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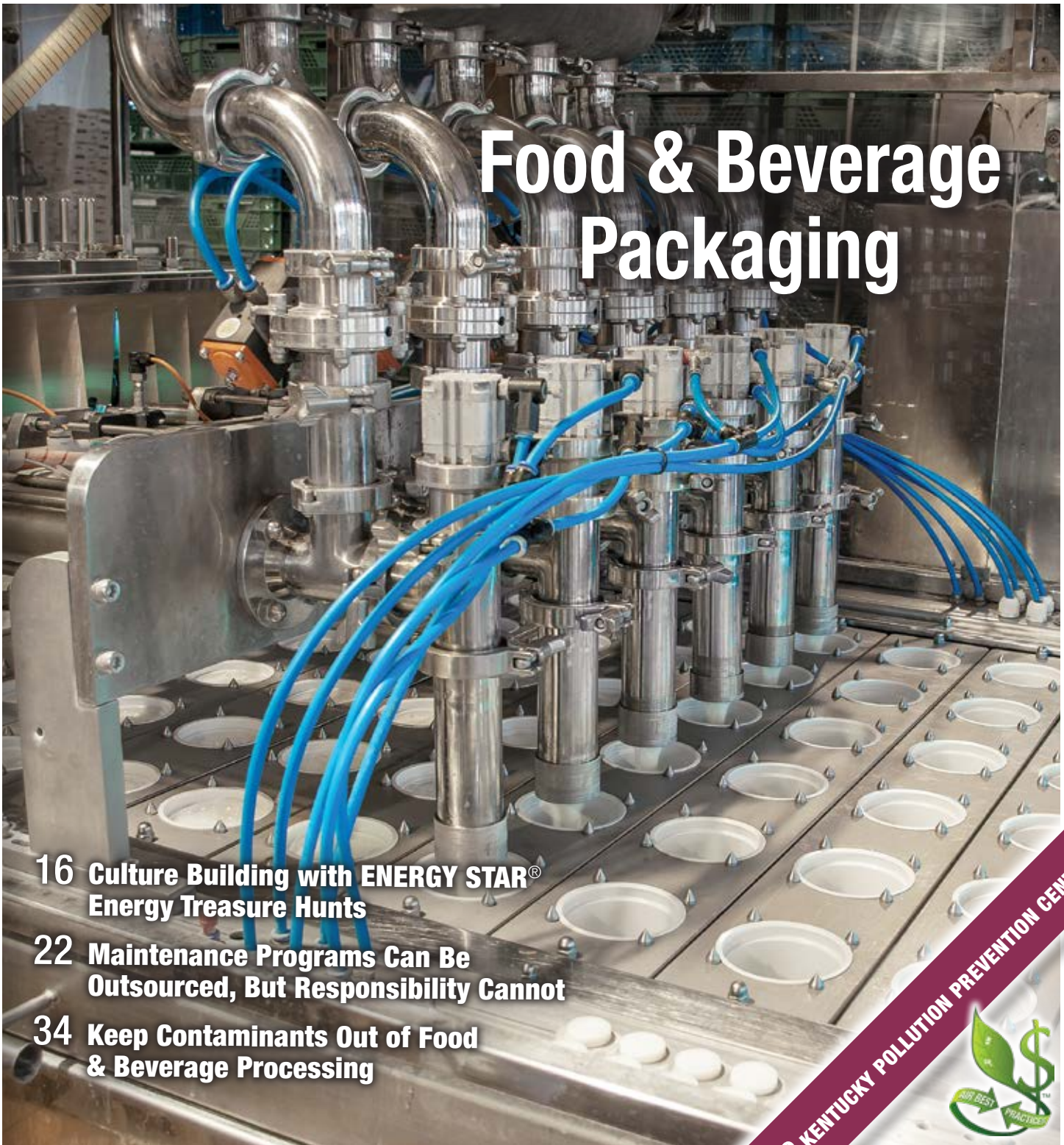
November 2019



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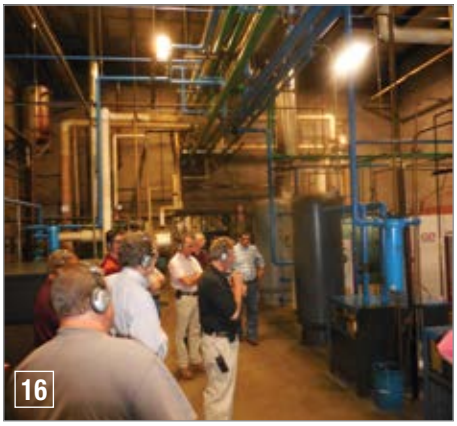
FEATURES

QUALITY, SAFETY & RELIABILITY FEATURES



PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION FEATURES

COLUMNS

FROM THE EDITOR | Food & Beverage Packaging

The team at Best Practices wants to thank the record-setting number of 850 attendees and exhibitors at the recently concluded 2019 Best Practices Expo & Conference! The technologies on display and the expertise shared by the world-class speakers made us very proud!

What is the kW/scfm (specific energy) of your compressed air system? What is the most intelligent Quality (moisture, particulates and oil) Specification, using ISO 8573.1, for your system? I had one factory engineer show me their "Benchmark Compressed Air System" complete with dewpoint, flow and pressure metering locations. I had another tell me the 2-hour session titled, "High Ambient Temperatures and Reliable Compressed Air" was worth the entire trip!

What is the kW per Ton of your cooling system? One exhibitor told me their water "upgrading" system has had a verified impact of a 5% efficiency improvement on the centrifugal air compressors at a major automotive plant (stay tuned). Others taught how engineered inlet water traps, on vacuum separators, can allow plastic extruders or craft brewer to dramatically reduce water cooling costs.

CAGI President, Gary Gillespie, was one of the Keynote Speakers in the Opening Session and he updated the audience on all the new educational and certification programs. Michael McCulley, from Quality Compressed Air Services, gets my "Owner of the Year" Award as he invested in training by bringing a team of 8 Outside Sales Engineers to the event!

Please mark your calendars for the 2020 Best Practices Expo & Conference taking place September 20-23, 2020 in Chicago, at the ultra-modern Schaumburg Convention Center located 10 minutes from O'Hare International Airport!

Thank you for investing your time and efforts into ***Compressed Air Best Practices®***.

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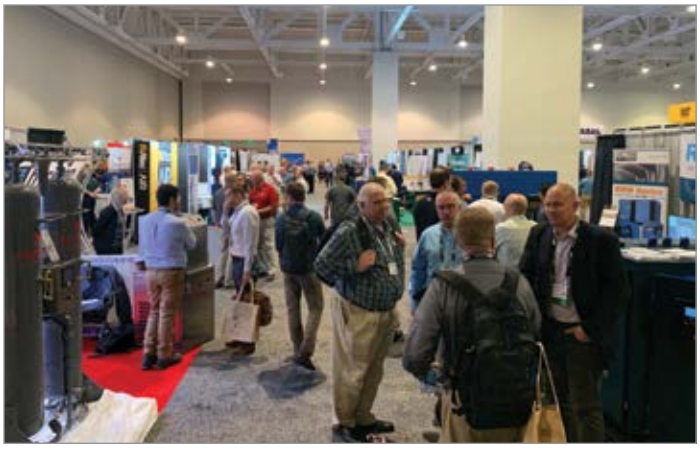

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INDUSTRY NEWS

Sullivan-Palatek Celebrates Its 25/35 Anniversary

This year marks a major milestone for the Sullivan-Palatek family, celebrating its 25/35 Anniversary, an exciting time for all who are currently working and those past employees who have worked to make the company the success that it is today. What does 25/35 mean? Ask anyone from Sullivan-Palatek, and they are beyond excited to share what it means to them and the entire compressed air industry.

Thirty-five years ago, the landscape of compressor manufacturing in Michigan City, Indiana was drastically changing forever. Several employees had left compressor giant, Sullair, at the same time and started companies like Vanair Manufacturing, Boss Industries, and Dekker Vacuum Company, which are all thriving companies headquartered in Michigan City to this day. One of those individuals that left was former Sullair President Donald Hoodes, one of the original founders of Sullair. Following his departure, Mr. Hoodes and former Sullair employee, Paul Laesch, were looking to start their own compressor manufacturing company, and so Palatek was born (Palatek derived from the name Paul Laesch Technologies).

Sullivan-Palatek boasts an incredible manufacturing facility and more than 185 employees.

Ten years later, in July, Palatek was purchased by GHS Corporation. Under GHS Corporation, Palatek continued to grow and looked to expand its product offerings and manufacture their own air ends. In 1998 GHS Corporation purchased Sullivan Industries, a New Hampshire company with a long legacy of building diesel powered portable air compressors. That year would be the beginning of Sullivan-Palatek, and the start of a journey that would lead to incredible growth and diversification. Today Sullivan-Palatek boasts an incredible manufacturing facility, more than 185 employees, a booming oem air end division, the one of the widest ranges of industrial electric and portable diesel air compressors in the industry.

About Sullivan-Palatek

Sullivan-Palatek Inc., a leader in innovation and design, offers the industry's widest range of electric and portable rotary screw air compressors. From its beginning in 1984, Sullivan-Palatek has grown from providing engineering services to existing clients, to a company that manufactures the most rugged and reliable machinery available in the market. Assembled in the USA, Sullivan-Palatek machines are as tough as the people that build them. For more information visit www.sullivan-palatek.com.

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INDUSTRY NEWS

Shaw Moisture Meters Opens U.S. Office, Bob Kenney Leads New Location

Backed by nearly 60 years of proven experience and expertise in the manufacture of dewpoint meters, hygrometers, and inline moisture analyzers, England-based Shaw Moisture Meters has established Shaw Moisture Meters USA with a new office in Hudson, Massachusetts. The company also named industry veteran Bob Kenney as CEO of Shaw Moisture Meters USA.

The U.S. facility marks the company's continued investment and commitment to regional and local markets around the world – and provides customers in North America with a direct source for sales and services support, said Bob Kenney.

"Shaw Moisture Meters has built a strong reputation for providing quality products and a high level of service since its founding in 1960," Kenney said. "Our increased presence in the United States takes it to an even higher level for customers in North America."

The U.S. facility is staffed with a team of knowledgeable and experienced specialists dedicated to providing superior support for the entire Shaw Moisture Meters product portfolio including new applications, sales, repair, service and traceable moisture calibration in accordance with the National Institute of Standards and Technology (NIST). The new location includes a fully equipped, ISO/IEC 17025-accredited calibration laboratory. For more about the new facility, visit: www.shawmeters.com/new-location-usa.

"Our U.S. office is another example of Shaw Moisture Meters' commitment to deliver exemplary service. We could not be more excited to establish this new facility to support customers in North America," said Kenney, who has worked in analytical instrumentation for more than thirty years and held various sales, customer care and management positions in several companies. Kenney graduated with a Bachelor's Degree in Chemical Engineering from the University of New Hampshire.

About Shaw Moisture Meters

Shaw Moisture Meters has been at the forefront of hygrometer design and manufacture since 1960 and is considered a globally recognized leader in trace moisture measurement. Its extensive range of dewpoint meters, hygrometers and moisture analyzers have been specifically designed to meet the most demanding requirements specified by industry. Shaw Moisture Meters products are designed to be reliable, easy to install and simple to operate. For more information, visit www.shawmeters.com.

Shaw Moisture Meters USA CEO Bob Kenney.

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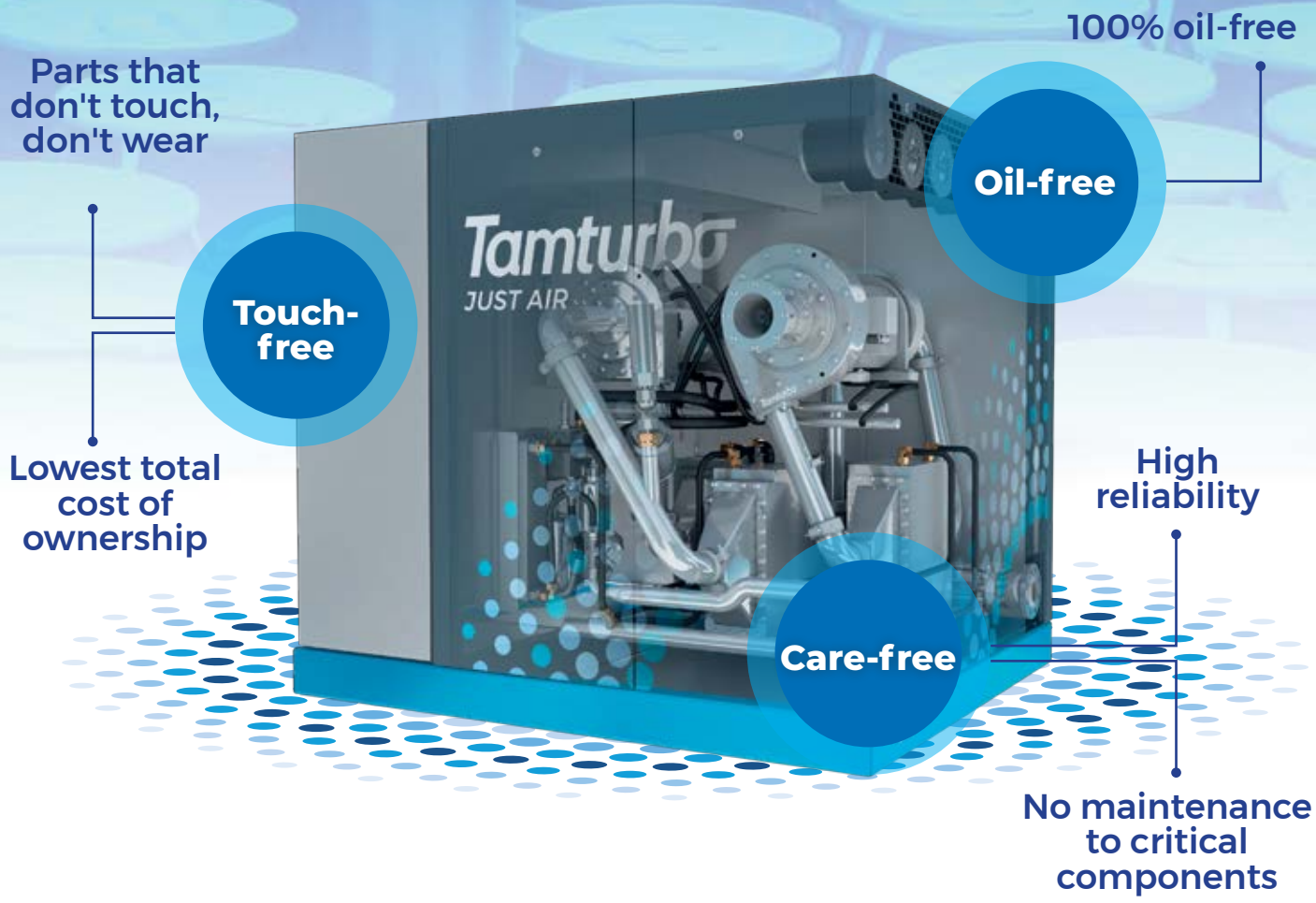

