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March 2020

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FROM THE EDITOR

Food Processing



Quality, Safety and Reliability

Energy Treasure Hunts have been strongly promoted by the U.S. Environmental Protection Agency ENERGY STAR® program. We were interested to learn of an initiative, led by the IUE-CWA labor union, to engage union employees to execute Energy Treasure Hunts. As we are still talking about average compressed air leak rates of at least 30% in the year 2020, I've reached the conclusion initiatives like this, engaging production and maintenance personnel, are the way to go to get leaks repaired (as opposed to identified). I hope you enjoy our article on this IUE-CWA effort.

Speaking of compressed air leaks, Ron Marshall provides us with another excellent article titled, "Protect Profits with Compressed Air Leakage Best Practices." I'd like to mention his first paragraph starts with the header, "Leakage Levels of 80% are not Uncommon!"

Productivity, Sustainability & Energy Conservation

Sharon Nolan is Eastman's Manager of Global Natural Resource Management. She has led Eastman's efforts to become a leader in Sustainability within the chemical industry. I hope you enjoy our article detailing the investments and metrics Eastman, celebrating their 100th anniversary, shares demonstrating their commitment to environmental stewardship.

Tim Dugan returns to our pages with an in-depth article titled, "Avoiding Control Gap with Centrifugal Air Compressors." Common in the larger industrial and process plants where Tim Dugan sightings are common, centrifugal air compressors have unique variables to manage to ensure they deliver the high performance they are capable of.

Thomas Wenning is the Program Manager for Industrial Energy Efficiency at the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL). Our own Mike Grennier spent time with him to provide you with an article on the DOE's Better Plants® program writing, "In 2019, more than 230 Better Plants partners, operating more than 3,200 facilities, cumulatively saved \$6.7 billion in energy costs and more than 1.3 quadrillion British Thermal Units!"

For all manufacturing and distributor personnel, we are thrilled to announce the following certification and formal training opportunities at the **2020 Best Practices Expo & Conference**, located near Chicago's O'Hare International Airport. For more information and to register, please visit www.cabpexpo.com

- Compressed Air & Gas Institute Personnel Certification: Compressed Air System Specialist
- Compressed Air Challenge Level 1 Fundamentals of Compressed Air Systems
- Compressed Air Challenge Level 2 Advanced Management of Compressed Air Systems

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

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INDUSTRY NEWS

Pye-Barker Acquires Florida Air Technologies

Pye-Barker Engineered Solutions announced that they have acquired Florida Air Technologies, LLC as part of their 2020 growth plans to exceed customer expectations. Since 1936, Pye-Barker has served the needs of industrial companies in Georgia with compressed air, pumping and blower/vacuum systems.

“With this acquisition, our clients will know that we are committed to growing to meet their needs and improving our coverage of the Southeastern United States,” said Eric Lunsford, Pye-Barker Engineered Solutions President and CEO. “All of our partners will receive faster access to industry-leading air compressors and accessories that are

all backed by our more than 225 years of combined engineering expertise, certified maintenance and repair services and 100% satisfaction guarantee.”

Pye-Barker will acquire all of the air compressors, air dryers, vacuum pumps, air treatment products, lubricants, and repair parts previously owned by the Orlando company. All employees of Florida Air Technologies will keep their jobs at their current location, and all accounting services will move to the company’s main headquarters in Forest Park, Georgia.

“We were ready to sell and looking for a company that had a long-term vision and shared our values for providing excellent customer service,” said Sundar Mylavarapu, Florida Air Technologies President and CEO.

“We approached Pye-Barker because they are successful and well-respected in the industry, and we know they will take good care of our customers.”

Pye-Barker has grown over the past 83 years by providing customers with the high-quality products and services they need, quickly and cost-effectively, with as little stress as possible. This acquisition is part of their continued mission for growth throughout the southeast of the United States.

“This will be a smooth transition for everyone involved, and we look forward to offering new and current customers an expanded selection of products, enhanced repair capabilities, and 24/7 emergency service they can rely on and all of the additional benefits of this acquisition and others in the pipeline,” said Lunsford.

About Pye-Barker Engineered Solutions

Founded in 1936, Pye-Barker specializes in creating engineered solutions to help industrial companies in Georgia with their compressed air, pumping and blower/vacuum systems. With over 150 years of combined engineering experience, they help clients create engineered solutions specific to their needs. Then, they deliver the highest quality products and services possible, all backed by certified maintenance and repair and their unique, 100% satisfaction, risk-free guarantee. With offices in Forest Park and Savannah, Georgia, Pye-Barker Engineered Solutions is ready to service the needs of local customers quickly and cost-effectively. For more information, visit www.pyebarker.com or call (404) 363-6000.



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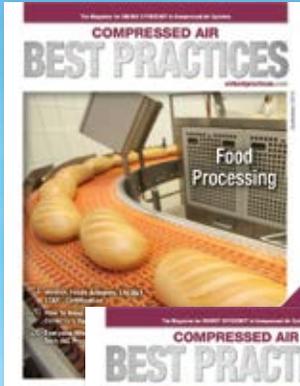


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INDUSTRY NEWS

Best Practices EXPO & Conference to Host Compressed Air Challenge® Level 1 and Level 2 Training

Learn how to achieve 15-25% cost savings through more effective production and use of compressed air

Pittsburgh, PA – Best Practices EXPO & Conference announced it will host the Compressed Air Challenge® (CAC) Level 1 Fundamentals of Compressed Air Systems and Level 2 Advanced Management of Compressed Air Systems training courses at their event scheduled for September 20-23, 2020, at the Schaumburg Convention Center (Chicago), Illinois.

“An important focus of Best Practices EXPO & Conference is to teach facility engineers, operators and maintenance staff how to achieve enhanced reliability, higher productivity, reduced downtime, increased product safety/quality, and greater efficiency through the optimization of compressed air systems,” says Rod Smith, Publisher, Compressed Air Best Practices Magazine and sponsor of Best Practices EXPO & Conference. “It’s a natural fit to host this training at our conference.”

Level 1 training provides 8 classroom and group project hours split into four sessions over two days (September 21-22), allowing attendees time to also participate in the Best Practices EXPO & Conference. The Level 1 Fundamentals of Compressed Air Systems course teaches participants to calculate and improve energy costs, identify inappropriate uses, establish a measurement baseline by which improvements can be measured, match system supply to actual production requirements for pressure and flow, find/fix leaks and establish a leak prevention program and better control compressed air to improve

productivity and reliability. Capacity is limited to 60 participants, seats must be reserved in advance.

Level 2 training is an intensive two-day (September 23-24) training providing in-depth technical information on troubleshooting and making improvements to industrial compressed air systems. This training is designed to help end users learn how to: Collect and use data and tools to assess the efficiency and cost-effectiveness of a compressed air system; Develop and use a system profile; Implement a system maintenance program; Address air quality, highest pressure requirements and high-volume intermittent applications; Understand complex control system strategies; Align the supply side to demand side operation; Explain the value of heat recovery; and Successfully sell compressed air improvement projects to management. Capacity is limited to 30 participants, seats must be reserved in advance.

Continuing Education Units (CEUs) are awarded for CAC training to those graduates interested in receiving them. The Fundamentals course is worth 0.7 CEUs and the Advanced course is worth 1.4 CEUs. Attendees will receive information on how to apply for credit.

Training workshops only open to distributors, engineering firm and manufacturing (end-user) personnel who are paid registrants of the full conference package. Not available to single-day registrants. For information on registration visit www.cabpexpo.com/conference



About Compressed Air Challenge[®]

Compressed Air Challenge[®] is an organization promoting energy and operational efficiency in compressed air systems for industry through product-neutral information and training, leading end users to adopt efficient practices and technologies while leveraging collaborative cooperation among key stakeholders. For more information visit www.compressedairchallenge.org

About Best Practices EXPO & Conference

Best Practices EXPO & Conference is an event devoted exclusively to optimizing onsite utilities powering modern plant automation. The event hosts more than 100 exhibitors and a multi-track conference program featuring industry experts willing to share “Best Practices” in deploying leaders who have profitably deployed energy and water conservation measures. For more information on the Best Practices EXPO & Conference, please visit www.cabpexpo.com.

Atlas Machine & Supply Selected by Sullair and Moves

Atlas Machine & Supply has been selected as the “New Distributor of the Year in North America by Sullair, a world-wide supplier of compressed air products. The announcement was made recently at Sullair’s annual distributors meeting in San Antonio, Texas. Atlas has been an authorized distributor for Sullair for less than two years. During that time, Atlas has experienced exceptional growth in selling Sullair’s industrial and commercial equipment in a widely expanded service territory.

To accommodate the growth, the company’s Compressed Air division has added two more branch locations within the past two years



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INDUSTRY NEWS

– one in Nashville, Tennessee and another in Lexington, Kentucky. Atlas also has moved its compressed air facility in Cincinnati to a larger, 27,000 square-foot facility with a better layout for storing parts and equipment, and two loading docks to better handle the ongoing expansion of the of the company's compressed air business.

Brian Tylisz, Sullair's Vice President of Commercial and Industrial Sales in the Americas, praised Atlas' success as a new supplier, saying Atlas has set the bar high for new distributors. "This award and recognition are well deserved for Atlas, and we look forward to continuing to grow our partnership," said Tylisz.

Regarding the achievement, Atlas President Richie Gimmel said, "Our employees stand out as exceptional within the Sullair channel. Our thanks for all of their hard work and dedication to our customers."

For more about compressed air systems from Atlas Machine & Supply, visit www.atlasmachine.com/air.

2020 AICD Annual Conference to Host Joe Theismann

As the AICD continues to help its members stay plugged into the compressed air industry, the AICD hosts an annual conference where members can connect and share industry experiences and learn from one another. The conference puts all of its members in one place for (3) days of learning, sharing and firsthand



The AICD will host Joe Theismann as the keynote speaker.

exposure to industry manufacturers and their products. This is a great way to keep you and your company on the leading edge of what's going on in our industry.

The 2020 AICD Annual Conference will be pulling into the Westin Savannah Harbor Golf Resort & Spa. In addition to spending time at this beautiful location the conference will host several guest speakers that will cover various topics ranging from the current / future of the economy to safety practices that will protect your company.

We are excited to announce that our guest speaker this year will be NFL Hall of Fame QB Joe Theismann. Joe will be sharing a very intuitive insight into winning, losing and preparing for the biggest game of your life. Every day is a challenge to be better, stronger and more prepared than our opponent in order to be successful. Sit in and listen to what this Super Bowl Champion has to say about what it takes to prepare for that day, show up and get the job done. Join us as we listen to a true champion share strategy and focus tactics that can help us all be successful in our very own game day.

Join us this year as we continue "Barging into Business" at the 2020 AICD Annual Conference.

About Joe Theismann

Joe Theismann is an entrepreneur and the former star quarterback for the Washington Redskins. He spent the last two decades working for ESPN on their NFL broadcast and the NFL Network. The former Washington Redskins quarterback joined ESPN in April 1988, reuniting with play-by-play voice, Mike Patrick. Theismann joined ESPN after spending two seasons as an NFL analyst for CBS Sports. A 12-year NFL veteran, Theismann played in 163 consecutive games from 1974-1985 and holds Redskins' records for passing yardage (25,206), completions (2,044) and attempts (3,602). A two-time Pro Bowl selection, Theismann led Washington to a 27-17 victory over the Miami Dolphins in Super Bowl XVII.

About AICD

In an ever changing market, the AICD exists to bring independent air compressor distributors together to share market strategies, market trends, and industry insights. These non-branded conversations foster an atmosphere of success among colleagues, rooted in the foundation of unlimited years of expertise. In addition to the great networking opportunities, the AICD provides exposure to equipment manufacturers ready to partner with independent distributors, allowing for portfolio growth. This exposure to both independent distributors and equipment manufacturers, educates AICD members in new technologies and industry best practices and encourages member growth and success. To find out more, please go to www.aicd.org.

Atlas Copco Has Acquired Hydra Flow West

Atlas Copco has acquired Hydra Flow West. The company is a distributor focused on sourcing and sales of spare parts and accessories used in compressor service. Hydra Flow West has 7 employees and is located in Walnut, California, a suburb of Los Angeles in the US.

“Hydra Flow West has built up a loyal customer base in their targeted market,” said Vagner Rego, Business Area President Compressor Technique. “Through the acquisition we will increase our presence on the US west coast and ensure timely delivery of parts,” said Vagner Rego.

The purchase price is not material relative to Atlas Copco’s market capitalization and is not disclosed. The company will become part of the service division within the Compressor Technique Business Area.

About Atlas Copco Group

Great ideas accelerate innovation. At Atlas Copco we have been turning industrial ideas into business-critical benefits since 1873. By listening to our customers and knowing their needs, we deliver value and innovate with the future in mind. Atlas Copco is based in Stockholm, Sweden with customers in more than 180 countries and about 37 000 employees. Revenues of BSEK 95/9 BEUR in 2018. For more information: www.atlascopcogroup.com.



Atlas Copco has acquired Hydra Flow West.



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PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

Sustainability is “Part of WHO WE ARE” AT EASTMAN

By Mike Grennier, Compressed Air Best Practices[®] Magazine

Eastman’s manufacturing operation in Kingsport, Tennessee, covers 900 acres.

► This year Eastman celebrates its 100th anniversary and marks its role as a leader in the chemical industry with \$10 billion in revenues. As an innovator and manufacturer of advanced materials and specialty additives found in items people use every day, there is no shortage of achievements to celebrate –

and one that stands out is its commitment to environmental stewardship.

