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Cover image courtesy of Klöckner Pentaplast.

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FROM THE EDITOR

Sustainability Is Our Theme this Issue and Every Issue

We didn't set out to make sustainability our theme for October. It just happened. It's going to happen a lot more.

For those of you I haven't had the pleasure of meeting at conferences, I'm the new Senior Editor for the Best Practices magazines. I have a background in technology journalism, and I'm excited to lead your favorite technology magazines into the future.

Yes, these are technology magazines, and the technology they cover impacts how we live more than any new music player or video device. One of the biggest areas in industrial technology is sustainability, and it's exciting to watch it develop.

We're thrilled to present an interview between Ethan O'Brien, Group Sustainability Director for Klöckner Pentaplast, and our Publisher Roderick Smith. Klöckner Pentaplast leads the way in sustainability, and O'Brien goes into detail about his company's goals and efforts.

Continuing that theme is our profile of operations at Tröegs Independent Brewing, written by Digital Content Editor Brooke Jones. The company's Maintenance Manager explains how his company saves energy and water while brewing its celebrated beers.

Saving energy was a major theme at the International Woodworking Fair, which I attended in August. Turn to page 38 for my report on the compressed air and vacuum pump innovations that help small and large woodworkers alike increase productivity while lowering costs.

If you regularly attend our online webinars (and I hope you do), you're familiar with Ron Marshall and Andrew Smith, both experts in their field. This month, Marshall presents the results of a compressed air audit at a Canadian plywood plant, while Smith explains how to collect data on compressed air systems and use it to evaluate efficiency.

Thank you for being part of the Best Practices community. The more I explore, the more I find (as our Publisher says) compressed air is everywhere. If you're attending our Best Practices 2024 EXPO & Conference later this month in Atlanta, please find me and tell me your own compressed air story.

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Readers From Around the World

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

We love a group photo, and this one comes from Cullum & Brown, a compressed air distributor that's been servicing the Midwest region since 1886! Celebrating 138 years of business, CEO Drew Hoffman (far left) and his C&B team pose with a Gardner Denver air compressor in the company's new 40,000-square-foot company headquarters in Lee's Summit, MO, which houses a state-of-the-art air compressor, electric motor, vacuum pump and blower repair center. Cullum & Brown also added, in 2023, service and support infrastructure in Denver, CO, Casper, WY, and Billings, MT, expanding its market coverage beyond Kansas, Missouri, North Dakota and South Dakota. Visit https://www.cullumandbrown.com.

G3 Industrial Solutions covers Kansas, Western Missouri and Northeast Oklahoma with 11 service locations focused on installing and servicing compressed air, process chiller, vacuum, blower, and nitrogen generation systems. Pictured are President Chad Gooding and Vice President Luke Johnson (left to right), while the staff of the Kansas City location is in the photo below. Visit https://www.g3industrialsolutions.com.

Long-time subscriber Brad Casemier is the Sustainability Engineering Leader for the Insulation Division of Owens Corning in Kansas City, Kansas. He's been with Owens Corning since 1984 and focuses on executing projects that save energy and water. He's thankful for the opportunities he's been given to do that kind of work. Owens Corning purchased its Kansas City site at the end of World War II, and has been making insulation there ever since. Visit https://www.owenscorning.com.

Submission Guidelines

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

Compressed Air Industry News

Hitachi Global Air Power Acquires Air Power Sales & Service

Hitachi Global Air Power US announced the purchase of Longview, Texas-based Sullair distributor, Air Power Sales & Service. Air Power specializes in 24-hour sales and service of air compressors, air treatment products, accessories and related equipment.

Hitachi Global Air Power has acquired Air Power Sales & Service, a Sullair Distributor.

"The East Texas and Dallas-Fort Worth regions are strategic territories for us due to the high concentration of high tech and oil and gas companies – among others – who all rely on compressed air to power their operations," said John Randall, President and CEO, Hitachi Global Air Power. "Air Power Sales & Service's customer-first approach and strong presence in the market expands and secures our sales and service capabilities to our current and future customers in this important region. It's also another step forward in our strategy for growth as a total seamless solutions provider."

With locations in Longview and Euless, Texas, Air Power has been a Sullair distributor for more than 35 years. Current employees and leadership will remain in their positions and the company will continue to sell Sullair brand air compressors and related equipment while providing service to a variety of compressed air systems.

"As a Sullair distributor for over 30 years, we could not be more excited for the acquisition of our company by Hitachi Global Air Power," said Craig Peterson, Owner, Air Power Sales & Service. "We look forward to new opportunities for growth, improved efficiency and a competitive edge in the compressed air market."

About Hitachi Global Air Power US

Headquartered in Michigan City, Indiana, Hitachi Global Air Power's compressed air solutions power manufacturing operations all around the globe, from food and beverage to pharmaceuticals and computer chips. As part of Hitachi Industrial Equipment Systems, Hitachi Global Air Power operates ISO 9001 certified factories in Michigan City, Indiana and Suzhou, China, and sales offices strategically located in Europe, Australia, Southeast Asia, and South and Latin America. Through brands Hitachi, Sullair and Champion (Australia), its machines have provided legendary reliability, durability and performance for more than 57 years. For more information, visit https://www.hitachiglobalairpower.com.

Quincy Compressor Acquires Compressed Air Technologies

Quincy Compressor has acquired Compressed Air Technologies, Inc. based in Florence, Mississippi, with sales and service covering Mississippi, Arkansas, Alabama, Georgia, Tennessee and Florida. The acquired company has been in business for more than 30 years.

Compressed Air Technologies has a strong reputation for outstanding customer service with a large, loyal customer base, which is supported by an experienced team of knowledgeable and dedicated employees. This acquisition allows Quincy Compressor to focus on growing the business with the intention of continuing to strengthen its market presence in the region.

Compressed Air Technologies has 53 employees and offers a wide portfolio of air compressors, dryers and accessories including full-service options and systems auditing.

About Quincy Compressor

Quincy Compressor is a leading designer and manufacturer of reciprocating and rotary screw air compressors, vacuum pumps and a full line of air treatment components. In business since 1920, Quincy has built its reputation on quality and rugged reliability, building tough air compressors for the most demanding applications. The Quincy brand is synonymous with quality, delivering "Performance You Demand. Reliability You Trust." For more information, visit https://www.quincycompressor.com.

Quincy Compressor has acquired Compressed Air Technologies.

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Compressed Air Industry News

Sullivan-Palatek Partners with BEKO Technologies

Sullivan-Palatek has announced a strategic partnership with BEKO Technologies to leverage the strengths of both companies by offering comprehensive solutions and customer value. By combining their product lines, Sullivan-Palatek and BEKO can offer a more comprehensive suite of solutions for compressed air systems. This expanded portfolio meets a wider array of customer needs, providing a one-stop solution for all compressed air requirements. Customers benefit from streamlined procurement and service processes, enhancing overall satisfaction. Products include:

Sullivan-Palatek and BEKO Technologies have announced a new partnership.

ProPure Filtration

- SPTF (threaded filter): 3/8"-3", 25-1,500 cfm, fine element
- SPFF: 4"-12" Flg, 1,900-21,000 cfm, active carbon element
- SPTWS (water separator): 3/8"-3", 25-1,500 cfm, coarse element
- SPFWS (water separator): 4"-12" Flg, 1,900-21,000 cfm, super fine element

Refrigerated Dryers

- SPRPN (pro series non-cycling): 10-480 cfm
- SPRPRN (premium series non-cycling): 20-10,000 cfm
- SPRPRC (cycling): 20-500 cfm
- SPRVSD (variable speed dryer): 800-6,000 cfm
- SPRHT (high temperature): 20-350 cfm
- SPRPSL (slim tank mounted): 15-100 cfm

Desiccant Dryers

- SPDC (compact heatless): 4-110 cfm, with filter
- SPDP (pro heatless): 80-800 cfm, without filter
- SPDPR (premium heatless): 80-2,800 cfm, three valve bypass
- SPDPHB (pro heated blower): 800-6,000 cfm
- SPDPRHB (premium heated blower): 800-6,000 cfm
- SPDH (pro heated purge): 100-3,200 cfm
- SPDHR (premium heated purge): 100-3,200 cfm

ZL Drain

- SPZL (zero loss): 100-50,000 cfm (115 volt), 80-800 cfm (230 volt)

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Compressed Air Industry News

Oil-Water Separator

- SPOWS (oil water separator): 100-400 cfm
- SPOWS (oil water separator): 550-3,330 cfm (90-246 volt)

The synergies between Sullivan-Palatek and BEKO Technologies go beyond product compatibility. They encompass shared values of quality, innovation, customer-centricity and sustainability. By leveraging their combined expertise, global reach and strategic marketing efforts, they can offer superior solutions and services that drive market growth and enhance their competitive advantage in the compressed air industry. This partnership promises to deliver unmatched value to their customers, setting new standards for excellence in the industry.

About Sullivan-Palatek

Sullivan-Palatek was founded over 35 years ago in Michigan City, IN, the "Compressor Capital" of the U.S.A. It focuses on continuous improvement to provide our users with the ultimate product, allowing them to meet the vast variety of compressed air demands. Sullivan-Palatek supports American jobs by assembling the compressors in Northwest Indiana with a local workforce. For more information, visit https://www.sullivan-palatek.com.

About BEKO Technologies

BEKO Technologies (BEKO USA) is the American subsidiary of BEKO TECHNOLOGIES GmbH, which is headquartered in Neuss, Germany. As part of the organization's global operations, it maintains a 50,000-square-foot and 28,000-square-foot production facility in Atlanta and Smyrna, Georgia, respectively. BEKO USA is the American headquarters and has been responsible for producing products and providing superior customer service for all of the Americas since 1990. For more information, visit https://www.beko-technologies.us/en-us/.

FNA Enters US Market

With FNA S.p.A.'s roots beginning in 1948 and evolving for decades through innovations, acquisitions and alliances, it has become a powerhouse in the global market for air compressors. The group's North American operations, FNA AMERICA (formerly Fini USA), has been extending its presence further with a newly established headquarters in Fort Mill, South Carolina.

FNA AMERICA has been extending its presence further in North America with a newly established headquarters in Fort Mill, South Carolina.

With a new 104,000-square-foot facility, FNA AMERICA is primed for additional production capabilities to serve various market segments and fulfill the demands of all channels. This strategic initiative has allowed FNA AMERICA to more than double its workforce, further add manufacturing capabilities and offer more efficient distribution through its network of locations in the U.S. and Canada. The company is also expanding its local portfolio through strategic acquisitions of complementary brands and operations.

FNA AMERICA is launching new and innovative products for the consumer, professional and industrial markets in 2024 to maintain its repertoire of diversity and dominance in the air compressor market. Some of the many channels the company serves include big boxes, e-commerce, farm and agriculture, industrial supply houses, buying groups, national chains, independents and everything in between. In 2024, FNA AMERICA will add the industrial market to its focus with Nu Air branded screw compressor technology that has been proven for decades in markets such as Europe and Asia.

All of these exciting changes and strategic initiatives would not be possible without the great employees and culture being developed at FNA AMERICA. The new President, Attila Madarasz, said "Every team member is hungry for growth and success, embracing the can-do philosophy. We build our vision, we execute our vision and enjoy our success together as one team. We are utilizing the decades of innovative success from our Italian roots and using that foundation to be the most trusted and sought after compressor supplier in North America."

About FNA

FNA S.p.A. is a Multinational company with over 75 years of experience. FNA S.p.A. has its headquarters in Turin, Italy, and employs around 1,300 people in its production plants in Italy, France, China and the United States. These plants supply over 1,500,000 piston compressors and over 11,000 screw compressors annually to meet the compressed air needs of the international markets for industrial, professional and consumer use. For more information, visit https://www.fnacompressors.com.

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Compressed Air Industry News

Next Air & Gas Partners with ATS

NEXT, a research and development firm and mass manufacturer of compressed air and gas dryers, is pleased to introduce ATS as its new global manufacturing partner for refrigerated dryer products in the U.S., Canada and Latin America. This partnership will provide end users with improved lead times, competitive pricing and an innovative portfolio of new products designed by both companies. In addition, the companies will utilize each other's assets globally, such as manufacturing facilities and distribution channels in the U.S. and Canada.

Initial product launches will consist of non-cycling and high temperature refrigerated dryers. In the future, additional dryer and filtration products will be added, as well as region-specific lines for targeted compatibility based on location.

The refrigerated lines have also been designed with environmental sustainability and regional specifications in mind. These include a 513a refrigerant gas, which lowers carbon emissions. The dryer lines are also CSA, CUL/ UL and EU electrical certified in multiple voltage options and in 50/60 HZ variants with specific lines including filtration packaging as standard.