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INDUSTRY NEWS

Sullair Announces Major Expansion Plan in Michigan City

Sullair, an industry leader in innovative compressed air solutions since 1965, announced it is making a major capital investment to expand its North America operations and headquarters campus in Michigan City, Indiana. "This is further evidence of our commitment to the Michigan City community and to making the necessary investments in the equipment and facilities needed to become a stronger air compressor manufacturer," said Charlie Takeuchi, COO and Executive Vice President at Sullair. "We're excited to break ground on the project and change the face of Sullair."

The approximately $30 million expansion project, scheduled to break ground on October 4th, includes the construction of a new 80,000-square-foot manufacturing building, a canopied storage building and an additional parking lot for employees. The project will also reconfigure and optimize portions of the existing, primary 280,000-square-foot manufacturing facility on the campus. "Following the acquisition of Sullair by Hitachi in 2017, our business has continued to grow both domestically and internationally," said Takeuchi. "To continue our aggressive growth in an increasingly competitive and consolidating space, we are making significant investments in Michigan City providing us more flexibility in how we run our business."

The expansion will allow Sullair to increase its manufacturing capacity and production of air compressors. With that, the company anticipates adding more than 30 full-time jobs in Michigan City. At the Michigan City campus, Sullair produces compressors for construction and industrial applications in nearly every vertical. The company also manufactures components such as air ends, used in oil and gas applications worldwide.

"As our business grows, we must grow with it," said Takeuchi. "Ultimately, this investment will allow us to better meet our end customers' needs and ensure Sullair is best-positioned for years to come." This expansion comes on the heels of Sullair investing more than $16 million to upgrade its Michigan City-based rotor shop equipment in 2017. Since the founding of Sullair in 1965, the company has designed and manufactured its rotors and air end assemblies in Michigan City.

About Sullair

Since 1965, Sullair has developed and manufactured air compressors with proven reliability and wear-free durability. Sullair is globally recognized as a leading manufacturer of air compressors for use in manufacturing, oil and gas operations, food processing, construction and more. Sullair has manufacturing capabilities in Michigan City, Indiana; and Shenzhen and Suzhou, China; as well as a JV (IHI-Sullair) based in Suzhou. For more information, visit www.sullair.com. Sullair is A Hitachi Group Company.

About Hitachi, Ltd.

Hitachi, Ltd., headquartered in Tokyo, Japan, is focusing on Social Innovation Business combining its operational technology,

The expansion will allow Sullair to increase its manufacturing capacity and production of air compressors.

information technology and products. The company's consolidated revenues for fiscal 2018 (ended March 31, 2019) totaled 9,480.6 billion yen ($85.4 billion), and the company has approximately 296,000 employees worldwide. Hitachi delivers digital solutions utilizing Lumada in five sectors including Mobility, Smart Life, Industry, Energy and IT, to increase our customer's social, environmental and economic value. For more information on Hitachi, visit www.hitachi.com.

INDUSTRY NEWS

Energy Department's Better Plants Partners Have Saved $6.7 Billion

The Department of Energy (DOE) announced that Better Buildings, Better Plants partners have cumulatively saved $6.7 billion in energy costs and more than 1.3 quadrillion British thermal units (BTUs). More than 220 organizations now partner with DOE through Better Plants; DOE welcomed 22 new companies to the program this year. These partners have more than 3,200 facilities and represent roughly 12% of the U.S. manufacturing energy footprint.

Through the Better Buildings, Better Plants partnership, managed by DOE's Office of Energy Efficiency and Renewable Energy, DOE works with partners who have set ambitious energy, water and/or waste reduction goals. As of 2019, partners have now met and exceeded 60 energy goals. All partners share their energy performance data and solutions with other companies, helping to expand innovation and savings throughout the industrial sector.

Partners of the Better Plants Challenge – a higher-level commitment than the Better Plants program – commit to sharing their solutions and best practices in addition to setting energy efficiency goals.

Some highlights from the 2019 Better Plants Annual Progress Update announced today include:

- Twenty-two new partners have joined the Better Plants Program, including: Autoliv, Alumalloy Metalcastings, Bendix Commercial Vehicle Systems, Custom Glass Solutions, Deschutes Brewery, Durable Products, Estée Lauder, Flowers Foods, GB Manufacturing, Graham Packaging Company, Intralox, MEKRA Lang North America, Michels Corporation, Mitsubushi Electric Automotive America, Ozinga Brothers, Saputo Dairy Foods USA, Shape Corporation, Sugar Creek Packing Company, TitanX Engine Cooling, Tyson Foods, and United Mechanical & Metal Fabricators, Inc.
- Two partners, Bristol-Myers Squibb and Xerox, have joined the Better Plants Challenge and have committed to publicly share energy performance data and solutions, and set an ambitious energy intensity reduction goal.
- Five Better Plants Challenge partners have achieved their energy intensity reduction goals: Bentley Mills, Bucks County Water and Sewer Authority (BCWSA), General Mills, J.R. Simplot, and TE Connectivity.
- Two Better Plants Program partners have achieved their energy intensity reduction goals: CalPortland Company and Navistar.
- Better Practice and Better Project awards were presented to thirteen partners to recognize their leadership in adopting exceptional energy efficiency solutions.
- ArcelorMittal, Saint-Gobain Corporation, and Owens

Corning are piloting a new Water Efficiency In-Plant Training, which helps participants calculate the true cost of water and look for water savings opportunities in their facilities.

- As of this year, Better Plants has hosted more than 2,160 participants at more than 120 In-Plant Trainings, helping to identify $40 million dollars in energy cost savings opportunities.
- In 2019, DOE launched a Waste Reduction Pilot to help partners reduce waste improve energy performance and reduce operating costs. Thirteen Better Plants partners joined the pilot to help demonstrate what is achievable in waste reduction.

Read the full 2019 Better Plants Annual Progress Update to learn more about partner successes and how the Better Plants Program boosts competitiveness through improvements in energy efficiency.

Through the Better Buildings Initiative, the DOE partners with public and private sector organizations to make commercial, public, industrial, and residential buildings more efficient, thereby saving energy and money while creating thousands of jobs. To this date, more than 900 Better Buildings Partners have shared their innovative approaches and strategies for adopting energy efficient technologies. Discover more than 2,500 of these solutions in the Better Buildings Solution Center. For more information, visit www.energy.gov.

INDUSTRY NEWS

ELGi Subsidiary Pattons Opens Office in Los Angeles, California

Pattons, a leading compressed air distributor and a subsidiary of ELGi Equipments Limited, announced the expansion of its services to Los Angeles, California. In addition to offering compressed air products, parts and services, the new office will also serve as ELGi's West Coast distribution center, adding to ELGi's ability to better serve distributors and customers across North America. ELGi has previously established offices in North Carolina, South Carolina, Georgia, Alabama, and Virginia.

"We are excited to announce the opening of our Los Angeles office," said David Puck, President of ELGi North America. "Los Angeles represents one of the most significant markets in the United States and by entering it with Pattons, we will provide the local customer base with our best in class products and services. This new branch will help drive further brand awareness and adoption of ELGi compressed air systems in the California market."

Malcolm Lindsay, Senior Vice President of ELGi's Industrial Division, added "In addition to serving the greater Los Angeles market, our new location will also serve as an ELGi distribution center enabling us to better address the West Coast compressed air requirements while ensuring enhanced customer service and responsiveness levels."

Since 1945, Pattons has successfully met compressed air needs across a wide variety of industries with reliable, efficient compressed air solutions ranging from air compressors, vacuum systems, and air accessories. In 2012, ELGi Equipments Limited entered the U.S. market and acquired Pattons. ELGi, a global compressed air manufacturer with over two million installations across 100 countries, aims to become the second-largest compressed air manufacturer in the world by 2027 and has made significant investments in the USA.

Over the past six years, ELGi has witnessed double-digit growth in the USA market, winning distributors and customers over with energy-efficient products backed by responsive service. As ELGi's top distributor, Pattons plays a crucial role toward ELGi's growth aspirations. With the US-Canada oil-lubricated market growing at approximately 2% annually, Pattons strategic expansion to the West Coast will enable them to deliver best-in-class systems and service to compressed air customers across the region.

"It all starts with a solid product and the engineering that goes into it," Puck said.

Shown form left to right are Joe Mendez, Danny Soto, Brian Williams, Zach Guzman, Scott Zimmerman, Brandon Todd with Pattons and Will Arellano with ELGi.

"As just one example, our air ends on our direct drive screw air compressors rated from 15 to 300 horsepower operate between 1,500 to 1,700 RPM, which is half the speed of our next slowest competitor. Yet our bearings are designed to allow for these slow speeds, giving customers highly efficient machines that deliver long life."

Puck said ELGi's presence in California and Pattons' eighth branch office further strengthens its customer-centric approach and addresses the West Coast compressed air market requirements.

"Pattons has been delivering superior service to customers throughout the Southeast for almost 75 years and now we're bringing the same level of service and responsiveness to end-users in California with the support of ELGi as a global company. Additionally, ELGi takes great pride in building relationships and balanced partnerships with all of our stakeholders. It's an approach that allows all us to succeed together," Puck said.

About ELGi

ELGi Equipments Limited is a global air compressor manufacturer with a broad line of innovative and technologically superior compressed air systems. ELGi has consistently worked toward ensuring its customers achieve their productivity goals while keeping the cost of ownership low. ELGi offers a complete range of compressed air solutions from oil-lubricated and oil-free rotary screw air compressors, oil-lubricated and oil-free reciprocating air compressors and centrifugal air compressors, to dryers, filters, and downstream accessories. The company's portfolio of over 400 products has found wide application across industries. For further information on the organization and its products, please visit www.elgi.us.

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

Culture Building with ENERGY STAR® ENERGY TREASURE HUNTS

By Mike Grennier, Compressed Air Best Practices® Magazine

Participants in an ENERGY STAR Energy Treasure Hunt at Intertape Polymer Group Inc.'s operation in Danville, Virginia, discuss ways the plant can save energy with its compressed air system.

There are many reasons why the U.S. Environmental Protection Agency (EPA) ENERGY STAR® Energy Treasure Hunts have proven successful in helping companies save energy and natural resources, but one that rises to the top is their ability to build a culture of energy efficiency throughout an organization.

That's because successful energy treasure hunts thrive on employee engagement, among other factors said Bruce Bremer. And Bremer is someone who would know. In the mid-1990s he led the team at Toyota Engineering and Manufacturing in Georgetown, Kentucky, that developed the foundation for energy treasure hunts – and the same basic concept is still used today. Additionally, Bremer, now as a consultant facilitating treasure hunts, works with companies in a wide range of industries has resulted in potential energy savings of $41 million to date.

"Many companies use energy audits and assessments to their advantage, and there's

> "The intent is not to go out and spend a whole bunch of money on changes on things that aren't running efficiently to begin with, which is why the idea of building a culture is important."
>
> — Bruce Bremer, President, Bremer Energy Consulting Services, Inc.

no question those are valuable tools," Bremer said. "Yet what we learned at Toyota is that we needed more people from all different areas of the plant to become involved with energy and work together to take what we already had and make it more energy-efficient."