By making sustainability a requirement and a core element of its growth strategy, Eastman (www.eastman.com) has improved the energy efficiency of manufacturing operations by 13% since its baseline year

of 2008 (the year Eastman became an ENERGY STAR[®] Partner). By 2018, Eastman had decreased its greenhouse gas intensity by 20%, two years ahead of its goal. Additionally, Eastman received the 2019 ENERGY STAR[®] Partner of the Year Award for Sustained Excellence, marking the company’s eighth



“We used to think of energy efficiency primarily as a means to save money, but that’s changed. We believe there are a lot of benefits beyond that and it’s become part of our identity.”

— Sharon Nolen, Eastman’s Manager of Global Natural Resource Management

consecutive ENERGY STAR award: two years as Partner of the Year and six years of Sustained Excellence recognition.

Headquartered at the base of the Appalachian Mountains in Kingsport, Tennessee, Eastman is committed to furthering its environmental performance with sustainability at the heart of its purpose and strategy.

“It’s an exciting time for our company,” said Sharon Nolen, Eastman’s Manager of Global Natural Resource Management. “A lot of our efforts are coming into alignment and we’re only going to increase our emphasis on sustainability.”

Sustainability Shifts into Higher Gear

Eastman has always been committed to saving energy and conserving resources. In 2010, soon after establishing baseline goals for energy efficiency and becoming a U.S. Department of Energy Better Plants Challenge Partner, these efforts expanded. The Eastman 2019 Sustainability Report is available at <https://www.eastman.com/Company/Sustainability/Reporting/Pages/References.aspx>.

Another factor driving increased emphasis in sustainability is Eastman’s refocus of a global energy team in 2010 and the naming of Nolen as global energy manager. With a dedicated

team and team leader, Eastman renewed its efforts to identify energy savings opportunities throughout its global manufacturing operations.

In addition to a highly focused approach, Nolen became active in the U.S. Environmental Protection Agency’s ENERGY STAR program. Attending program meetings and forming relationships with other companies involved in the program led to ideas and learning about new ways to turn ideas into action. Nolen points to increased employee awareness and engagement as one example of success from ENERGY STAR program participation.

“That’s something ENERGY STAR really

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Nolen Named Energy Manager of the Year by the Association of Energy Engineers

Nolen was named the International Energy Manager of the Year in 2019 by the Association of Energy Engineers (www.aeecenter.org). Nolen is the first woman to receive the award and was honored at the AEE International Awards ceremony in Washington, D.C.

Nolen said she is proud of her accomplishment and said Eastman’s commitment to environmental stewardship and overall philosophy toward protecting the environment are much like the values she learned while growing up with parents who were born during the Great Depression. Nolen’s parents taught her to:

- Help your neighbor.
- Be true to your values.
- Live within your means.
- Plan for the future.

“At Eastman, we want to provide a lot more value with the products we produce than the resources we consume,” Nolen said. “We also believe it’s important not to use more than you need to use and to make the most of what you have. When I think about our sustainability efforts and the lessons I learned when growing up, there are strong parallels.”

The future of sustainability at Eastman is bright, Nolen said.

“There is a lot of opportunity yet to capture and our company is only continuing to increase its emphasis on sustainability. I’m very excited about where we’re headed,” she said.



Sharon Nolen, Manager of Global Natural Resource Management, Eastman.

stresses,” Nolen said. “Approaches that work best for engagement are those that peak curiosity and interest. We’ve had energy fairs and a variety of events and communications to get people interested in how energy efficiency benefits our company and also how they can save energy at home.”

Nolen said it didn’t take long to generate fresh and new ideas for energy savings, especially after the company-wide commitment to sustainability gained traction.

“Any company that spends a lot of money on energy has been thinking about energy efficiency for a long time. We used to think of energy efficiency primarily as a means to save money, but that’s changed. We believe there are a lot of benefits beyond that and it’s become part of our identity.”

Switching Up the Energy-Savings Conversation

When starting her new position, Nolen identified the critical need for funding in order to turn capital intensive energy-saving ideas into reality.

“I heard a lot of great ideas from people about projects they wanted to do, but they hadn’t received funding,” Nolen said, adding how she worked to improve the program. One idea that was of particular benefit was the need to establish a corporate energy budget. Another was to change the way in which energy projects are evaluated and discussed with company executives.

“In talking with the top-level executives, I learned they like to look at things in terms of an Internal Rate of Return (IRR),” Nolen said. “So, I modified how I presented information to the executives and began to speak in those terms.”

In addition to talking the talk, Nolen walked the walk – starting at a meeting in 2011. There, she presented a portfolio of projects ranked by IRR to the executive steering committee. At the end of the meeting, the committee established a capital budget for energy projects that totaled \$4.2 million based on initiatives with an IRR greater than 23%. The IRR is a metric used in capital budgeting to estimate the profitability of potential investments.

“It was exciting for me,” Nolen said. “In a one-hour meeting, I was able to show how we could really make a difference. It wouldn’t have been possible without having established that working relationship with our company’s senior executives. Gaining a capital budget specifically for energy projects changed our conversations with manufacturing employees. In the past, we could encourage manufacturing to do energy projects, but it’s a different conversation when we can provide financial support as well.”

Annual Capital Energy Budget Totals \$8 Million

Based on proven success – and the ability to meet IRR goals – Eastman’s annual capital energy budget grew from \$4.2 million in 2011 to \$8 million today. In addition to the incorporation of energy efficiency in capital investments, Eastman’s guiding principles for managing energy efficiency include accuracy of information and the maximization of existing assets.

When planning energy projects today, Eastman aims to use the energy capital budget to fund initiatives that cost less than \$1 million and can generate an IRR greater than 20% – although there are exceptions to the rule.

“The reason we use the figure of \$1 million is because we believe it’s good to spread the money around, so the budget isn’t spent on one project or one site,” Nolen said. “We’ve made exceptions, but those are our general guidelines.”

In addition to funding, Eastman dedicates people and talent to its sustainability goals as evidenced by its global energy team of six full-time engineers. The team works closely with Eastman’s manufacturing plants to establish energy reduction goals and plan and prioritize projects. The team generally focuses on 22 of Eastman’s 51 global manufacturing plants since the 22 plants constitute the majority of the company’s energy. These plants have a local site energy coordinator

who participates in the worldwide energy team and is also responsible for overseeing energy improvements at the site.

The global energy team regularly updates each plant’s process improvement engineers, as well as other manufacturing and engineering groups, with information about innovative energy programs and best practices – and the availability of capital.

At each plant, energy consumption is carefully measured and energy surveys are conducted to identify areas for improvement, whether it’s maximizing operating efficiency or achieving energy efficiency through capital investments. Based on information gathered, the global energy team subsequently prioritizes projects



SUSTAINABILITY IS “PART OF WHO WE ARE” AT EASTMAN

based on a number of factors, including the investment required and the IRR. The team also works closely with the local plants to stimulate new ideas and assess the implementation of technologies.

“As an example, we supply our operations managers with information and data. Having that data generates questions and answers that lead to results,” Nolen said, adding Eastman invests heavily in computerized systems and metering needed for data acquisition and analysis.

Energy Projects: From Basic to Complex

At any given time, Eastman has as many as 150 energy-efficiency projects underway

at various manufacturing plants. Projects range from fundamental operational changes that save energy at little or no cost to highly sophisticated, capital-intensive initiatives.

An example of an energy reduction initiative completed with no capital cost involves a compressed air system used in a manufacturing area within the massive 900-acre plant in Kingsport.

In the manufacturing area, multiple air compressors are used to power numerous processes and machines. The production department had been utilizing the compressed air system without considering the compressor operational strategy. However, as energy-efficiency became a priority, the operations

department and production department discussed strategies to better manage compressed air for the process. The team subsequently decided to ramp up production in stages, which allowed the compressed air system to operate more efficiently. As a result, the plant saved considerable energy, while continuing to meet production goals.

On the opposite spectrum of project complexity is Eastman’s optimization of Combined Heat and Power (CHP) systems used to power various plants.

At the Kingsport plant, a CHP system supplies the operation with 90% of the power needed, while also providing steam for powering utilities equipment, including air compressors



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and refrigeration equipment. The steam is also used for process equipment and space heating. The system is very efficient and was also recognized by the U.S. EPA with an ENERGY STAR® Combined Heat and Power (CHP) Award for excellence in combined heat and power operations at its Kingsport site in 2014. EPA's CHP Partnership is a voluntary program that encourages the use of CHP to reduce the environmental impact of power generation.

To continue to achieve even more energy efficiencies, Eastman is updating the controls used to manage the system, which consists of 17 boilers and 19 turbo generators. In all, the system is capable of generating up to 200 megawatts (MW) of electricity, while also producing 3,600,000 lb./hr. of steam to meet the thermal needs of the plant.

In addition to systems optimizations, Eastman switched from coal to natural gas to fuel five of its 14 coal-fired boilers, leading to a significant decrease in the company's greenhouse gas intensity compared with the 2008 baseline.

Other energy-efficiency projects with a high IRR run the gamut from the use of variable speed drives on pumps, to a comprehensive steam leak repair program, to better insulation on miles of piping at various plants to reduce heat loss, to process optimization.

Eastman also switched out many low-efficiency light bulbs with LED lighting at several manufacturing plants. In planning the projects, Nolen reached out to her contact at ENERGY STAR who connected her with a steel company that implemented a similar program. The steel company provided information on how they approached lighting replacement projects including how they evaluated the economics and return on investment. The Eastman lighting project received approval with the help of this information from the steel company.

"You wouldn't think a chemical company and a steel company have much in common, but when you're evaluating a lighting project there's very little difference," Nolen said. "The ENERGY STAR network is extremely valuable."

Growing Enthusiasm for Sustainability

While the global energy team and local plants implement ideas for energy efficiencies, Eastman continues to look for other ways to improve sustainability. Among them are initiatives to increase water efficiencies and reduce volatile organic compounds (VOCs).

Looking ahead, Nolen anticipates increased emphasis on energy efficiency and other levers for reducing greenhouse gas emissions. She said interest and enthusiasm in sustainability at Eastman continues to grow.

"One thing that really encourages me is to see that the younger generation is very interested in sustainability along with our more experienced employees. The enthusiasm of the newer employees is contagious and also brings a fresh perspective" Nolen said. **BP**

All photos courtesy of Eastman.

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PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

Avoiding Control Gap with CENTRIFUGAL AIR COMPRESSORS

By Tim Dugan, P.E., Compression Engineering Corporation

► Have you ever wondered how to stay “in control” of an engineering organization with a fixed staff and a varying workload, where the engineers all have a mind of their own? “Herding cats” is what they call it. Of course, that’s normal, right? Well, controlling multiple centrifugal air compressors is pretty close to that model, which can lead to a condition known as “control gap.” This article discusses the reasons for control gap with centrifugal air compressors and solutions to help avoid it.

Load-leveling: A Common Management Challenge

I’ve managed the total profit and loss of several engineering service teams over the years, and one of my biggest problems has been “load-leveling” to get the optimum out of every individual and the team, given our infrastructure and logistics constraints. In other words, matching fixed staff to varying loads. The telltale that you did well is the bottom line. One “KPI” is total billable revenue

divided by total payroll and indirect plus direct costs. If that number is over 1.XX, you’re good. Another is everyone is pretty happy. So, having a good KPI is important. But what kills efficiency of an engineering team the fastest? Overworking of some team members and underworking of others. And having the wrong work assigned to each.

What if we looked at an individual sophisticated centrifugal air compressor with its own local controls as if it was an engineer? And the set



“Control gap is an effect the inability to match one air compressor’s effective and efficient flow variation to match the system’s load variation. It causes system instability and inefficiency.”

— Tim Dugan, P.E., Compression Engineering Corporation

of them as the team? When you have too many staffed versus the load, what happens in the engineering team? That depends on the mix of people, talents, experience, productivity, etc. What happens to the air compressor system? Well, that depends on the size, type, and control settings of each air compressor, doesn't it? What if the "master controller" is just the operator telling them to run, like the manager telling them to be "at work" and letting the work randomly come in the front door.

What happens if the total capacity online or the staffing level is too high? Physics takes over, just like economics does in the team. It will only take so much of your output that month. You might work one of them to the overheating point and push the other two back to inefficient and unproductive levels. One might not know the word "no" and always is swamped. Another might have a good idea of how to act like he's working, just to keep steady, and blow-off what he doesn't produce. "Don't bug me with more work – I'm swamped!" they say. That's like the constant pressure control air compressor in blow-off. Others will try to be effective and beat themselves up. They'll respond to their inbox or the latest crisis, crank out a deliverable in no time, then sit and spin their wheels, bugging their coworkers with questions, and being a pain in general. Then, when the next task comes, go full on and crank it out at 110% effort and do it over and over. That's the load-unload with surge.

What Exactly is Control Gap?

Given these scenarios, how would the manager know what was really going on? Measurement at the staff level is important, coordinated with total measurement at the team. The same with the compressed air system. How would she fix the problem? First, figure out the root cause, then fix it. What is

the real problem? *It is the inability of one worker to pull back and ramp up enough to compensate for the variation of the team.* He's one person, doesn't even know what the total load is, and the variation is more than him. And he can't be just "shut on and off" all the time. When he spins his wheels, and that still doesn't adapt to the team load, the guy in the next cube gets slowed down. The fundamental reason he can't match load is no different than a centrifugal compressed air system suffering from control gap.