Next Air & Gas NRD-NC Series

NEXT's current line of refrigerated dryers is available with a new generation of dryers being launched in early 2025.

"This partnership represents much more than two like-minded companies designing a dryer line together – rather it's about the synergy of our innovative spirit towards developing products for the purpose of continuous improvement. The products developed under this partnership will contribute to our PURA-AIRE generation of dryer lines," said Kevin F. Zarif, Vice President, Next Air & Gas.

"We are thrilled to partner with a company with such a rich legacy in air treatment. It was vital for us to share the same values of trust, honesty and innovation. This partnership promises dynamic products that give the end user a mindset of confidence and ease," said Tim Harrison, Director, ATS-North America.

About Next Air & Gas

Next Air & Gas, headquartered in Lenoir City, Tenn., is the next chapter in the Zarif's air treatment legacy, spanning over 30 years in the industry. The company is led by Founders CEO Mike Zarif and Vice President Kevin F. Zarif. Next Air & Gas is a research and development firm and mass manufacturer of compressed air and gas dryers, with a specialty in desiccant and refrigeration drying technologies, process cooling, compressed air filtration, and gas generation in nitrogen and oxygen. For more information, visit https://nextairgas.com.

About ATS North America

ATS North America is a subsidiary of ATS s.r.l headquartered in Legnano Italy., ATS s.r.l. (air treatment solution) operates as a global leader in the compressed air space. In a little more than 10 years, ATS has become a top choice for the production of air dryers, filters and accessories for compressed air treatment.

CAGI Releases Performance Datasheets for Portable Air Compressors

The Compressed Air & Gas Institute (CAGI) has developed a datasheet template for portable air compressors. Participants in CAGI's Portable Compressor Section have posted completed datasheets on their company websites. The datasheets aid users and purchasers of compressed air system equipment by standardizing the expression of key performance data. The new datasheet template can be found on the CAGI website, https://www.cagi.org, by clicking on "performance verification" and then "datasheets."

CAGI has released a performance datasheet template for portable air compressors.

The members of the Portable Compressor Section manufacture self-contained units designed for portability. A unit consists of a rotary positive air compressor, internal combustion engine and internal accessory items necessary to cool and control its output.

About Compressed Air & Gas Institute

For more than 100 years, the Compressed Air and Gas Institute has been the leading source on all matters related to compressed air. As the united voice of the industry, CAGI's activities include the development and organization of educational material about compressed air systems and equipment as well as training programs to benefit users of compressed air systems. In addition to information on data sheets, performance verification and training, the CAGI website offers many resource materials such as selection guides, videos and standards. For more information, visit https://www.cagi.org.

COMING TO AMERICA.

FNA's NUAIR brand arrives in America backed by its history in Europe since 1948, which has made it one of the most important global leaders in the compressed air market. In 2024, FNA America will focus on the industrial market, with NUAIR brand screw compressor technology, which has been tested for many years in markets such as Europe and Asia. NUAIR industrial screw compressors range from 3 to 100 HP and are offered in various configurations: tank-mounted, tank-mounted with dryer, fixed speed, and variable speed with excellent energy performances. Today, through its new 104,000 square foot subsidiary in South Carolina, FNA AMERICA is launching even more innovative products for the consumer, professional, and industrial markets to expand the richness and diversity of its offerings, reinforcing its commitment in being the leading provider in the North American market.

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Sustainable Operations in Practice at Klöckner Pentaplast

The plastics manufacturing giant is taking real steps to reduce energy consumption and carbon emissions, while increasing its use of post-consumer recycled material

By Roderick M. Smith, Compressed Air Best Practices® Magazine

➤ In June 2024, *Compressed Air Best Practices® Magazine* interviewed Ethan O'Brien, Group Sustainability Director, Klöckner Pentaplast.

Good afternoon, can you describe Klöckner Pentaplast (kp) and your operations in the Americas?

Good afternoon. Klöckner Pentaplast designs and manufactures plastic films and trays for many applications including food, medication, medical devices and durable products. Founded in 1965, we have 30 manufacturing plants (17 in Europe) in 18 countries and employ over 5,600 people. kp is a global leader in recycled content products and high-barrier protective packaging.

We operate six plants in North America: Montreal, Quebec; Greenville, Ohio; two in Gordonsville, Virginia; Rural Retreat, Virginia and Beaver, West Virginia. We also have two plants in South America, in Argentina and Brazil, and 22 others around the world. We use state-of-the-art equipment at our manufacturing plants to make, primarily, rigid plastic film products for conversion and thermoformed trays. Our core production process involves calendering, extruding and thermoforming polymers, adding chemical additives and then processing according to customer specifications and legal requirements. Our products are typically used by our customers on production lines where, for example, pharmaceuticals or food products are packaged. These items are then shipped to hospitals, pharmacies or retailers, after which they reach consumers.

Above: Klöckner Pentaplast's Gordonsville, Virginia site

We see a focus on post-consumer recycled (PCR) plastic in your products. Can you briefly describe sustainability at kp?

In manufacturing, sustainability often ranks fourth after safety, quality and efficiency. At kp, the goal is about moving sustainability higher up on the priority list, and integrating it into everything we do. Elevating sustainability requires recognizing it as a team sport, demanding cross-functional collaboration from procurement, finance, engineering, operations and HR. Crucially, environmental sustainability must be tangibly connected to financial sustainability, delivering for the bottom line and the planet. The Energy Task Force exemplifies this, focusing on reducing energy consumption, improving efficiency and deploying renewable energy across plants worldwide. This dedicated, cross-functional team demonstrates how sustainability can drive success in manufacturing by reducing carbon emissions. Progress is impossible without company-wide alignment and an understanding that sustainability and financial performance go hand-in-hand.

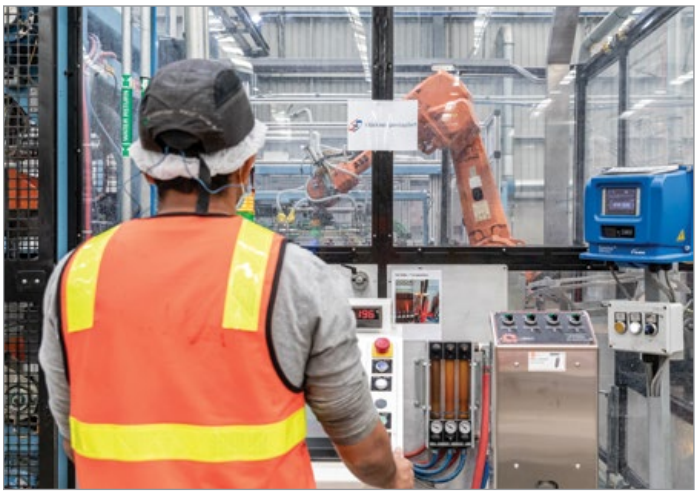
Our global sustainability strategy, Investing in Better, includes goals for increasing the use of post-consumer recycled materials, defined as materials that have been used by consumers for their intended purpose, collected through recycling programs and then processed into new products. This is where the circular economy and using more recycled material comes into play. We are innovating and simplifying our products to ensure they're designed for circularity and recyclability while remaining fit for purpose. Globally in 2023,

kp used 120,000 tons of post-consumer recycled content, which is 25% of our total production of packaging products – a phenomenal amount of recycled material. Additionally, over 700 tons of ocean bound plastics was used in our products, the equivalent to 20 million bottles. The standout milestone of 2023 was the fulfillment of our commitment to send no waste to landfills across our entire global footprint, where legislation allows.

Furthermore, our strategy is focused on working smarter in areas such reducing waste, improving energy efficiency and investing in renewable energy to reduce Scope 1, 2 and 3 carbon emissions.

Reducing energy consumption and carbon emissions in operations is where you come into play. Can you describe the Energy Task Force and your role?

I'm the kp Group Sustainability Director, based in London, U.K., with the responsibility to drive sustainability management globally in operations. At kp, we understand the greenest energy is the energy we don't consume,



Klöckner Pentaplast used 120,000 tons of post-consumer recycled content in 2023.

and our dedicated team, the Energy Task Force, is focused on energy efficiency first and foremost. Members are cross-functional employees from procurement, business excellence, operations, engineering and maintenance.

Sustainable Operations in Practice at Klöckner Pentaplast

Initially, we take a strategic, high-level view, but then we shift to a more data-driven approach. We manage a sustainability dashboard that tracks our progress on 10 goals across the three main pillars. We update this monthly and share it with relevant stakeholders. This information feeds into our monthly executive management meetings. It's about letting the facts speak for themselves while also keeping the bigger picture in mind.

I think my most important role is being passionate about energy efficiency and sustainability. This passion comes easily for me: I'm doing this job because I want to make a difference to the climate change challenge – to be part of the solution, not part of the problem.

What are the main production processes at kp and what are the largest energy users?

Our company operates in light manufacturing, transforming raw materials into packaging by using significant amounts of heat and subsequently cooling the products into their final form. Globally, this process consumes as much energy as a city with 200,000 houses, illustrating the significant energy use in our manufacturing operations. Managing this energy efficiently is one of the biggest impacts we can make in tackling climate change. In most of our factories, we have installed detailed energy monitoring systems at multiple points along production lines, including air compressors, chillers and lights. These systems feed into a digital dashboard that displays energy consumption throughout the factory. For data visualization, we use dashboards that aggregate data collected via SAP from production lines and allows us to visualize the data at a high level.

We are experts in plastic extrusion, calendering and thermoforming production processes. Our energy profile varies by plant but at a high level – 65% of energy use comes from production equipment (from large motors on extruders) and 35% comes from plant utilities. Within plant utilities, a normal profile would look like cooling water (15%), compressed air (10%) and lighting/IT/vacuum/other (10%) of the plant's total energy consumption.

Most of our plants operate round-the-clock. They are going 24 hours per day, seven days per week, with three shift operations. This means we don't get many shutdown periods, and we just need to work around that. Energy champions must pick battles and work around the edges without jeopardizing quality, reliability or output rates. We like to say our energy management efforts focus on doing the basics brilliantly to achieve half of our savings each year – with more savings coming from CAPEX projects that further improve the energy efficiency at sites.

Additionally, we recognize a certain percentage of energy used in manufacturing plastics comes from the baseload, defined as the energy consumption that does not end up in making the product. An example is a machine heating up to 356˚F (180˚C) for a certain time period before production begins. In 2023, we focused our efforts on the extended shutdown for the December seasonal holiday, with all sites following a comprehensive shutdown process ahead of these nonproduction days. Our kp Energy Champions offered guidance across our factories, and all employees performed the appropriate shutdown procedures in a logical order to minimize energy used over the holidays. The results were outstanding: 1,000,000 kWh of energy (worth $331k or €300k) was saved in one week alone. For context, a baseload of less than 10% is considered a good result in a manufacturing environment, yet multiple sites reached under 5%, including our Holiday Shutdown Challenge 2023 winner, which reached under 1%. All teams can be proud of their efforts.

One of Klöckner Pentaplast's energy efficiency projects was installing solar panels at its facility in Asturias, Spain.

I can feel your enthusiasm! What kind of results are you seeing from energy management at kp?

Overall, the consumption of energy in kp is down 20% since 2019. This energy reduction is the equivalent of eliminating the energy consumption of one of our larger manufacturing plants for an entire year. It's like we created a factory that produced product all year but used no electricity – that's what this is all about!

There are over 100 energy efficiency projects delivered from our plants all over the world. To name a few examples, we did LED retrofits to over

3,000 light bulbs in three U.S. plants, compressed air heat recovery projects in France, major upgrades to heat recovery systems in Germany and cooling optimization and high efficiency drive and motor projects in the U.K., Spain and Italy. We have a strong track record in implementing lean principles and, given our teams' familiarity with the concept, when we used these same principles to design our sustainability-focused projects, they were ready to get going straight away. We continue to go from strength to strength in tackling carbon emissions. We strive to do the basics brilliantly.

Production process efficiency and energy efficiency go hand-in-hand, so we train our employees on the connections between waste treatment and energy consumption. Best practice is shared across all sites as part of helping energy management collaboration at kp.

What do you mean by "doing the basics brilliantly"?

The funny thing about low-hanging fruit energy efficiency projects is that the fruit grows back after a year. Doing the basics brilliantly is about not allowing that fruit to appear again or, if it does, addressing it right away. We are learning to excel at doing annual compressed air leak surveys, cleaning our chiller condensers, measuring our condenser temperatures, monitoring our cooling setpoints and improving the power factor at sites, to name a few examples. It also means creating checklists for operators to shut off machines correctly when idle.