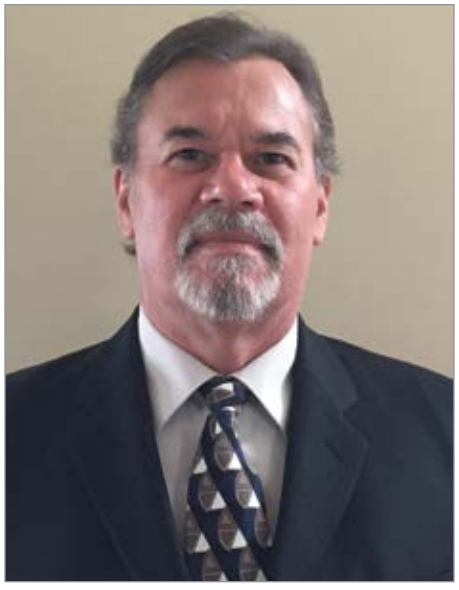
Energy Treasure Hunts Take Shape

The concept of treasure hunts soon gained momentum as Bremer and the team at Toyota shared the idea with other ENERGY STAR partners. Eventually, Bremer left Toyota and joined the ENERGY STAR Industrial Team in a role as a strategic energy advisor. He also wrote the ENERGY STAR "Energy Treasure Hunt Guide: Simple Steps to Finding Energy Savings," which is the document most companies now use to put the powerful tool to work as part of their ongoing sustainability efforts. The guide is available at www.energystar.gov/treasurehunt.

Energy treasure hunts are designed to identify no- and low-cost energy savings opportunities that result in immediate or short-term ROI. They also help build teams dedicated to an ongoing process for implementing energy control measures designed to reduce energy use, costs and associated greenhouse gas emissions.

Each energy treasure hunt is a dynamic process for identifying savings opportunities. It consists of four key elements: Preparation, pre-training, a three-day team event, and follow-up activities. Opportunities for energy efficiency are found in operational areas and involve all plant utilities including compressed air, chilled water, water, steam, and lighting, as well as electricity and natural gas.

"Treasure hunts are one tool in vast array of other tools used in an energy program," said Bremer who is President of Bremer Energy Consulting Services, Inc. (www.bremerenergy.com).



Bruce Bremer, President, Bremer Energy Consulting Services, Inc.

"The intent is not to go out and spend a whole bunch of money on changes on things that aren't running efficiently to begin with, which is why the idea of building a culture is important. Approximately 80 to 85% of the

CULTURE BUILDING WITH ENERGY STAR® ENERGY TREASURE HUNTS

Intertape Polymer Group Inc. A Shining Example of Success

Bruce Bremer has been intimately involved in 70 energy treasure hunts at a wide range of companies and organizations during the past decade. One early adopter of energy treasure hunts and a company that has achieved significant success with the program is Intertape Polymer Group Inc. (IPG).

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Headquartered in Montreal, Quebec, and Sarasota, Florida, IPG (www.itape.com) is recognized as a leader in the development, manufacture and sale of a variety of paper and film-based, pressure-sensitive and water-activated tapes, polyethylene and specialized polyolefin films, protective packaging, engineered coated products and complementary packaging systems for industrial and retail use. It employs approximately 3,500 employees with operations in 31 locations, including 22 manufacturing facilities in North America, four in Asia and one in Europe.

IPG, which received the 2019 ENERGY STAR Partner of the Year Sustained Excellence Award, conducted its first energy treasure hunt in 2013 and hasn't looked back. Since then, energy treasure hunts at IPG have identified $1.9 million in total energy savings.

Philip Kauneckas, IPG Corporate Energy Manager and Tape Department Manager, said there is no single reason for the company's tremendous success. Instead, it's a long list of best practices.

Among the top of the list is employee engagement, said Kauneckas, who is also a Certified Energy Manager (CEM). Kauneckas also serves as President of the Association of Energy Engineers, Danville Chapter.

"A big part of our success is because we want to engage people. We want to get their perspective and ask the deeper question of why?" he said, when referring to how products are manufactured, and energy is consumed in the process. "At IPG, engagement includes not only members of facilities management, operations and the plant floor, but also members of the IT staff and back-office departments, such as HR and Accounting."

"It's not one or two people auditing the whole plant and coming up with a huge report. It's how can we educate all employees and change behaviors, Kauneckas said.

"Of utmost importance with sustainability initiatives like energy treasure hunts at IPG is a commitment from the top down and ongoing communication. We have a great leadership team that supports energy efficiency. Our CEO, as well as our Senior VP of Operations, plant managers and everyone throughout the organization really supports it. When we identify energy savings leadership also holds us accountable to deliver," he said, adding energy treasure hunts are one of many initiatives included in IPG's Energy Action Plan.

When conducting energy treasure hunts, IPG typically assigns three separate teams to search for energy waste and opportunities for efficiency improvements. One team is dedicated to utilities, such as compressed air, chilled water and steam; one is focused on process equipment; and the third covers remaining areas, such as lighting. The teams then calculate energy savings opportunities and share ideas for capitalizing on them.

Energy treasure hunt teams at IPG receive training related to energy savings and also use the latest tools to identify and quantify energy-saving opportunities, such as ENERGY STAR Energy Treasure Hunt Detail Sheets. At the company's flagship facility in Danville, Virginia, a team dedicated to finding and repairing compressed air leaks uses an ultrasonic leak detector along with a smart phone application to record and track air leaks and potential savings. The team also fixes as many leaks as possible on the spot.

At Danville, energy treasure hunts have led to numerous measures to increase the efficiency of its compressed air system in addition to ongoing repair of air leaks. Examples include the installation of demand expanders with storage tanks to reduce plant pressure by 15%, the addition of Variable Frequency Drives on air compressors to better match supply for air with demand, and the use of booster air compressors where needed, eliminating the need for the entire

Intertape Polymer Group Inc. proudly welcomes participants to its first ENERGY STAR energy treasure hunt held in 2013 at its plant in Danville, Virginia.

Energy treasure hunt kickoff meetings, such as this meeting at Intertape Polymer Group Inc.'s Danville, Virginia plant, cover numerous topics and help set up cross-functional teams for success.

compressed air system to operate at high pressure.

"We've also gotten smarter along the way," Kauneckas said. "Now we work with corporate engineering and discuss whether equipment or a system can be designed up front to ensure energy efficiency so we're getting ahead of it."

Also key to IPG's successful energy treasure hunts is overall awareness of energy use. It's about making a connection with all who work together at IPG to produce quality products.

"When we talk about energy treasure hunts and energy savings in general the response has always been good because people can relate, which is why we've had success with even basic energy-saving measures, such as system shutdowns where we turn off equipment not being used," Kauneckas said. "When most leave their home for the day, they don't leave their lights on. It's no different here at IPG. It's just one of many things that come together to help us succeed with energy savings."

people involved in treasure hunts are from the plant floor," said Bremer. "Having members from the lean manufacturing groups be part of treasure hunts is also beneficial, especially since treasure hunts have lean concepts in them. It is important to ask the question; 'Why is it done that way and is there a better way?'"

An energy treasure hunt fosters cross-functional collaboration and typically includes three to five teams of employees from all areas of production, as well as facilities, engineering, maintenance and administration. The plant's energy manager, or continuous improvement manager, often leads the initiative.

"Energy treasure hunts are different than having an auditor or someone come in from the outside of the company with a list of projects. Instead, it's the team saying, 'Here are things we've found and projects we can implement to save money.' It's a whole different concept in terms of involvement, engagement and ownership. The culture side is what streamlines it and makes it all work," Bremer said.

Balanced Approach to Finding Opportunities

Also essential to an energy treasure hunt is a balanced approach to identifying opportunities on the supply and demand side of the energy equation. Bremer cites a compressed air system as an example.

"On the supply side the team looks at numerous factors," he said. "For example,

CULTURE BUILDING WITH ENERGY STAR® ENERGY TREASURE HUNTS

they might look at the efficiency of the air compressors themselves and the kilowatt hours of energy consumed per cubic foot to power the unit's electric motors. Or, it might be whether some or all of the air compressors can be turned off during low-demand periods and weekends. Or, the teams might consider the potential to use less air during seasonal periods of production. Those are just a few examples of things explored."

Bremer said the process is equally comprehensive on the demand side of a compressed air system.

"From the end-use side, where are opportunities to lower demand? There are many," he said. "Is the plant using energy-efficient nozzles for blow-off applications, or quarter-inch copper tubes? Or, is the header pressure 110 psi when the process only needs 80 psi?" he said, referencing a few examples. "It's important to look at compressed air or any utility as a system."

Bremer said a common energy treasure hunt project involves compressed air leaks, which starts off like all successful projects aimed at sustainability: With measurement.

"There are a lot of instruments out there to measure air leaks and quantify how much air is produced and how much is being used to serve air leaks. It's important to first measure air leaks with an ultrasonic leak detector, which I always recommend. The team can then go back to the supply side with meters on the air compressors to see how much air is wasted on leaks," he said.

With any energy treasure hunt, the vital next step with compressed air leaks is making a commitment to take action.

"There needs to be an ongoing program to regularly identify and quantify air leaks and also take that information and get it into a work order so someone goes out and fixes them, whether it's an internal or external team," Bremer said. "It's also important to keep the information in a tracking system so that it's integrated into an ongoing preventive maintenance schedule."

Leveraging Treasure Hunts with All Utilities

Bremer said the same energy treasure hunt used with compressed air systems process applies to other utilities, citing chillers and cooling systems as an example.

"Is there an opportunity to use Variable Speed Drives (VSDs) on pumps versus running fixed-speed pumps all of the time? Or, maybe it's a matter of not letting the air-handing units run all weekend when they're not needed. There are many areas where energy and water savings can be achieved on the supply side of these systems," he said.

Bremer said energy treasure hunt teams also frequently uncover numerous opportunities to reduce water consumption, stressing the importance of using flow meters to measure how much water is used by a cooling tower for cooling versus how much is evaporated. Most companies don't use them, he said, yet companies continue to find ways to save chilled water.

"The teams will look at water makeup systems and how to conserve water, such as using recycled water in a cooling tower rather than the fresh water. Or, it might even look at air-cooled air compressors versus water-cooled units to save water, or air compressors with heat recovery systems – both of which are often future considerations since the idea of energy treasure hunts is to implement no-cost or low-cost operational efficiencies versus expenditures."

A Path for Ongoing Progress

As a strategic energy advisor, Bremer works with a diverse range of companies to get energy treasure hunts off the ground. Additionally, he stays closely connected with companies throughout the process and afterward to offer advice along the way. Each company eventually adopts its own energy treasure hunt program.

Whether it's the initial effort or ongoing energy treasure hunts, success is often driven by engagement and ownership of employees at every level, he said.

"Energy should be integrated into the business culture of the company and should not be separated or made as a separate program. Energy has its foothold in a variety of areas inside a company," Bremer said, adding treasure hunts should be an ongoing process that will continue.

Energy savings are hidden in many places. ENERGY STAR's energy treasure hunts are a way to find that buried treasure – and for companies to share their findings and obtain recognition. For more information about ENERGY STAR Energy Treasure Hunts, visit www.energystar.gov/treasurehunt. BP

If you would like someone to facilitate an energy treasure hunt at your site please contact Bruce Bremer, tel: (859) 620-6180, email: bremerenergy@gmail.com.

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QUALITY, SAFETY & RELIABILITY

Maintenance Programs Can Be Outsourced, BUT RESPONSIBILITY CANNOT

By Jim Cross, JAX INC.

The importance of staying closely involved in the details of a compressed air system maintenance program – and the lubricants used – cannot be understated for food and beverage companies.

Outsourcing maintenance agreements for compressed air systems is commonplace in the food and beverage industry. The maintenance programs are often performed by air compressor distributors, who are experts in the specifics of the air compressors and compressed air systems they sell and service.

What can't be outsourced is the damage to your brand's reputation if there is a catastrophic failure or contamination event associated with a compressed system. That's why it's more important than ever to stay involved in the details of one of the most important systems in your facility.

Food-grade Lubricants in Food and Beverage Applications

Since the Food Safety Modernization Act (FSMA) was enacted in 2011, food-grade lubricants have increasingly become the standard for air compressors powering food and beverage facilities. Prior to that, air compressors were rather late adopters of food-grade lubricants because air compressors are not typically located in the processing area of the plant.

In the United States, lubricants are considered food grade (H1) if they are formulated using ingredients the U.S. Food and Drug Administration (FDA) lists as appropriate in incidental food contact lubricants at their prescribed levels or other ingredients such as US Pharmacopeia (USP) white oils or Generally Recognized as Safe (GRAS) substances.

Food-grade lubricants use a classification system originally developed by the U.S. Department

Hazard Analysis and Critical Control Point (HACCP) regulations place the responsibility for the integrity of the product directly on the processor. Food-grade lubricants should be used if plant air is identified as a Critical Control Point.

of Agriculture (USDA) and adopted by the National Sanitation Foundation (NSF). In 1999, NSF International launched its voluntary Nonfood Compounds Registration Program. Products eligible for NSF Registration include all compounds used in and around food establishments (nonfood compounds) – such as disinfectants and lubricants or fruit and vegetable washing agents.

Additionally, H1 air compressor fluid performance was limited in terms of life of the lubricant and deposit control within the air compressor. These systems became more of a target for food-grade lubricants once Hazard Analysis and Critical Control Point (HACCP) regulations came into play as part of the FDA Food Safety Modernization Act (FSMA). HACCP regulations place the responsibility for the integrity of the product directly on the processor. If plant air is identified as a Critical Control Point, then food-grade lubricants should be used.

Match the Oil to the Compressed Air Application

Undervaluing the fluid protecting your compressed air system can be an easy, but critical oversight. To maximize system performance, the oil chosen for your compressed air system should be matched to your specific facility, not just a general spec. While the manufacturer's recommendations are a great place to start, air compressor lubricants must also address the real-world conditions that exist in your plant.

