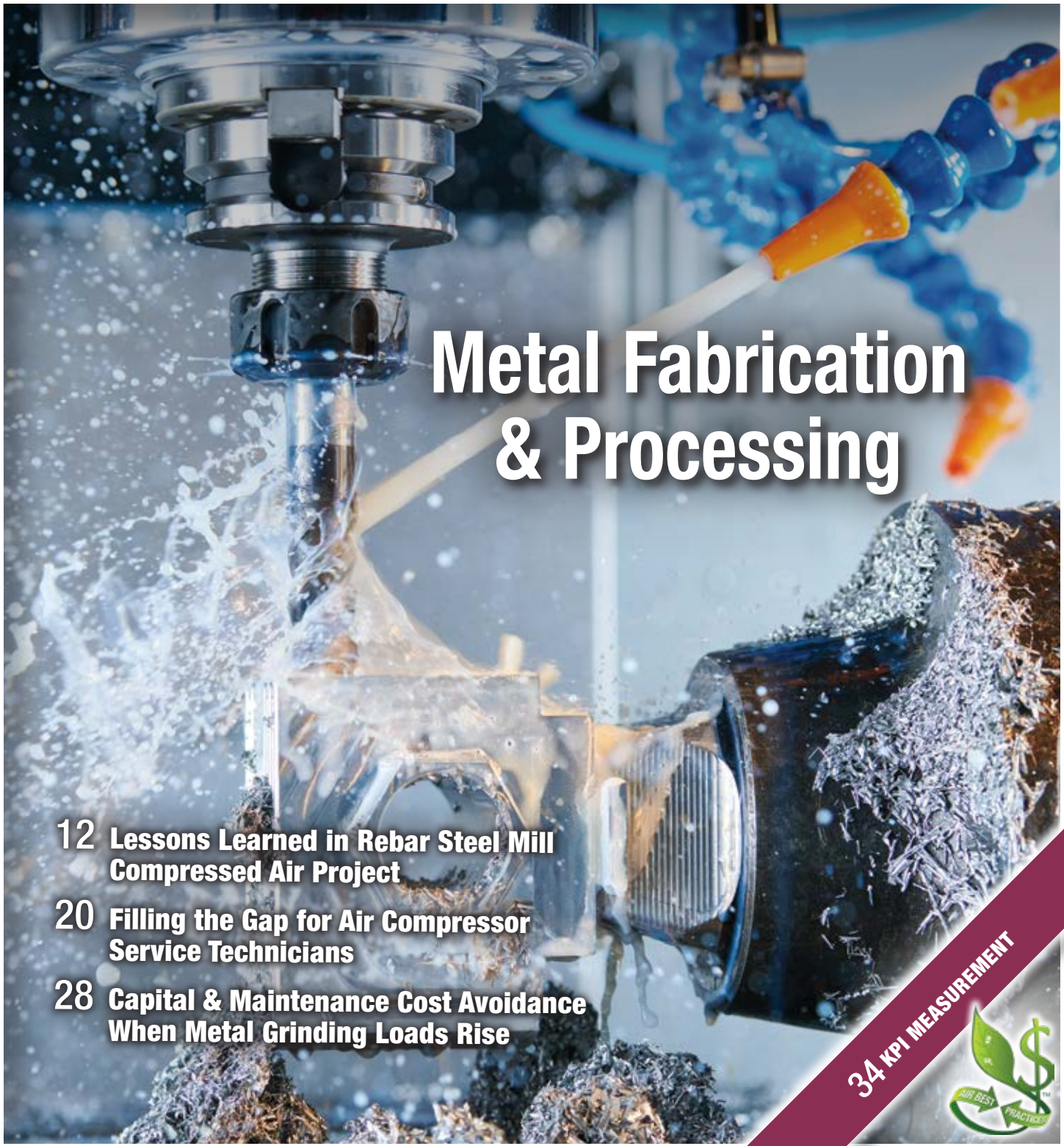
The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

airbestpractices.com

April 2019



Metal Fabrication & Processing

34 KPI MEASUREMENT

Atlas Copco

Atlas Copco – doing more for you!

What does that mean? It's simple. Atlas Copco goes further, bringing innovation to every aspect of our offering to you—and that extends far beyond products. Every compressor, dryer, vacuum pump, blower, control, and service visit is stamped with this promise.

We want to be your partner. Let's work together to find your savings level or productivity number, and then develop a plan to achieve it. Our promise to you is that we do more. And together, with you, we are more!

The key to making your number is our number.
Call us today: 866-472-1013

Let us help you discover what's possible!

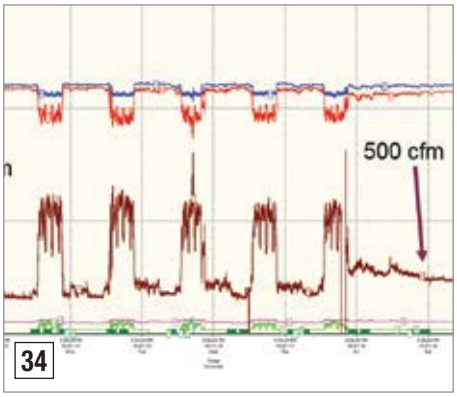
www.atlascopco.com/air-usa

FEATURES

QUALITY, SAFETY & RELIABILITY FEATURES

PRODUCTIVITY, SUSTAINABILITY & ENERGY-SAVING FEATURES

COLUMNS



FROM THE EDITOR | Metal Fabrication & Processing

I hope everybody is enjoying Spring weather and want to take this opportunity to announce registration is now open for the 2019 Best Practices EXPO & Conference at www.cabpexpo.com! We are thankful for the strong support we are receiving from Tennessee and would like to particularly thank and announce:

- Co-Sponsor: Tennessee Valley Authority EnergyRight® Solutions for Business & Industry
- Supporting Organization: Tennessee Department of Environment & Conservation
- Supporting Organization: Tennessee Tech Industrial Assessment Center

Quality, Safety and Reliability

I hope you enjoy Mike Grennier's story titled, "Filling the Gap for Air Compressor Service Technicians." He reached into our circulation and interviewed a sampling of owners and managers at several air compressor sales and service companies. I've been in the compressed air industry since 1992 (gulp), and the struggle to recruit and retain air compressor service technicians has always been a hot topic.

If you could reduce your capital spend by $500,000 and your 5-year maintenance costs by $100,000, would you be interested? No one has ever accused Hank van Ormer of not getting his hands dirty. In this issue he writes about how unstable compressed air pressure created product quality problems in the metallic surface grinding process at a high-end bicycle manufacturer. After receiving a proposal to solve this by adding a 300 horsepower air compressor, dryer and piping system, the plant asked Mr. Van Ormer to do an audit. You'll be surprised by what he discovered!

Productivity, Sustainability & Efficiency

We have an interesting article, from Tim Dugan, about work he did at a rolling "minimill", a facility that melts scrap recycled steel and produces rebar for the construction industry. His compressed air system assessment produced verified energy savings of $136,000. What is most interesting about this article are the "lessons learned" in project management and the organizational challenges faced.