This year, we implemented a new, more advanced shutdown mode on production lines at sites in Germany. Prior to the new mode, calender lines were cooled down to 248°F (120°C) during shutdowns. All machinery was operated at this temperature level when production was stopped. The process of switching lines to standby mode was therefore relatively inefficient, as lines idled at higher temperatures than required. In our streamlined shutdown operation, only circulation pumps and safety-relevant components remain in operation. This approach ensures optimal functionality without sacrificing reliability or lead times. We remain focused on maintaining peak performance while minimizing negative effects. Through this initiative, illustrative of kp's commitment to lean thinking, we saved a remarkable 4,600,000 kWh of electricity, natural gas and steam – equivalent to $1.9m (€1.7m) worth of energy annually. For context, 1,500 homes could be run for a year from the energy saved through this initiative in 2023.

Conducting energy treasure hunts and kaizen events, following a lean methodology to go after ways to improve the process and reduce energy consumption, is part of how we do things at kp. These succeeded in

Sustainable Operations in Practice at Klöckner Pentaplast

A Klöckner Pentaplast employee gives a vacuum system a high-efficiency motor upgrade.

bringing together different stakeholders on a treasure hunt and identifying opportunities to improve. There are the dragons of inaction with energy and carbon, and these workshops are great at getting teams involved with moving things forward.

Please describe the Energy Best Practice Toolkit that's been created to support facilities around the world.

Our team came up with an Energy Best Practice Toolkit and it's become an invaluable asset to our energy task force. It's a list of 200 energy best practices across every energy consumption area. The main categories include lighting, compressed air, vacuums, chillers, motors and drives, operations, management systems, peak demand management and heat recovery. Each category has subcategories of at least five areas where we identify what good looks like and ask sites to give themselves a score of one to five. For example, under heat recovery, air compressors is a subcategory, and plants score themselves on whether or not they are doing it. The Energy Champions at each plant adds up their score and this creates a radar for us all to use, whether at the corporate level to compare plants or for the plants themselves to use as roadmaps for improvement. At the corporate level, we use this score to compare plants against a global average. Executives like these benchmarking tools. Honestly, it's interesting, when you have such a diverse range of stakeholders. A lot can get done when you simplify things down to a score.

The Toolkit provides the Energy Task Force with fantastic information. We are constantly updating and improving it for each plant. It's a working document where we debate things. For example, we have set points (and scores) for cooling water for each plant. We can see deviations and look at what's happening – we don't let a site run at 50˚F (10˚C) when we think it can work well at 59˚F (15˚C) based upon our experience at other plants.

Plants are scored on whether we have VSD drives on every applicable motor and whether or not a site does free cooling for cooling water. Sites are ranked on a score of 1 – 5, reflecting average performance to best in class. We really have used it to drive change. When we developed the toolkit, we were thinking about the question of how do you convince site managers, engineering managers and maintenance managers that energy management isn't just a CAPEX exercise once per year? Now, it has become part of our continuous improvement culture and our focus on lean. The idea of the toolkit is even if we have limited CAPEX, we can still improve by doing the energy efficiency basics brilliantly.

Can you tell us the toolkit subcategories under compressed air?

In compressed air, we have some of the following categories:

- Annual monitoring of total kWh energy consumption by key consuming equipment
- Quarterly leak detection surveys, checking every six meters of piping
- Current air pressure setpoints for main system, as well as secondary and tertiary systems, to benchmark best in class
- Heat recovery opportunities including the distance from compressors to a suitable heat sink
- Frequency of efforts to reduce pressure loss
- Air flow (cfm) analysis mapped against production running hours
- Separate system for low pressure air to complement high pressure air system
- Variable speed drive air compressors
- Engineered nozzles for blowoff and air guns
- Air compressor, dryer and filter maintenance routines

Excellent, this is what we write about every month! What are the toolkit subcategories for cooling water?

This might not be everything, but off the top of my head here are some:

- Current cooling water set points, with global benchmarking checked annually
- Free cooling investigation and implementation where geography allows
- Full insulation of all chilled water piping
- Placement in well-ventilated areas and not exposed to sun
- Variable speed drives on all chilled water pumps
- Increasing chiller temps where possible
- Maintenance practices to ensure condensing temperatures are good
- Repairing damaged insulation
- Checking flow and return temperatures to understand the coefficient of performance as it changes throughout the year
- Pressure drops

What does the future hold for energy management at kp?

We published our latest sustainability report in July (https://www.kpfilms.com/en/sustainability/reports-and-disclosure/) We have a sustainability team driving this and reporting against our Investing in Better strategy goals. Energy efficiency comes under our objective to Work Smarter. We are building a high quality sustainability management program and want to be a leader in the plastics sector. We see energy management, renewable energy and material circularity as doing the right thing and being part of the solution. What better way to spend your time than this!

Thank you for sharing your best practices with our readers. BP

About the Author

Ethan O'Brien serves as the Global Director of Operations Sustainability at Klöckner Pentaplast. He holds a Chartered Energy Engineer (CEng) qualification and has over 10 years of global experience leading renewable energy, sustainability and energy efficiency projects. An alumnus of the University of Edinburgh, Ethan is passionate about advancing sustainability and promoting more sustainable operational practices within companies. He is currently completing an Executive MBA at the University of Warwick Business School.

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Brewing a More Sustainable Future at Tröegs

Pennsylvania brewery shares its innovative approach to water conservation and decarbonization

By Brooke Jones, Compressed Air Best Practices® Magazine

Sustainability is a topic on everyone's mind – not just individuals, but companies, too. Businesses are looking for ways to lower their carbon footprint and contribute to the cause.

Tröegs Independent Brewing, a craft brewery based in Central Pennsylvania, is making strides with sustainability best practices.

"We all have families, we all have children and we want to leave this world a better place than when we came into it," said Jason Knox, Maintenance Manager at Tröegs. "At Tröegs, we pay attention to our carbon footprint and drive sustainability efforts so we can be a good neighbor to our community."

Production at Tröegs

As the 27th largest craft brewer in the U.S., Tröegs produces 112,000 barrels of beer per year at its facility in Hershey, Pennsylvania. The brewery is 115,000 square feet, with about 25,000 square feet allocated for retail space, kitchen and a 250-seat restaurant.

Above: Aerial view of Tröegs Independent Brewing facility in Hershey, Pennsylvania

The remaining 90,000 square feet is devoted to production.

Tröegs has three brewhouses – 100 barrel, 15 barrel and 3 barrel. The 100-barrel brewhouse serves as the company's primary manufacturing plant where a vast majority of its beers are brewed. Known as Tröegs's scratch brewhouse, the 15-barrel brewhouse is used to solidify new recipes and do collaboration brews with other breweries. These beers are created in smaller quantities and are sold exclusively inhouse. Lastly, the 3-barrel brewhouse is a test kitchen used for research and development.

The brewery also includes two bottling lines. The larger line is capable of filling 215 bottles per minute, while the other is capable of filling 45 bottles per minute and is used for specialty bottles sealed with a cork. In 2022,

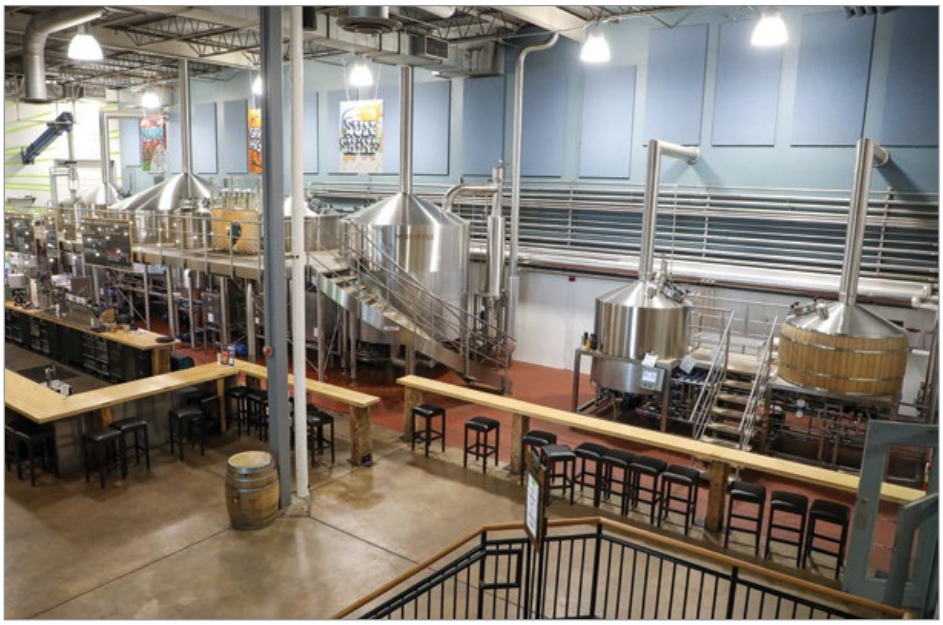
Jason Knox, Maintenance Manager at Tröegs

Tröegs installed a fully automated canning line that fills 390 12-ounce cans per minute. The brewery's semi-automated keg line can fill 40 half barrels per hour.

Compressed Air in the Production Process

Compressed air plays a large role in Tröegs's brewing process. One of its main uses is to control valves opening and closing all throughout production and packaging.

"In our brew houses, compressed air controls all of the openings and closings of the butterfly valves for all the paths the beer has to travel," said Knox. "This is the same in the cellar and our filtration process. For the packaging process, compressed air opens and closes



The main 100-barrel brewhouse, left, and 15-barrel brewhouse, right

Brewing a More Sustainable Future at Tröegs

Tröegs's rotary screw air compressor installation

valves. We don't have electric valves and use compressed air for as much as we can. It never directly touches the beer though, and there's nowhere we would have potential for crossover."

Tröegs's main source for compressed air is a 50-horsepower (hp), lubricated, air-cooled, rotary screw air compressor with a variable frequency drive. The brewery also has an older 25-hp rotary screw air compressor that's used for backup. The compressed air system includes an SSRC-250 cycling, refrigerated air dryer and a 400 gallon receiver tank.

"Compressed air is a 24/7/365 operation at Tröegs," Knox said. "99% of our valves are air operated. If a valve needs to open, the air compressor has to be ready to supply air or we risk ruining the beer."

Tröegs's main air compressor includes a variable frequency drive that delivers 235 cfm at 115 psi (8 bar) at full load. This is how the brewery runs when at full capacity using its air-driven diaphragm pumps that dispose of yeast and filtration media to outdoor storage tanks, which is the largest compressed air application at Tröegs. During operation periods with only two packaging lines running, Tröegs can run at 45% turndown.

Knox and his team understand the importance of regular maintenance, equipment monitoring and scheduled cleanings of screens and filters.

The majority of Tröegs's machinery has low air cutoffs, so if there's an issue with part of the system, the team can figure out where the problem is going to be. Each piece of equipment that uses compressed air has an air pressure monitor that will show an alert if the air pressure dips below that particular machine's setpoint. These issues would be present in the event of a compressor fault or failure, or a possible leak causing air to be starved from that location.

Since 2010, Tröegs has been under contract with Cleveland Brothers, its local supply house for partner vendor products. Every 2,000 hours, Cleveland Brothers services the equipment, conducts an oil analysis, changes filters and ensures everything is working properly.

Keeping Things Cool with Pro Refrigeration Chillers

Along with compressed air, Tröegs relies on three chillers for production. Each chiller is manufactured by Pro Refrigeration, and is responsible for keeping the beer and yeast

Tröegs's three chillers from Pro Refrigeration keep the beer and yeast at a stable temperature for production.

at a stable temperature, as well as providing cooling for the brewery's filtration and flash pasteurizer. The refrigeration compressors used in the chiller units are manufactured by Bitzer and all units use R-404A.

Chiller 1 is a packaged unit that uses two 50-hp reciprocating compressors to remove the heat from propylene glycol. It has a 1,200 gallon reservoir of glycol that is kept at -5°F (-21°C) freeze concentration.

Chiller 2 and chiller 3 each have two 110-hp rotary screw compressors that accomplish the same thing as chiller 1. These units share a separate 2,000 gallon glycol reservoir.

Making a Difference with Water Conservation

For Tröegs, the first step to being green starts with education. Brewery leadership believes it's crucial to educate employees on what's important to the company – such as being a good member of the community and prioritizing sustainability. Water usage is always top of mind.

"Breweries are notorious for being massive water consumers, so we pay attention to every drop of water we bring in," Knox said. "On the flip side, we also monitor every drop of waste we put out of here – anything that goes through our waste stream be it effluent, human effluent, lab waste, dishwashers or kitchen grease. We pay attention to what we're loading the local municipality with, such as total suspended solids (TSS) or biochemical oxygen demand (BOD) and other high-strength waste."