Control gap is an effect the inability to match one air compressor's effective and efficient flow variation to match the system's load variation. It causes system instability and inefficiency. It is caused by air compressor size and turn-down challenges, combined

with the wrong control algorithm and setting. It's the mismatch of people to load variance, and the wrong management methods to balance load.

Specific control gap problems in centrifugal compressed air systems include:

- Staying out of blow-off in a multiple centrifugal compressed air system with varying load, when load varies more than the upper throttle range of one air compressor.
- Avoiding instability and surge when trying to adapt to varying load with only one centrifugal air compressor in a set at a time.

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- Attempting to parallel modulate, or “load-share” a set of centrifugal air compressors.

In summary, the problem is to match the system variation (in change of flow) to an efficient and stable air compressor set in all load ranges. The “control gaps” are the flow ranges where a good match is not found, and either instability or blow-off occurs.

Compressed Air System Examined

Let’s look at an example centrifugal compressed air system to illustrate how and when control gap occurs.

Suppose you have four, 3,600 scfm air compressors, and demand shifts between 10,000 scfm (2.8X each compressor’s capacity) to 12,000 (3.3X each compressor’s capacity). See Figure 1. With local controls, you can control the system in one of two ways. Either in “cascade” control, with the

last unit on taking part-load, or “load-shared” with all units parallel modulating at about the same pressure. In reality, the latter is almost impossible to accomplish with local controls only. But even if possible, the system part-load swing is the upper modulation range of the trim air compressor(s). In cascade control, it is about 30% of one air compressor, a 1,080 scfm range. That gives a very narrow ranges for efficient turndown, from 9,720 to 10,800 scfm or 13,320 to 14,400 scfm. In parallel modulation, the optimal turndown of the set is 30% of the total, a much larger 4,320 scfm range. If combined modulation was possible, it would allow the system to vary from 10,080 to 14,400 scfm and be fairly efficient as shown in Figure 1.

The system flow variation is pretty much within the turndown range in load-sharing, but in the bad area where blow-off has to occur in cascade control. The mismatching of the available efficient turndown on inlet guide vane (IGV) modulation and the actual system

variation is control gap. If cascade control is used and the centrifugal trim air compressor was put into “auto dual” control (upper range modulation and unloading), it would cycle excessively. So that is avoided by controlling with “constant pressure” (upper range modulation and lower range blow-off) control, and blow-off happens.

Initially, three of the four air compressors were operating in parallel, feeding two parallel regenerative dryers, with local constant pressure points. They were sharing the load fairly well. There was minimal blow-off (less than 10%). The fourth air compressor was isolated to its dryer and blowing off a bit more. Total waste was about \$50,000 per year. Expensive control panel retrofits were done, which improved local control. However, they staged the three air compressors (“cascaded” the setpoints). This full-loaded the first two air compressors but caused the third (isolated still) to cycle and surge. Waste was now \$80,000 per year. See Figure 2.

The alternative of automatically starting and stopping a centrifugal air compressor (like a screw air compressor control system – a “target sequencer”) was not considered because of air compressor size and slow start-load time. Why was more blow-off happening with modern controls? The answer is control gap. The effective and efficient ranges were limited, and not where the demand was.

Unraveling the Root Causes of the Problem

The example above can be used to unravel the root causes of control gap. In this case, cascaded control settings forced one air compressor to play the “trim” role, and it could only trim in the upper 30%. Demand was in the other lower range (less than 3.1 X air compressor’s capacity), requiring the

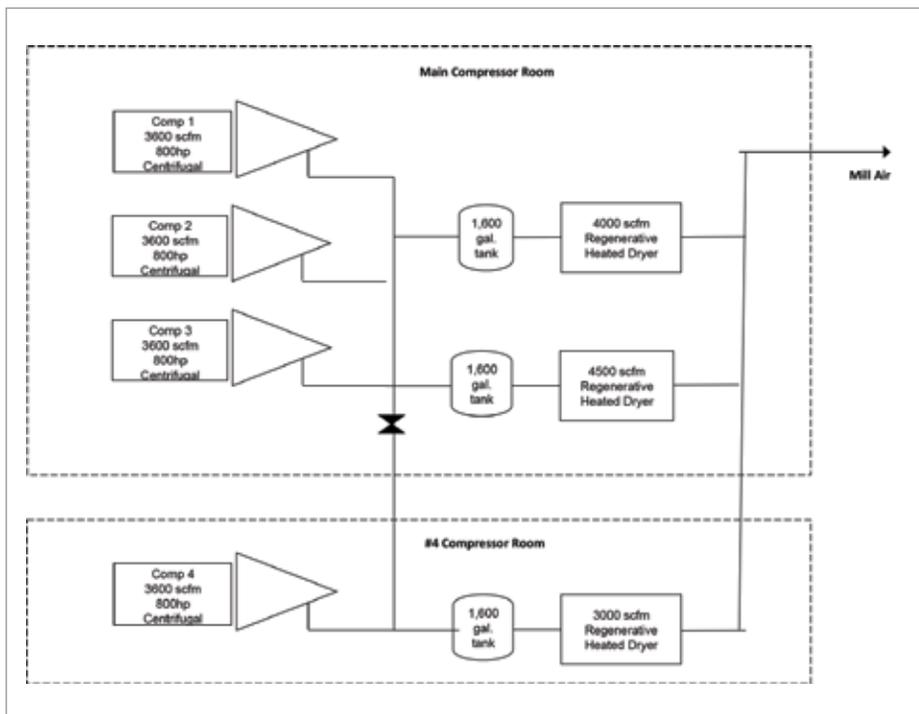


Figure 1: System before improvements.

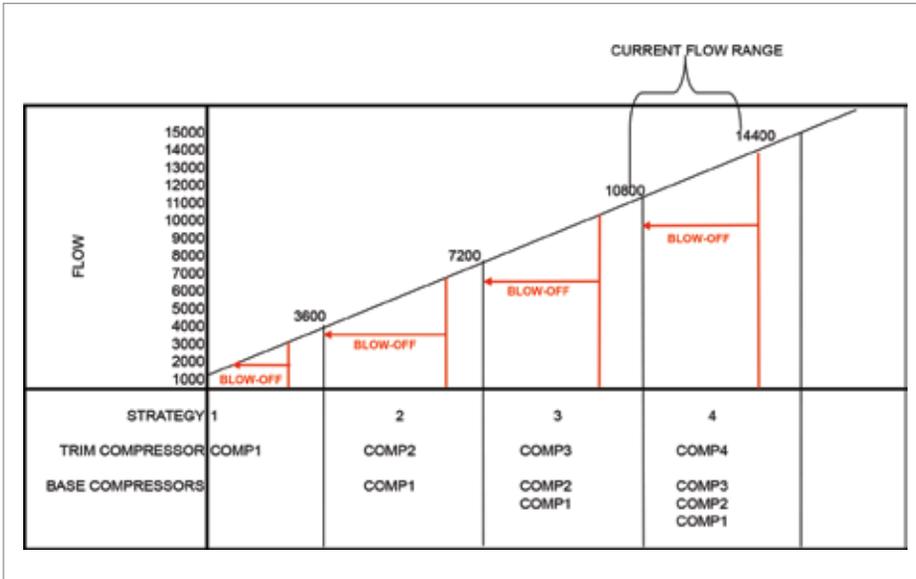


Figure 2: Control strategies before improvements.

fourth air compressor to blow off. Even if the following problems were fixed, there would be significant blow-off. System demand was just barely below three air compressors 95% of the time (about 2.9 to 3.0 air compressors) but regularly jumped over three units.

Piping and dryer pressure drop, along with partial segregation of one air compressor, also made controls coordination difficult. Air compressors No. 1 and No. 2 can't deliver full air, because the line between them and air compressor No. 4 is too small. When both air compressor No. 1 and air compressor No. load up, the pressure drop across their dryer spikes and air compressor No. 1 has to unload (and surges also). Storage is inadequate with three, 1,600 gallon receiver tanks before the dryers, including two for air compressors No. 1 through No. 3 and one for air compressor No. 4.

Now let's look at what might happen in this actual system if demand increased from 2.9 to 3.1 air compressors and cascade control is still used:

- Assume the valve is open between air compressor No. 4 and the rest of the system, the piping is adequate, and we are merely staging the air compressors in a "cascade" manner: 94 psig, 92 psig, 90 psig, and 88 psig are the start points of the four air compressors. Their pressure control points inlet guide vanes (IGVs) are five psi over that, 99, 97, 95, and 93 psig. Blow-off Valve (BOV) setpoints to protect from surge are five psi higher, 104 down to 98 psig. In reality, minimum power protects from surge also, so it is more complicated.
- When the demand slightly exceeds the three air compressors' capacity, say going up from 10,400 scfm to 11,000 scfm, and three air compressors were running, the IGVs would incrementally go to 100% slowly, pressure would drop to 88 psig and the fourth air compressor would start.



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- The size of the receivers and the size of the air compressors create a pressure rate of change event. The pressure quickly rises because 14,400 scfm is being delivered, 3,400 scfm more than needed.
- Rate of change = air compressor capacity (scfm) / [(tank size, gal) / 7.5] X 15/60 psi/sec.
- For a 3,400 scfm event, and this system which has three, 1,600-gallon tanks, the pressure rate of change is 3,400 / [(4800/7.5) X 15/60], which is about a 1.3 psi/sec rate of change. The first part of pressurization is 3 X faster,

when the pressure ahead of that air compressor's dryer is lower than system pressure, and the dryer is acting as a check valve. Only 1,600 gallons of the storage is effective for that time.

- Proportional and integral settings on the IGVs are set much slower than that, so the pressure rises quicker than the trim air compressor can react and hits the BOV maximum pressure point before the IGVs can react and control pressure. Power drops slower than the surge controls can work, and the air compressor surges. The dryer dynamic pressure drop was part of the problem.

- The cycle keeps going as shown in Figure 3. The cycling of air compressor No. 1 is primarily due to control gap. The upper modulation control range is only 1,080 scfm and is less than the system flow variance. It doesn't match either.
- The cycle keeps going and going and going ...

Two Solutions for Fixing Control Gap

Now that we've seen how and why control gap can happen and problems it creates, let's look at options to fix it.

One option involves load-sharing controls without a new trim air compressor. This can

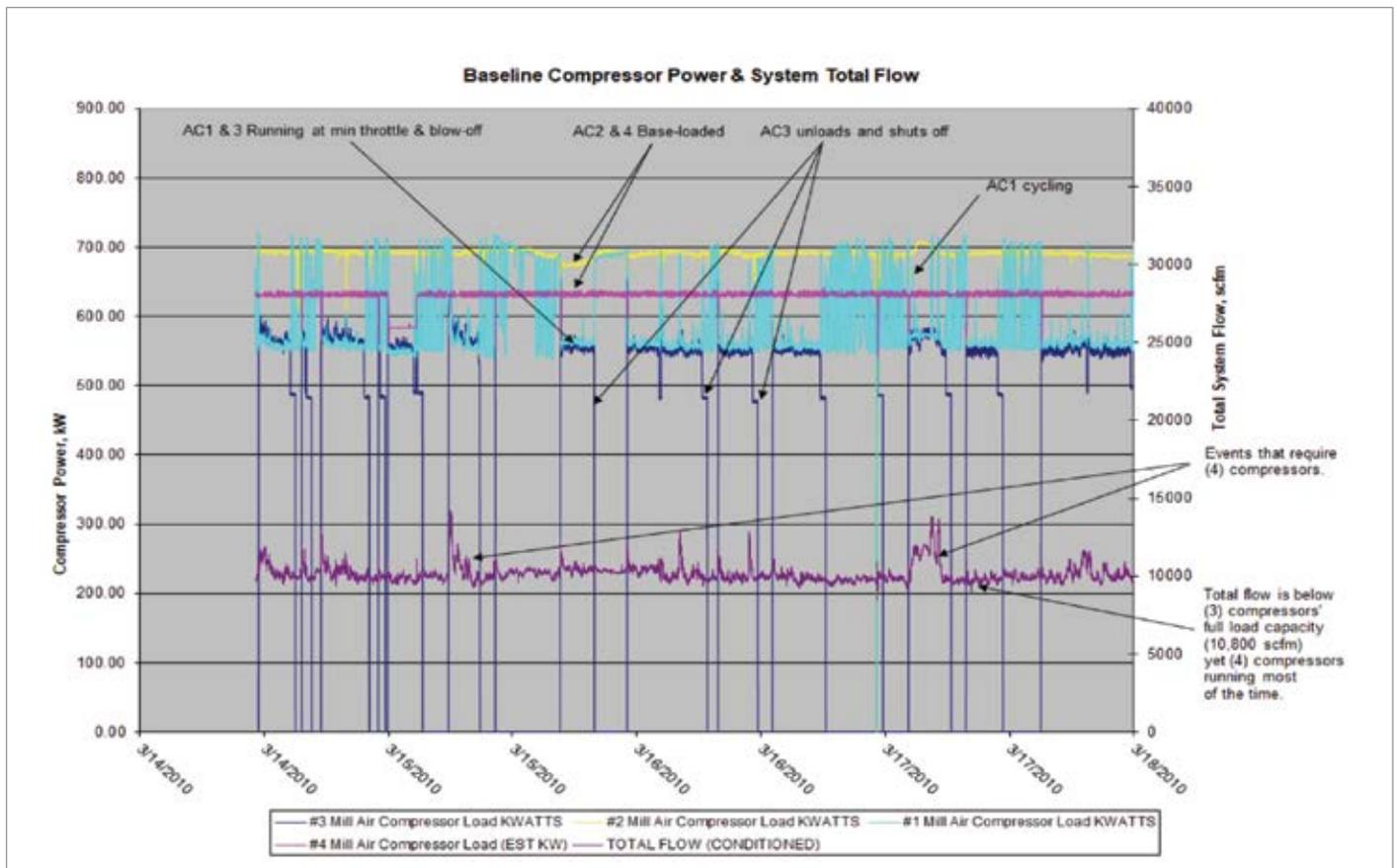


Figure 3: System operation before improvements.

make all the air compressors control together like a set, minimizing blow-off. See Figure 4, which describes the following steps:

1. Increase line size on wet and dry side.
2. Increase storage. Calculate storage based on tested control response that air compressors can achieve.
3. Balance dryers.
4. Add master control: Implement “load-sharing” controls – several options:
 - Have local control panels integrated with a master controller that understands their distance from surge line, and parallel modulate them to be equidistant from surge.
 - Use existing control panels and bump the air compressor setpoints to keep the air compressors approximately balanced in load. One method is to pick one at a time to
5. When all running air compressors are at the minimum load position and below a flow threshold you know can be delivered by three air compressors for a period of time, one air compressor can be unloaded. Since storage is enough and air compressor response time is fast enough, the remaining air compressors open up and pressure is maintained. Then that air compressor can shut off after its unloaded timer expires.