Ron Marshall provides us with a story about a metal processing facility using the ISO 50001 energy management standard. They were tracking the energy consumption of more than 250 SEU's (significant energy users) including compressed air. A manager asked Ron to visit them because he saw, on his computer, that air compressor amps didn't match readings from his compressed air flow meter. This article discusses the challenges at this plant and the need for accurate Key Performance Indicators (KPI's).

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

ROD SMITH, *Editor, tel: 412-980-9901, rod@airbestpractices.com*

hertz
KOMPRESSOREN

One of the best supply partners in the industry

Work With Us Building The Future!

- Hertz Kompressoren is known for its Fast Response and Fast delivery
- Hertz Kompressoren is known for its reliable, dependable, easy to use and simple service
- Hertz Kompressoren is known for its collaborative and unique team

HERTZ KOMPRESSOREN USA Inc. 3320 Service St. Charlotte, NC 28206 USA // P: +1-704-579-5900 F: +1-704-579-5997

INDUSTRY NEWS

New BEKO E-Learning Course on Compressed Air Basics

BEKO Technologies has announced the new and completely revised eLearning course titled, "The Basics of Compressed Air Technology."

With HTML 5 in the background, it isn't necessary to install Flash on the computer and the completely responsive design allows participants to use the course whenever and wherever wanted, on smartphone or tablet. The number of learning modules consists of 8 compact and easy-to-use learning modules.

BEKO welcomes topic newcomers to learn the basics and also encourages those with experience to give it a try and perhaps refresh some "rusty" knowledge in the process.

All are encouraged to use this tool. Further information and the registration form to request access can be found on the BEKO Technologies website.

Visit www.bekousa.com

Kaeser Kompressoren Expands Dryer Operation in Germany

Kaeser Kompressoren announced it is expanding its production center for refrigeration dryers in Gera, Germany. The project includes a new dryer testing room and an expanded logistics department. In total, the company will add 2,300 square meters of usable floor space to the operation.

In Gera, Kaeser manufactures blowers and refrigeration dryers with approximately 400 employees. The expansion will help to maintain and enhance the company's ability to innovate and continue meeting demand in the refrigeration dryer segment. The total investment amounts to approximately 9 million Euros.

"If the work keeps moving ahead at this pace, production could start in the new facility as early as June," said Thomas Kaeser, CEO of Kaeser Kompressoren. "Gera is an important location for us and the employees here make a big difference in keeping our customers satisfied. The new production facilities will enable them to do that even faster."

About Kaeser Kompressoren

Kaeser Kompressoren Gera emerged from *Geraer Kompressorenwerke*, originally established in 1877 as *Heinrich Leo Metallwarenfabrik und Eisengiesserei.* In 1890 it became Germany's first manufacturer of compressors and by 1945 was the country's leading producer with 70% market share. In 1991, the company was acquired by Kaeser Kompressoren. The compressed air specialist, with its head office in Coburg, in the Upper Franconia district, now employs over 6,000 people in more than 100 countries around the world. The main production sites are in Coburg and Gera. For more information, visit www.kaeser.com.

VPInstruments Celebrates 20 Years of Energy Management Solutions

VPInstruments this year celebrates 20 years of developing, manufacturing and supplying flow meters and energy management solutions for the compressed air industry.

Throughout its history, VPInstruments has developed innovative products for easy insight into energy flows of compressed air and technical gasses. Its products made it possible to perform compressed air audits in an easy manner, and today its product portfolio comprises a complete energy management solution.

Thomas Kaeser, CEO, Kaeser Kompressoren

VPInstruments was founded in 1999, however, the flow sensor technology itself dates back to 1974 when Anton van Putten, father of company founder Pascal van Putten, pioneered the development of the MEMS flow sensor technology. The technology can still be found in many other flow sensors around the world.

Years of further development led to the founding of VPInstruments. The first steps caught the attention of the compressed air industry and together with a leading compressor manufacturer, the company developed the first insertion flow meter for compressed air audits, the VPFlowMate®. A few years later it released the VPFlowScope®; one flow meter measuring flow, pressure, and temperature simultaneously in one product. VPInstruments' VPVision monitoring software was the first energy management software dedicated for compressed air systems. And with the more recent launch of the VPFlowScope M, its customers are ready for the IIOT revolution.

Today, the highly motivated team of VPInstruments is still developing new products and looks forward to many years to come.

About VPInstruments

VPInstruments offers industrial customers easy insight into energy flows. We believe industrial energy monitoring should be easy and effortless, to enable insight, savings, and optimization. VPInstruments' flow meters are calibrated on a state-of-the-art calibration facility. Our calibration equipment is maintained under our ISO 9001 Quality Management System and is traceable to National Standards.

VPInstruments products are recommended by leading energy professionals worldwide and offer the most complete measurement solution for compressed air flow, gas flow and electric energy consumption. Our monitoring software VPVision can be used for all utilities and enables you to see where, when and how much you can save. Our products can be found all over the world. We serve all industrial markets, for example; automotive, glass manufacturing, metal processing, food and beverage, and consumer goods. For more information, visit www.vpinstruments.com.

Air Products to Build, Own and Operate New Large-Scale Air Separation Unit

Air Products, a leading global industrial gases company, plans to build, own and operate a new air separation unit (ASU) in the Twin Cities area of Minnesota. The new large-scale facility, scheduled to be on stream in early-to-mid-2020, will provide reliable liquid industrial gas options for customers and distributors in the region.

"Air Products' goal is to be the safest and best performing industrial gas company in the world, providing excellent service to our customers. This is a prime example of making the necessary investment to provide that reliable and excellent service to our current and future customers," said Air Products Seifi Ghasemi, Chairman, President and Chief Executive Officer.

INDUSTRY NEWS

The large-scale ASU will produce liquid nitrogen, oxygen and argon, allowing Air Products to strengthen and grow its presence in a dynamic geography.

"Air Products has supplied customers in Minnesota and the surrounding region with both onsite gases and merchant liquid for decades. This investment shows further commitment to our customers in the Midwest region, will expand our ability to serve the greater area, and will provide reliable product to new customers as well," said Francesco Maione, Air Products Vice President, Northern Region, Americas.

Air Products owns and operates over 300 air separation plants in over 40 countries worldwide. In addition to its plants, the company has sold, designed and built more than 2,000 air separation units globally. Air Products' cryogenic offerings span plants with a capability of 50 tons per day (TPD) to single train facilities with oxygen production capacities beyond 4,000 TPD.

About Air Products

Air Products (NYSE:APD) is a world-leading industrial gases company in operation for over 75 years. The company provides industrial gases and related equipment to dozens of industries, including refining, chemical, metals, electronics, manufacturing, and food and beverage. Air Products is also the world's leading supplier of liquefied natural gas process technology and equipment.

