full load at varying ECWT. Table 2 below shows the chiller operating hours for the given ECWT for climatic conditions in Dubai. The electricity tariff for Dubai is assumed to be $0.12/kWh. Though the chiller is designed for and selected at 95°F (35°C) ECWT, the chiller will spend most hours operating with between 85 and 65°F (29.4 and 18.3°C) ECWT.

The Benefits of Variable Speed Drives for High-Load Chiller Operations

Capacity	ECWT in Deg F°	% hours in year	Number of hours in year	Performance of the chiller
Design Point Load (Full Load)	95	10	876	A
	85	25	2,190	B
	75	30	2,628	C
	65	25	2,190	D
	60	10	876	E

$$\text{Annual Specific Power Input (ASPI)} = \frac{A+876 + B \times 2190 + C \times 2628 + D \times 2190 + E \times 876}{8760}$$

Figure 3. ASPI Chart

Cooling load in TR	ECWT in DegF	Running time in year (%)	Running hours in year	kW/Ton (Constant Speed Chiller)	kW/Ton (VSD Chiller)	Energy consumption in CSD (KWh)	Energy consumption in VSD (KWh)
2,500	95	10	876	0.698	0.7113	1,528,620	1,557,747
2,500	85	25	2,190	0.6004	0.5787	3,287,190	3,168,383
2,500	75	30	2,628	0.5248	0.4637	3,447,936	3,046,509
2,500	65	25	2,190	0.4628	0.3667	2,533,830	2,007,683
2,500	60	10	876	0.4351	0.3254	952,869	712,626
Annual specific power input (ASPI)				0.537	0.479		
Total energy consumption in one year (kWh)						11,750,445	10,492,947
Annual energy cost (AEC) with $0.12/kWh						$1,410,053	$1,259,154
Savings in kWh with VSD chiller in one year						1,257,498	
Savings in annual energy cost using ASPI with $0.12/kWh						$150,900	

Table 2.

At the design point, the peak kW/Ton for a chiller using a VSD is higher than that of a chiller using a CSD. This is because of the electronic losses of the VSD. However, the kW/Ton of a chiller using a VSD starts to reduce below 65°F (18.3°C) and the accompanying efficiency improvements can be as high as 26 percent. This can even be seen at a constant full load of 2,500 TR compared to a chiller using the CSD.

The ASPI of a chiller using a VSD is 0.479 kW/Ton, which is approximately 11 percent lower than the 0.537 kW/Ton of a chiller using a CSD. This indicates a significant reduction in annual energy consumption. Energy costs can be achieved with the employment of a chiller using a VSD, even for an application where the chiller operates at very high loads. The example outlined in Table 2 shows that 1,257,498 kWh savings can be achieved over one year with the use of a VSD. This amounts to $150,900 in annual savings.

Conclusion

Between the load and the ECWT, ECWT has a higher impact on the efficiency of a chiller. An internal building load variation is a less significant parameter from an efficiency perspective.

As a result of the available variation in the ECWT due to annual weather patterns, the VSD dramatically improves the performance of a chiller. The improvement offered by the VSD is 25 to 30 percent better than a CSD. This conclusively shows that a VSD provides higher performance improvements with changes in the ECWT (lift) than the CSD.

The analysis of a water-cooled centrifugal chiller during a continuous full-load operation demonstrates that a CSD shows relatively little benefit: two to three percent on the design point. By contrast, the ASPI of a chiller using a VSD is greater by 11 percent.

As seen in the case study example, for a 2,500TR centrifugal chiller running continuously on a full load throughout the year, the annual energy saving is 1,257,498 kWh, which results in cost savings of $150,900. This is all achieved by using a VSD on a centrifugal chiller. BP

For more information, visit www.johnsoncontrols.com or follow us @johnsoncontrols on Twitter.

To read similar ***Chiller Technology*** articles visit https://coolingbestpractices.com/technology/chillers.