One of Tröegs's big initiatives was to side stream its high-strength effluent, which is wastewater that has higher concentrations of contaminants than standard domestic wastewater. The brewery side streams it out of the underground stream that goes to the local municipality, Derry Township Municipal Authority (DTMA), and has it tankard off site. This high-strength effluent then goes to DTMA to be run through an anaerobic digester, turning it back into electricity.

Typically, effluent first needs to go through a screening process. Tröegs bypasses these steps and directs its high-strength waste right into the DTMA's digester. Microbes eat the waste and generate methane, which DTMA uses to run its generators.

Bypassing the DTMA's screening not only saves Tröegs $600,000 per year, but means the municipality can skip the first steps of the treatment process, saving energy and manpower. The brewery provides effluent that's high in soluble sugars, so it can go straight into the municipality's digester.

"When I first started in this industry 17 years ago, it took an average of seven to eight gallons of water to manufacture one gallon of beer," Knox said. "Today, Tröegs has gotten water usage down to 4.6 gallons of water per one gallon of beer."

In order to reduce its water usage, Tröegs has implemented numerous tactics. The brewery has reverse osmosis systems, which are water filtration devices that use pressure to force water through a semi-permeable membrane to remove contaminants. This process creates two products – permeate, water that has nearly all contaminants removed, and concentrate, the

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Opening Session Keynote Presentations Tuesday, October 29, 10:15AM – 12:00PM

Opening Remarks

Frank Mueller, President, Compressed Air & Gas Institute

Compressed Air System Compliance with the ASHRAE 90.1 Commercial Building Energy Code

Paul L. Baker, PE, Senior Mechanical Engineer, Jacobs

Enhancing Industrial Cooling Water Systems: Strategies and Benefits

Abdulaziz Dulaijan, Engineering Consultant, Saudi Aramco

Ardagh's Asset Reliability Program: Compressed Air and Cooling Water

Tate Pearson, Director of Facilities Engineering & Asset Reliability, Ardagh Glass Packaging – North America

Plenary Session Keynote Presentations Wednesday, October 30, 10:15AM – 12:00PM

Specifying CTI Certified Cooling Towers for Performance & Reliability

Lee Seela, Mechanical Engineer – Energy Division, Black & Veatch

Reducing GHG Emissions With Integrated Heating, Cooling, And Compressed Air Design

Philip Johnston, PE, Technical Manager, Woodard & Curran

Gates Performance System (GPS) Standards: Chiller, Cooling Towers and Compressed Air

Alan Edington, Global Energy Director, Gates

Compressed Air Systems in the Amusement Park Industry – The Importance of Air Quality

Sean Ferris, Senior Manager Ride/Show – Facility Interface, Universal Creative

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leftover liquid with the contaminants unable to pass through the membrane.

To save water, Tröegs has converted most spray down hoses, most safety showers, foam trap rinses, keg cip tanks and the keg external washer from the main water line to concentrate water. The brewery has reduced and optimized the volume of whirlpool, lauter tun, mash tun, boil kettle and FV pre cip rinses. It also reduced and optimized pipe rinses pre hotloop as well as pre and postflush rinses for all packaging lines and filtration. Lastly, Tröegs reduced the time centrifuge sits in standby wet.

In addition to its water conservation efforts, the brewery has created its own solar farm, with more than 1,600 solar panels on its roof. At the time of installation, the solar farm accounted for 17% of the brewery's electrical needs. In 2023, the farm produced 727 megawatt hours of electricity.

Decarbonizing and Cutting Costs with Carbon Capture

Tröegs's next sustainability measure is already in progress: a carbon capture project.

Beer manufacturing creates three byproducts: heat, CO_2 and alcohol. The CO_2 vents back into the atmosphere, but soon Tröegs will be able to put it into a collection system and reuse it.

A large amount of CO_2 is needed to maintain the brewery's production. Currently, Tröegs buys liquid CO_2 by the pound and has three holding tanks on site. With the carbon capture project currently in development, the brewery will be able to reclaim the CO_2 from its fermentation process, clean it, recompress it from a gas back to a liquid and then reuse that CO_2. Once complete, this project is expected to produce 65% of the brewery's CO_2 needs.

As part of this CO_2 reclamation system, Tröegs will be making use of a nitrogen generator. It will use a Generon Nitrogen Generator that is 10 scfm with a purity of 95%.

The carbon capture process involves the collected CO_2 going through a pre-compression skid and then to a dryer, followed by an activated carbon bed to remove any impurities. After approximately eight hours of run time, the carbon will be saturated and needs to be cleaned. Nitrogen will be heated and run through the dryer and activated carbon bed until it is free of contaminants. BP

About Tröegs Independent Brewing

Founded in Pennsylvania in 1997 by brothers John and Chris Trogner, Tröegs Independent Brewing is driven by a sense of adventure and curiosity. It brews a variety of year-round, seasonal and limited beers as well as small-batch and specialty beers. For more information, visit https://troegs.com.

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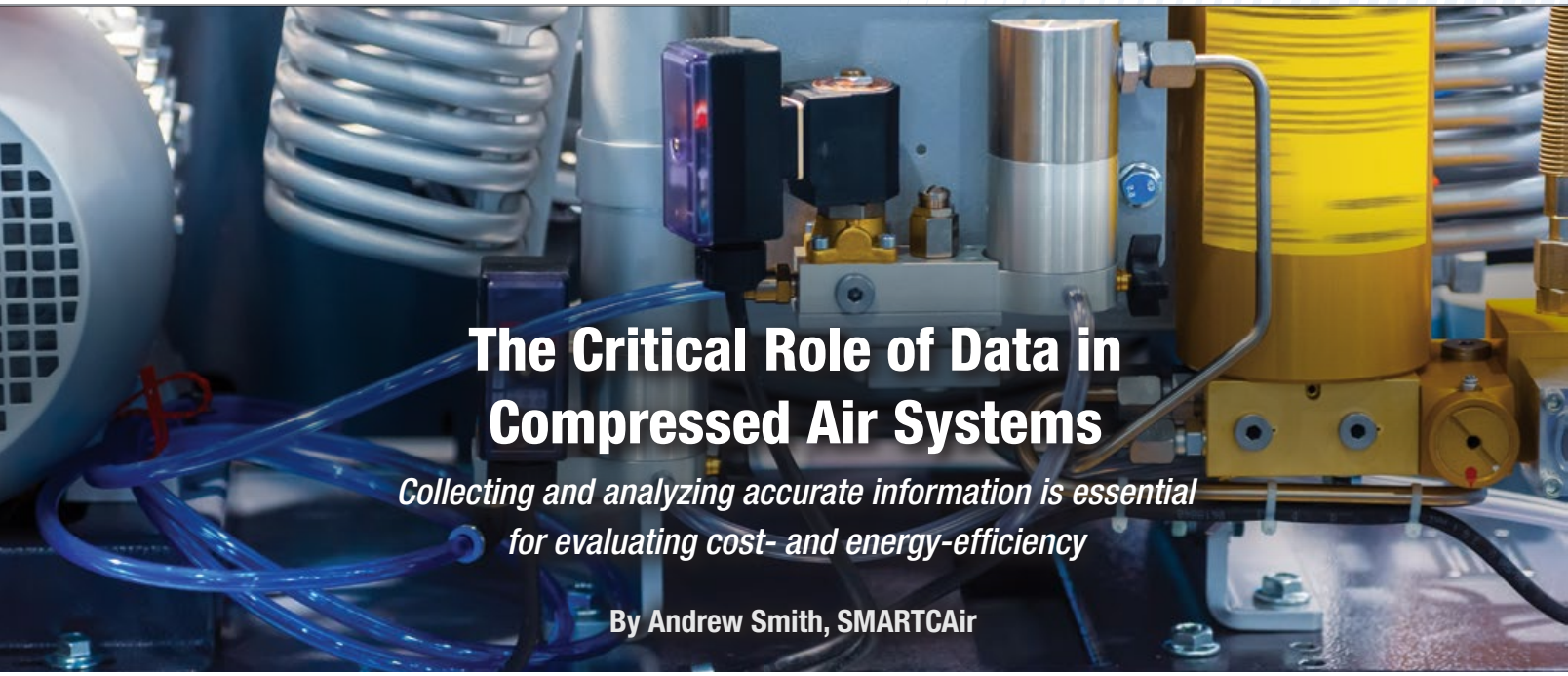

The Critical Role of Data in Compressed Air Systems

Collecting and analyzing accurate information is essential for evaluating cost- and energy-efficiency

By Andrew Smith, SMARTCAir

Compressed air systems are a cornerstone of modern industrial operations, providing essential power for a variety of processes. However, these systems are notoriously energy-intensive, with as much as 90% of the energy input being lost to heat of compression, frictional losses and motor inefficiencies. Due to their dynamic nature, compressed air systems can be challenging to understand well and easy to misinterpret, which is where accurate data measurement and analysis play a key role.

The primary goal of measurement in compressed air systems is ensuring they meet process requirements – specifically pressure and flow – in the most cost-efficient manner possible. Accurate data collection, management and analysis are crucial in ensuring this goal is achieved. This article highlights key data measurement requirements, the significance of accurate measurements and typical sensors required for data collection, then presents case studies that demonstrate the importance of accurate measurement data when evaluating system performance and cost efficiency.

The three key process parameters that require quantifying through measurement and analysis are input power, system flow and pressure.

Input power, the rate of electrical energy transfer, not only helps us determine the cost of producing compressed air, but is also important in determining system efficiency. Flow measurements are critical in understanding system efficiency, while pressure measurements allow us to ensure the system consistently meets process requirements.

Typically, we evaluate system efficiency through the lens of specific power of the compressed air system, which is a ratio of the rate of energy use (measured in kilojoules per second, or kilowatts) and measured as input power versus the rate of air production, measured as system flow in cubic feet per minute (cfm) in North America, or m^3/hour or m^3/min in other areas.

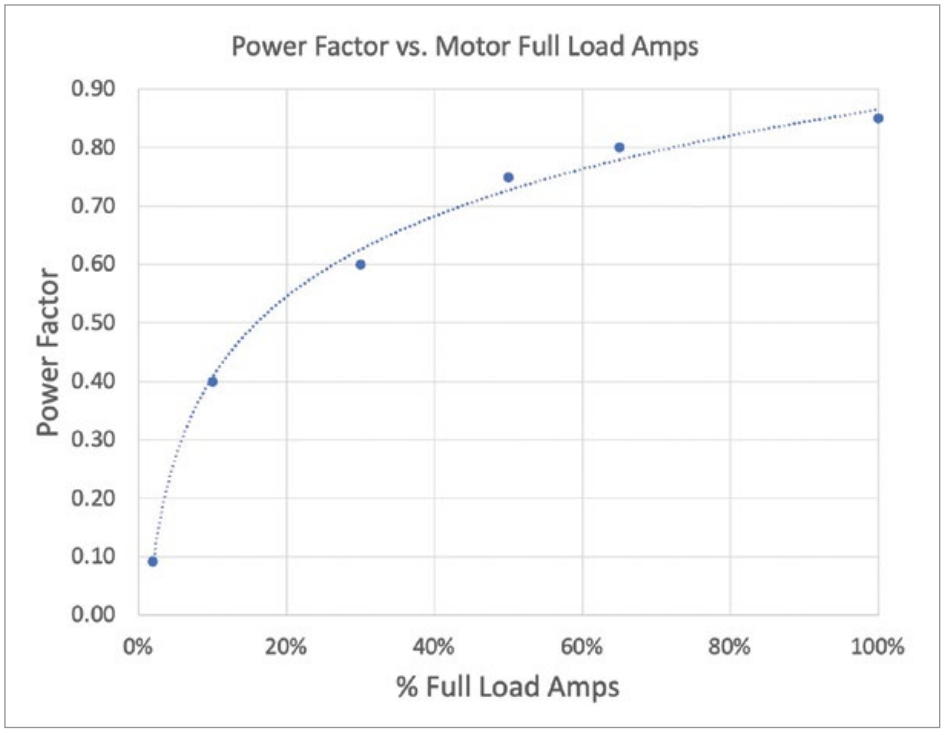

Figure 1: Typical power factor curve

In North America, which is where we will focus, specific power is measured in kW per 100 cfm.

Most commercially available air compressors have a published rating for specific power from the manufacturer. It is important to note the manufacturer's specific power is typically in kW per 100 actual cubic feet per minute (acfm) at inlet conditions, whereas most flow meters will produce measurements in standard cubic feet per minute (scfm), which is measured at standard temperature, humidity and pressure (temperature: 68°F (20°C), pressure: 14.7 psi (1 bar or 101.3 kPa), relative humidity: 0% (dry air)).