The company had fiscal 2018 sales of $8.9 billion from operations in 50 countries and has a current market capitalization of about $35 billion. Approximately 16,000 passionate, talented and committed employees from diverse backgrounds are driven by Air Products' higher purpose to create innovative solutions that benefit the environment, enhance sustainability and address the challenges facing customers, communities, and the world. For more information, visit www.airproducts.com.

Motion Industries to Acquire Automation and Robotics Company

Motion Industries, Inc., a leading distributor of maintenance, repair, and operation replacement parts and a wholly owned subsidiary of Genuine Parts Company (GPC), announced it has entered into a definitive agreement to acquire Axis New England

Axis to operate as part of Motion Industries Automation Solutions Group.

and Axis New York ("Axis"), an automation and robotics company.

With expertise in advanced machine automation, the company will continue its focus on motion control, robotics, and machine vision. Areas of specialty include precision components, electro-mechanical assemblies and fully engineered automation systems.

Todd Clark, Axis President, said, "We are pleased to join the Motion team and excited about the growth opportunities this will afford the company and our employees. Our customers and suppliers can expect the same partnership, support, and service as we continue our focus on delivering high-value solutions."

"We are very pleased with the addition of this well-established company," said Randy Breaux, President of Motion Industries. "Acquiring Axis is in keeping with our strategic intent and compliments our growth in the area of industrial plant floor automation. We welcome the Axis employees to the Motion Industries family and we look forward to the contributions they will make to our company in upcoming years."

About Motion Industries

With annual sales of over $5 billion, Motion Industries is a leading industrial parts distributor of bearings, mechanical power transmission, electrical and industrial automation, hydraulic and industrial hose, hydraulic and pneumatic components, industrial products, safety products, and material handling. Through EIS, which joined with Motion Industries to form its Electrical Specialties Group in 2018, the company has

INDUSTRY NEWS

broadened its offerings with process materials, production supplies, specialty wire and cable, and value- added fabricated parts for the electrical OEM, motor repair and assembly markets. Combined, total Industrial Group annual sales are approximately $6 billion.

Motion Industries has over 550 locations, including 14 distribution centers throughout North America and serves more than 300,000 customers from the food and beverage, pulp and paper, iron and steel, chemical, mining and aggregate, petrochemical, automotive, semiconductor, wood and lumber, medical, and pharmaceutical industries.

Motion Industries is a wholly owned subsidiary of Genuine Parts Company (NYSE: GPC). For more information, please visit MotionIndustries.com.

Paul Gruhn Named 2019 International Society of Automation President

The International Society of Automation (ISA) has named Paul Gruhn, PE, CFSE, and ISA Life Fellow, as its 2019 Society President.

Gruhn will lead the ISA Board of Directors, which is responsible for governing, setting policy and establishing the strategic direction of the organization. ISA is a nonprofit professional association that provides technical resources and programs for those who apply engineering and technology to improve the management, safety and cybersecurity of modern automation and control systems used across industry and critical infrastructure.

"I'm honored to be the 2019 Society President," said Gruhn, a globally recognized expert in process safety and safety instrumented systems who has played a pivotal role in developing ISA safety standards, training courses and publications. "Like any organization over the last 30 years, ISA has naturally had its ups and downs. To grow and remain relevant, we must adapt to both the changing times and the changing demographics of our industry."

Gruhn is a global functional safety consultant with aeSolutions, a process safety, cybersecurity and automation consulting firm. He serves as a Co-Chair and long-time member of the ISA 84 Standard Committee on safety instrumented systems, and continues to develop and teach ISA courses on safety systems. He also developed the first commercial safety system

> "Like any organization over the last 30 years, ISA has naturally had its ups and downs. To grow and remain relevant, we must adapt to both the changing times and the changing demographics of our industry."
>
> — Paul Gruhn, PE, CFSE, and ISA Life Fellow

modeling program. Gruhn has written two ISA textbooks, numerous chapters in other books and dozens of published articles.

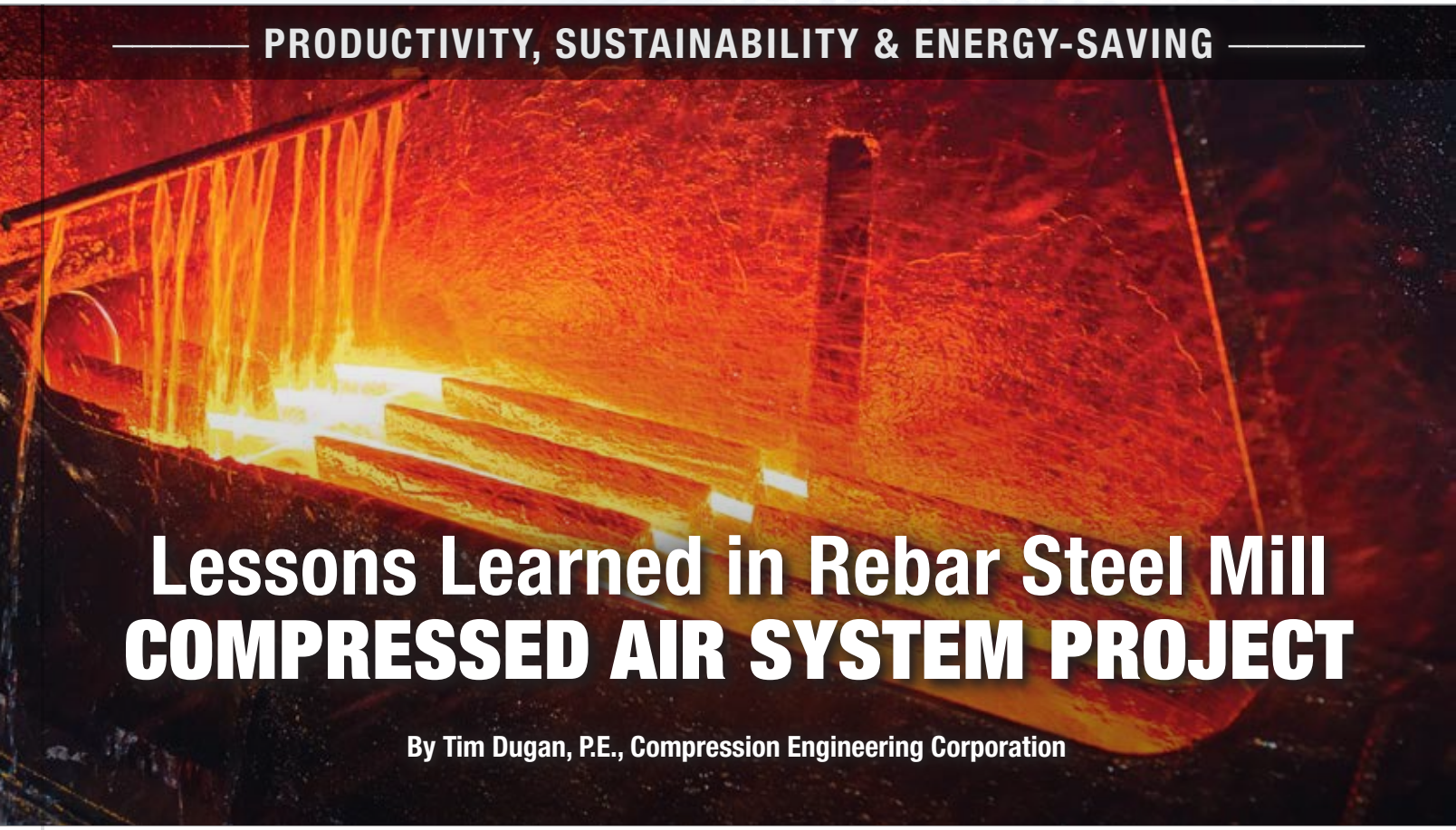
Gruhn earned a Bachelor of Science degree in mechanical engineering from Illinois Institute of Technology, is a licensed professional engineer (PE) in Texas, and both a Certified Functional Safety Expert (CFSE) and an ISA 84 safety instrumented systems expert.