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

BEST PRACTICES

2021 EXPO NOVEMBER 2-4 CHICAGO, IL

COMPRESSED AIR / VACUUM / COOLING

OPTIMIZE ON-SITE UTILITIES

Powering Automation

Research and Identify Innovations

to Enhance the Efficiency and Reliability of Your Systems

Compressed Air

Air Compressors
Air Compressor Controls
Air Purification & Piping
Condensate Management
Pneumatics

Blower & Vacuum

Aeration Blowers
Industrial Blowers
Vacuum Pump Systems
Inlet Filtration/Oil Separators

HVAC & Process Cooling/Steam

Chillers
Heat Exchangers
Cooling Systems
Cooling Towers
Water Treatment
Boilers
Steam Traps

Motors & Drives • Lubricants • Measurement Instruments • IoT Automation & Monitoring

EXPO HOURS

Tuesday, November 2 12:00-6:00PM

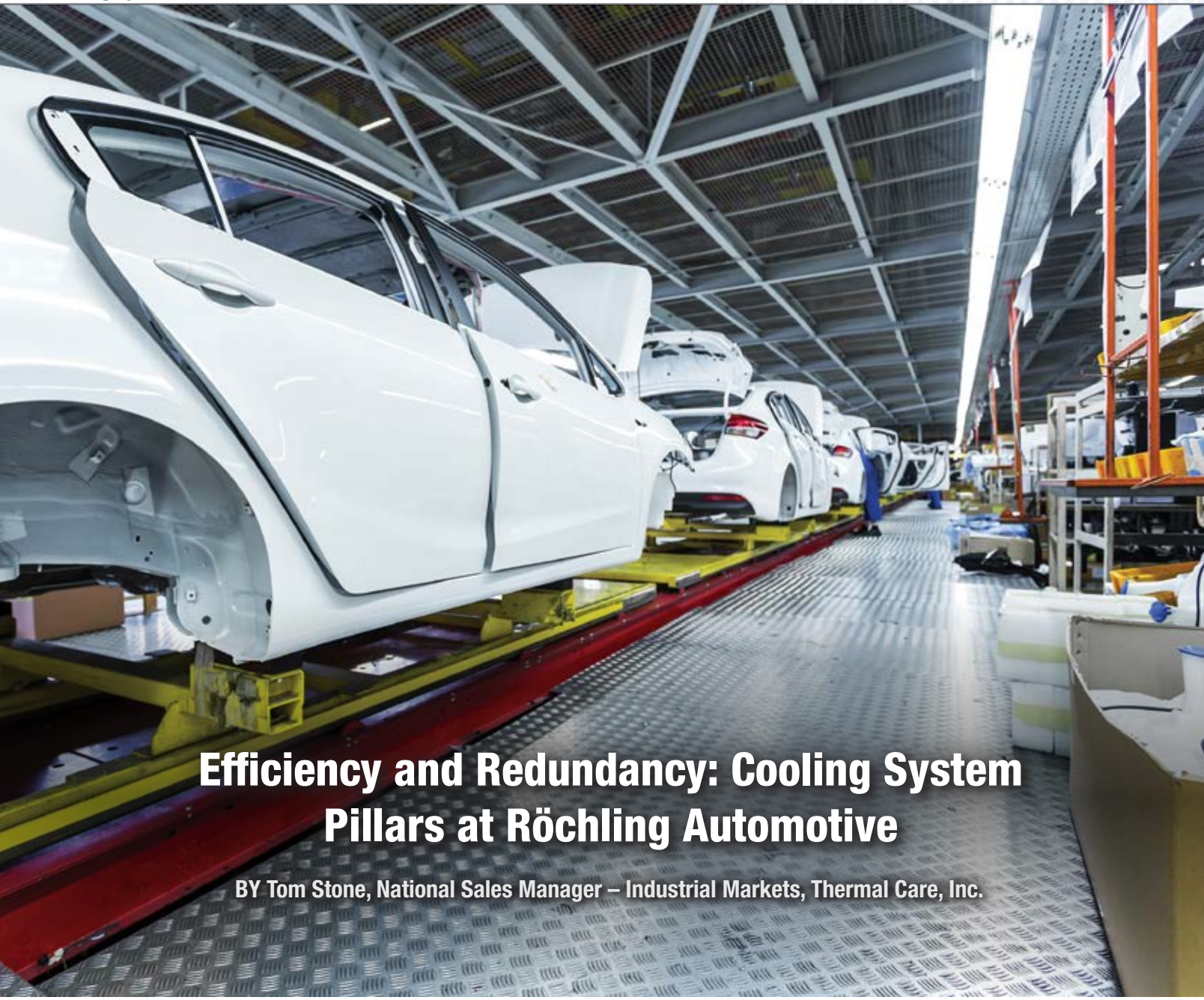
Wednesday, November 3 12:00-6:00PM

SAVE THE DATES ON YOUR CALENDAR!