For instance, supply side air quality is a huge factor in determining the demands on air compressor lubricants. The ambient air is a serious concern for rotary screw air compressors where the entire flow of air through the air compressor will directly impact the fluid. In addition to lubricating bearings, the fluid is effectively acting as a scrubber to absorb the acids and contaminants.

Even a low concentration of inlet air contamination is significant, when the sheer volume of air being handled is considered. Downstream components, such as after-coolers and dryers, are also often compromised by corrosion caused by acid gases which pass through the air compressor from the environment. These gases then condense with water in the

MAINTENANCE PROGRAMS CAN BE OUTSOURCED, BUT RESPONSIBILITY CANNOT

coolers and dryers and drastically increase corrosion rates.

Choosing the Right Lubricant

The simple truth is that a wide array of lubricants can protect a compressed air system at a very basic level. Most lubricating fluids that include a base oil, antioxidants, and some level of anti-wear and corrosion inhibitors can work in an air compressor. But that doesn't mean they are the best choice for your facility.

First off, food and beverage processors should be using NSF H1 food-grade lubricants in their compressed air systems. A single contamination event can do irreparable harm to your brand reputation.

It's been well documented that first-generation of food-grade lubricants did not deliver the performance needed for food plant compressed air systems. Part of the reason for this is that many early food grade lubricants used plain mineral base oils. While mineral oil provides excellent lubricity, it has a relatively low oxidation stability.

Second-generation, food-grade lubricants utilize the synthetic base oil Polyalphaolefin (PAO). PAOs are a synthetic hydrocarbon that offer excellent lubricant life and thermal oxidation stability, but when used exclusively in an air compressor fluid formulation can present deposit and lubricant life issues. The most recent offerings in food-grade air compressor lubricants will often offer blends of synthetic fluids and additives that greatly improve performance over first and second-generation fluids.

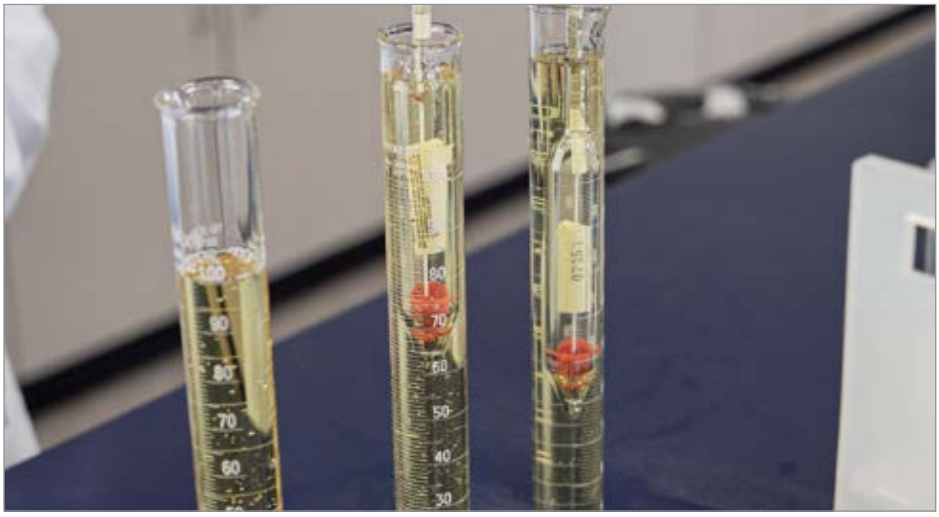
Oil Oxidation Stability: The No. 1 Requirement

The No. 1 requirement for air compressor oil options is oxidation stability. Oxidation is the chemical reaction that occurs between a lubricating oil and oxygen. The rate of oxidation increases over time, and is significantly accelerated by high temperatures, water, acids and catalysts. The results are dire for compressed air systems. Viscosity increase, varnish, sludge and sediment formation, additive depletion, base oil breakdown, filter plugging, loss in foam control, acid number increase, rust formation and corrosion can all have damaging impacts on system efficiency.

Since controlling oxidation is key, every air compressor lubricant formulation contains antioxidants. These antioxidants are designed to be sacrificial, meaning they react before the remainder of the lubricant (the base oil) to provide protection. This protection is a critical mechanism in saving the lubricant from premature failure due to oxidation. The right amount and combination of antioxidant additives and synthetic base fluids is key to ensuring longer change intervals, reduced downtime, and longer equipment life.

One method lubrication chemists use in the laboratory to determine desired levels of antioxidants is Thermogravimetric Analysis, or TGA. Remember, contaminants such as moisture in the supply air can elevate temperatures and otherwise accelerate the oxidation process.

TGA analysis is a technique in which the mass of a substance is monitored as a function of temperature or time as the sample specimen is subjected to a controlled temperature program in a controlled atmosphere. A careful TGA can help chemists understand how a specific antioxidant and synthetic base fluid combination will perform in a formulation throughout a range of temperatures. For instance, a formulation can often include both primary and secondary antioxidants. Understanding the thermogravimetric curves allows the lubricant chemist to engineer the best possible thermal oxidation profile for a given formulation, thereby promoting longer lubrication life.



Recent food-grade air compressor lubricants often offer blends of synthetic fluids and additives that greatly improve performance over first and second-generation fluids.

Stay Involved in Preventive Maintenance Program

Compressed air is critical to your food and beverage operation. Some may argue it's as vital as electricity, water, and natural gas. Unfortunately, it requires as much or more care and attention than the utilities you rely upon.

Maintenance professionals understand the benefits of preventive air compressor maintenance programs – reduced downtime,

cost savings on emergency repairs, longer air compressor life, and lower energy costs because the system runs more efficiently.

Many air compressor distributors offer preventive maintenance programs. Outsourcing these programs to your local distributor make perfect sense. They address consumables and wear items such as air and oil filters, motor bearings, and belts. Inspecting system components and performance add a predictive component to the maintenance program. Regular inspections for air leaks, elevated operating temperatures and increased vibration can all indicate potential emerging problems and allow them to be corrected before incurring costly downtime and emergency repairs.

Of vital importance to the overall health of your compressed air system is the lubricant used and how often it is changed. Certainly, any compressed air maintenance system will include changing the lubricant at a specified time period. Oftentimes, the lubricant is simply replaced with the air compressor manufacturer's branded air compressor lubricant. Furthermore, the time period used is the standard lubricant change interval identified in the air compressor operator's manual. While these are great places to start, both the lubricant and change intervals should be tailored to your unique circumstances.

For instance, if your source air is contaminated, or contains high moisture content, you may very well experience accelerated oxidation cycles. In that case, you would want to ensure that the lubricant used in your compressed air system is of a formulation that has an excellent viscosity control and exceptional thermal oxidation stability. Your air compressor manufacturer likely offers the right formulation for your needs, but it's your responsibility to understand what's being used in your system. It's your equipment ROI,

A thorough analysis program of oil used in air compressors offers multiple benefits for food and beverage operations.

MAINTENANCE PROGRAMS

your efficiency, your maintenance costs and potentially your brand that are on the line.

While the manufacturers' standard oil change intervals are a great place to start, they should not be treated as a given. Rather, the change interval should be determined by a number of programmatic observations, including regular used oil analysis. Staying involved in the preventive maintenance program is important.

Important Oil Analysis Parameters

An effective analysis program for oil used in your facility's air compressors should focus on a few key parameters. Source air aside, the following analysis parameters are of particular interest for food-grade compressed air lubricants:

- pH – A rapid or excessive decrease in pH indicates ingestion of acid gases or other contaminants from the environment. This will not only require a fluid change, but will also require that the source of the contamination be eliminated to rectify the condition.
- AN – The acid number is an indication of remaining useful fluid life. Oxidative degradation of the lubricant or an accumulation of contaminants from the environment can trigger an increase in AN. Regardless, accumulated acid is reflective of a depletion of the corrosion inhibition package.
- Contaminants – Hydrocarbon contamination is typically monitored to assure that operators are not mixing fluid types. Mixing fluid types can compromise fluid life.
- Oxidation – Synthetic fluid changeout intervals can be

CAN BE OUTSOURCED, BUT RESPONSIBILITY CANNOT

determined by the degree of oxidation of the base fluid by using FTIR infrared spectroscopy.

- Viscosity – The viscosity of some OEM compressor fluids is specifically engineered for the needs of the air compressor and do not fit into either the ISO 32 or 46 viscosity ranges. Therefore, it is always important to compare viscosity to the specification for that fluid, rather than an ISO range.

A thorough analysis program of oil used in the air compressors has analytic benefits beyond just the air compressor fluid as well. It can also help identify other system concerns by identifying any particulates found in the used lubricant. For instance, analytical ferrography can be used to identify the source of the particulates, such as wear debris from bearings and rotors, contamination from inlet air, or corrosion particles from the tank.

Take Ownership in Maintenance of Compressed Air Systems

The bottom line is the bottom line. Staying actively involved in the maintenance of your compressed air system and having a basic understanding of the chemistry and capabilities of your air compressor fluids ensures that the program is optimized to help your food and beverage facility meet your safety, operational and financial goals. BP

About the Author

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About JAX INC.

JAX INC. is a U.S.-based industrial lubricant manufacturer with expertise formulating high-performance synthetic lubricants, fleet and heavy-duty lubricants, industrial lubricants and biodegradable and food-grade lubricants. Since 1955, JAX has earned a worldwide reputation as a leader in emergent lubrication technology. For more information, visit www.jax.com.

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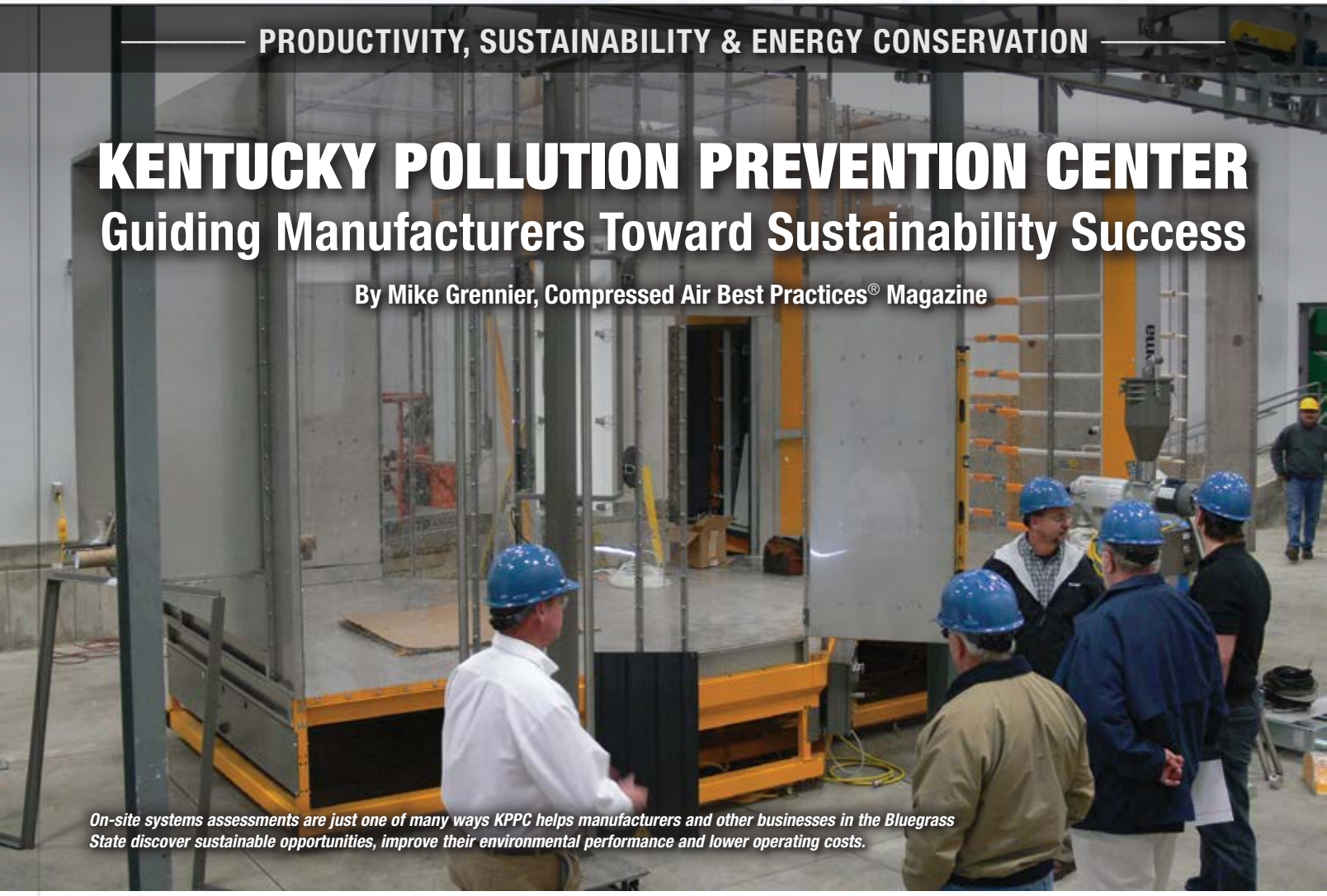
PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

KENTUCKY POLLUTION PREVENTION CENTER

Guiding Manufacturers Toward Sustainability Success

By Mike Grennier, Compressed Air Best Practices® Magazine



On-site systems assessments are just one of many ways KPPC helps manufacturers and other businesses in the Bluegrass State discover sustainable opportunities, improve their environmental performance and lower operating costs.