About ISA

The International Society of Automation is a nonprofit professional association that sets the standard for those who apply engineering and technology to improve the management, safety, and cybersecurity of modern automation and control systems used across industry and critical infrastructure. Founded in 1945, ISA develops widely used global standards; certifies industry professionals; provides education and training; publishes books and technical articles; hosts conferences and exhibits; and provides networking and career development programs for its 40,000 members and 400,000 customers around the world. For more information, visit www.isa.org.

ISA owns Automation.com, a leading online publisher of automation-related content, and is the founding sponsor of The Automation Federation, an association of non-profit organizations serving as "The Voice of Automation." Through a wholly owned subsidiary, ISA bridges the gap between standards and their implementation with the ISA Security Compliance Institute and the ISA Wireless Compliance Institute.

PRODUCTIVITY, SUSTAINABILITY & ENERGY-SAVING



Lessons Learned in Rebar Steel Mill COMPRESSED AIR SYSTEM PROJECT

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

Steel mills come in many sizes and shapes. Since the Iron Age, man has improved the conversion of iron ore into a myriad of steel products. Thousands of alloys, grades, and shapes are manufactured in specialized plants. Broadly speaking, they can be divided into four categories, by SIC code:

- 3310 Steel Works, Blast Furnaces & Rolling & Finishing Mills
- 3312 Steel Works, Blast Furnaces & Rolling Mills (Coke Ovens)
- 3317 Steel Pipe & Tubes
- 3320 Iron & Steel Foundries

The steel mill in this article is a rolling "minimill," a facility that melts scrap recycled steel and produces rebar for the construction industry. It fits in SIC code 3310. There are many plants like this all over the world, providing an environmentally sound service and product for their local community. They recycle waste steel from local sources and support local infrastructure projects with rebar, using electricity generated locally.

Besides the huge electric load for the arc furnace (which is an awesome thing to behold!), the next largest electric load in a rebar minimill is the compressed air system. Not only is it a high operating cost, due to large loads to move heavy products, but it is essential for continuous operation of a mill that operates 24 hours a day, seven days a week. As in any heavy manufacturing process, compressed air is the "muscle of manufacturing," powering automation machinery that does what oxen, men, and steam power used to do. And do it far more humanely, productively and efficiently.

"The system ended up saving $136,000/yr in electricity, representing 91% of projected savings."

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

Upgrading a compressed air system project for a rebar minimill is not a simple project. The right team is key to success. Real system upgrades require a real team that maps to the real organization and the plant's real technical challenges. This article will discuss a comprehensive, $1.4 million project Compression Engineering tackled.

Understanding Organizational Challenges

No business is "perfect," particularly steel manufacturing. In the United States, most organizations have dual challenges of consolidation and disaggregation at the same time. They are part of a large national or global corporation, which affects policies, practices, and budgets. But they get no central support for making projects happen.

Local plants operate independently from a functional and resource level, yet have corporate oversight that usually hinders more than helps. Historically, most of the early plants built in the United States were individually owned and operated, making decisions about staffing and budgets locally. A plant had a "plant engineer," whether that person was a degreed engineer or not. A plant engineer in a steel mill was a craftsman of the art of making that particular type of steel. Their job was to optimize production and support operations and maintenance with engineering skill. Often, they had the support of a corporate engineering group with specialty skills. Design of new facility improvements was largely done in-house. If a plant engineer needed to buy something, the process was streamlined for approval and purchase. Vendors and the plant engineer had a flexible teamwork, and everyone knew their place.

Through consolidation, acquisition, and regulation, many steel mills have become loosely aggregated pieces of a large company,

LESSONS LEARNED IN REBAR STEEL MILL COMPRESSED AIR SYSTEM PROJECT

with fewer local resources. Smaller plants like rebar plants might not have local engineering. Those large enough to have facility engineering staffs tend to focus them on project management rather than design.

Engineers often are absorbed in non-value-added administration and meetings, making it necessary to outsource engineering design and analysis. However, the purchasing systems of these companies are usually not set up well for outsourcing engineering, and tend to be dictated by the mother company's policies pushed down on the local plant. They have gotten more and more restrictive on terms and conditions, insurance, safety, etc. This makes the list of companies that can be utilized for outsourced services smaller and smaller. Furthermore, turnover of in-house project engineering staff make it difficult or even impossible to maintain a corporate memory of how systems work (or don't work) and have been modified.

Two Operations in One

The steel mill discussed in this article is two operations in one, a scrap recycling plant, called "Melt", and a rebar mill, called "Rolling Mill". They had no local or remotely available facility engineering staff. However, they have a loyal and technically knowledgeable Rolling Mill maintenance supervisor who was able to get a project approved, and a mechanical supervisor who was able to manage the project.

Melt had their own maintenance management, but stepped back and allowed Rolling Mill to provide them air and run the project. This was key to success. Without centralization of authority and responsibility, the system could have easily become "Balkanized," with two separate project approvals, systems designs, and projects. Consolidation of decision-making was far better, providing one infrastructure for the entire site, at a maximum reliability and efficiency for all.

The purchasing system of this plant was dictated by a major corporation, requiring terms and conditions that were quite difficult to meet. This caused at least two of the equipment vendors contacted during the audit phase to back out. Fortunately for the plant, the remaining vendor who could comply with the Terms and Conditions (T&C) was very capable. Also, the local plant had enough discretionary funds to purchase some engineering assistance and instrumentation outside the primary contract with the equipment vendor, using very reasonable T&C that a small firm could comply to.

Addressing System Complexity

The compressed air system was complex, and ran the entire mill, so all parts of it needed to be addressed at the same time to maximize benefits. The system at this minimill was composed of three 440 hp lubricated screw air compressors, one 6,000 scfm heatless regenerative dryer, 12,000 gallons of storage and an automation system as shown in Figure 1. On an initial scan, this appears to be an efficiently designed system. It has multiple air compressors, controls, adequate storage, and potentially efficient drying. However, a detailed audit revealed there was over 2,175,000 kWh/yr ($149,000) per year of savings opportunity, just in the supply side!