Converting scfm to acfm requires measurements of ambient inlet air temperature, humidity and pressure. Ambient air temperature, humidity and pressure all impact the density of the inlet air, which ultimately impacts the actual mass flow rate of air through the system (as positive displacement compressors are volumetric devices), and that will impact the pressure developed within the compressed air system. Converting between acfm and scfm is well understood and documented but is beyond the scope of this article.

Determining Input Power

Input power, the instantaneous electrical energy rate of transfer, is determined by measuring input amps, power factor and voltage. Input energy consumed can then be determined by aggregating the measured input power within each measurement time interval. Amperage measurements determine the amount of current being used. Power factor is the ratio between real and apparent power, usually resulting in a power factor of slightly less than 1 for a fully-loaded induction motor since apparent power is typically higher than the real power required by the compressed air system. Apparent power is higher since some additional level of current is required to magnetize the induction motor.

Power factor varies with the load on the motor and across phases, and is much lower than 1 at lower loads relative to fully-loaded induction motors. Assuming a constant power factor would introduce a significant error, so the power factor should be either measured directly or determined depending on the level of amps being measured relative to full-load amps (fla) for the motor.

Since compressors are typically driven by three-phase inductance electrical motors, the measurement of input power is accomplished in one of two ways:

1. Measuring amps using a clip-on or wrap-around current transformer (CT) on a single phase, estimating power factor using some sort of standardized curve based on the motor loading relative to fla (See Figure 1), and estimating input voltage to calculate input power in kW using the following formula for three-phase power (where supply voltage is measured phase-to-phase):

$$P[kW] = Amps \times Supply\ Voltage \times \sqrt{3} \times PF \div 1{,}000$$

2. Measuring input power directly using a three-phase power meter where amps, power factor and input voltage are measured individually and concurrently on all three phases to determine the true total input power (See Figure 2). Input power and energy are then automatically determined based on these measurements for each time interval.

The Critical Role of Data in Compressed Air Systems

Figure 2: Typical three-phase power meter

Measuring input power with a three-phase power meter is by far a more accurate approach, as we will discuss in one of the case studies, primarily since it is relatively common to have unbalances in power usage between each phase of the inductance motor. That will also result in differences in power factor for each phase, and there are often variations in supply voltage over time. As a result, taking a single amperage measurement on one phase and assuming power factor and supply voltage can result in significant errors in the resulting input power.

Measuring Flow

Flow measurement is also vital to compressed air system analysis. It's common in compressed air demand studies for auditors to use input power data to estimate compressor flow data using performance data from the manufacturer for that particular model. Some of the key factors that impact the accuracy of this approach include:

- Performance data is not always readily available for older machines, and often newer machines are able to produce higher flows than older models due to design improvements over time. Older machines may also operate at lower than the manufacturer's rated flow due to mechanical wear. For example, in a recent assessment a 20-year-old machine nameplate stated 426 cfm while the current machine nameplate stated 471 cfm for the same model – an 11% increase. Using the rated manufacturer data for the new machine to model the older machine would overstate the efficiency of the system.
- Modeling flow using manufacturer performance data will not produce correct peak flow values. Without a measured flow value, the maximum peak flow will never exceed the manufacturer's stated maximum value, which does not account for true system peak flows that may occur.

Different types of flow meters offer varying levels of accuracy and suitability for different applications. Table 1 itemizes typical flow meters commercially available and their main differentiating factors. The key to effective flow measurement is ensuring the flow meter is installed in a clear and straight portion of piping free of upstream and downstream fittings. The most common meter used is the insertion style thermal mass meter, which can be installed live into a system.

Table 1. Typical Flow Meters Commercially Available And Their Main Differentiating Factors

Type	Description	Advantages	Disadvantages
Vane style anemometer	Radial fan shape, held against inlet air filters or mounted on inlet air	• Can be used with the system running without system modification	• Moving parts • Slow to respond to changes in flow • Difficult to keep an accurate measurement • Lower accuracy, have to estimate the input area to determine volumetric flow
Thermal Mass	Measures the temperature differential between two heating elements; this differential, in combination with the supplied heating power and fluid properties, allows the meter to determine the mass flow rate accurately	• High accuracy and response • No moving parts • Insertion style can be installed through existing piping ports or valves with system live if piping allows	• Sensitive to liquid in the air stream • Can provide false data if dryer is failed or failing or is used upstream of dryer
Vortex	Measures the flow rate by detecting vortices shed by a component placed in the flow stream using a frequency sensor	• High accuracy and response • No moving parts • Can be mounted directly on compressor output	• Can't be installed live
Venturi	Uses Bernoulli's principle and the measurement of the pressure differential of the air flow relative to a reduced throat	• High accuracy and response • No moving parts • Can be mounted directly on compressor output	• Can't be installed live
Orifice Plate	Creates a pressure difference and relates to the flow rate	• Reasonable accuracy and response • No moving parts	• Can't be installed live • Creates a pressure drop in system

Pressure Sensors

Pressure sensors typically use electronic strain gauges to detect the deformation of a steel diaphragm under pressure. There are several commercially available models that are easy to install and are usually supplied with a standard quarter-inch NPT connection (See Figure 3). They can be installed with the system live and provide accurate readings.

Case Studies on Measurement Approaches

The impact of accurate measurement approaches can be demonstrated through the following case studies.

Case Study 1: Input power using single-phase measured amps versus true power. In a 75-horsepower (hp) load/unload air compressor system, the maximum rated motor amps were back-calculated from the manufacturer's rated input power using 575 VAC supply voltage and a power factor of 0.85, giving a calculation of 77 amps. However, the measured data showed approximately 100 amps when fully loaded. This discrepancy,

Figure 3: Typical pressure sensor

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likely due to an unbalanced amperage draw between phases, results in an overestimation of power consumption by almost 20%, making the machine appear significantly less efficient than it actually is and negatively affecting the accuracy of the results and the conclusions drawn.

Case Study 2: Measured flow vs. calculated flow. A system contained two rotary screw air compressors with inlet modulation control, one 300-hp and one 350-hp. The total system flow was measured using a thermal mass insertion-style meter. The flow was also calculated using performance data supplied by the manufacturer and the measured input power. The actual measured flow was significantly lower than the calculated flow. If the study had relied solely on the calculated flow, this would have significantly impacted the perceived efficiency of the system.

The calculated flow data suggested a specific power of 21.3 kW/100 cfm, whereas the measured flow indicated a specific power of 37.1 kW/100 cfm. The measured specific power highlights the potential for significant cost savings, which would have been missed if relying on calculated flow values.

By using measured flow data, a 45.6% reduction in total cost was realized, amounting to $175,000 per year, compared to a small 2% cost reduction ($8,000 per year) using calculated flow data.

Accurate data management and analysis are indispensable for optimizing compressed air systems. By leveraging precise measurements of input power, flow and pressure, industries can achieve significant cost savings, improve system efficiency and ensure their processes run smoothly. The case studies presented highlight the potential errors that can occur between calculated and measured data, underscoring the importance of accurate measurements in achieving optimal system performance. As technology advances, the integration of sophisticated sensors and data analysis tools will continue to play a crucial role in the efficient management of compressed air systems, driving both economic and environmental benefits. BP

About the Author

Andrew Smith is a registered professional engineer in Ontario and British Columbia with over 20 years' experience in compressed air auditing and analysis, including successfully developing and implementing IOT-enabled custom compressed air controllers. Andrew has a Master's in Applied Science from the University of Waterloo and a Bachelor of Applied Science in mechanical engineering from the University of Toronto.

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Compressed Air Audit Uncovers Waste at a Plywood Plant

A Canadian facility saves significant energy by reducing system pressure and inappropriate uses

By Ron Marshall, Marshall Compressed Air Consulting

A comprehensive compressed air assessment was conducted at a Canadian plywood facility. The purpose was to determine the proper size of any new air compressors and to look for ways to improve the system. Analysis of the data and a demand-side audit finds significant energy savings could be gained if the system is upgraded through air compressor replacements and demand-side reductions.

Far from Optimal Specific Power

The study used cellular connected data loggers to measure and track air compressor power (calculated from amps), discharge and plant pressure, compressed air dew point and compressed air flow for a period of four weeks. The instruments showed the system ran at poor efficiency (specific power of 27.7 kW/100 cfm), not including compressed air dryer power, during this period. Optimal specific power for systems of this size running at 100 psi (7 bar) would be about 19 kW/100 cfm, including an optimized compressed air dryer.

The system consists of three independently controlled air-cooled lubricated screw air compressors – two at 200-horsepower (hp) and one 150-hp – with total rated output estimated at 2,870 cfm. The air compressors operate quite inefficiently due to internal control problems and aging conditions. The air is filtered and dried using a heated blower desiccant dryer. The dryer heater control circuit has failed resulting in wet air entering the plant even though the dryer blower continues to operate. A thorough inspection of plant piping could find no reason to operate a desiccant dryer for this plant.

Total effective system volume, including piping, is estimated at about 2,800 gallons, a small volume for a system of this size. Optimal would be to have 4,000 gallons or larger (about four gallons per cfm times the 1,000 cfm rated flow of the largest air compressor). There was no wet storage tank before the compressed air dryer, just a large dry storage tank. The main plant piping backbone is well sized using six-inch and four-inch piping with little pressure loss across the system, confirmed by placing data loggers at the far end of the system. Most of the system pressure loss – 5.8 psi (0.4 bar) average – is due to the compressed air dryer and filters.

Channel	Week 1 Avg	Week 2 Avg	Week 3 Avg	Week 4 Avg	Avg
Far psi corr [PSI]	100.3	99.6	100.2	99.8	100.0
Plant psi [PSI]	101.3	100.6	100.6	101.1	100.9
Wet psi [PSI]	106.9	106.5	106.8	106.8	106.8
Flow cfm [CFM]	1493.1	1582.3	1516.8	1456.2	1512.1
Power C.01 [kW]	116.4	120.2	114.5	117.1	117.1
Power C.02 [kW]	181.8	175.7	181.8	179.6	179.7
Power C.03 [kW]	122.9	124.7	121.7	117.6	121.7
System power [kW]	421.0	420.6	418.0	414.3	418.5
System specific power [kW/100cfm]	28.2	26.6	27.6	28.5	27.7
Dewpoint [˚C]	26.1				26.1
C1 amps [A]	198.4	202.8	196.6	198.9	199.1
C2 amps [A]	265.5	256.7	265.6	262.3	262.5
C3 amps [A]	180.6	183.1	179.3	173.9	179.2
D1 amps [A]	6.3	6.4	8.9	9.2	7.7
D1 [kW]	5.4	5.4	7.6	7.8	6.6
Peak cfm	2055.0	2160.0	2017.0	2017.0	2062.3
Compressor [kWh]					**3,665,841**
Dryer [kWh]					**57,409**
Total [kWh]					**3,723,250**
Cost [$]					**$781,882**

Table 1: Data logging concluded the system was inefficient and the compressed air dryer had failed, causing poor air quality.

	Rated	Test 1	Test [cfm]	kW	Actual SP	Rated SP
Air Compressor #1	1050	706	715	160.4	22.4	17.0
Air Compressor #2	1000	744	800	179.7	22.5	20.0
Air Compressor #3	820	597	650	122.5	18.8	15.7
Total	**2870**		**2165**			
Difference	-705					

Table 2: Initial data logging and flow measurement pointed to reduced capacity, and a physical flow test confirmed this.

Control coordination uses a poorly configured manual cascade strategy, which leads to less than desirable efficiency. One 150-hp air compressor runs in modulation mode, which is the least efficient way to run an air compressor. The two other air compressors seem to produce air with poor efficiency, likely due to inlet valve problems and internal wear on the screws. The product in this plant uses a compound to bond the layers of plywood together. The glue mixing area is adjacent to the air compressor room. When the compound is removed from shipping bags, the ambient air is contaminated with dust from the bags, which is then ingested into the air compressors. This compound clogs the operation of the poppet-style inlet valves, preventing them from operating properly.

Constantly High Pressure

Another issue is higher than desired operating pressure (Figure 1) that exceeds the 100-hp pressure rating of the two 200-hp air compressors, making the air compressors consume greater than required power and sometimes leading to overcurrent trips.

Figure 1: The pipes connecting this 200-hp air compressor to the remote cooler installed on the air compressor room wall were only two-inch size, causing a large pressure loss. Because the air compressor is only rated at 100 psi (7 bar), the dive motor would trip.