Mountain climbers in the Himalayas place a great deal of value in the wisdom and expertise of Sherpas who guide them on their journey through high-altitude peaks and valleys.

In Kentucky, many industrial manufacturers have experienced something similar as they strive to save energy and reduce pollution. Only in this case, there isn't a Sherpa involved. Instead, it's the Kentucky Pollution Prevention Center (KPPC): a non-profit resource center dedicated to guiding manufacturers and other businesses on their journey toward sustainability.

KPPC has helped more than 800 businesses and organizations in the state discover sustainable opportunities, improve their environmental performance and lower operating costs. And the list of companies KPPC has guided along the way continues to grow – as do the advantages of improved sustainability.

Holistic Approach Offers Insight and Perspective

Established in 1994, KPPC is a state-mandated technical assistance resource center and part of the J.B. Speed School of Engineering

> "Through our expertise, we give them a set of glasses to look at their operations differently. Soon they start having aha moments and the opportunities start flowing. It's a lot of fun."
>
> — Lissa McCracken, KPPC Executive Director

at the University of Louisville. Through state funding and federal grants, KPPC provides manufacturers in Kentucky with a range of technical services at no-cost to help them reduce waste and improve efficiencies. The organization has been recognized at the state and national level as a Center of Excellence.

KPPC offers help with Pollution Prevention (P2) and Energy Efficiency (E2) projects. Its mission is to provide technical assistance and training aimed at helping companies reduce energy and water use, as well as hazardous waste, at low or no cost.

"We work with companies holistically and look at things that can make an organizational impact," said Lissa McCracken, KPPC Executive Director, adding KPPC team members are not experts in their clients' processes. Instead, they offer a fresh perspective on energy savings and waste-reduction opportunities and work hand in hand with clients to achieve their goals.

"We come in and ask things like, 'What is it that is not serving your purpose? Do you have policies in place for energy reduction and pollution prevention? Do you have a team in place?' Our role is to lead them down the path toward efficiencies to help them save energy, reduce pollution and save costs. It doesn't take long for companies to benefit from the perspective KPPC brings to the table," McCracken said. "Through our expertise, we give them a set of glasses to look at their operations differently. Soon they start having aha moments and the opportunities start flowing. It's a lot of fun."

Kentucky Pollution Prevention Center (KPPC) Executive Director Lissa McCracken.

KENTUCKY POLLUTION PREVENTION CENTER: GUIDING MANUFACTURERS TOWARD SUSTAINABILITY SUCCESS

Students and Manufacturers Win with Co-op Program

One way KPPC guides companies down the path of continued sustainability – and helps start the flow of opportunities – is through the J.B. Speed School of Engineering Co-op Program. Through the program, KPPC provides engineering students the opportunity to work with companies on sustainable solutions and gain real-world experience in the growing field of sustainability.

Student Co-ops not only earn educational credits but also serve for the three semesters as paid employees for the companies they support. Seniors of the engineering school are also offered the opportunity to work with companies through "Capstone" projects, which are intensive research projects focused on specific areas, such as chemical and industrial engineering.

KPPC student Co-ops also learn how to perform sustainability assessments and participate in KPPC workshops and training sessions. Systems assessments cover virtually all utilities, including compressed air, boilers, industrial chillers and cooling systems, among others. KPPC's engineering team provides technical oversight of students throughout the process.

"The program is tremendously beneficial to students who are essentially work-ready for an entry-level engineering position when they graduate, putting them above graduates of other engineering programs," said McCracken. "Manufacturers benefit because they can take advantage of KPPC's services while contributing to efforts in training the next generation of engineers."

Following a systematic approach to assessments, companies are provided recommendations for energy- and waste-saving measures, including cost estimates based on measurements and calculations for improved system performance. KPPC also provides ballpark costs based on information and quotes from vendors.

Projects vary in scope and complexity. Compressed air systems initiatives, for example, range from identifying and fixing compressed air leaks to more sophisticated projects designed to optimize compressed air systems. The same holds true for projects aimed at waste reduction and energy efficiency. As an example, KPPC recently collaborated with engineering students working on a Capstone project to help a distillery advance its goal of becoming a zero-waste facility. The project encompassed recommendations to save energy, as well as methods to reduce food and production waste, and ideas for streamlining the use of materials in the distillery process.

"We don't do the implementation, but we feel like we're teaching clients to fish by empowering them with knowledge. This gives their internal team the ability to go to the front office and say, 'I had somebody come in and take a look at our systems. Here's what we can do to save money and increase efficiency,'" McCracken said.

Students enrolled in the J.B. Speed School of Engineering Co-op Program gain real-world experience working with companies on sustainable solutions.

Sustainable Manufacturing Training and More

KPPC offers a wealth of training opportunities for manufacturers and other businesses. Training takes the form of in-person workshops, seminars and online webinars. To date, more than 40,000 attendees have taken advantage of training offered.

KPPC's training programs cover the gamut, from compressed air efficiency strategies, to saving water and more. Sustainable Manufacturing is an example of one program that is quickly gaining in popularity. The training initiative focuses on sustainable manufacturing principles and practices and how they can drive a strategy for enhanced environmental performance – as well as helping companies achieve key business goals and objectives.

Through workshops hosted at manufacturing sites and supplemental webinars, the Sustainable Manufacturing training program covers a number of helpful topics and tools. The initiative implements aspects of the ISO 14001:2015 standard, as well as sustainable product development, and focuses on helping companies build a culture for sustainability and innovation. Additionally, training emphasizes economic competitiveness and improved environmental performance.

Sustainable Manufacturing Value Stream Maps

KPPC Senior Sustainability Engineer Mark Toda said the Sustainable Manufacturing program also leverages a Sustainable Value Stream Map (Sus-VSM). Adopted from the Institute for Sustainable Manufacturing at the University of Kentucky, a Sus-VSM is a highly practical and beneficial method for helping companies make progress toward sustainability.

Toda also said a Sus-VSM is a natural extension of a Value Stream Map and incorporates lean manufacturing principles used by most companies. Yet the Sus-VSM helps capture sustainability aspects of product flow and the materials involved, as well as environmental and societal impacts. Additionally, companies can use it to more easily identify locations where sustainability can be improved.

"Helping companies implement a Sus-VSM is becoming a key service we provide," Toda said. "We map out energy and materials inputs and outputs at each process step, as well as waste. Then we look at what's going in and going out so we can get an accurate assessment and identify opportunities for savings along the way."

Mark Toda, KPPC Senior Sustainability Engineer.

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Toda said although KPPC only recently introduced the concept of sustainable value stream mapping to clients, it is quickly catching on.

"We're working with about a half-dozen companies on sustainable value stream mapping. It's a great snapshot of their operation from an environmental perspective," he said. In addition, he said the collaborative effort provides invaluable insight into the raw materials involved and the energy consumed by all systems used to manufacture products.

A Go-to Source for Sustainability Best Practices

Given the value provided by the co-op program and technical assistance, it's not hard to imagine how demand for assistance from KPPC is high. Yet that doesn't keep it from offering even more to manufacturers, businesses and the sustainability community.

For example, KPPC serves as a technical and engineering resource for the Kentucky Department for Environmental Protection's KY EXCEL initiative (https://eec.ky.gov/Environmental-Protection/Compliance-Assistance/Pages/KY-EXCEL.aspx), which is the Bluegrass state's environmental leadership program. It provides KY EXCEL members with information, resources and ideas to support environmental leadership development. KPPC also hosts a nationally recognized Building Operator Certification Program (http://kppc.org/customized-technical-services/building-operator-certification/), which trains facility personnel to understand how building systems work together and how to bring them to their most efficient level of operation.

All that, plus KPPC supports numerous other organizations focused on sustainability. An example is the National Pollution Prevention Roundtable (http://www.p2.org/), which promotes the development, implementation, and evaluation of efforts to avoid, eliminate, or reduce waste generated to air, land, and water. McCracken currently serves on the Board of Directors.

Through its website, KPPC also offers an extensive library of resources, ranging from publications to training tools to webinars to a library of over 60 videos focused on helpful topics ranging from understanding power factor to compressed air management.

For KPPC, it boils down to providing the knowledge and resources many companies need in order to save energy, prevent pollution and improve upon their sustainability efforts.

"We work with companies to identify their pain related to sustainability and help them identify things they might not have thought about as far energy efficiency and pollution prevention," McCracken said. "We then recommend the most cost-effective – and ideally no-cost – methods of implementation to make it real. Along the way, we're informing them. That is key." BP

For more information about Kentucky Pollution Prevention Center, visit www.kppc.org

All photos courtesy Kentucky Pollution Prevention Center.

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QUALITY, SAFETY & RELIABILITY

KEEP CONTAMINANTS OUT of Food and Beverage Processing Air Supplies

By Brandon Brownlee, Motion Industries

According to the United States Department of Agriculture, more than 30,000 food and beverage processing plants across the United States employ more than 1.5 million workers.[1] Each of those plants applies a wide range of processes to raw agricultural goods to produce consumable food and beverage products.

Within those processes, industrial compressed air applications have a major role. Processing plants use compressed air systems to support the sorting, cutting, shaping, and packaging of food and beverage products. Companies also use compressed air to clean containers before filling and to blow off particles while cleaning food and equipment.

Compressed air systems used in food and beverage production plants consist of air compressors, dryers, filters, system piping, fittings, seals, air storage devices, valves, pumps, cylinders, and motors.

The systems include several moisture, oil and particulate removal stages. The different stages include water separators, absorption dryers, refrigeration dryers, oil vapor removal filters, coalescing filters, adsorption filters, dust removal filters, and sterile filters. Each of the moisture and particulate removal stages must meet or surpass Federal Drug Administration (FDA) and International Standards Organization (ISO) performance standards.[2] In addition to those standards, the British Compressed Air Society (BCAS), the British Retail Consortium (BRC), and the Safe Quality Food Institute (SQF), and the Canadian Food Safety Enhancement Program (FSEP) have also issued standards or best practices for monitoring compressed air quality.[3]

Although system requirements vary, food and beverage processing applications employ either contact compressed air systems, non-contact high-risk compressed air systems, or non-contact compressed air systems. Contact systems place compressed air in direct contact with food products. While non-contact high-risk systems do not place compressed air in direct contact with food products, the systems create materials – such as packaging – that directly contacts food. Non-contact systems contain control valves, air motors, and equipment but do not have direct contact with food or packaging.

Compressed air systems play a major role at most food and beverage processing facilities.

Hygiene in Food and Beverage Processing a Top Priority

Despite the size and complexity of the industry, a health and safety recall of a product because of the presence of contaminants or pathogens can cause nearly irreparable financial harm and damage to a company's reputation. Harmful microbial communities can enter through raw foods, air, water, process surfaces, and the hands or clothing of plant employees. The microbes form biofilm on slicing and cutting equipment, conveyors, tanks with piping, filling and packing machines, and heat exchangers.

A 2011 survey by the Grocery Manufacturers Association described the impact of a health and safety recall on the food and beverage processing industry.[4] The combination of lost sales, downtime costs, and product loss, along with the effort placed into recovering from a recall, ranged from significant to astronomical.

All this points to the vital importance of safety and hygiene for the compressed air systems used for food and beverage production. Any moisture in compressed air piping, air motors, or air compressors can promote fungus and microbial growth. Without hygienic processes in place, compressed air systems can blow microbial contaminants, oils, and other particulate matter onto food products. Food and beverage compressed air systems also require dry air; any excess moisture blown onto food products creates an opportunity for fungus or microbial growth on the food.

Regulatory Compliance Impacts Compressed Air Systems

All food and beverage processing operations must comply with food safety standards and practices contained within the FDA's Food Safety Modernization Act (FSMA). The FSMA covers the food supply chain from raw production through preparation for consumer use and focuses on preventing foodborne

The safety and hygiene of compressed air systems at food and beverage processing operations is vitally important.

KEEP CONTAMINANTS OUT OF FOOD AND BEVERAGE PROCESSING AIR SUPPLIES

illnesses. Placing the regulatory law into effect increased inspections of food processing plants, improved capabilities to detect the outbreaks of food borne illnesses and provided increased authority to order recalls of food products. In addition, the FSMA established a central database for tracking and tracing food safety information.

The FSMA Final Rule for Preventive Controls for Human Food mandates food facilities to have a safety plan in place that includes a Hazard Analysis and Critical Control Points (HACCP) plan. Risk – in this context – involves any point of contact between compressed air and food.

The HACCP plan analyzes biological, chemical, and physical hazards, describes the product, and includes risk-based preventive controls to minimize or prevent identified hazards. The preventive controls cover processes such as cooking, drying, refrigeration, filtering, freezing, pasteurizing, and acidifying foods; define methods for controlling allergen cross-contact; and describe sanitation processes. Processing plants must monitor, correct, verify, and document the application of preventive controls.[5]

Critical Control Points (CCPs) identify potential hazards that can occur. They also define process controls that prevent the likelihood of foodborne hazards causing illnesses, injuries, or death. After the identification of a CCP, members of the plant food safety team establish and manage critical limits that define operating conditions for the process.

Along with identifying CCPs, a HACCP plan also establishes pre-requisite programs that operationalize good hygiene practices and training programs. The HACCP plan also defines corrective actions if a system failure causes a deviation from the CCP critical limits and verification actions to ensure compliance with the food safety plan.