Maintenance management was completely unaware of the energy savings opportunity, and brought in a consultant to attempt to find some cost savings, while addressing their primary reliability concerns:

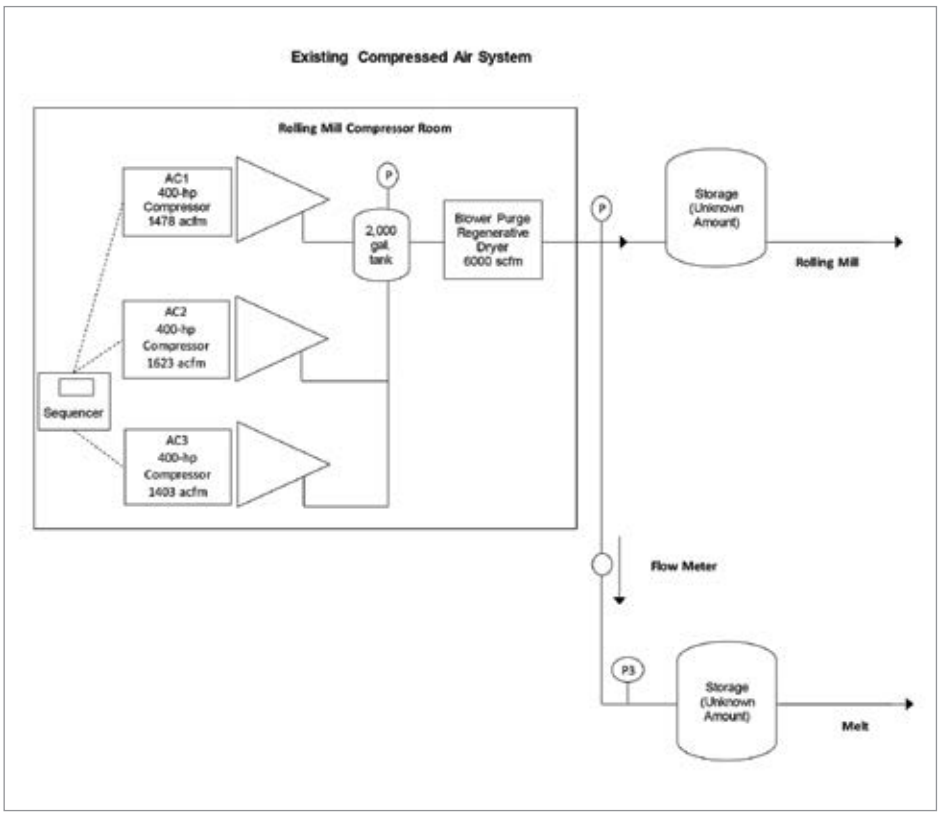


Figure 1. Compressed Air System

- No air compressor redundancy. All three air compressors ran during production, so routine repairs were difficult or impossible. This contributed to their reduced performance. When new, these air compressors offered the best efficiency available, but as operated, two of them had reduced efficiency.
- No dryer redundancy. One large dryer, which had controls problems and poor performance, also had obsolete parts. As such, it could never be shut down for maintenance.
- Poor compressor room layout. All three air-cooled air compressors were jammed end-to-end in one dark room, with only about three feet of clearance between the air compressors and the walls. Restrictive ducting brought cooling air in and out.

A future article will describe the audit and findings in more detail. Certainly, there are multiple ways to address the concerns, including repairing and retrofitting the existing equipment. In this case, the mill wanted new air compressors, so a new project was justified on both a maintenance and energy basis.

These challenges were overcome with a new centralized, efficient system design. Savings were verified with our independent audit. The system ended up saving $136,000/yr in electricity, representing 91% of projected savings. The post-audit flow calculation aligned perfectly with the calculated baseline flow (without dryer purge peaks), so the air

LESSONS LEARNED IN REBAR STEEL MILL COMPRESSED AIR SYSTEM PROJECT

compressors were sized to operate in their sweet spots. The improved system has the following components:

- (1) 400 hp VFD-driven 2-stage oil-lubricated screw air compressor, remote air-cooled cooler.
- (2) 300 hp fixed speed 2-stage oil-lubricated screw air compressors, remote air-cooled cooler.
- 3,000 gallon wet storage and 3,800 gallon dry storage.
- Mist eliminator.
- Dual drying system, regenerating for winter and refrigerated for other months.
- Master control system.

Total project costs, including the new compressor room, were about $1,401,000. A utility incentive was about $537,000, and the final payback for a completely new, 20-year life system was six years.

Effective Project Management

How could a complex project like this be identified and approved in less than six months? How could it be accomplished in only 15 months and without an engineering staff on site? There were some key players and other factors that made the difference:

1. The rolling mill maintenance superintendent and mechanical superintendent.
2. Local utility Seattle City Light.
3. Utility Demand Side Management program: Bonneville Power Administration Energy Smart Industrial.
4. Equipment supplier: Rogers Machinery Company, Inc.
5. Technical consultant: Compression Engineering Corp.

Here's a chronology of the process that led to the success of the project:

1. **Meetings with utility and DSM program, selection of audit firm**

   The plant had enough concern about their system that they had planned on hiring a consultant to do a study. When they discovered the consultant would be funded by the utility, a study was initiated. As described, the detailed study resulted in significant findings, which were acted on. Just pausing here to reflect on the value of an independent study, or "audit." The dryer findings particularly, with their impact on air compressor sizing and reliability, would probably not have been discovered, and air compressors sized to meet the false peak of 4,400 scfm

would probably have been sized. A typical study that was part of an air compressor distributor's sales team would probably not have been done so thoroughly as this was a custom audit. Some air compressor dealers have really improved their audit teams, however, so my bias (as an independent) might not seem fair to some. If you prefer getting an audit from them, I recommend you check with your utility DSM program to get an objective assessment of their capabilities.

2. Audit

After a scoping visit, a detailed plan was developed for the supply-side audit. A plant down time was selected to start the audit, so testing of air compressors and dryers could be done. In an air compressor replacement audit, actual air compressor capacity is valuable to develop, if possible. Since there were no flow meter tap points, an innovative subtractive method was developed. A flow meter was installed on a vent, and each air compressor fully loaded during a steady leak load period, with pressure being constant. The air compressor with highest vent flow was the highest capacity, and was assumed to be at original specifications. The other ones were de-rated incrementally based on the lower vent flow needed to stabilize. In addition, crossover flow between Melt and Rolling was measured with a flow meter, to develop profiles for both sides of the facility.

After the baseline was developed, rigorous models calculated savings for each of the measures. Multi-point curves of performance curves, adjustments for alternate pressure, etc., are part of the analysis. A written report presented findings, savings, system improvements, budgetary costs, and economic analysis. Options for centralized and split Melt/Rolling Mill systems were developed. Fortunately, the plant chose centralized.