The advantage of this solution is that it offers a lower cost than adding trim air compressor(s). There are several disadvantages, including

be “trim.” When it gets to minimum IGV position (at the surge offset) and load is dropping, shift trim to the next air compressor, and modulate it to minimum, and then the third, and then the fourth unit. Attempting to change all four to balance at the same time would probably be unstable.

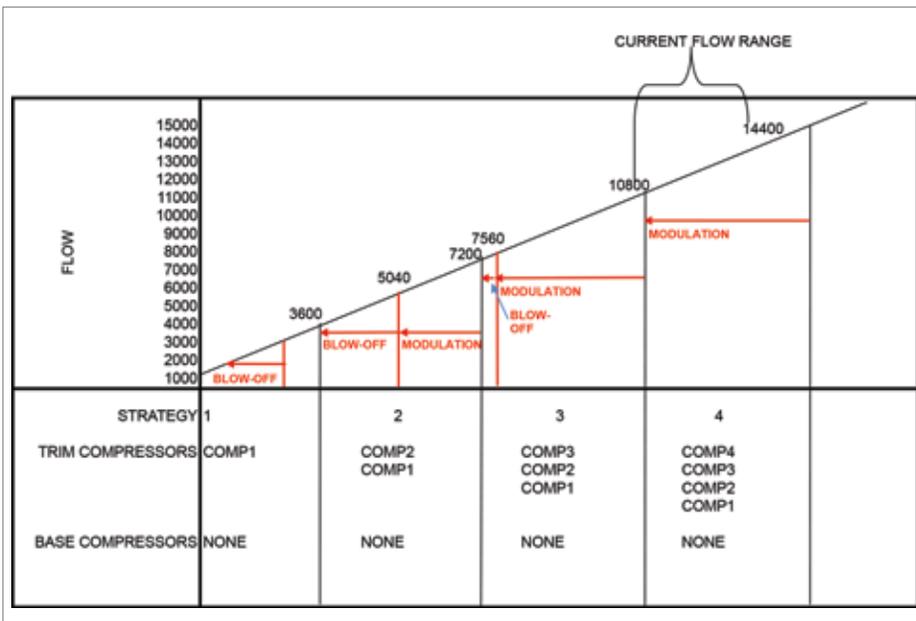
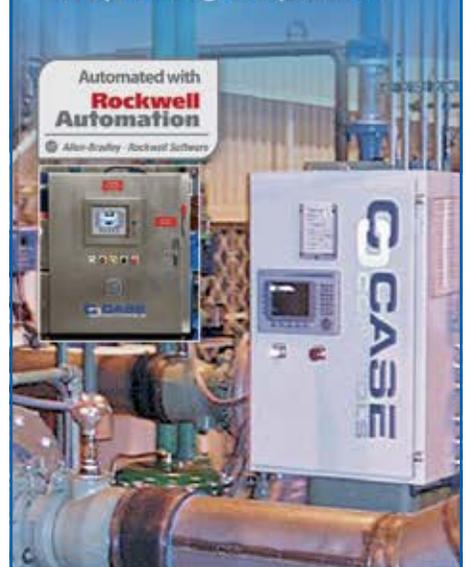


Figure 4: Control strategies after improvements, pure load-sharing.

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efficiency drops when operating close to the surge line, and at 10,000 scfm with four air compressors, the system will be right at minimum throttle. In addition, the system has no standby capability.

A second option to resolve the control gap issue is to use a hybrid load-sharing and a trim air compressor. This can compensate for most of demand variance with a smaller, faster trim air compressor, and in “gaps,” load-share the centrifugal units. See Figure 5, which describes the following steps:

1. Open line between all air compressors.
2. Increase line size on wet and dry side.
3. Increase storage.
4. Add 500 horsepower (hp) load-unload screw air compressor.
5. Balance dryers.
6. Add master control: Implement a hybrid system, incorporating both centrifugal/screw base-trim and “load-sharing” controls. Use a third-party controller that performs one of two algorithms, depending on flow range.
7. Base-trim: Base load X centrifugal air compressors and trim the screw air compressor.
8. Load-sharing: To avoid “control gap” when flow is in the 70 to 100 percent of the centrifugal air compressors online, load-share the running centrifugal air compressors. When all running centrifugal air compressors are at the minimum load position, an air compressor can be unloaded. Then, the centrifugal air compressors will fully load and the screw air compressor will start and carry the difference. Then that air compressor can shut off after its unloaded timer expires.

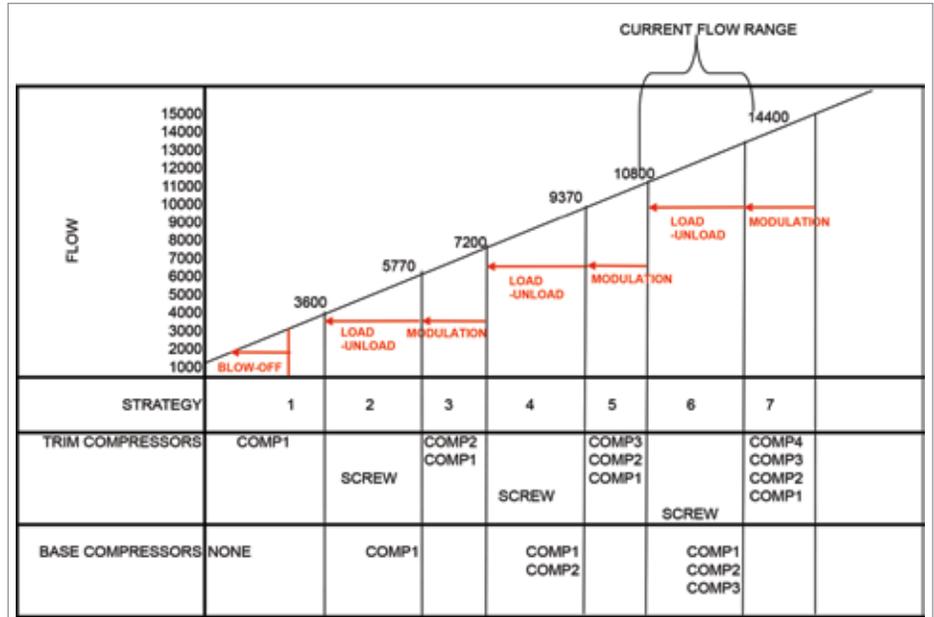


Figure 5: Control strategies after improvements, hybrid system with 500 hp trim air compressor.

One advantage of this method is that it’s more efficient than running all four centrifugal air compressors. The unloading losses of one smaller screw air compressor (about 20% of 500 hp less than half the time) are less than the losses for running four air compressors at minimum load (about 10% of 3,600 hp). This method also provides one back-up centrifugal air compressor. The downside of this solution is that it’s more complex and costly.

One company I’m familiar with actually implemented a hybrid system and was very successful in doing so. The added benefit of having a standby centrifugal machine drove the project. A new dryer was installed also to reduce pressure differential and allow one to be shut off for maintenance at a time. The screw air compressor ended up fully loaded rather than loading and unloading. But it still worked well, eliminating control gap, saving

\$100,000 per year just in electricity, and netting an incentive check of \$394,000!

A Happy Bottom Line

Avoid control gap by good management. Develop the proper master controls and system configuration to balance the air compressors with parallel modulation, or to bring in a new trim air compressor, or a hybrid of both. In any case, match the efficient and effective air compressor selections and control modes to the actual flow variances that could happen in any scenario. Costs will be minimized, and reliability maximized. Your team will be happy and so will your bottom line! **BP**

For more information about this article, contact Tim Dugan, President of Compression Engineering Corporation, tel: (503) 784-2331, email: Tim.Dugan@comp-eng.com, or visit www.compression-engineering.com.

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QUALITY, SAFETY & RELIABILITY

IUE-CWA Labor Union Members EMBRACE ENERGY TREASURE HUNTS

By Mike Grennier, Compressed Air Best Practices® Magazine

The IUE-CWA Energy Treasure Hunt team conducts a recent energy treasure hunt at Northstar Aerospace Inc. in Bedford Park, Illinois.

► Manufacturers familiar with the U.S. Environmental Protection Agency (EPA) ENERGY STAR® Energy Treasure Hunts initiative know it's a great way to save energy and natural resources – as long as it's done right – which is why some are turning to perhaps their best asset to achieve success: their unionized workforce.

Such is the case with energy treasure hunts led by the IUE-CWA. The IUE is industrial division

of the Communication Workers of America labor union. The IUE represents over 45,000 manufacturing and industrial workers in a wide range of industries including automotive, aerospace, furniture, and appliances.

IUE-CWA Energy Treasure Hunt Coordinator Bill Draves said companies who don't already engage union employees have come to value how someone working on the plant floor can contribute to a successful effort. Equally

important is how production employees appreciate the opportunity to make a difference.

“After the process of an energy treasure hunt gets going employees who work on the floor often say, ‘Oh man. There’s a lot of money here to be saved.’ They soon realize they’re empowered to do something about it and take part in a project that contributes to everyone’s success. Their involvement in energy savings, as with others throughout a company, is critical.”



“Our mission is to add to the bottom line of the plant and we’re going to help preserve jobs. That’s the premise.”

— Bill Draves, IUE-CWA Energy Treasure Hunt Coordinator

Overcoming the 'Fear Factor' to Save Energy

Since 2011, the energy treasure hunt team at IUE-CWA has worked side by side with manufacturer after manufacturer to help implement successful treasure hunts and identify annual energy savings opportunities ranging from \$50,000 to \$500,000 at each operation.

While the concept of using union members to conduct energy treasure hunts is usually welcomed with open arms there are some companies who are initially hesitant to do so, Draves said.

“The fear factor is that it’s a union project, which stems from false expectations and the history of unions and management relationships at different companies during different times,” he said. “But after we get the process going, decision-makers start to see there’s nothing behind it except to make the company more profitable. That’s when the proverbial lightbulb goes on and they start to say, ‘Wait a minute. This isn’t fairytale stuff. It’s real.’ ”

There are also times, Draves said, when the lightbulb goes on immediately after the IUE-CWA team first explains the purpose of the initiative and how it works.

“We like to make it clear, we’re here to help. We’re looking to make the plant better and to save money,” he said. “Our mission is to add to the bottom line of the plant and we’re going to help preserve jobs. That’s the premise.”

Pilot Project Leads to IUE-CWA Program

The IUE-CWA energy treasure hunt program started when the team began working with the Environmental Defense Fund (EDF) and Bruce Bremer of Bremer Energy on a pilot program at a manufacturer in Ohio.

On the project, the IUE-CWA team worked hand in hand with Bremer, a pioneer in energy treasure hunts who is credited with leading the development of the foundation for the program. To read more about Bremer and the genesis of energy treasure hunts, visit <https://www.airbestpractices.com/energy-manager/corporate-sustainability-programs/culture-building-energy-star%2%AE-energy-treasure-hunts>

IUE-CWA Lead Trainer Ken Hess said the pilot project pointed to an excellent opportunity for both the union and member companies.

“The first pilot project was an eye-opener,” Hess said. “What caught my attention was the ability to identify and quantify wasted energy and put it into dollars and cents that everyone can understand.”



IUE-CWA Energy Treasure Hunt Coordinator Bill Draves.

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IUE-CWA LABOR UNION MEMBERS EMBRACE ENERGY TREASURE HUNTS

Hess said most plants the IUE-CWA team partners with already understand how compressed air represents low-hanging fruit for energy savings. But there's much more to it, he said.

"Compressed air is kind of a no-brainer as far as energy savings, but most don't understand the cost behind it. When they do, it's one of those ah-ha moments. But you can't just focus on compressed air

since there's many more opportunities with different systems," Hess said.

After completing the initial pilot phase with the EDF, the IUE-CWA committed program resources to conduct energy treasure hunts on a regular basis at small- to mid-size manufacturing plants who employ IUE-CWA members. Today, the IUE-CWA energy treasure hunt team is comprised of Draves, Hess, and two other IUE-CWA members, Sean Diglaw and Jon Parkhurst.