Compressed Air Audit Uncovers Waste at a Plywood Plant

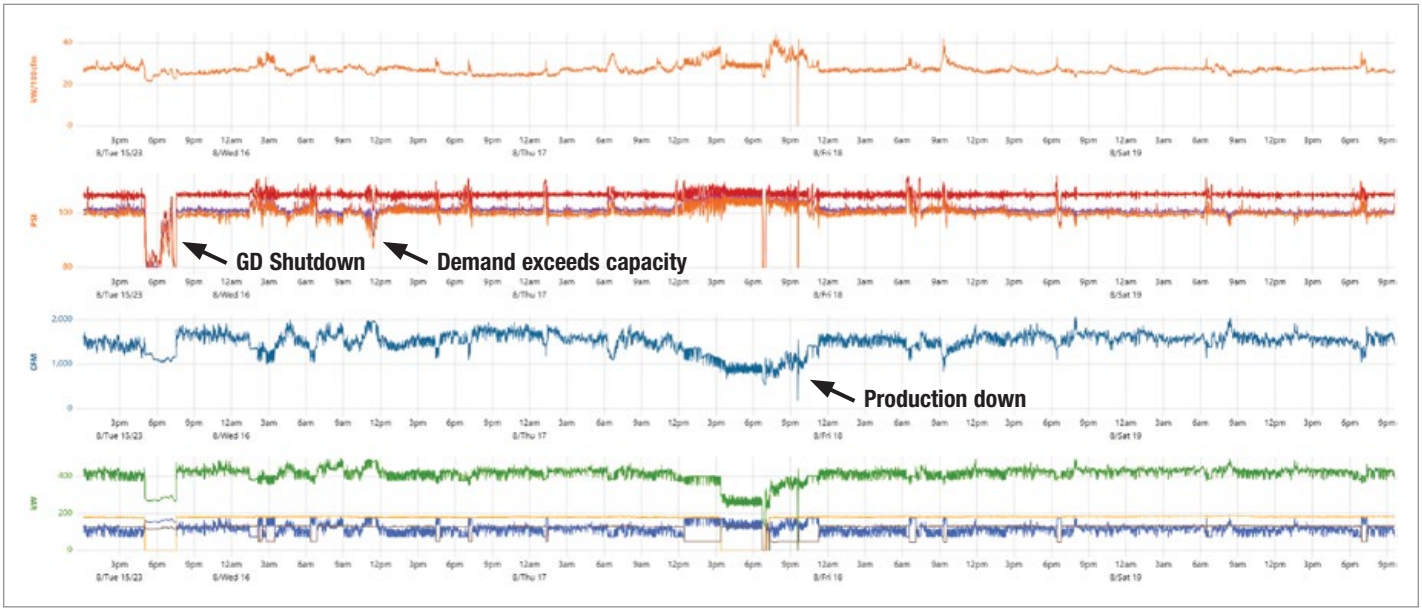

Figure 2: Demand exceeds supply causing low pressure dips. Use of larger storage and higher capacity air compressors would eliminate this problem.

The use of timer-style condensate drains on receivers, compressed air dryers and filters wastes compressed air. A better choice would be high efficiency airless drains. The condensate from these drains is directed outdoors where it contaminates the soil outside the air compressor room, causing an environmental problem.

The lowest desired plant pressure is assumed to be about 90 psi (6.2 bar) based on interviews with maintenance staff, yet the system is set at 106 psi (7.3 bar) to compensate for pressure loss across compressed air dryer and filters and to compensate for the drop caused by the poorly set cascaded control mode.

At current peak load there is not enough air compressor capacity to withstand the loss of any air compressor and still maintain full plant pressure (Figure 2). Either the purchase of additional capacity should be considered or the reduction of demand-side waste. The best place for new capacity would be in a new air compressor room away from the chemical mixing area that causes air compressor issues due to air compressors ingesting chemical dust.

The difference between the actual system specific power compared to the ideal (27.7 vs 19 kW/100 cfm) suggests significant levels of air compressor energy savings are possible (about 25 to 30%) if air compressor control inefficiency, drainage waste and discharge pressures are reduced. Figure 3 shows the difference between actual and optimal levels.

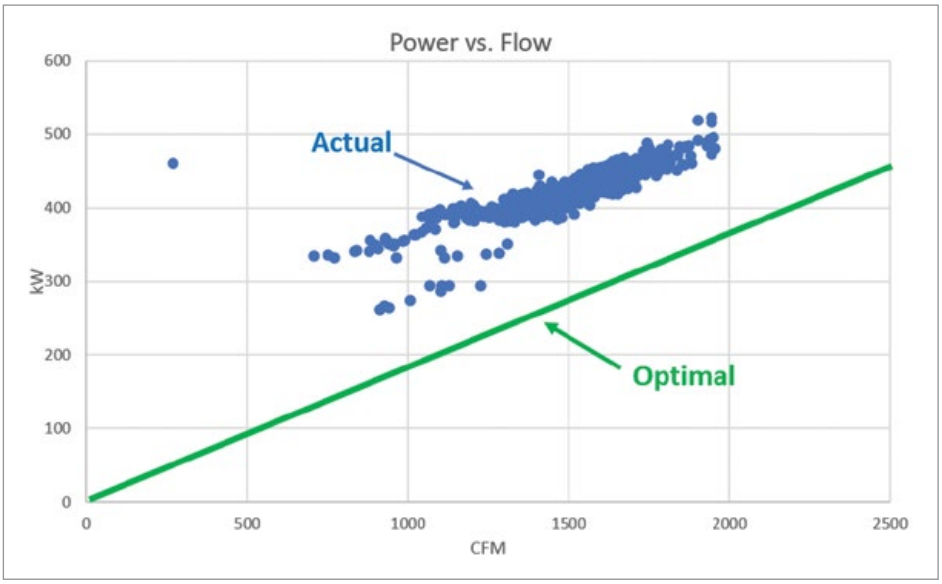

Figure 3: The flow vs. power characteristics of this system were less than optimal due to higher discharge pressure and poor air compressor operating efficiency.

The study found the compressed air system consumed an estimated 3,723,000 kWh through 8,760 hours of operation, while producing about 1,510 average cfm of compressed air, costing about $782,000 in annual charges. The power cost for this plant is $0.21 cents per kWh – much higher than similar plants in other areas. (All monetary figures in this article are in Canadian dollars; exchange rate September 2024; $1U.S. = $1.35 Canadian)

A leakage and end-use survey done with an ultrasonic detector found total leaks estimated at 200 cfm. The plant has an ultrasonic detector, but it isn't used regularly. Quarterly use of this detector is recommended to keep leakage waste in check.

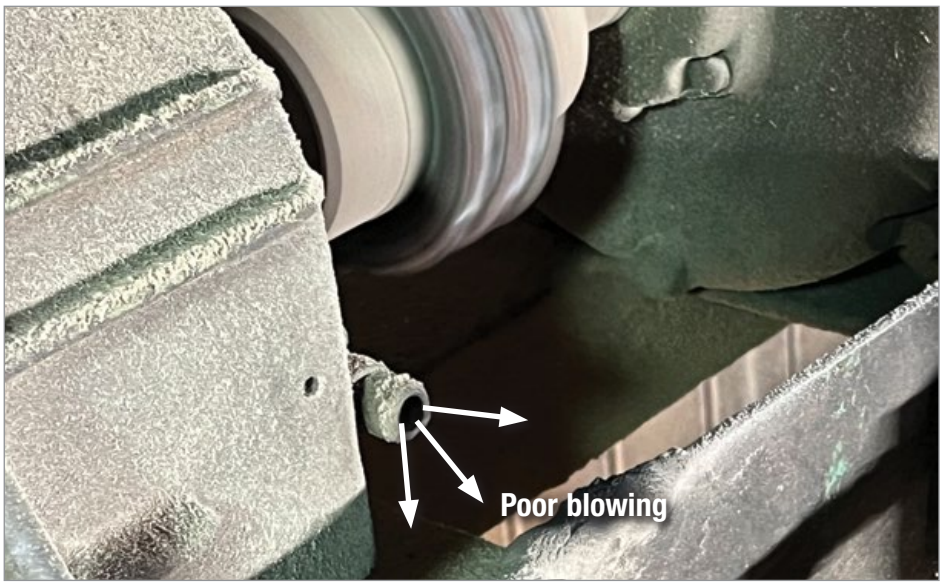

Figure 4: Clutch bearing blowing was implemented, yet the nozzle on one was not blowing on anything. It is likely this blowing can be removed for a substantial savings.

A Variety of Inappropriate Uses

On the demand side, significant inappropriate use and waste was found. If repaired, this could result in significant energy savings and free up air compressor capacity. Achieving these savings requires significant work and persuasion of plant personnel. Some items found to contribute to wasted flow include:

- **Compressed air-powered vortex electrical enclosure coolers.** A few PLC panels have compressed air-powered electrical enclosure coolers installed to cool the internal electronics. These coolers are uncontrolled and operate even when the PLC panel is off and temperatures are normal. About 25 cfm of compressed air is used for these applications. Refrigerative cooling consumes 20 to 30 times less power for the same result.

- **Cooling clutches above the press.** Four clutches control the raising and lowering of the press beds where plywood is formed. Bearings attached to

Compressed Air Audit Uncovers Waste at a Plywood Plant

Figure 5: A blow wand stuck in a sawdust recovery duct blows constantly, even during production downtime. This application could be eliminated with proper ducting.

the clutches sometimes get hot, so air nozzles were placed to cool them. This demand was measured at 140 cfm. One blowing nozzle wasn't even directed at the clutch (Figure 4). Cooling bearings with clutches can cause mechanical problems because this cools only one side of the bearing, causing deformities

Measure	Load/Unload			VSD		
	Total Cost*	$ Saved*	% Saved	Total Cost*	$ Saved*	% Saved
Air Compressors	$562,933	$219,081	28.0%	$430,128	$351,886	45.0%
Lower psi	$541,301	$21,632	2.8%	$412,940	$17,188	2.2%
Leaks	$506,971	$34,329	4.4%	$386,573	$26,367	3.4%
Drains	$503,435	$3,536	0.5%	$383,413	$3,160	0.4%
Dryer Purge	$503,435	$0	0.0%	$383,413	$0	0.0%
End Uses	$462,932	$40,504	5.2%	$348,455	$34,958	4.5%
Refrig Dryer	$459,597	-$3,427	-0.4%	$346,838	-$3,427	-0.4%
Total		**$322,417**	**41%**		**$435,176**	**56%**

Table 3: A summary of potential savings opportunities if aggressive measures are implemented. Use of a VSD air compressor would save the most. All monetary figures in this article are in Canadian dollars; exchange rate September 2024; $1U.S. = $1.35 Canadian.

and alignment issues. The plant is advised to consider fans or blowers if cooling is needed.

- **Diaphragm pumps.** Some air-operated diaphragm pumps were running continuously, even when not required, consuming 100 cfm continuously. New versions of pumps have electronic optimization to reduce air use. Electric diaphragm pumps are now available that can result in 80 to 90% electrical savings.

- **Blowing wands in ducts to clear sawdust.** Blow wands have been stuck in sawdust pick up ducting to prevent clogging in two locations (Figure 5). These are controlled by the machine operator through partially cracked open ball valves, so the flow varies considerably. It was measured at 200 cfm during the plant inspection.

- **Dry ice blasting.** The layers of wood used in the assembly of plywood pass through a kiln to dry. These kilns must be cleaned of flammable residue weekly. Dry ice blasting is used and consumes significant peak air flow, causing low pressure events that impact production. The plant should either consider adding a separate compressed air system or protect the existing system from high flows by using a large storage tank to isolate this demand from the main plant system.

By adopting a more efficient air compressor control (using new or rebuilt air compressors, including one with a VSD), lowering discharge pressure, adding a cycling refrigerated dryer, reducing leaks and eliminating inappropriate uses could lead to energy savings of up to $435,000 (56%). BP

About the Author

Ron Marshall is a seasoned compressed air expert and the Chief Auditor at Marshall Compressed Air Consulting. With extensive experience conducting air system assessments, Marshall specializes in optimizing air compressor efficiency and reducing energy consumption. He is a Certified Engineering Technologist (C.E.T.), Certified Industrial Manager (C.I.M.) and Certified Compressed Air System Specialist contributing valuable insights through his training sessions and writings on compressed air topics. His expertise and practical solutions have made him a trusted authority in the field of industrial compressed air systems.

*All monetary figures are in Canadian dollars.

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

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

IWF 2024 Highlights Compressed Air and Vacuum Systems for Woodworkers

Space-saving designs, high temperature operation and energy efficiency were the hot topics

By Troy Dreier, Compressed Air Best Practices® Magazine

➤ In early August, the International Woodworking Fair (IWF) took place in Atlanta, Georgia, bringing together woodworking companies of all sizes to promote new and innovative technologies. In all, 26,000 attendees visited with nearly 1,100 exhibitors. Air compressor system companies were in attendance, as their products are widely used to power hand tools or apply spray finishings. Likewise, the top vacuum pump manufacturers were there to talk to OEMs about integrating their products in CNC router boards, and to talk to business owners about upgrading the vacuum pumps that came with their CNC router boards.