3. Design

The plant maintenance supervisor contracted with Compression Engineering and their contractor to develop piping, mechanical, and control logic design. This was delivered to Rogers Machinery Company who designed and built custom packages. Special requirements for motors, starters, controls, and remote coolers were incorporated.

4. Purchase and fabrication

The supplier had to manage a complex process of purchasing hundreds of components, many of which had to be specified by engineers who specialize in air compressor system design, and assemble and test large, complex air compressor skids. Rogers Machinery Company did a commendable job. There were some startup challenges and components that had to be replaced, as there are on many complex projects, but they were addressed quickly.

5. Construction

The rolling mill mechanical supervisor did a fabulous job running the construction side. A new transformer had to be installed, building modifications made, complex piping installed, machinery installed, and controls installed. Great pains were made to make sure the old air compressor system (and a dryer) was available during the testing period of the new system.

6. Testing and Commissioning

Compression Engineering developed plans for and supervised performance tests at Rogers Machinery Company for the air compressors and in the system.

BLOWER & VACUUM BEST PRACTICES
blowervacuumbestpractices.com

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

CHILLER & COOLING BEST PRACTICES
coolingbestpractices.com

PROUDLY PRESENTING THE 2019 EXPERT WEBINAR SERIES

Ross Orr
Systems Engineer, Compressor Energy Services

Ron Marshall
Chief Auditor, Marshall Compressed Air Consulting

Tim Dugan, P.E.
President and Principal Engineer, Compression Engineering Corp.

Loran Circle
Senior Consultant, Circle Training & Consulting

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

Hank van Ormer
Technical Director, Air Power USA

Tom Taranto
Owner, Data Power Services

JAN 24
Proper Installation & Sizing of VSD Air Compressors
Presenter Ross Orr, Systems Engineer, Compressor Energy Services
January 24, 2019 – 2:00PM EST

FEB 28
Visualizing KPI's: Specific Power, Flow, Pressure, Dewpoint
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting
February 28th, 2019 – 2:00PM EST

MAR 14
How to Design a Centralized Vacuum System
Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corp.
March 14th, 2019 – 2:00PM EST

APR 04
Safety and Quality in Compressed Air: Why You Should Care
Presenter Loran Circle, Senior Consultant, Circle Training & Consulting
April 4th, 2019 – 2:00PM EST

APR 25
Techniques for Determining Savings from Aeration Blowers
Presenter Tom Jenkins, P.E., President, JenTech Inc.
April 25th, 2019 – 2:00PM EST

MAY 16
Selecting & Sizing Heat of Compression Desiccant Dryers
Presenter Hank van Ormer, Technical Director, Air Power USA
May 16th, 2019 – 2:00PM EST

JUN 06
Selecting & Sizing Oil-Free Air Compressors
Presenter Tom Taranto, Owner, Data Power Services
June 6th, 2019 – 2:00PM EST

JUN 27
Sizing and Operating Vacuum Pumps
Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corp.
June 27th, 2019 – 2:00PM EST

JUL 18
Control Strategies for Multiple VSD Air Compressors
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting
July 18th, 2019 – 2:00PM EST

AUG 01
Alternatives to PID Algorithms for DO & Blower Control
Presenter Tom Jenkins, P.E., President, JenTech Inc.
August 1st, 2019 – 2:00PM EST

AUG 22
Piping and Storage for Compressed Air Systems
Presenter Tom Taranto, Owner, Data Power Services
August 22th, 2019 – 2:00PM EST

SEP 19
Sizing Steps for Chillers in Process Cooling
Presenter Ross Orr, Systems Engineer, Compressor Energy Services
September 19th, 2019 – 2:00PM EST

NOV 14
Liquid Ring Vacuum Pump Replacement Projects
Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corp.
November 14th, 2019 – 2:00PM EST

DEC 12
Air Compressor Lubrication & Maintenance
Presenter Loran Circle, Senior Consultant, Circle Training & Consulting
December 12th, 2019 – 2:00PM EST

Register for Free Today at airbestpractices.com/magazine/webinars

SPONSORED BY

VP INSTRUMENTS
BUSCH
TRACE Analytics
BEKO
KAESER COMPRESSORS Built for a lifetime.
SAMURA
Nidec –All for dreams
Atlas Copco

LESSONS LEARNED IN REBAR STEEL MILL COMPRESSED AIR SYSTEM PROJECT

The old system was left in place so full off-line testing could be conducted, using false loads. Controls were tuned based on peak and minimum flow, and transitions in between. Dryer switching algorithms were refined and tested. This is an essential part of the process. Without properly supervised and implemented system commissioning, over half of the savings would have been left on the table. A typical utility-contracted energy engineer (not a compressed air expert) doing typical measurement and verification (M&V) after the vendor was done would not have known how to "commission" the system. We have found that without a compressed air expert energy consultant involved in commissioning, *prior* to M&V, the project performance will not be achieved as projected.

Lessons Learned

This article discussed organizational challenges, system complexity issues, and project management issues of a comprehensive compressed air supply-side project in a steel minimill. Here are lessons learned:

1. If plant facility engineering staff is not available, an "outsourced" engineering process is needed. First, an audit, then design, and finally commissioning. If a facility/plant engineer is available, the auditor can and still should be involved, but would partner with the engineer. They usually still need outside help.

2. If purchasing and/or payment term requirements are stringent, select the one vendor who can meet them and supply everything identified in the audit, and be able to test it thoroughly. If you can purchase from multiple vendors, you might have more financial leverage, but there could be less technical support and potential conflicts and gaps.

3. Consider VFD air compressors with sufficient swing capacity to cover normal variances in airflow during production, without "bumping" base-load air compressors.

4. If regenerative blower-purge dryers are used, turn off the cool-down purge and trend the dewpoint. It is unlikely that this will create a problem, but the trending would show if it did.

5. Perform thorough testing at the factory where the air compressors and dryers are built and as a system. Keep the old system in place if possible until the new one is completely tested and running the plant for months.

6. Use a qualified, expert compressed air consultant for the initial audit, system design, and commissioning. The consultant needs to be very experienced in systems evaluation, analysis and design. There is a place for a simplified audit that a sales engineer can do themselves. A system of this size and complexity is not one of them. BP

For more information, contact Tim Dugan, President of Compression Engineering Corporation tel: (503) 520-0700, email: Tim.Dugan@comp-eng.com, or visit www.compression-engineering.com.

To read more ***Steel Industry*** articles, please visit www.airbestpractices.com/industries/metals

QUALITY, SAFETY & RELIABILITY

Filling the Gap for Air Compressor SERVICE TECHNICIANS

By Mike Grennier, Compressed Air Best Practices® Magazine

Photo courtesy of Zorn Compressor & Equipment.

As demand for compressed air use continues to grow, the future looks bright for distributors who design, sell, install and service compressed air systems. But perhaps only one thing stands in the way of continued growth and profitability for the vast majority of distributors throughout the United States: the shortage of experienced air compressor service technicians.