Located at the modern Schaumburg Convention Center just 10 minutes from Chicago O'Hare International Airport.

cabpexpo.com

Sponsored by CAGI Compressed Air & Gas Institute



Efficiency and Redundancy: Cooling System Pillars at Röchling Automotive

BY Tom Stone, National Sales Manager – Industrial Markets, Thermal Care, Inc.

➤ The automotive sector is one of the largest and most active markets for process cooling equipment. The extremely high standards for equipment specifications are reflected directly in the quality of their products. Thermal Care has worked with some of the industry leaders including Röchling Automotive.

Röchling required a new comprehensive cooling system for their Akron, OH facility. The forward thinking management at Röchling elected to pursue a system that was not only reliable and cost effective, but would incorporate industry leading technology for efficiency and built-in designs for redundancy. Their facility required both a cooling tower system and a chiller system. Below are the design features of each of these Thermal Care systems, and the benefits of some of the unique features are explained.

More Than One Cooling Water Temperature Required

One of the most critical questions when beginning a cooling system design is, "What temperature is required?" This drives the design toward either a cooling tower system using evaporative cooling for higher temperature supply, or a chiller system using mechanical refrigeration for lower temperature supply. Generally, anything at or above 80-85°F (27-29°C) can use a cooling tower system, and anything below that will require refrigeration. The temperature requirement is dictated by the processing equipment requiring cooling. Sometimes, facilities will utilize both a higher water temperature and a lower water temperature for various equipment throughout the facility. This is true for Röchling Automotive.

In cases like this, a water-cooled chiller is an excellent solution for the chilled water system. A water-cooled chiller is the most energy efficient chiller design available. It can utilize the cooling tower system for its condenser cooling, which eliminates the need for multiple fans for forced air cooling. Because the cooling tower system is already required for other equipment, the additional capacity needed for the chiller's condenser has minimal impact on the overall cost of the system.

Variable Speed Turbo Water-Cooled Chiller

Röchling elected to install industry leading technology with the TC series central chiller. The chiller utilizes a variable speed, magnetic bearing Danfoss Turbocor® compressor. This design can modulate the speed of the compressor to match the demand of the system. With the magnetic bearings, there is no oil required in the compressor. This feature allows the compressor's speed to be reduced much lower than a traditional compressor. Traditional compressor technologies require a minimum pressure differential to ensure proper oil circulation in the system. To achieve the minimum differential, the compressor's speed can only be lowered so much. This minimum differential is no longer a factor when using a TC chiller.

TC Series Dual Circuit Chiller.

It also incorporates two completely independent circuits, both refrigeration and water. For high level production facilities like Röchling's, built-in redundancy like this is critical. Finally, the chillers use high efficiency brazed plate evaporators. With these, not only is the chiller's efficiency optimized, but the extremely compact design helps to minimize the footprint of the chillers which frees up valuable space in the mechanical room.

Chilled Water Circuit Pumping System

The pumping system for the chilled water circuit also reflects Röchling's comprehensive philosophy of energy efficiency and redundancy. It includes an all stainless steel reservoir to add volume to the system for temperature stability. The reservoir is fully insulated with industrial grade material to minimize waste energy losses through condensation.

The process pump, which supplies cooling water to the production equipment, is controlled by a variable frequency drive (VFD) based upon input from a pressure transducer. As production machines are brought online or taken offline, the pressure in the chilled water system is altered. The pressure transducer measures this and provides input to the VFD, which responds by ramping the speed of the pump motor up or down to match the demand. The pumps in this system are configured with a dual standby pump and discharge manifold. This design allows for a standby pump to act as either the process pump or chiller recirculation pump in the event of an emergency.

Pumping system with 3 pumps – process pump with VFD (left), dual standby pump (middle), and recirculation pump (right).

Efficiency and Redundancy: Cooling System Pillars at Röchling Automotive

Fiberglass cooling tower with counter-flow design.