The overriding goal of the program, which is funded by union dues, is to teach hourly workers and decision-makers the many easy ways to identify no- and low-cost energy savings opportunities with immediate or short-term ROI and implement successful initiatives. Opportunities for energy efficiency are found in operational areas and all plant utilities including compressed air, chilled water, water, steam, and lighting, as well as electricity and natural gas.

Recycled Aluminum Manufacturer's Energy Treasure Hunt Yields \$147,000 in Savings

IUE-CWA partners with as many as 10 manufacturers each year to help launch EPA ENERGY STAR® Energy Treasure Hunts. Many have gone on to achieve tremendous success, such as a manufacturer of recycled aluminum cans and bottles on the East Coast. The company's commitment to sustainability, combined with IUE-CWA energy treasure hunt initiative, led to \$147,000 in savings in energy, water and natural gas consumption.

Since aluminum is renewable material, the manufacturer has always made sustainability a priority. Yet its sustainability efforts reached new heights when it worked with IUE-CWA to implement focused energy treasure hunts.

The combined IUE-CWA and manufacturer energy treasure hunt team immediately identified the potential for substantial energy savings associated with the plant's compressed air system, which consists of six air compressors rated at 400 horsepower (hp) each.

One of the first opportunities for energy savings with the compressed air system was also an obvious one, said IUE-CWA Treasure Hunt Coordinator Bill Draves.

"The facility maintained its plant-wide system pressure at 105 psig, even though the plant only needed a maximum of 80 psig to power equipment," Draves said. "As with all energy treasure hunts, we challenged the practice and asked the reason for the unnecessarily high pressure. And what we learned is because it was always done that way, which is not unusual for us to hear. It's also something that can often be easily addressed."

In addition to maintaining high pressure to meet artificial demand, the team identified numerous compressed air leaks in the plant. It also learned it didn't need to use compressed air to activate numerous devices used to channel materials in various directions as it traveled along conveyors. The team also noticed a number of air-powered tools without proper regulators.

To address the issues, the plant reduced system air pressure to 92 psig incrementally and did so without interrupting production. It also fixed many of its compressed air leaks and used mechanical methods instead of compressed air to activate devices on some of its conveyors. Additionally, it installed fixed-pressure regulators on

various production tools. The effort netted \$69,000 in energy savings. The plant was also able to take two air compressors offline and place them in reserve versus running them regularly.

The energy treasure hunt team didn't leave off at compressed air energy savings. It also assessed the plant's water use and found it could save millions of gallons of water by reducing water used for cleaning sludge pits rather than flushing it down the drain. The water initiative shaves \$22,000 off the plant's water bill each year.

The same energy treasure hunt revealed how the plant could lower the setpoint for natural-gas ovens used for curing paint and save \$51,000 in energy costs. Like many, the facility also installed energy-efficient lighting to save \$5,000 per year in energy.

"This plant is just one example of how it's getting easier for the IUE-CWA energy treasure hunt team to show what we can do for plants that employ our members," Draves said. "When we share successful stories like this it doesn't take long before they see this is a really good program."

Energy Treasure Hunt Techniques that Work

The IUE-CWA team uses a variety of proven and unique methods and techniques to ensure successful launches of energy treasure hunts. One technique is to set clear expectations, said Draves.

“The engineering manager or plant manager we’re talking with is a person who wears many hats,” he said. “The first thing they often think of when we talk to them is, ‘Oh, Good gosh. I can’t take on more work.’ But then we make our purpose clear, which is to take a lot of that extra work out of it for them.”

The team also stresses the ease of which energy treasure hunts are conducted and the free tools available, such as the EPA’s Detail Sheet, which is an Excel spreadsheet designed to help easily quantify energy-savings opportunities.

Most IUE-CWA led energy treasure hunts start on a Saturday or Sunday with a walk-through audit of equipment and processes when production and energy use is lowest. The walk-through identifies areas of opportunity. The team then follows the established process for energy treasure hunts, including a three-day workshop and subsequent recommendations and various follow-up activities.

Draves said the importance of involving cross-functional teams in energy treasure hunts cannot be understated. He said inclusion of people who work in production day in and day out is especially important.

“The guy on the floor sees things at a granular level. He knows how production flows in his department as good if not better than anybody. He’s the guy who hears the compressed air leak hissing, or questions why the plant doesn’t shut down a machine when it’s not used. His participation is invaluable,” he said.



Ken Hess, IUE-CWA Lead Trainer.

Draves said involving managers, maintenance staff and skilled tradesmen throughout any given plant is equally vital.

“At the managerial level, they understand the dollars and cents of energy and the importance of energy-savings from a 10,000-foot view,” he said. “At the same time, the maintenance and skilled trade people see things managers never see that need to be addressed. Everyone sees the plant and the energy use through a different set of eyes.”

The IUE-CWA team also works to instill other best practices for successful energy treasure hunts. Examples include sharing realistic dollar figures for energy savings with decision-makers, rather than overpromising; taking a few minutes or more to discuss energy-savings opportunities during already-scheduled team meetings, such as safety or Kaizen meetings; sharing data in relatable terms, such as saving enough water to fill an Olympic-sized pool; and

thinking twice about purchasing equipment based on the lowest price without factoring in its energy efficiency rating.

Another proven technique is to embed the concept of energy treasure hunts in the company culture at every level to keep energy savings top-of-mind and to ensure everyone at the plant takes ownership in it.

“The plant manager might be able to make the program run really well,” Draves said. “But if that person leaves the position for any reason it might not have the legs to continue. That’s why having a good cross-section of people on the team is key. They’ll keep it going as long as they’re getting results.”

Controlling Energy Costs: A Change for Good

Draves and Hess said they are seeing more manufacturers becoming aware of the need to adopt initiatives aimed at saving energy and natural resources. A priority for the IUE-CWA energy treasure hunt team is to spread the word about the value of sustainability best practices.

“For a long time, many American manufacturers have looked at energy as a given and a cost of doing business. They just pay the utility bill,” Draves said. “Yet these same manufacturers have always focused on controlling the cost of materials, controlling the costs of shipping and controlling the costs of labor. They somehow forgot to control energy costs. We’re hoping to affect change and help them do that.” **BP**

For more information about IUE-CWA-led energy treasure hunts, visit <https://www.iue-cwa.org/treasure-hunts>.

All photos courtesy of IUE-CWA.

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QUALITY, SAFETY & RELIABILITY

Protect Profits with Compressed Air LEAKAGE BEST PRACTICES

By Ron Marshall, Marshall Compressed Air Consulting

► We all hear it time and time again, leakage reduction is one of the first things we can do to reduce compressed air system electrical costs. Yet almost every industrial compressed air system assessment finds high levels of leakage, and too often plant maintenance staff are fully aware they have a problem but fail to act.

This condition is so very common it results in millions of dollars of wasted power all across the world. This article discusses leak assessments and the barriers to effective leak management. Some best practices will be discussed as suggested tips to help you get the most of your leakage reduction efforts, should you choose to act.

Leakage Levels of 80% Not Uncommon

Many years ago, detailed studies of hundreds of industrial sites were done by the U.S. Department of Energy and it found that only 50% of all the compressed air produced in the average plant is used wisely. The other 50% is consumed through higher airflow caused by high pressure (called artificial demand), lost through inappropriate use, and wasted by general leakage. The average leakage level was found to be between 20 and 30 percent of the total. (Source: www.compressedairchallenge.org.) Experienced leak auditors will tell you some plants waste far more than average, with leakage levels of over 80% not uncommon.



“Key to managing system waste is to do regular compressed air leakage assessments.”

— Ron Marshall, Marshall Compressed Air Consulting

Typically, plants with very large compressed air systems, ones that might be oversized for the current production levels, have less worry about large leakage levels because they have more capacity to waste. For this type of plant, levels of 40 to 50 percent or higher will not usually affect the compressed air system pressure at all, because they have lots of spare capacity.

It is very common to see industrial plants with extremely tight maintenance budgets and a shortage of maintenance staff. As a result, routine maintenance falls by the wayside and only priority breakdown maintenance is done. Leakage management becomes a lower priority because the wasted compressed airflow typically does not cause any immediate problem unless it becomes extreme. Many times, there is no regularly scheduled leakage management program programmed into the plant work management system. And often the employees responsible for any leakage repair have little or no awareness of the high cost of the compressed air waste, nor are they aware of the changes to this airflow month-to-month.

The Cost of Leakage

Compressed air is a very costly way to transmit energy to industrial machines and processes. It usually takes between seven and eight horsepower (hp) of input energy to produce one hp of work at the end use. This high cost also makes it very costly to waste compressed air. For a compressed air system running at its peak efficiency, 24 hours/day, seven days a week, consuming electricity worth 10 cents per kilowatt hour, even a leak sized at 1/16th of an inch, which is a hole smaller than the head of a match, will consume over \$1,000 worth of electricity per year.

This cost becomes even greater if the system pressure is jacked up to overcome system pressure loss, or to compensate for transient low-pressure events. It can be seen in Figure 1 that the flow of compressed air increases as higher pressure is applied to a constant sized leak. The relationship is about 1% more airflow for every one psi in higher pressure. If the air compressor discharge pressure is increased at the

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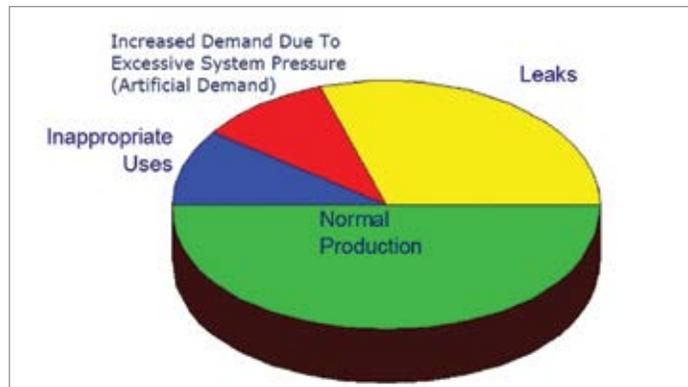
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same time, the power consumed by the air compressor per unit of compressed air output also goes up by 1% for every 2 psi in pressure increase.

The costs shown in Figure 1 are for a compressed air system running at 18.4 kW per 100 cfm, which is below average for a typical compressed air system. Often the system air compressors will be running above 25 kW per 100 cfm due to poor air compressor control mode choices, which significantly increases the cost of leakage shown in the table.

Poor control might limit the savings achieved by leak reduction efforts due to poor system power turndown characteristics. Figure 2 shows the problem: If a compressed air system is operating on Curve No. 1 or Curve No. 2, the power reduction as the airflow reduced is limited to only about 3% for every 10% reduction in leakage airflow. Best practice



Leakage accounts for between 20 and 30 percent of the total compressed air demand in an average plant. Experienced auditors report levels of up to 80% in some poorly performing plants. Image source: Compressed Air Challenge.

Size	Air Flow	Cost per year
1/16"	6.49 scfm	\$1,050
1/8"	26.0 scfm	\$4,190
1/4"	104 scfm	\$16,760

	1/64"	1/32"	1/16"	1/8"	1/4"	3/8"
70 psi	.300	1.20	4.79	19.2	76.7	173
80 psi	.335	1.34	5.36	21.4	85.7	193
90 psi	.370	1.48	5.92	23.8	94.8	213
100 psi	.406	1.62	6.49	26.0	104	234
125 psi	.494	1.98	7.90	31.6	126	284

Figure 1: At 8,760 hours per year and 10 cents per kW an efficiently operated compressed air system will consume the airflow and cost listed in the upper table while running at 100 psi. The bottom table shows the effect of increased pressure on leakage airflow.

would be to have a system control characteristic very near Curve No. 4, which is near a 1:1 ratio of power reduction for reduction in airflow.

Challenges Preventing Leakage Repairs

When asked if he had repaired any of the 170 leaks detected in a recent assessment, one client answered this way, "No, not even one.... Problems in scheduling work, overloaded people, and overspent budget money all prevented any action. And the question came up, 'Does it cost more money to fix it than it is worth?' This was hard for me to answer."

A leak detection and repair service provider said this about typical plant repair efforts, "Don't get me started about leak repairs! We've had some spectacular success...because we took responsibility for the leakage survey. We've also had some spectacular failures. By far the biggest issue is that there is almost never any money allocated to the end-user maintenance budgets for leakage surveys or repairs. And if assessments are done, the repairs will always be much more costly than the leakage survey, but with no allocated budget there will be few or no repairs done."

Too often when a leak auditor shows the client their leakage detection equipment the maintenance staff will root in their tool cabinet to find a dusty, top-of-the-line leak detector, purchased years ago, but sitting unused in its storage case. The staff will cite lack of training, instrument complexity, and a shortage of time for reasons why they never use this expensive equipment.

Obviously, getting leakage repaired after the detection effort is done is extremely challenging and sometimes frustrating in today's economy. But, where many plants fail, others do extremely well in managing their leakage levels. The latter plants are the ones using best practices.

Four Best Practices Leakage Assessment Steps

In conducting leak assessments four important steps come up when researching the practices of the best performing industrial plants. These are:

1. Baseline and monitor: The best plants keep track of their leaks with flow meters and are able to identify where they are at and how much they have saved each time they do their leakage assessments.
2. Proper tools for the job: Top-performing plants have an excellent set of ultrasonic detection tools at their disposal, with available staff trained on the use of the devices. There is a wide range of available leak detectors out on the market, from basic small budget units costing less than

\$500 to top-of-the-line units costing over \$10,000. For compressed air leakage auditing it is usually best to use simplified leak detectors of mid-range cost. Very complex detectors designed for other ultrasonic work are often so complex they defend themselves from use, therefore staff with rarely want to place these into service.