HACCP Plans Identify Compressed Air Systems Risks

The normal operation of a food and beverage processing compressed air system draws ambient air into the system through an intake filter. Ambient air contains moisture, dirt, particulates, oils, and other materials that can become toxic when allowed to contact food. One cubic meter of untreated compressed air contains approximately 180 million dirt particles, water, gaseous hydrocarbons, pollen, trace metals, and other pollutants.[6]

Untreated compressed air also carries bacteria that can easily travel through a compressed air system and gain contact with food products. Along with the possibility of directly contacting food, the bacteria carried within a compressed air system can also attach to air compressors, reservoirs, system piping, and fittings…and grow as microbial biofilm.[7]

Because compressed air systems may directly contact food or may contact food packaging, numerous opportunities for CCPs and pre-requisite programs may exist. For example, air-driven knives and mixing tools have direct contact with food and represent CCPs. Bagging systems have indirect contact with food products and also work as CCPs.

Managing Compressed Air System Risks

HACCP plans and CCPs link risk identification with risk management built through carefully planned designs and preventive maintenance procedures. Regulatory and industry standards for prioritizing consumer health and safety within food and beverage processing should influence design. As an example of design based on industry benchmarks, manufacturers recommend that compressed air systems have sterile filters at any location where compressed air has indirect or direct contact with food.

Another key design point involves removing moisture from the compressed air, before distribution throughout the system, with

Carefully planned designs and preventive maintenance are key to managing risks associated with compressed air systems.

dryers.[7] Moist air can promote the growth of microorganisms and fungi within the air compressors and system piping of contact and non-contact high risk compressed air systems. As the systems operate, the microbial and other contaminants can blow onto the food or packaging.[8]

Consistent maintenance programs consider sources of contamination and begin with the atmospheric air flowing into the input of an air compressor through an intake filter. They continue with careful inspection of air compressors and testing of piping distribution systems for the presence of contaminants, as well as monitoring of storage receivers, and taking corrective actions. Maintenance procedures also address the performance and maintenance of separators and dryers. For example, a thorough maintenance inspection should confirm that separators remove bulk liquids and that pressure dewpoints remain below the critical temperature threshold needed.

Filters in a compressed air system also serve as key maintenance points because of the need to remove particulates from the system. Those solid particulates may include bacterial spores that remain viable in dry conditions, ambient dust, pipe scale, residue from chemical cleaners, and other contaminants. An inspection may verify that coalescing filters continue to remove solid contaminants, water, and oil aerosols from compressed air according to an established threshold of 0.01 micron at ≥ 99.99% DOP (Dioctylphthalate Fog Method test) efficiency.[7]

Preventive maintenance also includes the regular monitoring of compressed air used for all production processes. As defined by International Standards Organization, the British Compressed Air Society, and the Safe Quality Food Institute, compressed air audits cover the analysis of particles, oils, and microbial contaminants. The BCAS Food and Beverage Grade Compressed Air Best Practice Guideline specifies that companies should test and verify the quality of compressed air that directly or indirectly contacts food products two times per year or when maintenance activities may impact air quality. [3,9]

Ounce of Prevention Worth a Hundred Pounds of Cure

Since food processing involves human input, the probability of a recall is very real. For example, in 2016, there were 905 recalls.[10] Data shows that the majority of food recalls are voluntary and are driven by "reasonable probability" that the food may be contaminated.

Let's step back a minute from the technical information and put this topic into a language that we all understand. I have had the pleasure to tour many different types of food processing facilities in North America, and every single one of them holds food safety as their top priority. These facilities, though monitored by government inspection, are self-policing with dedicated quality control specialists. When you are processing or packaging food, do not think an ounce of prevention is worth a pound of cure. In food consumed by humans and the risk of food-borne illnesses, an ounce of prevention is worth a hundred pounds of cure. BP

About the Author

Brandon Brownlee, a Corporate Account Manager for Motion Industries, has been involved with Reliability Centered Maintenance for 20-plus years, and has served industry for more than 35 years. His main specialty is determining best warehousing practices to ensure inventory is stored properly for the maximum product life. In addition, Brownlee is a subject matter expert for protein conversion and wind power. For more information, visit MotionIndustries.com/compressedairbp, or click to Motion Industries' On-site Solutions services (https://tinyurl.com/yxkgejo8).

About Motion Industries

With annual sales of $6.3 billion, Motion Industries is a leading industrial parts distributor of bearings, mechanical power transmission, electrical and industrial automation, hydraulic and industrial hose, hydraulic and pneumatic components, industrial products, safety products, and material handling. Motion Industries has over 600 locations, including 15 distribution centers throughout North America, and serves more than 200,000 customers from the food and beverage, pulp and paper, iron and steel, chemical, mining and aggregate, petrochemical, automotive, semiconductor, wood and lumber, medical, and pharmaceutical industries. Motion Industries is a wholly owned subsidiary of Genuine Parts Company (NYSE: GPC). For more information, visit MotionIndustries.com.

All photos courtesy of Motion Industries.

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To read more about the ***Food Processing*** industry, please visit www.airbestpractices.com/industries/food.

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

Milk Products Plant Finds 52 PERCENT POTENTIAL SAVINGS

By Ron Marshall, Marshall Compressed Air Consulting

A food processor was having compressed air problems, so they invited a compressed air auditor into their plant for an assessment and to help them size future permanent air compressors. The plant was experiencing low air pressure and detecting water in the compressed air lines despite having a desiccant air dryer. The auditor thoroughly analyzed the compressed air system production equipment and did end-use assessment and leakage detection. This article discusses the findings leading to a potential cost savings of 52% of the current level.

Multiple Areas of Opportunity Examined

The plant involved produces and packages milk products. The study was designed to quantify the current and potential operating costs, estimate operating profiles, and calculate potential operating savings based on recommended energy conservation measures. The audit consisted of site measurements with electronic data loggers monitoring pressure, power and flow, and also included ultrasonic leak detection, visual inspections, research of potential energy efficiency measures and interviews with facility personnel.

The compressed air production and conditioning equipment consisted of one large rented 145 kW lubricant-free air compressor and two smaller permanent lubricant-injected air compressors (75 and 40 horsepower, respectively) that were originally part of the plant before an expansion took place (Figure 1).

When new production was added the plant decided to upgrade their air quality to the corporate standard of lubricant-free Class 0 air quality per ISO 8573-1, at which time a large lubricant-free air compressor, a heatless desiccant dryer, and 1,060-gallon-storage receiver was installed on a temporary rental basis. It was hoped that the oil-injected air compressors and associated refrigerated dryers would only be run in emergencies if there was a shutdown of the lubricant-free air compressor. Unfortunately, the plant flow was regularly exceeding the capacity of the lubricant-free unit, and the 75 horsepower (hp) Variable Speed Drive (VSD) air compressor was required to supplement the capacity. A smaller 40 hp air compressor had reached the end of its useful life and was taken out of service leaving the plant with a deficit of capacity during production peaks. Even with the two air compressors running, and with the use of a desiccant dryer, the plant experienced pressure and air quality problems. Something had to be done, so a compressed air auditor was called in to investigate.

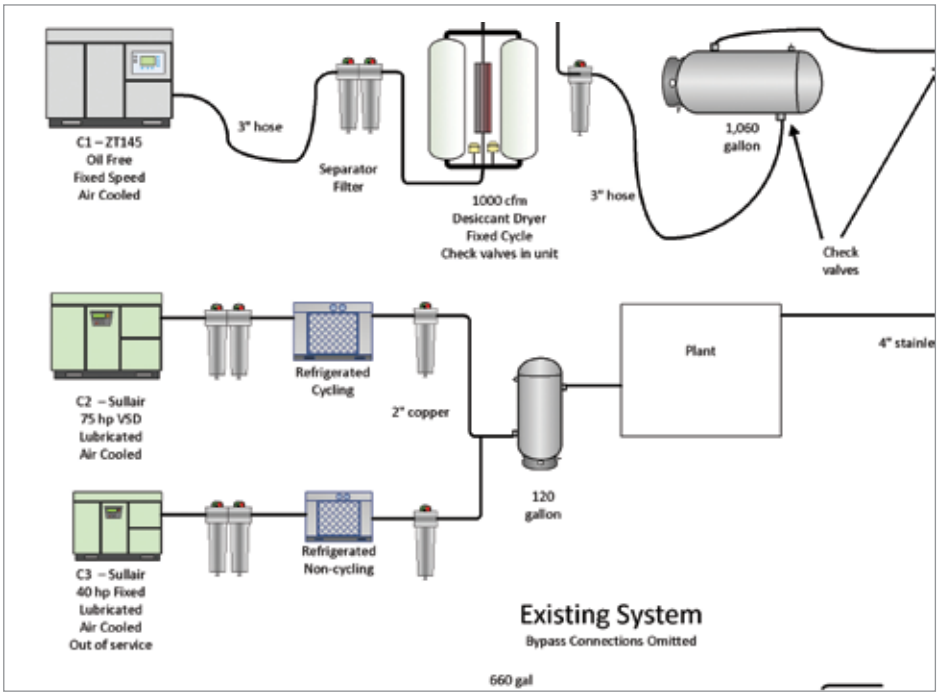

Figure 1: The site had a mixture of oil-free and lubricated air compressors with different dryer types. As a result, the air quality was not meeting with corporate standards for food-quality compressed air.

Pressure and Power Profile

Plant personnel were concerned the compressed air piping was being overloaded by excessive flow and were thinking this was the cause of the pressure issues. To check the pressure gradients the auditor placed pressure data loggers at the air compressor discharge, after the air dryer, and in a central location in the plant where low pressure was being experienced. Power loggers were also placed on the two running air compressors to track the performance of the equipment and to determine system loading at the times of pressure excursions.

Figure 2 shows there was indeed low pressure, but the air compressor discharge pressure, air dryer outlet pressure, and pressure at the critical location track each other. This shows there is no appreciable pressure loss across the piping or the air dryer. As such, there was a lack of air compressor capacity. The air compressors were experiencing drawdown. This occurs when the load exceeds the capacity of all the running air compressors because the plant pressure will "draw down" to a low level due to a deficit in the compressed air supply since less compressed air is being produced than is being used. In this condition, the pressure must fall.

The power profile also showed a few interesting things; during light loads two air compressors were running, with the VSD unit running at minimum speed, its least efficient point, and the large 145 kW air compressor loading and unloading, also causing inefficiency due to unloaded power consumption. Running two air compressors at a time when only one can feed the load is inefficient because one more fully loaded air compressor would use less power and reduce the maintenance hours. In addition, the oil-free air compressor was found to be rapidly cycling one cycle every 15 seconds during light loads. A check of the air compressor hour meters showed the air compressor had experienced over 700,000 load cycles in one and a half years of operation. This is excessive duty and will prematurely wear out an air compressor.

Low Pressure Impacts Productivity

The air compressor power was measured over a period of about a month, annual system operation is estimated at 8,760 hours, during which the existing system consumes a projected 1,707,300 kWh of annual electricity. The total electrical costs for the system are estimated at about $119,700 per year, including taxes. Rental costs are estimated at $208,000 per year with $10,000 per year in estimated maintenance costs.

Compressed air production is an average of 800 cfm minus 190 cfm in air dryer purge (610 cfm), with peaks to 1,190 cfm (1,000 without dryer purge). The specific power of the system calculates to 32 kW per 100 cfm of air used when dryer purge is considered. Typical optimized systems of this type would have a specific power in the 21 to 23 kW/100 cfm range. This shows there is good potential for savings if the air compressor control strategy is improved.

Peak plant demands were consuming 1,190 cfm, more than the capacity of the two active air compressors, but this was occurring only 2% of the time. The occasional deficit allowed pressures to fall lower than 100 psi, which reportedly caused production machine shutdowns affecting productivity. The plant also has inadequate air compressor back-up capacity, the failure of any one air compressor will cause difficulties meeting even production demands. The 75 and 40 hp units are of oil flooded screw type, with refrigerated drying,

MILK PRODUCTS PLANT FINDS 52 PERCENT POTENTIAL SAVINGS

but this is not in keeping with the corporate air quality standards for food product plants.

On the demand side, the system was found to be quite inefficient, with significant leakage and non-productive load, estimated at 300 cfm continuous flow, accounting for 43% of the average consumption. The system was also operating at a higher than required average pressure due to the need to compensate for the pressure dips when the air compressors lacked adequate capacity, this caused higher than normal average air compressor power, and higher than desired artificial demands, further loading the air compressors.

Three Sets of Check Valves Create Issues

As mentioned, the air compressor cycle count was found to be excessive, with the air compressor cycling loaded and unloaded every 15 to 20 seconds during light loads. The auditor found the system installers had placed check valves in the air compressor piping to prevent the back flow of compressed air from the plant to the air compressors.

Check valves like this were needed in the days of reciprocating air compressors to prevent the units' motors from tripping when they tried to start with pressure in their compression cylinders, but modern-day air compressors have check valves built into the internal circuitry. The desiccant air dryer also has check valves installed within the circuitry to prevent the backflow of compressed air through the desiccant. The presence of not one but three sets of check valves, however, causes problems with load/unload-controlled air compressors with desiccant air dryers.