Finally, the chilled water loop includes a full flow, stainless steel filter so 100% of the water circulated through the system is as clean as possible. This helps prevent any clogging or fouling in the piping and production equipment that reduces the efficiency of the system over time.

Closed Loop Cooling Tower System with a Plate and Frame Heat Exchanger

The second part of the facility's process water system is the cooling tower system. It provides cooling to the chiller's condenser but also any production equipment that can accept higher temperatures (in the 80-85°F range as mentioned above). Röchling's cooling tower system is a specific type known as a closed loop design which includes a plate and frame heat exchanger. It isolates the water flowing through the cooling tower from the water circulating to the production equipment. While cooling towers are a cost effective and energy efficient means of cooling, they can introduce contamination into the water as well as create the potential for scale build-up in the system.

Cooling towers use evaporation to reject energy from the system. Evaporation increases dissolved solid concentrations and results in scaling. By using a plate and frame heat exchanger, which can be opened and cleaned, the closed loop design protects the production equipment from efficiency losses associated with clogging and fouling. Both the tower side and the process side of the heat exchanger include stainless steel, full flow filters for added protection.

There are multiple cooling towers in the system that stage on and off to match demand and add redundancy. The fiberglass cooling tower shells are designed to withstand constant exposure to the elements and harsh industrial environments for long lifespans. The efficient counter flow design maximizes evaporation and thus heat rejection. Counter flow refers to the direction of the water flow versus the air flow. The fans and motors are all direct drive and ready for VFD control.

Cooling Tower Pumping System

The cooling tower pumping system is similar to the chilled water pumping system configuration. It also uses a VFD controlled process pump and a dual standby pump for an efficient, redundant combination. The dual standby includes a suction manifold and a discharge manifold. This allows the standby pump to draw water from either the tower side or the process side of the fully divided tank.

A fully divided tank refers to the baffle installed in the reservoir. It extends completely from top to bottom and is welded at all seams. This design removes the need for two separate tanks by housing completely separate wells within the same tank conserving floor space. Cooling tower reservoirs do not require insulation because of the operating temperatures of the system.

Conclusion

When reviewing the components and overall designs of these systems it is easy to see a consistent theme: efficiency and redundancy. Design decisions like these play a part in Röchling's continued success in the market. As Röchling's product quality is recognized in the industry and their market share continues to grow, their cooling system is ready to support the increased demands and even expand to match as needed. BP

About the Author

Tom Stone is the National Sales Manager of Industrial Markets for Thermal Care. He has been in the process cooling field for 14 years after graduating from Purdue University's School of Mechanical Engineering. For more information visit https://www.thermalcare.com

To read similar ***Chiller Technology*** articles visit https://coolingbestpractices.com/technology/chillers.

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

aee ENERGY CONFERENCE & EXPO

WORLD

aeeworld.org

Join Leading Energy Efficiency & Sustainability Professionals

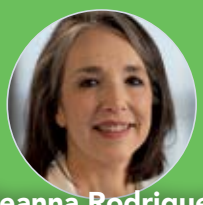
New Orleans, LA | Oct. 20-22, 2021

Keynote Speakers

Bill Kent, CEM
Executive Director, Association of Energy Engineers

Bear Grylls, OBE
Survivalist and Outdoor Adventurer

Robert Swan, OBE
Record Breaking Polar Explorer & Environmental Campaigner



Deanna Rodriguez
President and CEO Entergy New Orleans

Announcing More Speakers Soon

Conference Tracks Over 140 Sessions

- FEDEnergy Works
- Energy Manager's Summit
- Energy Basics
- Energy Services
- Industrial Energy Management
- The Better Plants Program
- High-performance Communities
- Renewable Energy
- Sustainable Development
- Emerging Energy Trends
- Big Data & IoT

Panel Discussions

- Evolving Global Energy Policy
- Global Energy Transformation Post Pandemic
- Resiliency & Cybersecurity
- Achieving Climate Change Goals Through Energy Efficiency

Plus...