3. Detect, document and fix: Best-practice plants have a simple set of procedures in place where leaks are detected and tagged with brightly colored identification. The leaks are all documented and recorded in a database with accompanying photographs so the location can be easily found again and the required parts for repair procured. Staff are all trained on the cost of leakage and the use of leakage detection equipment. The database will provide an ongoing record of the trouble locations and the financial savings, which is available for staff and management. In all cases, a successful program requires someone to take responsibility for the follow-up of the leakage repair.

4. Verification: Excellent leakage reduction programs ensure the results of the leakage repair is captured by some sort of easy to use monitoring system, with real savings calculated. This can go a long way in proving to management the benefits of spending the staff time in repairing the leaks. The monitoring systems can also serve as a catalyst to further efforts. If the plant leakage level is regularly monitored, and a significant change is detected, emergency detection and repair efforts can be initiated.

Addressing Leaks: Best Practices Examples

There are a number of superior compressed air leakage management programs running in plants that can be used as examples to follow for success, some of these have already been written about.

A past article published in Compressed Air Best Practices Magazine, entitled “Compressed Air Training; It’s a Gold Mine!” showed the benefits in training plant staff about the high cost of compressed air and

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what to do about it. (The article is available at www.airbestpractices.com/system-assessments/leaks/compressed-air-training-it%E2%80%99s-gold-mine.) In the article Andrew Cooper, the plant site's award-winning Energy Manager, describes how he trains each and every employee about the efficiency of compressed air and how they can help reduce system waste. His plant maintains a leakage tag board that assists in identifying individual leaks for not only the compressed air, but also other utilities such as steam and water.

With a large group of trained employees Andrew now has hundreds of partners to help him find and detect costly system waste. Andrew has had many of the key staff attend the Compressed Air Challenge's (CAC) Fundamentals and Advanced Compressed Air Systems trainings. Recently CAC has developed a new, one-hour awareness training session called "Compressed Air: It Isn't Free," that can be self-administered and delivered by plant staff. This is something all plants should consider delivering to their production line staff.

As another example, a very good compressed air maintenance program is being delivered by Monarch Industries in Winnipeg, Canada. This company is one where plant management holds a keen interest in reducing compressed air costs. They offer some important key points to their success:

- Monthly auto-generated work order to audit the facility (using ultrasonic leak detection equipment).
- Identify leak locations with red tags and assign responsibility to repair.
- Supply lines to all equipment distribution points are hard-plumbed with shutoff valves to prevent main supply leaks.
- Machine operators are encouraged to report leaks.
- Elimination of quick couplers where possible (crimp fittings only).

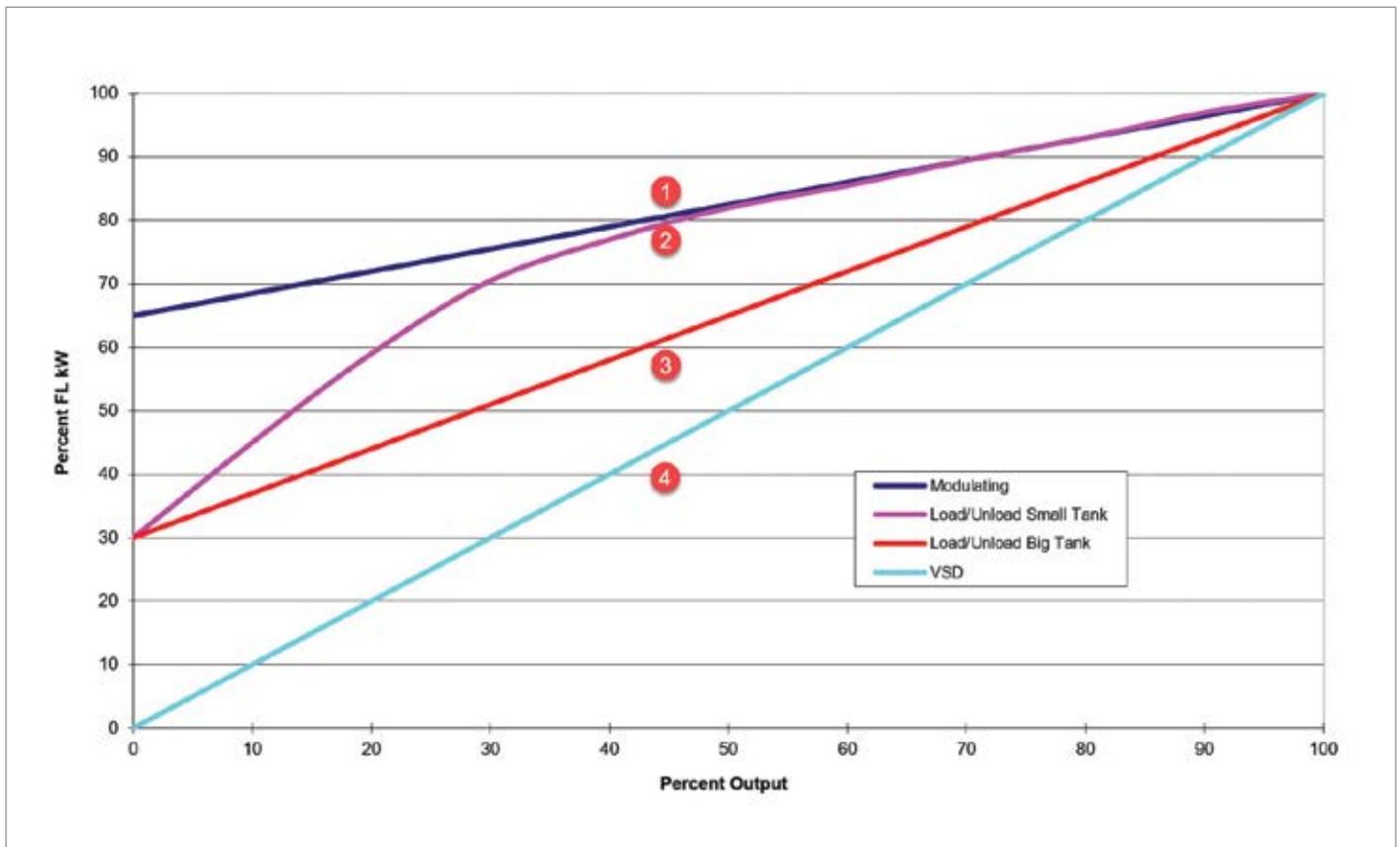


Figure 2: Air compressor control mode choice often limits the savings that can be gained from leakage repair efforts. If system air compressors run on Curve No. 1 or Curve No. 2, they gain only about 3% savings for every 10% leakage airflow reduction. Best practice would be to improve system control to run near Curve No. 4.

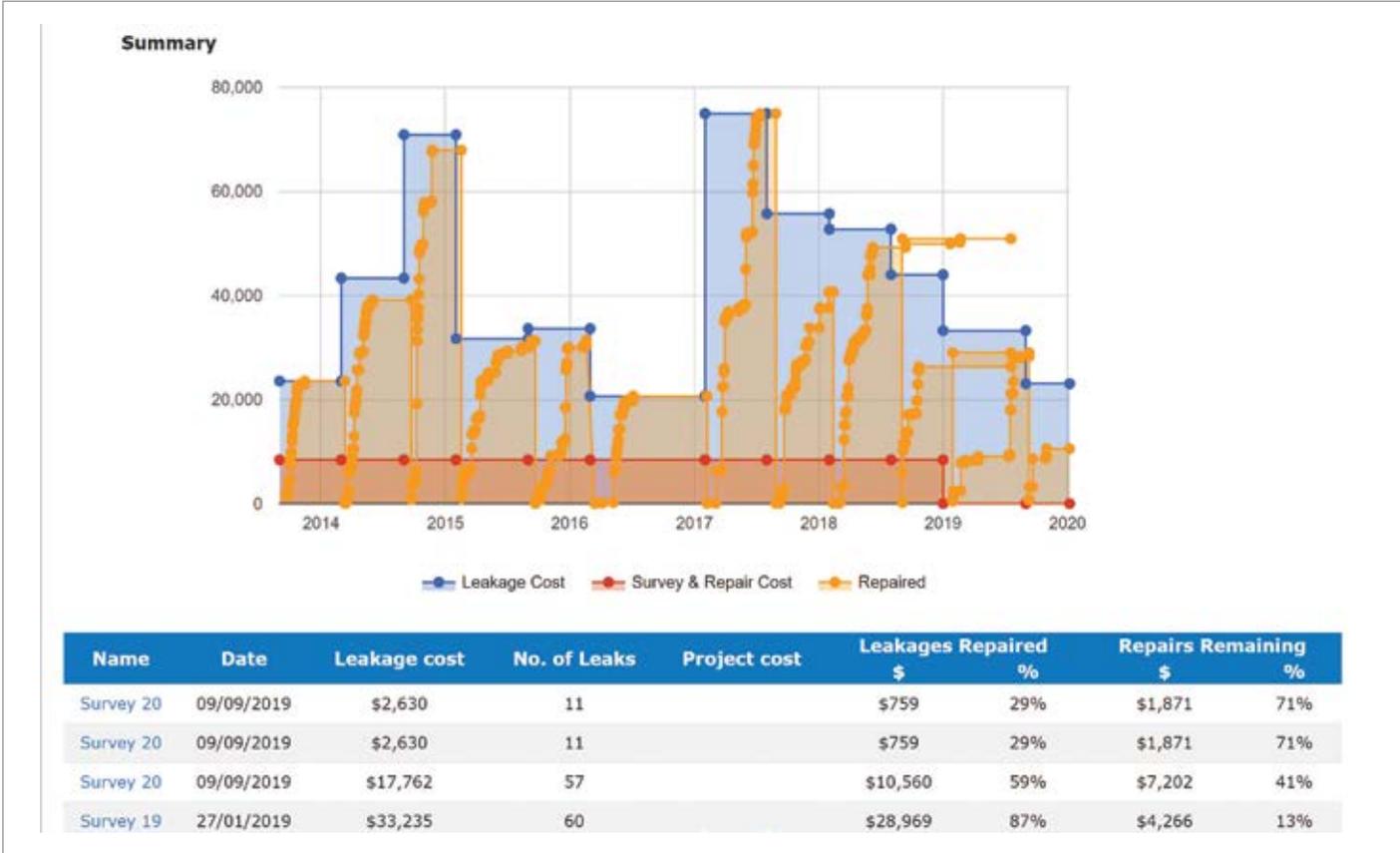
- Elimination all ratchet-type hose clamps.
- Better quality airline/hose utilized.
- Remove leaking air tools and blow guns from service for repair/replacement (spares in stock).
- Regularly reinforce awareness and importance with maintenance staff.

To add to this list, a manager said, “And most importantly, I express extreme displeasure when leaks are not dealt with as soon as detected. Most are simple fixes and there is no excuse to ignore them. I expect our total facility leakage at any given time to be no greater than 50 cfm. I occasionally verify this when I am in the building during off hours.”

As the manager points out, dealing with leaks is likely the most important element of a leak management program. It shows management is very involved in reducing the waste due to leakage, and this attention drives corrective action.

One very experienced compressed air auditor, Chris Beals, owner of Air System Management, Inc., put it this way when asked about getting superior results from his leak assessment efforts, “When I do my audits, I always insist on having at least one employee with me with tools and supplies. Many times, when we find a leak, we can fix it right away. This saves everyone both time and money.”

Chris hits on a key important point; in achieving successful leakage reduction, the contribution of the plant staff in reducing leaks is very valuable. Chris uses his wealth of experience to help plant staff find even well-hidden leaks, and also finds a large number of inappropriate uses. His experience guides the customer to quickly and efficiently reduce the contributing leakage flow. He, rightly so, is not content with simply finding the leaks and leaving them for the production staff to ignore. Many of the best leakage management programs have a good set of well trained and motivated staff who can immediately repair problem areas and will always arrange for more complex repairs to be entered into the plant work order system.



Shown are the results of 20 different leak assessment and repair efforts over the past seven years at one plant. In all cases the value of the leaks found always exceeded the cost of doing the assessment. Image source: Basil V. R. Greatrex.

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Additional Tips to Maximize Leak Reduction

Additional things that can be done to maximize leakage reduction efforts:

- Make sure your air compressors have good power turnaround.
- Lower the pressure (double savings in reducing airflow and air compressor power).
- Turn your system off at night and on weekends when not needed.
- Fix the biggest leaks first.
- Continuously monitor leakage levels.
- Make sure found leaks get repaired using a maintenance work order system.
- Track the savings and report regularly.

Getting Help: Wide Range of Available Resources Available

You may feel you need some assistance with your leakage problem.