When the air compressor is loaded the output flow from the discharge feeds the air dryer purge, but when it unloads there is no flow to feed the dryer purge flow, which in this case was 190 cfm. This purge demand caused the pressure at the discharge of the air compressor to immediately collapse after each air compressor unload operation, causing the air compressor to quickly load again, even when the plant pressure is not low enough to need the air compressor to load. This rapid cycle operation continued as long as the air dryer is purging. Since the air dryer is a fixed cycle unit, it continually to purged at full flow, even when lightly loaded at a fraction of its capacity.

A test was done where the dryer purge was turned off temporarily as shown in Figure 4. The chart shows when the purge was removed the air compressor started cycling normally, and the power consumption dropped considerably, this shows that if something can be done about the air dryer purge and rapid cycling there could be significant energy savings.

The test also showed that the air dryer purge was 190 cfm, this is based on the change in compressor cycle time in the two conditions, the purge was found to be 40 cfm higher than the rated purge. The dryer was also set on a six-minute cycle (three minutes per side) rather than the normal 10-minute cycle. These extra unnecessary cycles wasted considerable

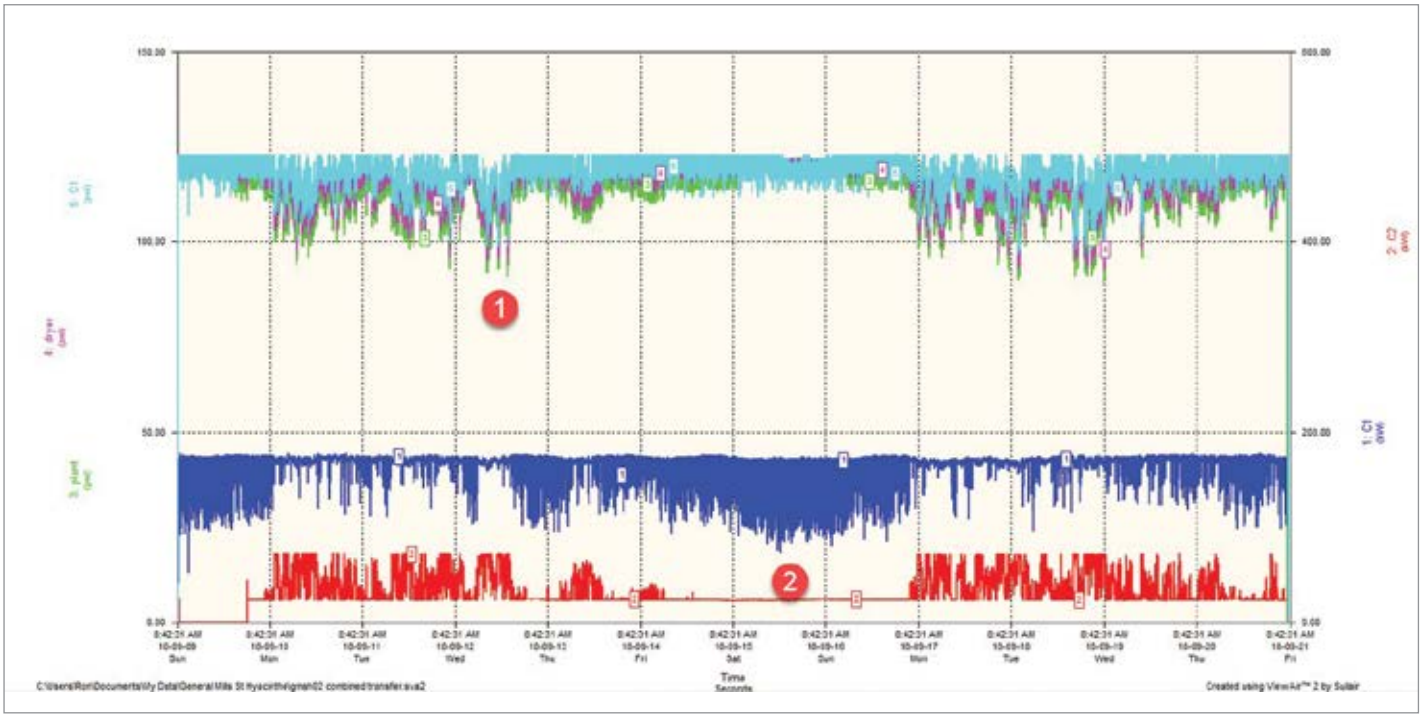

Figure 2: This pressure and power profile plot shows pressure falling below the critical pressure of 90 psi (top lines designated by No. 1), but during light loads two air compressors continued to run when only one was required (bottom lines designated by No. 2).

compressed air due to the extra air required to pressurize the dryer vessels each time, only to depressurize them when the cycle ended three minutes later.

A condensate separator had been installed on the air dryer before the inlet filter. This separator had airless condensate drains installed, however, someone had slightly cracked open the manual drain. Interviews suggested this was done because moisture was regularly forming inside the plant pipework, and it was thought that the extra drainage would prevent this problem. After further investigation, however, it was found that a condensate drain on the 75 hp lubricated-air compressor wet receiver had failed closed, allowing the tank to almost completely fill with water. Free water was inadvertently being injected into the plant from this receiver whenever the 75 hp air compressor had to run at high flows.

Poor Local Connection Practices Revealed

Some local low-pressure shutdowns on critical machines were occasionally occurring which affect production. Overall, the main cause of low pressure in the plant is the air compressor capacity problem, but local issues were also found due to poor local connection practices.

One in particular was mentioned by personnel. Data logging of the input pressure to this machine showed no significant local piping losses between the main line and the pipe drop. However, significant pressure loss likely exists between the piping drop and the actual end use. It can be seen that the FRL component chain of this machine is fed with only flexible plastic tubing, which is not a best practice when it comes to preventing pressure loss during peak flows within the machine. Careful analysis of the capacity of the tubing, filter, regulator, and lubricator needs to be done

	Hours	Flow	Sp Power	Ave kW	kWh	Cost
Peak		1190		236		$ 47,083
C1	8760	680	24.1	163.6	1,433,136	$ 60,967
C2	8760	120	25.3	30.3	265,428	$ 11,292
Dryer	8760			1.0	8,760	$ 373
Total		800	24.4	194.9	1,707,324	$ 119,714

Figure 3: Energy costs were calculated based on the power utility rates. The plant consumed about $120,000 per year to produce an average of 800 cfm of compressed air, not including dryer purge. The system specific power of 32 kW/100 cfm is in the higher range for similar systems and shows there are efficiency problems with the production of compressed air.

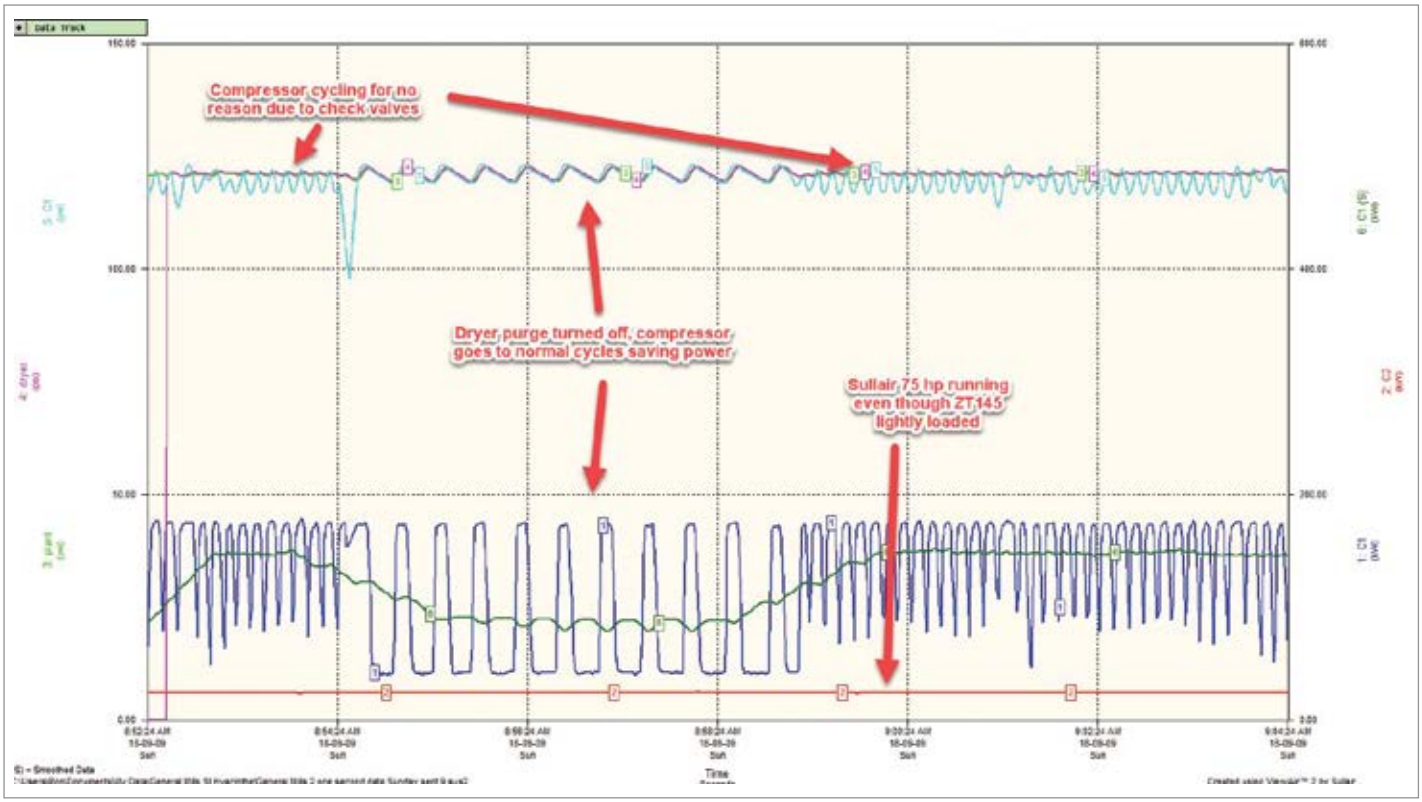

Figure 4: Shown is a special test where the air dryer purge was interrupted by temporarily turning off the air dryer purge. When the purge was interrupted, the air compressor cycles (blue line) went to normal and the air compressor power (average shown in green) dropped by 43%. At the same time, the 75 hp VSD air compressor continued to run at minimum speed, even though it was not required, showing poor air compressor coordination.

MILK PRODUCTS PLANT FINDS 52 PERCENT POTENTIAL SAVINGS

TABLE 1

	LOAD/UNLOAD		VSD	
MEASURE	$ SAVED	% SAVED	$ SAVED	% SAVED
Air compressor replacement	$17,035	14.2%	$16,842	14.0%
Reduce pressure	$2,480	2.1%	$3,875	3.2%
Fix leaks	$7,215	6.0%	$10,963	9.1%
Convert drains	$12,420	10.4%	$6,475	5.4%
Eliminate dryer purge	$13,298	11.1%	$20,220	16.9%
Reduce end uses	$2,489	2.1%	$3,417	2.8%
Upgrade filters	$645	0.5%	$577	0.5%
Reduce refrig. dryer	$455	0.4%	$455	0.4%
Total	$56,037	47%	$62,823	52%

and compared to the peak demands of the machine to ensure these restrictions are not causing excessive pressure loss.

Compressed Air Leakage Grows in Time

Compressed air leakage represents a constantly growing load on the air compressors as the plant ages, as well as a continuous energy cost. Leak detection using an ultrasonic gun was done in the plant to assess the situation with 32 significant leaks (or uncontrolled end uses) identified. This flow was estimated at 116 cfm.

Flow meters were later installed on the system and showed that the total plant demand during non-production hours was about 300 cfm, representing about 53% of the average plant flow. Obviously not all leakage had been found by the ultrasound test. Some of this flow was due to uncontrolled blowing devices, like compressed air powered vacuum generators left on, and some uncontrolled cleaning flow using flat nozzles left to run during non-production time.

Recommended Solutions for System Efficiency

Some recommended solutions at this site were:

- Remove the system check valves or install remote pressure monitoring on the oil-free air compressor to reduce the rapid cycling.
- Return the undersized temporary rental air compressor and purchase multiple properly sized permanent oil-free units, one air compressor being VSD controlled. The VSD machine would eliminate wasted unloaded power consumption. The air compressors should be chosen to adequately supply peak plants demands, but also efficiently run during average and low loads. Purchase of enough backup capacity so the lubricated air compressors can be taken out of service was recommended. The air compressor sizes should be carefully chosen to prevent control gap that might be caused by a VSD air compressor equal to or smaller than the base units.
- Purchase the new air compressors with heat of compression dryers. This dryer type would eliminate 190 cfm of wasted purge flow and increase the available air compressor capacity.
- Reduce air compressor discharge pressure by 10 psi, and better coordinate air compressor pressure settings so that only one unit runs during light loads.
- Install airless condensate drains on all air compressors, dryers, filters, receivers.
- Better control compressed air vacuum generators so they do not run continuously when there is no production.
- Eliminate or better control blowing devices so they don't waste air when there is no production or when there is nothing on the conveyor line to blow clean.
- Investigate local pressure problems and upgrade any undersized supply lines to critical production machines.
- Implement a compressed air monitoring system to ensure the compressed air efficiency and leakage levels can tracked.
- Repair 100 cfm in leaks.

Table 1 details the estimated cost reductions.