Annual Awards
Recognizing Achievements

Networking Events
Connect with Your Peers

Get Certified
In-line Training Programs

Go Virtual

Cannot attend in person? Gain access to general sessions and on demand content, find out what's included at **aeeworld.org**

Event Sponsors

Platinum Sponsor

Entergy

Gold Sponsors

Better Plants U.S. Department of Energy

YARDI

Bronze Sponsors

AEROSEAL

Bernhard

Dude Solutions

Energy Star

Utility Management

World Energy Innovations

Abraxas Energy Consulting

Energy Leaders

Honeywell

Entergy Solutions

Entergy

APTIM

EnergySmart

Entergy

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Critical Rental Solutions Site Air

Critical Rental Solutions announced Site Air, a new utility providing an alternative to temporary rental compressors, allowing companies to startup operations or replace underperforming compressors without the capital expense or cost of ownership. Critical Rental Solutions provides oil-free air and temperature control solutions to companies around the world. Located in Houston, TX, Critical Rental Solutions has one of the largest and highest quality fleets of rental equipment including high pressure centrifugal and rotary screw compressors, dryers, low pressure blowers and fans, cooling towers, and accessories. With the new addition of Site Air, Critical Rental Solutions is expanding their versatile rental platform. Site Air systems are completely self-contained, integrate with existing permanently installed compressed air capacity, and are customizable for each facility.

Critical Rental Solutions, https://criticalrentalsolutions.com

Parker PPD Series Portable Desiccant Dryer

The Industrial Gas Filtration and Generation Division of Parker Hannifin Corporation, the global leader in motion and control technologies, announced the launch of its new Parker PPD Series Portable Desiccant Compressed Air Dryers and ROVR Oil Vapor Removal System, designed to deliver 'technically' oil-free compressed air for the rental industry. Parker's new PPD Series is a range of comprehensive compressed air treatment systems each equipped with multiple stages of a filtration, a twin tower adsorption (desiccant) dryer, optional integrated aftercooler and water separator package and an industry-leading Programmable Logic Controller (PLC). Packaged on a portable, heavy-duty skid, these highly engineered systems ensure high quality compressed air in accordance with ISO8573-1, the international standard for compressed air quality.

Parker Hannifin, www.parker.com

Atlas Copco Enhanced Filtration Range

Atlas Copco's next-generation air filters now feature the pioneering inPASS™ technology to simplify maintenance and reduce costs significantly. The new range also gives customers the flexibility to choose between advanced filter media to match their specific air quality requirements. Filtration is a crucial but sometimes overlooked component of a compressed air system. There is an assumption that all filters do the same job and have the same filtration properties. However, untreated or poorly treated compressed air can contain dirt, water, and oil, compromising tools, production processes, and final products. That is why Atlas Copco offers a complete range of filters that remove even the smallest contaminants – from dust to water and oil vapors.

Atlas Copco Compressors, www.atlascopco.com

Festo VPPI Proportional Pressure Regulator

Festo recently introduced VPPI, a new family of proportional pressure regulators. Highly dynamic to 30Hz, VPPI offers precise and stable operation in vacuum applications as well as tasks up to a pressure range of 12 bar. Coupled with an IO-Link interface as well as a fieldbus connection for controlling the valves via a Festo CTEU valve manifold, VPPI represents the state of the art in proportional pressure regulation. VPPI units are ideal for pressure regulation in dispensing, pressing, press-fitting, and testing in such industry segments as food and beverage, packaging, electronics, light assembly, automotive, and machining. Overall VPPI offers a range of operational features that give OEMs and end users greater flexibility compared to other regulators on the market. These regulators have a flow rate of up to 1000 liters/min.

Festo, www.festo.com/us

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Gardner Denver GD70 Piston Compressor

Gardner Denver introduced the GD70 Oil-Lubricated Piston Compressor to the Gardner Denver Transport product line. This compressor is intended for use in pressure off-loading bulk liquids, ranging from solvents to resins. This two-cylinder, single stage compressor provides a small footprint via its in-line design, which allows additional space for other necessary on-loading and off-loading equipment. The GD70 is manufactured using all cast iron construction, providing maximum durability that is built to last.