Here are some suggested sources:

- Compressed air service providers: Many compressed air vendors can offer leakage detection services as well as efficiency monitoring.
- Monitoring and control system vendors: There are new compressed air monitoring devices and services available that can help you track your leakage levels and verify the results of your efforts. Most are offered on a permanent basis as a subscription service.
- Leak detection equipment manufacturers: There are many newly developed ultrasonic leak detectors available. Some of these instruments have detectors, cameras and data tracking databases all-in-one to make your tasks much easier. Some even work coupled to a smartphone. Many of these companies also have software and smartphone apps available for you to keep track of your leaks and measure your progress.
- Independent auditors: There are a few independent system auditors available to provide advice that is unbiased, because they don't sell specific compressed air equipment.
- Power utilities, which offer a variety of services:

- Incentive programs: Some utilities have financial incentives to help you with your efficiency efforts if it involves spending funds to do the work.
- Equipment lending: A few companies have services loaning out leak detectors for your use.
- Energy manager programs: Some utilities have energy manager programs where the wages of a technical support person can be supported by special grant. One of the duties of this manager could be leakage program management.
- Compressed Air Challenge (CAC): There are compressed air awareness training sessions going on across North America every month. Check out the CAC website calendar for more details: www.compressedairchallenge.org. The newly developed “Compressed Air: It's Not Free!” training session can be run in any plant by your own staff at reasonable cost and with limited time expenditure.

Protect Well-deserved Profits

In summary we know that compressed air is an expensive utility to waste. Most compressed air systems have a significant number of leaks that reduce system efficiency and increase costs. High system pressure and poor air compressor efficiency can further increase the electrical bill.

Key to managing system waste is to do regular compressed air leakage assessments. Capturing a baseline, carefully finding and documenting leaks, and ensuring they are quickly repaired is an important part of plant maintenance. Verifying the savings gained through your efforts can inform management their money is well spent.

It is important to have strong management support for your programs and a budget to support leakage reduction efforts. Training and awareness is a very important part of a successful program as well as the partnering with plant personnel. Continuous monitoring of your compressed air system airflow can go a long way in keeping the leakage levels low and alerting staff of any unforeseen problems that might rob you of your well-deserved profits. **BP**

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

To read similar **Compressed Air System Leaks** articles, please visit www.airbestpractices.com/system-assessments/leaks.

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BETTER PLANTS® PARTNERS GET A LEG UP in the Battle for Energy and Water Efficiency

By Mike Grennier, Compressed Air Best Practices® Magazine

A growing number of manufacturers are taking advantage of the Department of Energy (DOE) Better Plants® program and saving on energy and water in the process.

► Manufacturers have always known it's not always easy to make improvements in energy and water efficiencies. Fortunately, more and more companies are learning there's plenty of help available through the Department of Energy (DOE) Better Plants® program that makes the job a whole lot easier.

In 2019, more than 230 Better Plants partners took advantage of the program to gain considerable ground in their sustainability efforts. In so doing, they cumulatively saved more than \$6.7 billion in energy costs and more than 1.3 quadrillion British Thermal Units (BTUs). These same companies have

more than 3,200 facilities and represent approximately 12% of the U.S. manufacturing energy footprint. In addition to energy, partners are excelling at projects to improve water efficiency.

Last year also saw 22 companies joining the rapidly growing list looking to capitalize on



“Really, the whole reason for this program is to provide a leadership platform that allows leading companies to showcase what they’re doing – and then using that as a motivator for all companies to hopefully step up their game.”

— Thomas Wenning, registered Professional Engineer and Program Manager for Industrial Energy Efficiency at the DOE's Oak Ridge National Laboratory (ORNL)

the advantages of the program, pointing to good days for those who place a priority on environmental sustainability, said Thomas Wenning, a registered Professional Engineer and Program Manager for Industrial Energy Efficiency at the DOE's Oak Ridge National Laboratory (ORNL).

"I'm really excited about how far we've come since the program started. We're in a really good place in terms of partners showing success and the number of companies pledging to additional long-term goals," said Wenning who provides Better Plants partners with technical assistance and energy management guidance. Wenning also serves as Assistant Professor in the Department of Industrial and Systems Engineering at the University of Tennessee.

Committing to Environmental Stewardship

Through the Better Plants program (<https://betterbuildingssolutioncenter.energy.gov/better-plants>), which officially launched in 2011, the DOE works closely with partners to achieve energy and water efficiency improvement goals – while offering a host of resources.

Manufacturers don't need to meet any qualifications to become a Better Plants partner and gain access to the numerous perks that go with it. Instead, they're asked to voluntarily set a specific goal, typically to reduce energy intensity by 25% over a 10-year period across all of their U.S. operations. The program also includes the Better Plants Challenge, in which partners commit to a higher-level of transparency than the Better Plants program.

The underlying goal of the program is to give manufacturers another leg up if they need it, said Wenning.

"The business-as-usual approach is to let people do it themselves and that's perfectly fine. Some companies are good at it; others not so much," Wenning said. "Really, the whole reason for this program is to provide a leadership platform that allows leading companies to showcase what they're doing – and then using that as a motivator for all companies to hopefully step up their game."

In addition to serving as a source of motivation, the DOE recognizes that many companies don't have the resources to devote to sustainability, Wenning said.

"A lot of it has to do with filling that void within a company," he said. "A lot of companies are extremely busy, and while they might have an energy manager at the facility, he's not just the energy manager, he's also the engineering guy, the maintenance guy and he's wearing a lot of different hats."

Making it easier for manufacturers to save energy and water wherever they can not only helps the environment; it also helps companies become more competitive.

"Whether it's a dollar saved on electricity, or a dollar saved on water, that goes directly to the bottom line," Wenning said. "That in turn, has a multiplier effect that allows a company to invest in people, or technologies, or capital equipment. Or, it can just be pure profit, which in an ideal world, is going to grow the business."

Learning from the Best and Brightest

Many Better Plants partners are proven leaders in environmental sustainability, which is integral to the program since successful partners share their experiences and insights. That gives others ample opportunity to learn from the best.

"While the program is a leadership platform to showcase great achievements, we work with a lot of companies who aren't leaders – yet.



Information-sharing is a vital component of the Better Plants program.

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The program offers a great opportunity for companies just starting on their energy- or water-efficiency journey because they can learn from this collective experience that's been developed over the years."

Whether a company is a Better Plants rock star, or just getting started, all companies gain access to a wealth of knowledge as well as a deep reservoir of resources.

Among the resources is a dedicated technical account manager who helps partners establish energy baselines, develop energy and management plans, identify energy-saving and energy-recovery opportunities, and track performance metrics. An account manager is also assigned to each partner.

"Our technical account managers are engineers with a lot of experience, and in some cases, we have people with 30-plus years of experience and/or doctorate degrees," Wenning said. "Our account managers are there to figure out where companies are at in their energy or water journey and how we can help."

Among the many resources available to members are In-Plant Trainings. The two- to four-day clinics are led by technical account managers and focused on a variety of areas, such as system optimization and energy management.

An example of In-Plant Training focused on achieving efficiencies is compressed

air systems. Topics range from eliminating inappropriate uses of compressed air to the delivery of appropriate compressed air pressure and ensuring compressed air quality. In some cases, the In-Plant Training might be designed to help manufacturers understand the true costs of water and identify opportunities for water efficiencies.

"In-Plant Trainings have been one of our most popular offerings," Wenning said. "We're able to send in an expert for a couple of days where they can not only find some really solid opportunities and projects at their site, but then also train people within the company so they can replicate what they've learned."



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Energy Assessment Tools at Your Disposal

In addition to dedicated resources and training services, Better Plants partners are provided access to an assortment of tools at no charge to improve their energy data collection, analysis and validation efforts.

The Diagnostic Equipment Program lets partners borrow equipment free of charge for up to four weeks so they can test individual instruments before investing in them. The long list of tools available include invaluable instruments, such as pressure transducers, power loggers and ultrasonic leak detectors.

“What’s really great is that we can come in and offer advice and technologies from an agnostic standpoint. We’re not trying to sell anything; we’re just trying to put good information out there and highlight best practices,” Wenning said.

Among the highly useful tools is the Energy Treasure Hunt Exchange Toolkit, which aids in the process of planning and performing Energy Treasure Hunts. The toolkit provides the treasure hunt participants with tools to effectively plan for the event, successfully run it and track results. To learn more about Energy Treasure Hunts, visit www.airbestpractices.com/energy-manager/corporate-sustainability-programs/culture-building-energy-star%20AE-energy-treasure-hunts.

Also available to Better Plants partners – and non-partners alike – is DOE’s Manufacturing Energy Assessment Software for Utility Reduction (MEASUR) software tool suite. MEASUR consists of updated DOE legacy energy system assessment tools designed to help manufacturers increase industrial energy efficiency, both at the plant and system level.



As part of the Better Plants program, experienced engineers guide companies toward energy and water efficiencies.



Better Plants partners get to the chance to put diagnostic equipment to the test before investing in it.

The tool suite, which does away with several older legacy and siloed tools written in a variety of programming languages, was created to provide a more user-friendly and

versatile set of tools. MEASUR also ensures interoperability between the individual tools and gives users the ability to assess most major support systems, including pumping,

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fans, process heating, steam, motors, and compressed air. By entering facility-specific energy and operating data, users can discover how much energy each piece of equipment uses annually, plus estimated annual energy cost so they can evaluate opportunities for improvement.

“We’re incredibly excited about MEASUR,” said Wenning. “The feedback we’re getting about it is overwhelmingly positive from industrial end-users, as well as consultants and public utilities. We’ve brought all of these different tools into one platform and it’s super flexible. It’s also open to everyone.”

Whether it’s software tools, instruments for data collection and accurate system

assessments, or the wide range of other Better Plants program resources, the goal is to help manufacturers overcome barriers to improving energy and water efficiencies.

“There’s the information barrier,” Wenning said, pointing to an example of a common challenge in the industry. “Knowing what you could be doing differently and what resources or best practices you should be implementing is challenging when you’re working in a facility and trying to get product out the door. Beyond that, energy managers face a cultural barrier of convincing colleagues that energy is important. And obviously, one of the most common and challenging barriers is trying to make the case for financing capital investments to improve energy efficiency.”

Another resource gaining in popularity is the annual Better Plants Technology Day event, which gives partners the opportunity to visit one of the seventeen DOE National Laboratories to learn firsthand about various early-stage technologies best positioned to enable industrial competitiveness and innovation.

“The DOE has invested heavily in R&D and we want to help companies make connections that will guide them along in the world of the next technologies that address industry problems and challenges,” Wenning said.

More Partners, More Pledges, More Environmental Sustainability

While the Better Plants program offers many resources and tools to choose from, Wenning said the program is built around the needs of manufacturers looking to improve energy and water efficiencies.

“We’re always looking to see where the industry is raising its hand and providing the resources needed,” Wenning said, noting how the Better Plants program is also gaining more and more attention and increasingly better results.

“There are many companies that have already met their 10-year goals, and in numerous cases, they did it ahead of time. Many of those same companies have repledged to aggressive goals beyond that,” Wenning said. “That, in and of itself, shows the value of the program. Our partners are fantastic companies who are not resting on their laurels. They’re continuing to push forward.” **BP**



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Kaeser Introduces New High Temperature Refrigerated Dryer

New High Temperature Refrigerated Dryer (HTRD) with quick-release front panel is easy to install and designed to be low maintenance. By reducing water and harmful contaminants, it helps extend tool and equipment life and improve product quality.

Kaeser's redesigned HTRD is perfect for systems with small piston compressors in the 5-30 hp range, or commercial shops with high discharge temperatures and troubled with dusty, humid ambient air. These small, compact dryers remove moisture and filter contaminants in one compact, easy to install, low maintenance package.

All HTRD models feature a precooler/reheater, chiller, demister, and drain trap. Designed to remove water from your air lines, these dryers help extend tool life and eliminate



Redesigned HTRD features quick-release front panel.

flaws in paint or finishes. Plus, with better air quality, maintenance intervals and the service life of more expensive pneumatic equipment such as CNC and packing machines can also be extended. Maintenance points are easily accessible from the new quick release panel on the front providing even more flexibility for placement.

About Kaeser Compressors, Inc.

Kaeser Compressors is a leader in reliable, energy efficient compressed air equipment and system design. We offer a complete line of superior quality industrial air compressors as well as dryers, filters, SmartPipe™, master controls, and other system accessories.

Kaeser also offers blowers, vacuum pumps, and portable gasoline and diesel screw compressors. Our national service network provides installation, rentals, maintenance, repair, and system audits. Kaeser is an ENERGY STAR Partner. For more information, visit www.us.kaeser.com.

BOGE's New C-2 Generation

BOGE introduces the new generation of its screw compressors from the popular C-series. The C-2 compressors from the Bielefeld-based compressed air expert are available as a complete solution ready for connection together with compressed air receiver and dryer, as well as in a standalone version for larger complete systems. The machines are compact in design and, thanks to their easily accessible components, particularly maintenance-friendly and ergonomic. Fitted with a sound insulation hood as standard, the new C-2 compressors are once again quieter than their predecessors. BOGE has given all



C-2 as a complete solution with compressed air receiver.

versions of the machine an elegant, uniform design with high recognition value – but watch out, appearances are deceptive: the range of individual configuration options is huge.

BOGE has optimized its popular C-series all round. And what about this new updated version? Well, what ends up looking so elegant, modern and uniform on the outside, is more diverse than ever before on the inside. BOGE offers its new C-2 compressors belt-driven, directly coupled, frequency-controlled and also directly coupled at the same time in the same casing. Thanks to a sound insulation hood that is built in as standard, all compressors are even quieter than before. With optional super-soundproofing, the noise level is reduced by even more decibels. While the C-2 compressors are fitted as standard with a high-performance IE3 motor, efficiency is increased to new best values as required thanks to an IE4 motor.

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Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** in compressed air systems — estimated by the U.S. Department of Energy to represent 30% of industrial energy use. Each edition outlines **Best Practice System Assessments** for industrial compressed air users — particularly those **managing energy costs in multi-factory companies**.