Energy Savings and More

This article shows yet another example of the energy savings and cost reductions that can be found by auditing a compressed air system. Not only energy savings are possible, but also improvement in air quality and reduction in production machine downtime. The audit identified the source of the pressure and water contamination problems the plant was experiencing, but the cause was surprisingly not what the company was initially expecting. BP

For more information about this article, contact Ron Marshall, Marshall Compressed Air Consulting, tel: 204-806-2085, email: ronm@mts.net.

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RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

KSI's New APF Filter Range Achieves Low Differential Pressures

The German company KSI introduced an exciting new line of compressed air filters. The manufacturer of compressed air treatment products presented Advanced Premium Filtration (APF).

This filter line incorporates KSI's newly developed pleating technology that allows for an even deeper pleating of the filtration material through which a larger filtration capacity is achieved. As a result of this technology, in combination with other features, the differential pressure saturated on submicro level has been reduced to just 1.59 PSI, which makes the APF filter range a market leader in energy efficiency.

"In order to strengthen our position as a leading and innovative company we pushed ourselves to create a new line of air filters that combines energy efficiency with the quality and reliability our customers expect from us.

The differential pressure saturated on submicron level has been reduced to just 1.59 PSI.

We are very proud to have set a new standard in the field of compressed air filtration," said General Manager and company founder Mr. Holger Krebs.

About KSI

The company's core business consists of three main product groups: KSI ECOCLEAN® compressed air filtration, ECOTROC® compressed air drying and KONDRAIN® & KONTREC® condensate management solutions. For more information, please visit https://en.ksi.eu/.

Ultrachem Unveils Omniflush FG

Omniflush FG is a food grade system flush developed to assist in converting industrial air compressors from standard lubricants to food grade (H-1) approved technologies. This advanced technology allows for online system cleansing and should be applied in the following scenarios:

- Converting standard lubricants to food grade (H-1) approved technologies
- Converting mineral based food grade lubricants to advanced food grade synthetics
- Remove varnish and deposits to improve system efficiency

About Ultrachem, Inc

Founded in 1965, Ultrachem is a long-standing, leading manufacturer of premium synthetic lubricants serving OEM & industrial maintenance markets. Products manufactured include compressor oils, vacuum pump oils, gear & bearing oils, hydraulic oils, chain oils, food grade oils, greases, impregnating oils & gels, and other specialty cleaners & chemicals.

Ensure food safety compliance, capitalize on your equipment investments without costly offline maintenance and accelerate uptime with Omniflush FG.

Ultrachem's proven technologies offer industry leading performance combined with an established reputation for quality, technical support & customer service. Ultrachem is a wholly owned subsidiary of FUCHS Petrolub S.E. For more information, visit www.ultracheminc.com or call 302-325-9880.

Gardner Denver Enhances Rotary Vane Compressors

Gardner Denver is proud to announce the exciting additions and enhancements to its 2-10hp V/VR Series of rotary vane compressors. These popular fixed speed, direct drive rotary vane compressors are a great bridge for customers that operate at 100% duty cycle but have outgrown a reciprocating compressor and/or have a low noise requirement. When compared to a rotary screw compressor, a rotary vane unit is less

RESOURCES FOR ENERGY ENGINEERS

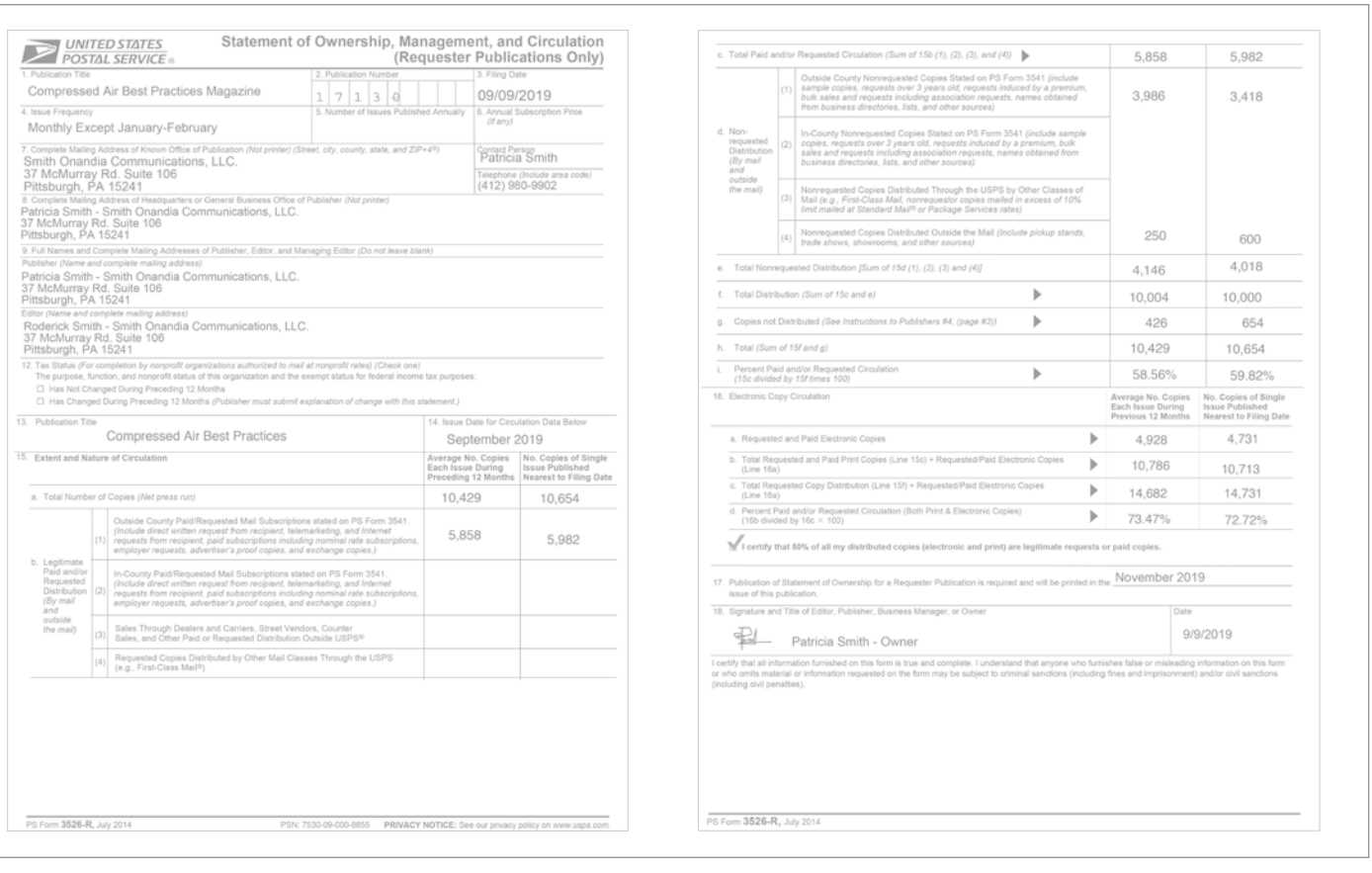
TECHNOLOGY PICKS

Each horsepower size hypac is available with an 80, 120 or 240 gallon wet tank equipped with a drain as standard.

complex, has a lower price point and often times has a smaller footprint.

An exciting addition to the V/VR Series is the 5, 7.5 and 10hp hypac. The hypac is a complete air system in one package incorporating a tank mounted V/VR Series lubricated rotary vane compressor and a refrigerated air dryer to better treat the air before releasing it to the plant supply. Each horsepower size hypac is available with an 80, 120 or 240 gallon wet tank equipped with a drain as standard. The hypac is a true plug-and-play compressed air solution at a great value price.

In addition to the new hypac offering, Gardner Denver has also made a variety of enhancements to its popular 5-10hp V/VR Series simplex packages. The new version of these robust packages includes:



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For more information, visit www.gardnerdenver.com/gdproducts

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Gardner Denver Industrials Segment, part of Gardner Denver, Inc., is headquartered in Milwaukee, Wisconsin, USA. Gardner Denver was founded in 1859 and today has approximately 6,500 employees in more than 30 countries. For further information, please visit: www.gardnerdenver.com/gdproducts.

About Gardner Denver

Gardner Denver is a leading global provider of mission-critical flow control and compression equipment and associated aftermarket parts, consumables and services, which it sells across multiple attractive end-markets within the industrial, energy and medical industries. Its broad and complete range of compressor, pump, vacuum and blower products and services, along with its application expertise and over 155 years of engineering heritage, allows Gardner Denver to provide differentiated product and service offerings for its customers' specific uses. Gardner Denver supports its customers through its global geographic footprint of 40 key manufacturing facilities, more than 30 complementary service and repair centers across six continents, and approximately 6,500 employees world-wide. For more news and information on Gardner Denver, please visit www.gardnerdenver.com.

Lupamat Unveils CO_2 Compressor

Lupamat unveiled a CO_2 compressor. First produced in Turkey using CO_2 gas, this three-stage slide bearing, high pressure (20 bar), V type and oil-free compressor has a capacity of 1000 m3/h, 200 kW engine power and is water cooled.

The system is designed to operate as a closed cycle with no CO_2 gas output to the atmosphere. Since CO_2 gas is corrosive, the valves, elbows, sleeves, flanges, bumps, heat exchanger and all other parts are made of stainless steel. All of the critical materials used are stainless steel as well and the compressor is long lasting. The CO_2 compressor uses an

The CO_2 gas supplied to the system under pressure is 100% oil free.

RESOURCES FOR ENERGY ENGINEERS

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Advanced 10" TFT LCD touch screen user panel. The CO_2 gas supplied to the system under pressure is 100% oil free and is therefore suitable for use in the beverage, pharmaceutical, food and health sectors. In the CO_2 compressor, carbon dioxide gas discharge is returned to the compressor suction rather than to the atmosphere, thus saving energy. Stainless steel collector tanks located at the 2nd and 3rd stage outlet provide vibration reduction to a minimum level.

About Lupamat

Lupamat started production in 1968 and has been a pioneer of many innovations in the compressed air industry for over 51 years. Having become part of the Dirinler family in 2000, Lupamat has made great progress in quality thanks in part to the cooperation with other companies within the group. In our group, there is Dirinler Makina, established in 1952 for eccentric-hydraulic press production; Dirinler Sanayi Makinaları producing CNC lathes, CNC double machining centers and multipurpose and completely customer personalized CNC machines, and Dirinler Döküm, which carries out cast iron production, 80% of which is aimed at export for the wind energy sector. For more information, visit www.lupamat.com.

Bimba Launches BPVA – Affordable, Compact Line of Pinch Valves

Bimba, an industry-leading innovator of pneumatic, hydraulic, electric, and vacuum motion solutions, has launched the BPVA, an affordable, compact, pneumatic pinch valve. The BPVA expands Bimba's pinch valve portfolio with a more cost-effective solution for industrial and medical applications. As with its other pinch valves, the BPVA is designed as an alternative to traditional wetted valves by opening and closing flexible tubing to control the flow of media so it never makes contact with the valve.

The BPVA:

- Requires less maintenance and reduces the risk of contamination
- Offers high-performance life expectancy of 3 million cycles
- Features a compact design that enables operations in confined spaces
- Is available at a cost-effective price point

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TECHNOLOGY PICKS

With a completely stainless-steel, corrosion-resistant option, the BPVA is ideal for wash down and sanitary environments. Additional options such as mounting brackets, various seal materials, and magnetic position sensing accommodate a broad range of applications.

"The BPVA targets a wide range of applications needing a simplified design and a low price per unit for high quantities," said Sarah Manuel, Product Manager. "By offering four models with different sizes and options, the BPVA adds a versatile yet compact pinch valve design, all at an affordable price to our existing portfolio of pinch valve products. An electrical solenoid piloted version of the BPVA is planned for release in the near future and will be announced as soon as it is available for ordering."

BPVA Technical Features:

- Tube slot sizes: 1/8", 1/4", 3/8", 1/2"
- Material: anodized aluminum or stainless steel
- Normally closed or normally open configurations

Visit www.bimba.com for more information on the Pneumatic Pinch Valve BPV Series.

About Bimba

Bimba is part of IMI Precision Engineering. Bimba is a forward-thinking innovator providing industry-leading pneumatic, hydraulic, electric and vacuum motion solutions that are easy to use, reliable and ready for all engineering solutions. Bimba markets an extensive line of industry-leading products including pneumatic, hydraulic, and electric actuators; valves; fittings; vacuum products; air preparation and a variety of safety and production solutions. In addition to its broad line of standard catalog products, the company's business develops many custom and semi-custom products designed for specific customers and applications. These products, used in machinery and automation, are sold to original equipment manufacturers and end-users throughout the world in an expanding variety of industries.

IMI Precision Engineering is a world leader in motion and fluid control technologies. IMI Precision Engineering's reputation rests on a world-class portfolio of high-performance products, the innovation and technical expertise of its 6000 people, and an ability to deliver exceptional local service. A division of the £1.75 billion turnover engineering group IMI plc, IMI Precision Engineering has a sales and service network in 75 countries, technical centers in the USA, Germany, UK and China, and manufacturing facilities around the world.

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JOBS & TECHNOLOGY

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Reach 13,000+ readers of Compressed Air Best Practices® Magazine with Marketplace Ads every month! Job Marketplace ads are also placed for one month on www.airbestpractices.com and promoted in our three monthly e-newsletters.

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