Yet despite the limited availability of seasoned service technicians distributors are finding ways to tackle the issue head on to ensure they have the right team in place to service customers – and keep them coming back. Here's what leading distributors from throughout the country say about the importance of service technicians and their strategies to successfully overcome one of the industry's biggest challenges.

Service Technicians: Unique & Highly Valued

Distributors everywhere view service technicians as not only a unique breed of professionals with specialized skills and talent; they see them as the lifeblood of their operations.

"We are a service company that provides equipment. We don't have the capability of only

> "We are always actively searching for experienced service technicians, but your chances of finding someone with industry knowledge are small because any tech of value is not out looking for work."
>
> — Jimmy Hamilton, President, Q Air-California

chasing equipment sales. Service technicians are the foundation of our success," said Phil Kruger, Vice President/General Manager of Harris Equipment, headquartered in the Chicago suburb of Melrose Park, Illinois. The company employs eleven service technicians.

Jim Timmersman, co-owner of Power Supply Industries (PSI), headquartered in Fenton, Missouri, said service technicians are highly valued for a very good reason. Their job is to keep customers' plants functioning.

"If a plant loses air, it's like the lights going out," said Timmersman. "It's absolutely crucial for our service technician to correct problems and satisfy the customer." PSI, which also has locations in Peoria and Decatur, Illinois, employs 14 service technicians.

The job of an air compressor service technician requires a unique set of skills, such as understanding the heart of a rotary screw air compressor-the airend. Photo courtesy of Atlanta Compressor.

BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM

3-DAY CONFERENCE & FREE EXPO!

SUSTAINABLE ON-SITE UTILITIES POWERING AUTOMATION

YOU FOCUS ON PRODUCTION

What's Your kW/ H_2O Use per Unit of Production?

OPTIMIZE THE TECHNOLOGIES POWERING MODERN PLANT AUTOMATION

96 SESSIONS IN FOUR CONFERENCE TRACKS

Track 1: Quality & Safety Management | Track 2: Maintenance & Reliability

Track 3: Energy Conservation / IoT Monitoring | Track 4: Water Conservation / Energy Management

SPONSOR

CAGI Compressed Air & Gas Institute

REGISTER AT WWW.CABPEXPO.COM

SUPPORTING ORGANIZATIONS

TN Department of Environment & Conservation

FILLING THE GAP FOR AIR COMPRESSOR SERVICE TECHNICIANS

Zorn Compressor & Equipment General Manager/Vice President Jeff Carlson said the importance of service technicians is only growing. Zorn is headquartered in the Pewaukee, Wisconsin. It also has branches throughout Wisconsin, as well as Northern Illinois. It has a team of 30 service technicians.

"We're seeing more and more customers with fewer and fewer maintenance people on their staffs. That means they rely on professionals like Zorn to take care of their equipment," said Carlson. "Service is the backbone of our business."

Finding a Needle in a Haystack

There is no single reason for the shortage of experienced service technicians for hire. Reasons vary from a general shortage of people interested in working in technical trades to the uniqueness of the occupation. The combination of factors adds to the difficulty of finding good service technicians.

Many like Robert Agnetti of Pye-Barker Engineered Solutions, Forest Park, Georgia, say the lack of experienced professionals could be a sign of the times.

"I think a lot of it has to do with the younger generation. Not many want to get their hands dirty. It's just a different world we live in," said Agnetti, Vice President of Operations at the company. Pye-Barker also has an office in Savannah, Georgia. It employs six service technicians.

Distributors like Agnetti say finding an experienced service technician is like finding a needle in a haystack largely because the job requires a highly specialized set of skills. Needed are technicians who can install and maintain all types of air compressors, as well as system components; read wiring schematics and diagrams; and diagnose air compressors and components using precision measurement tools.

It's also critical for a service technician to have accomplished communication and soft skills, making it even harder to find the right candidate.

"Obviously, they need to be technically capable, but they also need to be customer-focused. They're the people customers see the most. They are ambassadors of sorts to our customers," said Carlson, echoing the sentiments of virtually all distributors.

"People have to look at what the title, 'air compressor service technician,' means," said Sal Calvo, Owner of MidState Air Compressor, Inc., Berlin, Connecticut. Calvo is Vice President of the Association of Independent Compressor Distributors (AICD), and has spearheaded AICD educational initiatives aimed at service technician training.

Sal Calvo, Owner, MidState Air Compressor, Inc.

FILLING THE GAP FOR AIR COMPRESSOR SERVICE TECHNICIANS

"The job is not just about fixing air compressors," said Calvo who employs seven service technicians. "It's about talking. It's about figuring out what's going on in a certain situation. A service technician needs to be a detective to survive in this industry."

Jimmy Hamilton, President, Q Air-California, began his career as a member of the service team.

Hiring Less Experienced Technicians Works

Nearly every distributor encounters the same reality: Experienced service technicians with a combination of rare and valued skills are gainfully employed. What's more, the supply of highly qualified service technicians is small to begin with. It's why most are fine with hiring less experienced candidates.

"There just isn't a huge field of air compressor service technicians," said Timmersman, adding that people who graduate from a technical school have a myriad of options beyond the compressed air industry.

"You don't see people coming out of school to be an air compressor technician," said Jimmy Hamilton, President, Q Air-California, Santa Fe Springs, California. The company employs a team of 10 service technicians. "We are always actively searching for experienced service technicians, but your chances of finding someone with industry knowledge are small because any tech of value is not out looking for work."

Distributors like Q Air-California say it takes an ongoing, strategically focused effort – and often a creative approach – to find, train and retain a qualified team of technicians. With a small pool of experienced candidates, many concentrate on hiring candidates with the potential to grow into the job.

A must for many like Harris Equipment is for candidates to have at least a few years of mechanical and electrical experience.

"We look for people that have some kind of wrenching experience in their background. This isn't easy work. On top of everything else, they're going to be physically tested. If they don't have that mechanical aptitude we don't look at them," said Kruger.

Morty Hodge, CEO of Atlanta Compressor, LLC, Hoschton, Georgia, said some level of exposure to the mechanical and electrical work is essential for his company.

"We're looking for folks who have basic mechanical reasoning abilities and who are already trained in the basics of electricity in a different industry, such HVAC or the automotive industry," said Hodge, who also oversees affiliate companies Nashville Compressor, Nashville, Tennessee, and Charlotte Compressor, Charlotte, North Carolina. The three companies together employ 14 service technicians.

Service vans ready to roll out at MidState Air Compressor. Photo courtesy of MidState Air Compressor.

Hiring for Upside Potential Also Works

While many distributors concentrate on hiring service technician candidates with mechanical or electrical backgrounds – and train them on the specifics of the job – many are willing to start from the ground up.

Hodge said Atlanta Compressor and its affiliate distributors don't focus on hiring seasoned service technicians. Rather, the goal is to hire well-rounded candidates with upside potential to help the company fulfill its vision.

"We hire based on the three C's," Hodges said. "Number one is character. We look for people who have the ability to care. Number two, we look for a cultural fit and number three is competency," he said. "We'll hire entry-level candidates based on that criteria."