Gardner Denver, www.gardnerdenver.com

Siemens New Simatic Micro-Drive

Siemens is extending its drive portfolio in the safety extra-low-voltage range for 24-48V EC motors by introducing a new servo drive system named Simatic Micro-Drive. The new system with UL and CE marked components consists of the PDC (Profidrive Control) servo drive in conjunction with a flexible range of motors and connecting cables from product partners. Simple connectivity to Simatic programmable logic controllers (PLCs) helps significantly reduce the engineering workload, while integration into Siemens automation technology via its TIA Portal makes for simple commissioning and servicing. Attributes such as smart encoders and one-button tuning add to its plug-and-play startup. Communication takes place over Profinet using Profisafe and Profidrive profiles. The new Safety Integrated function SLT (Safely Limited Torque) limits torque by monitoring motor current in running operation.

Siemens, www.siemens.com

EXAIR New Look Website

EXAIR.com® is freshly renovated with a new look and feel to heighten our user's experience. Putting research to use and taking customer feedback to heart, we've made strides to ensure shopping on EXAIR.com is easier than ever. With attention paid to overall speed and ease of navigation, the new site allows for quick and easy browsing of EXAIR products, videos and countless other resources. The new site is fully responsive, whether using a PC, tablet or smartphone, and also brings an improved search function with filtered results that allows for quick navigation to specific products in seconds. In addition to these new features, EXAIR.com continues to provide the critical tools to understanding the best EXAIR product for you with 64 native extensions for CAD drawings, PDF files, product videos, complete performance data, installation and maintenance guides, air savings calculators, case studies, slide presentations and a huge application database including a solution pathway for learning what Intelligent Compressed Air® products can achieve.

Exair, www.exair.com

Teledyne Acquires FLIR

Teledyne Technologies Incorporated announced the successful completion of the acquisition of FLIR Systems, Inc. At each of the respective company's special meeting of stockholders, the stockholders approved and adopted merger proposals related to the Agreement and Plan of Merger. FLIR will now be included in Teledyne's Digital Imaging segment and operate under the name Teledyne FLIR. Under the terms of the agreement, FLIR stockholders received $28.00 per share in cash and 0.0718 shares of Teledyne common stock for each FLIR share, which implies a total purchase price of approximately $57.40 per FLIR share based on Teledyne's closing price. The aggregate consideration for the transaction was approximately $8.2 billion, including net debt. Previously, Teledyne secured all permanent cash financing for the transaction with a weighted average borrowing cost of less than 2%

Teledyne FLIR, www.flir.com

CHILLER & COOLING INDUSTRY & TECHNOLOGY NEWS

MH Element Fluid Cooler Line

SPX Cooling Technologies Inc. expanded its MH Fluid Cooler line, designed to meet an even more diverse range of applications. The MH Fluid Cooler is now available with three coil materials. The most recent innovation, the MH Element Fluid Cooler, is equipped with copper coils. Copper offers superior corrosion resistance and improved heat transfer. Compared with traditional hot-dip galvanized coil fluid coolers, the copper coil requires 35% less fluid volume, and cooler operating weight is reduced by 20%. Copper is also sustainable, with a high recycle value at the end of its operational life. Other MH Fluid Coolers are available with coils of either HDG steel or stainless steel. HDG steel offers good thermal performance in a closed and pressurized system. Models with stainless steel coils require more surface area and are often utilized in coastal regions and applications prone to corrosion.

SPX Cooling Technologies, www.spxcooling.com

LDK Adiabatic Cooler

The imperatives of sustainable development as well as the ever-increasing demand for energy efficiency improvement call for new solutions. By building on the vast experience in process cooling and using the latest technologies available today, Frigel Group is introducing a brand-new range of adiabatic coolers: the LDK. This is the first step on the way of the extension of the proven Ecodry platform, in order to replicate its success in new industries and applications. Adiabatic Cooling plays a key role in technology conversion, especially related to cooling tower replacement. This is driven by many factors, including the underlying strategies to improve overall efficiency, the growing desire of the business community to use "green" solutions, as well as hygienic safe operation.