“We’re not just picking low-hanging fruit, we’re walking on the fruit because compressed air represents such a major opportunity for energy reduction.”

— Darren Borden, P.E., CEM, Energy Management Engineer, Corporate Health, Safety and Environment, Weston Foods

“We are committed to the protection of the environment and the conservation of natural resources, as well as quality. We knew a better way to approach compressed air would be one of the best ways to meet our goals.”

— Carroll Bruckner, Maintenance Engineer, SumiRiko Tennessee

“Demand Side” and “Supply Side” information on compressed air technologies and system assessments is delivered to readers to help them save energy. For this reason, we feature Best Practice articles on when/how to correctly apply **air compressor, air treatment, piping, storage, measurement and pneumatic control technology**.

Industrial energy managers, utility incentive program managers, and technology/system assessment providers are the three stakeholders in creating energy efficiency projects. Representatives of these readership groups guide our editorial content.

“Implementation of the compressed air automation and data acquisition platform in combination with the upgrades to the system reduces the facility’s annual energy consumption by 6,098,619 kWh per year, resulting in yearly savings of \$600,000.”

— Pascal van Putten, VPInstruments, and Tyler Costa, ALD, Inc. (feature article in June 2019 Issue).

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From 7.5 kW, the compressors are available with frequency-controlled fans: meaning the cooling capacity can be adapted optimally to the environmental conditions. A dryer can also be integrated across the entire series – and a control system ideally adapted to customer requirements. Users have the choice between the basic control and the advanced focus control 2.0 versions.

Regardless of which extras are required, it works the same for all users: with the machines from the new C-2 series, you obtain a complete compressed air station as a plug-and-play solution in the smallest space, whether without or – for the first time ever in this series with a performance up to 22 kW – also with a receiver. BOGE has ergonomically optimized both installation versions and designed them to be particularly user-friendly: the control panel has been built directly into the front plate or angled, depending on the version. Control cabinet, belts and all other maintenance parts are accessible thanks to plates that are easy to remove.

About BOGE Compressors

BOGE America is the USA based America's subsidiary of BOGE KOMPRESSOREN Otto Boge GmbH & Co. KG based in Bielefeld, Germany. Whether for centrifugal compressors, screw compressors, high-pressure piston compressors, scroll compressors, controls, air treatment equipment, complete systems or individual devices, BOGE meets the most diverse requirements and highest standards – in a precise and customer-oriented manner. BOGE solutions are used by all sectors of industry to supply compressed air for a wide range of manufacturing processes. The USA Operations of BOGE America stocks the various technologies of high-quality compressors

and spares for immediate support to needs. Compressed air systems are designed, sold and serviced through a dedicated network of over 50 distributors in North, Central, and South America. The USA Operations is also the “Center of Excellence” for Technical Trainings for our partners to ensure Top Level Support for the consumer. For more information, visit www.boge.com.

Champion Enhances CRH Series Dryers

Champion is excited to announce the enhanced CRH (Refrigerated High Temp) Series Dryer models from flows of 25 to 125 scfm. These dryers are designed to efficiently dry compressed air with inlet temperatures up to 180 °F while achieving the moisture removal ISO 8573-1 quality standards.

Improvements to the legacy CRH line include:

- Consumes less energy (kW)
- Lighter weight for ease of transportation & installation
- Equipped with a user adjustable timed electric drain – protected by inlet strainer
- Quick release front panel for ease of routine maintenance
- Integral moisture separator
- Top mount condenser fan discharges hot air vertically – enables installation in tight spaces
- More intuitive, user-friendly controls
- Base rail design promotes ease of floor mount or baseplate installation



CRH Series Dryers efficiently dry compressed air with inlet temperatures up to 180 °F.

With product enhancements like this, they have the customer in mind and aim to provide the best quality equipment along with the technology that sets Champion apart from the rest. With the new CRH, they are providing a high temperature dryer that consumes less energy, is lighter weight, provides easier maintenance access with a removable front panel and has controls that are more intuitive. All of these product changes align with Champion's goal to provide best-in-class technology and products.

About Champion

Champion is part of Gardner Denver, a leading global manufacturer of highly engineered products. Champion provides the highest quality reciprocating and rotary air compressor systems, parts and service. Champion utilizes a century of experience in designing and manufacturing air compressor

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systems. We know and understand the application of our products in many different operating environments. Our products keep industries such as automotive, industrial, woodworking and agriculture up and running. With the compressed air market's widest breadth of compressed air products – reciprocating, rotary vane, rotary scroll, and rotary screw – choosing the right product for the application is key to continuing the success that was started in 1919. Champion has more than 500 authorized air compressor Distributors and Service Centers Nationwide. Our distributors are available to sell or service your compressed air system. For further information, please visit: www.championpneumatic.com.

Emerson's New ASCO Series 353 Pulse Valve

Emerson is introducing its newly redesigned ASCO Series 353 Pulse Valve, designed to help original equipment manufacturers and end-users achieve a more effective, efficient and convenient bag cleaning every time.

With a higher peak pressure, wider temperature range, patented quick mount clamp connection and overall part simplification, the new series provides longer bag and filter life and lower maintenance.

The new valve can be used in a wide range of applications, including concrete processing, grain, agriculture and feed, metalworking, food processing, foundries, pharmaceutical, mining, rubber mixing/processing, metal processing, lime industry, cement factories, power plants and steel mills.

Without optimum peak pressure, dust collector cleaning becomes inefficient and the consumption of compressed air rises. Because it hits peak pressure quickly, the Series 353 creates a more effective cleaning process. The new design also leads to improved airflow through the filter bags or cartridges for optimized dust collector performance while reducing costly compressed air consumption.

“Through a rigorous engineering design and testing process, Emerson has optimized the ASCO Series 353 Pulse Valve to open, hit peak pressure and close faster than the competition. This gives our customers optimized filter cleaning and significant compressed air savings across all reverse-jet dust collector system applications,” said vice president of global marketing for Emerson's industrial automation business, Erik VanLaningham.

Contact Rod Smith for ad rates: rod@airbestpractices.com, Tel: 412-980-9901

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A Publication of **Smith Onandia Communications LLC**
37 McMurray Rd, Suite 106
Pittsburgh, PA 15241

Compressed Air Best Practices® (USPS# 17130) is published monthly except January-February combined by Smith Onandia Communications LLC, 37 McMurray Rd., Suite 106, Pittsburgh, PA 15241. Periodicals postage paid at Pittsburgh, PA and additional mailing offices. POSTMASTER: Send address changes to: Compressed Air Best Practices®, 37 McMurray Rd, Suite 106, Pittsburgh, PA 15241.

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In addition, the valve is designed with fewer moving parts for increased reliability and simplified maintenance. A longer valve lifespan – over one million cycles on average – results in more time between valve maintenance cycles.

The Series 353 also offers a patented quick mount clamp connection, providing faster, easier installation, as well as connection options, like the classic dresser connection and threaded version.

Emerson’s redesigned Series 353 provides a broader operating temperature range of -40 °F to 284 °F, making it suitable for moderate-to-harsh industrial and hazardous environments.

About Emerson

Emerson, headquartered in St. Louis, Missouri is a global technology and engineering company providing innovative solutions for customers in industrial, commercial, and residential markets. Our Emerson Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs. Our Emerson Commercial & Residential Solutions business helps ensure human comfort and health, protect food quality and safety, advance energy efficiency, and create sustainable infrastructure. For more information visit Emerson.com.



New ASCO Series 353 valve improves cleaning while cutting compressed air use and installation time.

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Silvent Launches New Pro One + Air Gun

Silvent launched a new safety air gun that delivers up to 50% more blowing force than a regular air gun. Pro One + is equipped with a new, patented multi Laval air nozzle that improves the performance of cleaning with compressed air in industry.

Sometimes a higher blowing force is needed to ensure a quality blowing result. Meeting this industry demand, Pro One +’s unique multi Laval nozzle creates a concentrated air jet for increased blowing force. The nozzle’s design also reduces air turbulence, resulting in quieter blowing.

“The multi Laval nozzle optimizes the air pressure’s change from potential energy to aimed concentrated kinetic energy. This creates a more pointed and efficient blowing force. The goal was to meet the industry’s needs. Therefore, Pro One + was developed together with the operators from the manufacturing industry,” said Rasmus Tibell, Technical Director at Silvent AB.

Pro One + is a further development of the Red Dot awarded safety air gun Pro One and has the same design. The new safety air gun combines quiet, efficient and safe blowing with compressed air. This is a rare combination,



Silvent Pro One + air gun with a multi Laval air nozzle.

since compressed air often creates high sound levels that can lead to hearing loss and tinnitus. It is Silvent’s special blowing technique that reduces air turbulence, thereby decreasing the sound level, and allowing more efficient blowing with compressed air for the operators. The safety air gun also minimizes the risk of aeroembolism if the operator would accidentally block the nozzle opening, since the static pressure does not exceed 30 psi.

“The safety for the operators is important. Therefore, we wanted to develop an efficient air gun without compromising the security. The result is Pro One +. An efficient, safe, quiet and ergonomic safety air gun,” said Rasmus Tibell, Technical Director at Silvent AB.

About Silvent

Silvent helps manufacturers with energy optimization and improved working environment. The headquarters are located in Borås, which is where all research and development takes place. The company has unique expertise in the area of compressed air dynamics. Silvent’s products and customized solutions for blowing with compressed air are used by leading manufacturers and brands worldwide. Today, Silvent’s products are available in 92 countries, and in 2018 the company’s sales brought in SEK 150 million. Silvent is part of the Lifco group which are listed on Nasdaq Stockholm. For more information, visit www.silvent.com.

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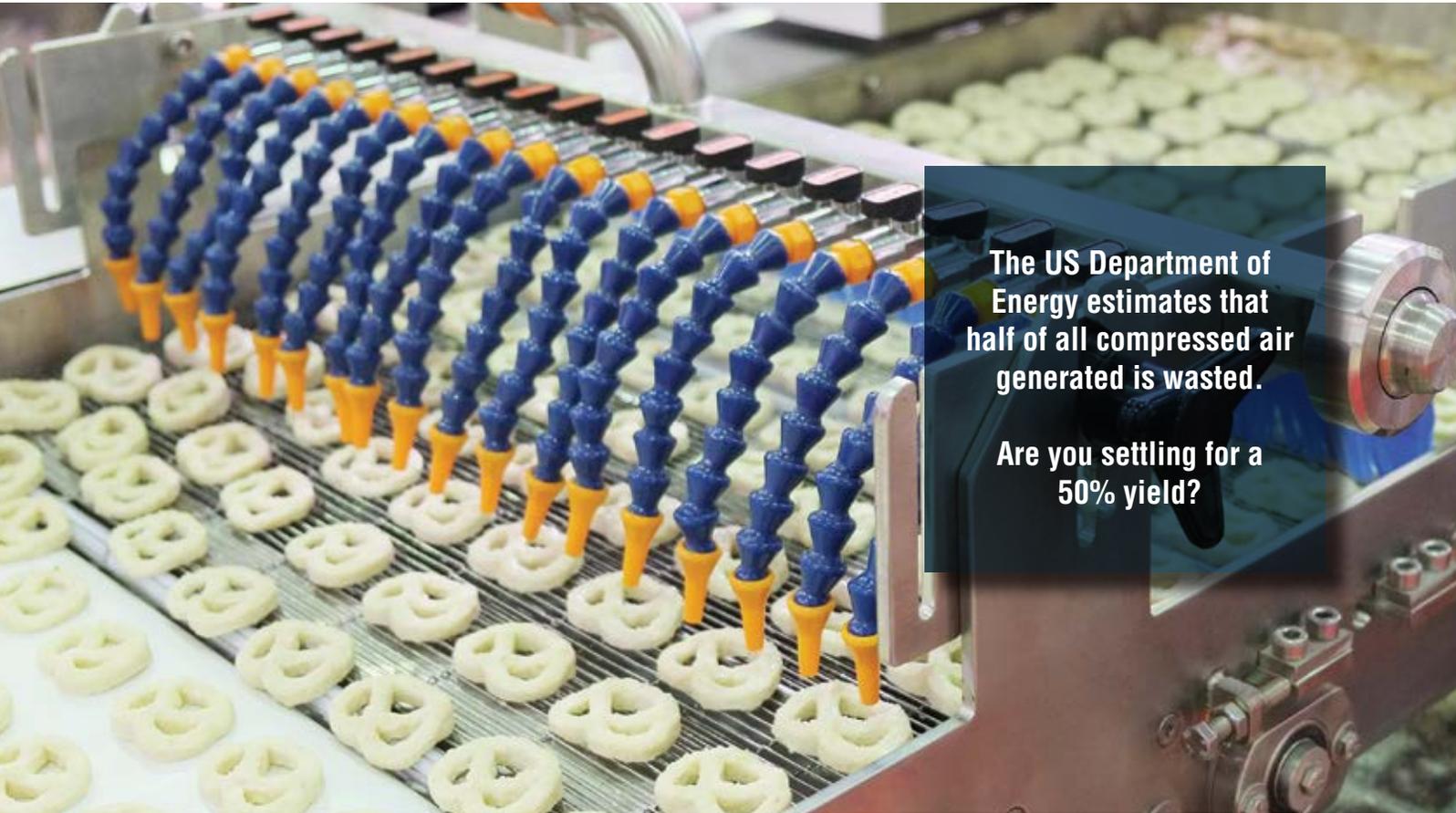
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