Air Compressor Systems

Kaeser Compressors knows woodworking shops appreciate enclosed air compressor packages built with easy serviceability in mind. These models offer easy installation with only one process connection required, and come with a small footprint. That's why Kaeser talked up its SX, SM and SK AIRCENTER rotary screw compressors, ranging from 3 to 20-hp and including an integrated refrigerated compressed air dryer, condensate drain, receiver tank and optional filtration package. For even greater ease, Kaeser offers its Sigma Air Utility maintenance package, where customers pay a monthly fee based on hours run, then Kaeser handles all monitoring and maintenance. It's a strong option for businesses expecting to expand in the near future, as there's no air compressor purchase involved. "If someone uses compressed air a modest amount or a lot, it will be more expensive than purchasing the machine, but you've got to take into account the added value of us monitoring the machine and doing all service, no questions asked," said Marketing Services Manager Michael Camber.

Atlas Copco Compressors split its IWF booth between air compressors and vacuum pumps. On the air compressor side, it promoted its 15 to 40-horsepower (hp) GA FLX series of dual-

Brian Glover of Leybold USA with NDk vacuum pumps in a triple stack configuration.

Michael Camber of Kaeser Compressors with an SM 10 AIRCENTER.

speed, oil-injected, load/no load rotary screw air compressors that save money by running at a reduced motor speed when unloaded. The series' six models deliver maximum pressures between 58 and 191 psig (4-13 bar) and 53-213 cfm, automatically delivering greater flow at lower pressures. The Full Feature version includes a built-in refrigerated compressed air dryer. "They can run at any pressure variant they're designed for and still operate on those load and unload setpoints," said Regional Sales Manager Jon Wallace. Owners don't need

Ryan Summerlin and Walt Pitts of Hertz Kompressoren (left to right) with an HPC-E reciprocating air compressor.

Fabio Rosa of Schulz of America with an SRP 3015 Compact air compressor.

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to change a gear, pulley or belt set to achieve wide-ranging pressures.

Hertz Kompressoren USA now has reciprocating air compressors for the standard 80-200 psi (5.5-14 bar) market, complementing its high pressure (500 psi or 34.5 bar and above) reciprocating air compressors. The company started selling its HPC-E reciprocating line this summer, and found a receptive audience at IWF. The line includes three models at 5, 7.5 and 10-hp, with respective outputs of 19, 31 and 38 cfm at 175 psi (12 bar). The lower two models are mounted to 80 gallon wet storage tanks, while the top model includes a 120 gallon tank. All include four layers of air intake filtration to not only clean the air, but also quiet the air compressor's operation. "The standard here is a one-year warranty; it's bumper-to-bumper," said Ryan Summerlin, Technical Operations Manager, Hertz.

PneuTech shared a booth with longtime partner WSI Machinery. The company showed off its rotary screw units with integrated compressed air dryers, as well as its ability to create custom packages. One model on display was initially created for a customer with challenging warm weather requirements. "This was somebody we worked with in Arizona, where the temperatures are so hot they typically like to double the size of the refrigerated dryer for the output of the air compressor," said Daniel Schopf, National Account Manager, PneuTech. "Working with them is how we started putting this package together." The package includes a 20-hp rotary screw air compressor, a refrigerated dryer and an integrated 120 gallon dry storage tank.

Prevost showed off its variety of compressed air piping systems and quick-connect accessories, inviting woodworkers to step up to durable,

Tara Magee of Busch Vacuum Solutions with a Mink MV 0312 B dry claw vacuum pump.

Daniel Schopf of PneuTech with an RK 25F rotary screw air compressor with an integrated refrigerated compressed air dryer.

Gavin Green and Jon Wallace of Atlas Copco Compressors (left to right) with a GA FLX air compressor.

Mike Kreklau of Tsunami Compressed Air Solutions with a Pure-7 compressed air dryer.

high-quality products that can lead to greater efficiency. The company is known for its pushbutton quick-connect couplers, which began replacing older model slideneck couplers in Europe in 1978, arriving in the U.S. several years later. Its couplers are shock-resistant and durable, said Central Region District Sales Manager Jayson Schofield, noting 80% of compressed air system leaks come from connection areas. Prevost now offers larger 4 and 6-inch aluminum pipe size diameters. "We know woodworkers want to create high-quality products. Might as well use high-quality systems to get them there," Schofield said.

Schulz of America was at IWF to talk to its woodworking-focused distributors about its SRP Compact series of compact rotary screw air compressor systems. The line includes six models running from 7.5 to 40-hp, delivering from 25-150 cfm. Models come with 60, 80 or 120 gallon wet storage tanks. On display was the SRP 3015 Compact 15-hp unit rated for 51 cfm, which has a 60 gallon tank and can come with or without a soundproof cabinet. The company's SMH line of high-temperature, refrigerated compressed air dryers can accept up to 194°F (90°C) inlet air and operate in 113°F (45°C) ambient conditions. "This dryer is designed to work in harsh environments. This summer, you had temperatures over 110°F (43°C) in Florida, Georgia and Texas. A standard refrigerated compressed air dryer won't perform," said Fabio Rosa, North America Sales Manager for Schulz.

Tsunami Compressed Air Solutions showed off its Pure-7 heatless regenerative compressed air dryer, meant to be paired with 7.5-hp air compressors. It is rated for 25 cfm and includes a water separator and an oil coalescing filter, as well as a two-unit molecular sieve desiccant dryer. It provides dew points as low as -80°F (-62°C) when used in a series. This dryer's fill is in a bag, preventing dust contamination and making swapping in new fill easy. The unit comes with a wall mount. With its compact solutions, Tsunami targets woodworking customer who use paint guns, sanders or other hand tools. The company plans to have a small point-of-use aftercooler ready for the Best Practices EXPO & Conference in October. "Our compressed air dryers are rated for up to 115°F (46°C) inlet temperature," said Mike Kreklau, National Sales Manager. "We support mobile equipment applications whether they're on trucks or pulled behind air compressors and the air is super hot, where they're outside and there's no control of the temperature. If we can have an aftercooler, it will not only help customer air systems collectively, but will also help our dryers and filter systems perform."

Vacuum Pumps and Systems

Atlas Copco saw two different types of vacuum pump buyers at IWF: smaller workshops and medium-sized companies. Smaller workshops often wanted to upgrade the pumps that came with their CNC router boards. They explored the company's DZS line of non-contact dry claw vacuum pumps which range from 3 to 30-hp, provide maximum flows of 48-670 acfm, and offer 24-28"Hg. For medium-sized woodworkers that want to run multiple CNC router boards from a central vacuum pump system, the company recommended its GHS VSD+ line of oil-injected rotary screw vacuum pumps. These run from 7.5 to 125-hp, offer a maximum flow of 230 to 2,945 acfm, and all deliver 29.9"Hg. They include variable speed motors capable of 90% turndown. "As you continue to cut

IWF 2024 Highlights Compressed Air and Vacuum Systems for Woodworkers

and make more leaks, the machine will speed up, creating more flow to maintain a constant pressure," said Vacuum Business Line Manager Steve Nash. That results in roughly a 50% energy savings, he noted.

Becker Pumps highlighted its VTLF series of oil-less rotary vane vacuum pumps, which includes five models with between 6.4 and 24-hp, outputting 128-336 cfm at between 22"Hg to 27"Hg. Multiple units can be used in parallel for the same level of vacuum but double the cfm. The key selling point is the easy maintainability, letting the owner do much of the work themselves. "If the vanes break, you can take it apart, blow it out and put in a new set of vanes within 20 minutes, as long as you have them on hand," said Marketing and Expansion Manager Mike Ruff. Buyers can choose to get their VTLF with a variable speed drive for greater energy savings. The VSD recognizes when the pump is already delivering deep suction and automatically slows down.

Busch Vacuum Solutions wanted to entice woodworkers to step up from the vacuum pump that came with their CNC router board and switch to its Mink MV 0312 B dry claw vacuum pump. This model has no oil in the pumping chamber, and the twin claws are carefully machined to never touch – meaning there's less wear on the parts and reduced maintenance. The vacuum pump uses 8.7-hp, delivers 203 acfm flow and offers 26"Hg vacuum pressure. Busch emphasizes its quiet operation (72 dB) as a selling point. "We've been having a lot of conversations about the efficiency of the pump. This pump is quieter, it uses less energy and it delivers more capacity at deeper pressures," said Phil Kaht, Sales Director USA South. "These pumps are also made in the U.S.A., right in Virginia Beach, Virginia."

Dekker Vacuum Technologies covered all the bases at IWF by offering both oil-free and oil-flooded units. For lower-flow applications, dry vacuum

Jeff Joost of Republic Manufacturing with an RCV-250 dry claw vacuum pump.

Mike Ruff of Becker Pumps with a VTLF vacuum pump.

Steve Nash of Dekker Vacuum Technologies with a Vmax 553 liquid ring vacuum pump.

Scott Stejskal and Ben Cameron of Quincy Compressor (left to right) with a QSV-205 rotary screw vacuum pump.

pumps like its oil-free claw work well. For higher-flow applications, the company displayed the Vmax 553, a 40-hp oil-sealed liquid ring pump offering 550 acfm at 29"Hg. The full Vmax line ranges from 5 to 125-hp. "Often, we use Vmax for centralization," said Business Line Manager Steve Nash. "If a plant has multiple router tables and they each require a 10-hp pump, maybe we put a larger Vmax unit on there so instead of maintaining three small vacuum pumps, he maintains one larger pump."

Leybold USA wanted woodworkers to discover its NDk series of oil-less, twin screw, belt driven vacuum pumps capable of delivering 29.9"Hg of pressure. They're pitched as ideal replacements for the vacuum pumps that come with a CNC routing table. The only maintenance they need is a belt change every 6,000 hours. Models come at 5, 10 or 15-hp, and, thanks to their frictionless design, deliver the same 350 cfm output as vacuum pumps with higher energy requirements. "20-hp versus 15-hp; it gets you the same amount of cfm," said Brian Glover, Sales Engineer for Leybold USA. The booth showed NDk pumps arranged in a three-rack stacked configuration for redundancy.

Quincy Compressor's booth promoted its QSV-205 oil-sealed rotary screw vacuum pump, the starting model in the company's QSV lineup. The 205 has a 7.5-hp motor, is capable of 18 to 29.9"Hg and a flow of 250 acfm. According to Ben Cameron, Business Line Manager with Quincy, the line's 750 model, which has a 30-hp motor and a maximum flow of 814 acfm, is a popular option for woodworkers. "I visited a furniture manufacturer in Michigan two months ago. They had a dozen CNC machines and each of them had a QSV 750 operating under it," he said. The QSV line offers variable speed drives, inlet filters and discharge separators. Buyers often see them as more energy efficient and easier to service than the vacuum pumps that came with their CNC router boards, Cameron noted.

Republic Manufacturing showed its RCV-250 7.5-hp dry claw vacuum pump, an air-cooled model with no oil in the chamber and only uses oil in the side-mounted gearbox. The company promises low maintenance requirements and parts that don't wear out since they don't touch. A built-in silencer keeps the volume down below 85 dB. Set at 7.5-hp, it outputs 166 cfm at 24.0"Hg. "Everything's made of cast iron so it's a super heavy-duty machine. As long as you keep those claws clean, this thing will run and run and run for many years," said Business Development Manager Jeff Joost. It's part of a line of dry claw pumps that can be duplexed or triplexed for redundancy, or to create a centralized vacuum system.

IWF will return to Atlanta's Georgia World Congress Center August 25 to 28, 2026. BP

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Visit our Webinar Archives to listen to expert presentations on ***Compressed Air and Vacuum Systems*** at https://www.airbestpractices.com/webinars.

Compressed Air Technology News

VPInstruments Introduces VPStudio 4

VPInstruments, manufacturer and worldwide supplier of flow measurement, instrumentation and energy monitoring systems, announced the release of VPStudio 4. With this latest software innovation, flow meter configuration has never been easier.

VPInstruments has launched VPStudio 4.

VPStudio 4 features an intuitive interface with automatic flow meter detection. This new feature enables users to effortlessly connect one or more VPInstruments flow meters via USB ports for immediate recognition and setup. Users can configure all 4-in-1 VPFlowScope flow meters with one software. The VPFlowScope flow meters simultaneously measure bi-directional flow, pressure, temperature and total flow, and feature an optional built-in datalogger.