Frigel Group, www.frigel.com

QWC4 Water-Cooled Screw Chiller

Johnson Controls announced the Quantech QWC4 Water-Cooled Screw Chiller has been added to the brand's expanded chiller portfolio. The QWC4 chiller uses variable speed drive technology to reduce energy costs and carbon emissions by as much as 30% when compared to traditional chillers. Throughout most locations, the variable speed drive saves energy during 99% of operating hours spent at off-design conditions, which include reduced load and/or reduced entering condenser water temperature. Since the QWC4 screw chiller is capable of handling a higher-pressure lift than a centrifugal chiller, it can be used in both thermal-storage and heat-pump applications. The variable speed drive technology provides the chiller flexibility in handling high-lift applications with the highest efficiencies available. This allows the chiller to use a wide range of heat-rejection methods, including an open cooling tower, dry cooler, adiabatic cooler, heat recovery or heat pump.

Johnson Controls, www.johnsoncontrols.com

Resolute Industrial Acquires All American Portable Air

Resolute Industrial announced it has acquired All American Portable Air, which will operate under Resolute's rental division, Mobile Air & Power Rentals. Terms of the transaction were not disclosed. Founded in 2007 by Roscoe Nesmith to provide temporary cooling equipment rentals in the Orlando, FL market, All American Portable Air now has a second location in Nashville, TN, from which it services the Southeast market. All American Portable Air rents out a full range of climate control products, including portable spot coolers, air conditioning rentals, dehumidifiers, air scrubbers, evaporative coolers and misting fans.

Resolute Industrial, www.resolute-industrial.com.

CHILLER & COOLING INDUSTRY & TECHNOLOGY NEWS

Cooling Tower Corrosion Protection System

Baltimore Aircoil Company highlights the TriArmor Corrosion Protection System which provides the best corrosion and leak protection for the cold water basin at the best value. For over 20 years, thousands of cooling towers, fluid coolers and condensers with the System have withstood the harshest environments, proving its durability and reliability. This patented system designed specifically for evaporative cooling equipment for HVAC, industrial, and refrigeration applications is now backed by an industry leading 10-year warranty. The System offers three layers of protection, starting with G-235 Galvanized Steel, the heaviest commercially-available galvanized steel. Universally recognized for its strength and durability, it offers excellent service life under normal operating conditions, with proper maintenance and water treatment. The second layer is a Thermosetting Hybrid Polymer baked onto the galvanized steel to create a durable barrier.

Baltimore Aircoil Company, www.baltimoreaircoil.com

Trane Establishes Operations in Las Vegas

Trane is establishing new operations in Las Vegas, Nevada, to serve the market. Trane's expansion in Las Vegas builds on a series of transitions to company-owned operations in the U.S. this year, including the greater Dayton, Ohio; Tampa, Fla.; and Louisville, Ky., markets. Trane will expand its workforce in Las Vegas as part of the new operation and plans to hire additional engineers, energy services specialists and technicians throughout 2021. Trane associates will partner with local engineers, contractors, commercial building owners and facility directors to provide energy management and HVAC systems, services and aftermarket parts solutions. Trane has operated in Nevada for more than 20 years, including through the company's commercial sales office in Reno.

Trane, www.trane.com

All-Stainless Steel BPHEs

SWEP enhanced the existing All-Stainless product range with the introduction of new products developed for the most demanding applications and systems requiring 100% stainless steel components. The B85S medium-size high-capacity model is the most recent addition to the range. All-Stainless is a range of durable, compact, and efficient BPHEs for the most demanding applications that often use aggressive media such as ammonia, deionized water system, or fluids with high sulfur content, all of which can be corrosive to copper. All-Stainless is therefore ideal for a wide range of industrial applications and utilities with high demands on corrosion resistance, low tolerance for contamination and/or high operating temperatures. With a 100% stainless steel construction and minimum use of raw material in its construction relative to its mechanical strength, the All- Stainless is all about increasing efficiency.

SWEP, www.swep.net

Nidec Invests in Embraco Production

Nidec Global Appliance, holder of the Embraco brand of refrigeration solutions, started its new fiscal year announcing the investment of 70 million dollars to leverage and set up new production lines of best-selling refrigeration compressors and condensing units in several parts of the world. The new lines will increase the annual production capacity by more than 10 million units, which will be added to the current capacity of 45 million compressors and condensing units per year. The investment goes to manufacturing plants that produce Embraco solutions in Austria, China, Brazil and Mexico. In Mexico, the production site in the city of Apodaca is receiving investments of $35 million to build a new production line of ES compressors, increasing production capacity by 60%. It will be focused on responding to the North American market.

Nidec Global Appliance, www.nidec.com

THE MARKETPLACE

COMPRESSED AIR BEST PRACTICES®
www.airbestpractices.com

ADVERTISER INDEX

Company	Page	Web Site
Kaeser Compressors	Outside Back Cover	https://us.kaeser.com/cabp
Atlas Copco	Inside Front Cover	www.atlascopco.com/air-usa
BEKO Technologies	Inside Back Cover	www.bekousa.com
Mikropor	5	www.mikroporamerica.com
Sullair	7	www.sullair.com/industrial
Fluke	9	www.fluke.com/ii900leak
Parker	10	www.parker.com/igfg
Hertz Kompressoren USA	11	www.hertz-kompressoren.com
Aignep	12	www.aignepusa.com
Sullivan-Palatek	13	www.sullivan-palatek.com
CDI Meters	15	www.cdimeters.com
Jorc Industrial	17	www.jorc.com
Tamturbo	19	www.tamturbo.com
Critical Rental Solutions	21	www.criticalrental.com
Clean Resources	23	www.cleanresources.com
Augwind	25	www.aug-wind.com
Air System Products	27	www.airsyspro.com
Rogers KNW Series	29	www.rogers-machinery.com
Howden	31	www.howden.com
Compressed Air Challenge	32	www.compressedairchallenge.org
Case Controls	33	www.casecontrols.com
Sahara Air Products	35	www.saharahenderson.com
ZEKS	37	www.zeks.com
WEFTEC	39	www.weftec.org
Assured Automation	41	www.assuredautomation.com
IPPE	42	www.ippexpo.org
LeakShooter	43	www.BergEng.com
Compressed Air and Gas Institute	45	www.cagi.org/personnel-certification
AHR Expo	46	www.ahrexpo.com

CHILLER & COOLING BEST PRACTICES

Best Practices 2021 Expo & Conference	16, 26, 44, 55	www.cabpexpo.com
Best Practices Webinars	18, 36	www.airbestpractices.com/magazine/webinars
SMC	49	www.smcusa.com
Innovative Polymers	51	www.decaion.com
AEE World	59	www.aeeworld.org

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

TECHNOLOGY & JOBS

Job & Product Marketplace Advertising Information

Reach 16,000+ 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 $300.00 per Job Marketplace Ad and $350.00 per Product Marketplace Ad ($300 if 6 or more ads are placed). Contact Rod Smith at rod@airbestpractices.com to schedule your Marketplace Ads.

THE MARKETPLACE

TECHNOLOGY & JOBS

We proudly provide you with the best solutions

QWIK-PURE® / ÖWAMAT®
Oil-water Separators

The disposal of air compressor lubricant carryover in condensate is a concern, as is the variety of regulations across the country.
Installation of an oil-water separator is simple. The oily condensate from each drain valve is individually piped to a depressurization chamber to reduce pressure to atmospheric. The clean water is then piped into a waste water drain. The separated oil is contained within the cartridge and/or held in a collection vessel for proper disposal.

Features and Benefits

- Simplified Service
- Unique Adsorption Material
- Reliable Operation
- Environmentally Safe
- Future Proof

Our promise

www.bekousa.com beko@bekousa.com +1 (800) 235-6797

Truth in Compressed Air
Reliable | Efficient | Innovative

BEKO

Custom Engineered Solutions

Turnkey compressor, blower, and vacuum systems

Expanding production and need more air in a hurry?

Custom engineered solutions from Kaeser Compressors are air systems built to specification for the most demanding and challenging applications. Available as skids or custom weatherproof enclosures, these complete systems are designed for exceptional reliability, simple maintenance, and superior energy efficiency.

- Eliminate construction/renovation time costs
- Faster installation and commissioning
- Move compressed air to a better environment
- Make space for production equipment
- Easy remote monitoring
- Eliminate Class 1, Div 1 constraints
- Sigma Air Utility option (air as utility)

See how they eliminate space, weather, and accessibility constraints and greatly reduce construction and installation time. Visit **us.kaeser.com/cabp**.

Where innovation meets reliability.

KAESER COMPRESSORS®

Built for a lifetime.

Kaeser Compressors, Inc. • (866) 516-6888 • us.kaeser.com/cabp