VPStudio 4 allows full control of the data log export files, with the possibility to set the time interval and reference conditions to match the application and purpose of analysis. Furthermore, the real-time measurement graph displays live data on-screen for instant feedback on your measurements and first insights into your compressed air or gas consumption.

Available in English, French and Dutch, VPStudio 4 is designed for global accessibility, ensuring a seamless user experience.

This significant upgrade emphasizes VPInstruments' commitment to providing efficient and user-friendly solutions for energy flow measurement and analysis. VPStudio 4 is now available for download.

About VPInstruments

VPInstruments offers industrial customers easy insight into energy flows. The company believes industrial energy monitoring should be easy and effortless, to enable insight, savings and optimization. It serves all industrial markets, such as automotive, glass manufacturing, metal processing, food and beverage and consumer goods. For more information, visit https://www.vpinstruments.com.

Festo Introduces Pre-Configured, Assembled Air Preparation Units

Festo has introduced a line of pre-configured, assembled and tested compressed air preparation units that not only makes specification and ordering faster and easier, but also ensures clean air in food and beverage production. Right out of the box, the new units meet the Safe Quality Food guidelines of final filtration stage 0.01 micron (µm) and a particulate removal efficiency of 99.999% at the point of food and beverage contact.

The units also cover most, if not all, requirements of both original equipment manufacturer and maintenance, repair and operations (MRO) standards for air flow, connection size and particle class rating. While air preparation units have multiple modules, each assembled unit is easily ordered with a unique part number.

Units include the latest generation modules in price and performance offered by Festo – filter regulator, filter, lubricator, on/off valve, soft-start valve and branching module. Units can be easily tamper proofed and feature lockout/tagout functionality for assured safety and performance. An easy-to-read gauge simplifies pressure monitoring, and a visual indicator signifies when a filter cartridge needs to be changed. The new units are available globally with fast shipping times.

About Festo U.S.

Festo is a leading manufacturer of pneumatic and electromechanical systems, components and controls for process and industrial automation. For more than 50 years in the U.S., Festo Corporation has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Through advanced technical and industrial education, Festo Didactic Learning Systems and its partners prepare workers for current and future manufacturing technologies. For more information, visit https://www.festo.com/us/en.

Festo pre-configured, assembled, and tested air preparation unit for safe quality air in food and beverage production. For tagout, the rotary on/off valve, top left, is secured against restart with a padlock.

Kaeser Launches SFC 110M VFD Compressor

Kaeser Compressors' new SFC 110M extends the SFC 45 to 90M series to 150-horsepower (hp) with an enhanced flow range of 103 to 742 cfm at 100 psig (7 bar). The SFC 110M features a new Sigma Profile™ airend driven by a permanent magnet motor. This combination boosts energy performance and flow with a smaller physical footprint and less heat. This model inherits all the features of the current series such as the speed controlled fan with a brushless DC motor for better cooling and the Sigma Control 2 for superior condition monitoring and external communication capabilities.

Other key features of the SFC110M include:

- Improved energy performance with flow increases up to 20% and specific power below 18kW/100 cfm.
- Improved maintenance access for faster service including fluid changes and valve maintenance, ensuring minimal downtime and maximum productivity.
- Optional integrated refrigerated dryers with improved service access.
- Reduced environmental impact from lower energy usage, an eco-friendly fluid filter element and low GWP refrigerant R-513A on models with integrated dryers.

"The introduction of the SFC110M to our product line underscores Kaeser's commitment to innovation and sustainability," said Werner Rauer, Product Manager for Screw Compressors, Kaeser Compressors. "Our customers will benefit from enhanced performance, lower operational costs and a reduced environmental impact, making the SFC110M a valuable addition to their operations."

About Kaeser Compressors

Kaeser Compressors is a leader in reliable, energy efficient compressed air equipment and system design. It offers a complete line of superior quality industrial air compressors as well as dryers, filters, SmartPipe™, master controls and other system accessories. The company's national service network provides installation, rentals, maintenance, repair and system audits. For more information, visit https://us.kaeser.com.

Kaeser Compressors has launched the SFC 110M variable frequency drive compressor with a 150-hp (110 kW) permanent magnet motor and flows up to 742 cfm.

Compressed Air Technology News

SUTO iTEC Unveils S532 Acoustic Imaging Leak Detector

SUTO iTEC, a leading company in compressed air and gas monitoring solutions, has introduced the S532 Acoustic Imaging Leak Detector, a new tool designed for detecting leaks in compressed air systems.

The S532 uses 64 high-sensitivity microphones to capture sound waves from leaks, converting them into visual images on a seven-inch touchscreen. This enables maintenance teams to identify leaks quickly and accurately, improving system performance and reducing downtime.

Key features include:

- High-resolution imaging: Provides real-time acoustic images for clear leak identification.
- Wide detection range: Capable of detecting leaks from up to 150 meters.
- User-friendly interface: Intuitive controls suitable for users of all skill levels.
- Integrated reporting: Includes tools for documenting and analyzing leaks.
- Durable and portable: Designed to be lightweight and robust for industrial use.
- Enhancing efficiency and sustainability.

SUTO iTEC has launched the S532 Acoustic Imaging Leak Detector.

The S532 assists industries in reducing energy waste, lowering costs and minimizing environmental impact by accurately detecting and addressing leaks. It is available through SUTO iTEC's distributors.

About SUTO iTEC

SUTO iTEC specializes in compressed air and gas monitoring solutions, providing measurement and monitoring technologies for industrial applications. The company is committed to quality and customer satisfaction. For more information, visit https://www.suto-itec.com.

FS-Elliott Unveils R3000 Control Panel

FS-Elliott, a global leader in the engineering and manufacturing of oil-free, centrifugal air and gas compressors, has announced the launch of its latest innovation, the R3000 control panel. This highly configurable and customizable engineered PLC control system sets a new standard for reliability, energy efficiency and advanced customization tailored to diverse centrifugal compressor applications.

Leveraging FS-Elliott's decades of experience as a leading centrifugal manufacturer, the R3000 control system comes with unmatched engineering support. The system includes advanced compressor diagnostics with onboard historical data logging, providing users with factory-direct engineering assistance at the click of a button.

The R3000 integrates FS-Elliott's innovative Energy Advisor and Maintenance Notification System, ensuring compressors operate at peak efficiency and reliability. The Energy Advisor continuously monitors operational efficiency, offering actionable suggestions for improvement. Meanwhile, the maintenance notification system tracks the usage of maintenance parts and alerts users when predictive maintenance is required, effectively reducing energy consumption and CO_2 emissions.

FS-Elliott has launched the R3000 Control Panel.

Understanding the critical importance of compressor reliability, FS-Elliott has equipped the R3000 with remote monitoring capabilities. The optional FS-Connect system offers an easy-to-read data dashboard and customized reports, ensuring efficient and reliable operation. Additionally, authorized FS-Elliott Channel Partners can receive notifications when service is needed, minimizing unnecessary downtime.

"We're excited to introduce the R3000 control panel, proudly manufactured in America and the latest addition to our Regulus® series," said Justin Johnson, Product Manager, Aftermarket & Controls. "The R3000 not only sets a new standard in efficiency and reliability but also supports our customers'

ESG efforts. This panel is designed to enhance performance, streamline maintenance and contribute to sustainable operations, offering a powerful tool for achieving operational excellence while advancing environmental and social goals."

When choosing the R3000, customers invest in a control system that combines the latest control technologies with FS-Elliott's engineering expertise. This ensures every compressor operates efficiently and reliably, providing a sense of security, peace of mind and enhanced operational productivity.

About FS-Elliott

FS-Elliott, a global leader in the engineering and manufacturing of oil-free, centrifugal air, and gas compressors, is known for delivering reliable and energy-efficient solutions to a global market. Committed to innovation and customer satisfaction, FS-Elliott continues to set the standard in compressor technology, providing industry professionals with confidence and reassurance. For more information, visit https://www.fs-elliott.com.

ABB Expands Baldor-Reliance® SP4 Motor™ Line

ABB continues to help companies increase motor efficiency by as much as 20% by expanding the ABB Baldor-Reliance® SP4 motor™ line.

The development of the new cast-iron totally enclosed fan cooled (TEFC) severe duty motor marks the second phase of ABB's SP4 technology launch. This model is uniquely designed for applications in hazardous environments with certifications for Division 2 and Class I Groups A, B, C, D, as well as Class II Groups F, and G, making it suitable for areas with explosive gases and combustible dust. The model also features an IP55 rating, ensuring protection against dust and water spray, making it reliable for harsh and dirty conditions. ABB previously introduced two different models with SP4 technology: rolled steel open drip proof and totally enclosed fan cooled motors.

The SP4 product line builds on the simplicity of ABB's proven AC induction motors and features a range of durable motors tailored to meet diverse, severe-duty applications. These motors are compatible with pumps, fans, compressors and conveyors and are ideal for all industries. The new cast-iron motors cover a power range of 25 to 300-horsepower (hp), and the rolled steel models, which were launched earlier this year, are available in ¼ to 20-hp.

"Reducing electricity consumption benefits communities, businesses and the environment," said Brandon Canclini, ABB NEMA Motors Division Global Product Manager. "The addition of the ABB Baldor-Reliance SP4 motors doubles down on our commitment to advancing our motor technology and maximizing energy savings."

ABB continues to advance its technology and maximize energy efficiency with the latest addition to its Baldor-Reliance SP4 motor line.

More than 80% of industrial electric motors run direct-on-line (DOL), independent of a drive. As a standalone DOL unit, SP4 achieves NEMA Super Premium (IE4) efficiency. The motors become even more efficient when paired with an ABB variable speed drive. SP4 motors run cooler, reducing heat-based energy losses and extending bearing and other component life. Reducing energy losses also leads to lower electrical energy consumption, which lowers operating costs and total cost of ownership.

Available in 2, 4 or 6-pole configurations, SP4 can seamlessly replace existing units to deliver efficiency upgrades for current applications. All SP4 models come with a standard 48-month warranty and are designed to easily replace existing NEMA motors, whether in simple direct-start setups or more advanced variable speed operations.

SP4 motors comply with current U.S. Department of Energy efficiency standards and anticipated Medium Electric Motor (MEM) regulations, which take effect June 1, 2027. These regulations require motors up to 100-hp to meet NEMA Premium efficiency and motors between 100 and 250-hp to achieve NEMA Super Premium efficiency.

About ABB

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

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"Crazy" Systems & Maintenance

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

Manufacturing plants perform admirably under "crazy" profit expectations while dealing with "crazy" staffing reductions. Our editorial staff salutes our subscribers who keep on-site utilities up and running every day, with fewer resources at hand. These subscribers requested we publish some observed "crazy" system designs and maintenance practices to encourage increased investments in staffing.

When Floorspace Is Hard to Come By

Rick Brown is Sales Manager Eastern U.S. for Powerex-Iwata Air Technology, and is based in the Nashville metropolitan area. Visit https://www.powerexinc.com.

Brown remembers when the call came in: "Can you help us do some troubleshooting on one of your units?" a distributor partner asked. The issue was with an air compressor system at an ambulatory surgery center in South Carolina. Sure, Brown said, send us a picture of what you're working on.

Here's the picture Brown got. Safe to say it took him by surprise. But there's no job too small – or too high – for Powerex. All his crew needed was a ladder and a safety harness.

When planning a compressed air system, consider future maintenance needs and make sure it's easy to service.

Hoisting an air compressor system might seem like a good solution to cramped conditions, but consider future maintenance needs.

When purchasing a compressed air system, plant operators should give special attention to the entire piping system.

Find the Right Piping for the Job

Rob Wilkinson handles technical sales and special projects for CFM Air Equipment of Alberta, Canada. CFM Air Equipment is a Kaeser Compressors Canada distributor for Southern Alberta and Southern Saskatchewan, and a distributor for Chicago Pneumatic at its Manitoba branch. Visit https://cfmair.com.

A woodworking plant in Alberta called CFM to solve problems caused by low airflow and pressure. When CFM's technical sales representative walked in, he immediately heard the hiss of leaks. The plant relied on PEX polyethylene tubing and fittings, which aren't approved for compressed air use and can fail. Tubing arrangements like this will typically contribute to elevated pressure drop.

CFM quoted the company for a dedicated aluminum piping system with appropriate connections to production equipment. The plant wants to upgrade its air compressor, but the opportunity here is with the piping system.

Submission Guidelines

We invite our subscribers to send their observed "Crazy" Systems & Maintenance experiences to Troy Dreier at troy@airbestpractices.com. Please send a high-resolution picture as a JPG or GIF file and a note describing the installation, what was wrong and what the solution should be. We will edit the text and remove equipment brand names and references from all materials. If we publish your submission, we'll thank you with a $25 Amazon gift card.

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