MidState Air Compressor and many others follow a hiring approach similar to Atlanta Compressor's strategy.

"People need to be a little more open minded about hiring and training based on the times," said Calvo. "It's not like it was years ago. I basically hire on a person's potential for the job, their personality and how they're going to fit into a team. If they want to learn you can train them."

Distributors like Calvo who hire service technician candidates with limited mechanical or electrical background follow a rigorous process to ensure a positive outcome – as do all distributors. The process involves careful interviewing, and in many cases: pre-employment testing.

As an example, MidState Air Compressor screens candidates with the help of an online testing service. Tests help determine whether a candidate has some level of mechanical or electrical aptitude. Those with acceptable scores then take another series of tests to pinpoint their strengths. If they score higher in any one area such as electricity, MidState Air Compressor begins to focus training on that area of strength – in addition to putting the person through its well-rounded training program.

Continuous education and training is critical for all service team members. Photo courtesy of Atlanta Compressor.

FILLING THE GAP FOR AIR COMPRESSOR SERVICE TECHNICIANS

A Good Career, a Good Salary

Those looking for jobs as an air compressor service technician are in the driver's seat in today's marketplace when it comes to career opportunity. Not surprisingly, it's an occupation that can pay well.

Compressed Air Best Practices® Magazine asked distributors from throughout the country to shed light on the annual salaries paid to service technicians based on varied levels of experience as part of an informal survey.

An entry-level candidate with no compressor technician experience can earn an annual salary of approximately $24,000 to $42,000. A service technician with one to five years of experience can earn approximately $40,000 to $62,000 per year.

Salaries climb significantly for more experienced and senior service technicians. Those with five to 10 years of experience working on air compressors and related equipment can expect to earn a minimum of approximately $46,000, and as much as $73,000 per year. A service technician with 10 or more years of experience can command approximately $60,000 to $89,000 per year.

The range of salaries described here does not include benefits normally including a company service truck and full healthcare coverage. In addition, many factors, such as such as the candidate's background, previous certifications and personality, as well as the level of competition within each region for skilled professionals, greatly influences the compensation offered.

AIR COMPRESSOR SERVICE TECHNICIAN SALARIES*

EXPERIENCE	None	1-5 Years	5-10 Years	10+ Years
SALARY	$24,000-$42,000	$40,000-$62,000	$46,000-$73,000	$60,000-$89,000

*Based upon an informal survey of Compressed Air Best Practices® Magazine subscribers.

The service truck fleet at Q Air-California. Photos courtesy of Q Air-California.

Agnetti at Pye-Barker will also take a close look at inexperienced service technician candidates who don't have mechanical backgrounds, but are willing to learn.

"If someone shows me they have the drive and are willing to learn, we'll give him the opportunity for an entry level position," Agnetti said. The new hire then starts with basic training, he said. However, Agnetti – like others – said it doesn't work out for all candidates.

"If a person doesn't have mechanical ability, it's my job to tell him they don't have what it takes, but if they have the drive we'll find other areas of the company where we can use them," he said.

Hamilton of Q Air-California said it's fairly easy to know whether it's worth investing in a candidate without any compressed air experience. It starts with good mechanical questions in the interview process.

"I'll typically ask basic questions like, 'Do you own a tool box? Do you work on your own car? Do you have any mechanical skills?' If they can't satisfactorily answer questions like these, we're typically not going much further in the conversation."

Teachers and Coaches, not Just Distributors

Distributors everywhere have found they are no longer only in the business of selling and servicing compressed air systems. Instead, they have become teachers and coaches who excel at educating and training service technicians regardless of whether someone is a new-hire or a seasoned professional.

Training typically starts with classroom and video training on safety and air compressor basics. Distributors also focus on essential

industry certifications, including Occupational Safety and Health Administration's OSHA 10-Hour online course designed to teach workplace safety and reduce jobsite hazards. Another is the Environmental Protection Agency's EPA Technician certification. The EPA's mandatory program requires all technicians to be certified before working on equipment that contains refrigerants.

"Distributors also capitalize on online training courses offered by AICD and the Compressed Air and Gas Institute (CAGI). The availability of online training is invaluable," said Calvo.

"The younger guys eat up the online training," he said. "It's what they do. They grab a tablet and go right through it. It's crazy to see how they come back to me two days later and say the online training is done."

The next step after general training for most entry-level trainees with some level of experience – or none at all – involves work in the shop for several months where they work on air compressors and related equipment.

At Harris Equipment, for example, a dedicated trainer begins training a trainee in the shop using a curriculum that spells out clear objectives to be met.

"Our trainers don't just show a trainee how something is done. They instruct them on how to do it, why they do it, and review what's been accomplished. It's set up as pass/fail scenario and both the trainer and the trainee sign off. A fail involves more work until the trainee passes," said Kruger.

At Harris Equipment and other distributorships the next step in training for less-experienced trainees is for a trainee to work side-by-side with a seasoned service technician in the field.

On-the-job training at all distributors involves multiple checkpoints and multiple team discussions about the trainee's progress and ability to work independently at a customer's site. The time devoted to training a newer service technician varies by person. Distributors say it's only when all parties are comfortable when new service technician goes in the field on their own.

At all distributorships, training is ongoing regardless of a service technician's experience. Training often includes informal training during the lunch hour, online training, in-shop training, and on-the job training. Distributors also take advantage of regular training offered by manufacturers of air compressors and related equipment.

More Than a Job

Like any occupation where the demand for proven skills outweighs supply air compressor technicians stand to make a good living. And say distributors, it's a rewarding career.

"Service technicians are never going to be replaced by robots," said Hamilton at Q Air-California. "If you're serious about it and you can find a good company that will take care of you, it's a job for life."

Calvo at MidState Air Compressor could not agree more. His company, like others, works hard to ensure service technicians know they're valued.

"We tell candidates MidState Air Compressor is a career," he said. "It's not a job. If you're ready for a career, we're the right place for you." BP

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

QUALITY, SAFETY & RELIABILITY

Capital & Maintenance Cost Avoidance WHEN METAL GRINDING LOADS RISE

By Hank van Ormer, Air Power USA

The thread of previous columns focused on direct energy reduction as the savings. We presented calculations and the energy savings in a simple manner and only looked at the direct savings associated with electric power and compressed air reduction.

What we did not shine a light on is the additional and accompanying savings that inevitably come along with a well-applied and implemented operating system. These additional benefits include such as things as capital cost avoidance, reduced maintenance costs, safety improvements, increased productivity and product quality.

You may remember the article in the October 2018 issue of Compressed Air Best Practices® Magazine titled, "The Importance of System Pressure Control." The article focused on a Midwestern manufacturing facility that produced a multitude of custom high-end performance touring and racing bicycles. This article features the same manufacturing facility and how improving its compressed air system, particularly in process grinding, allowed the plant to use the same compressed air system – while plant production increased by 30% to meet demand for its product.

> "Implementation of the recommended solution gave the plant the ability to achieve its goals, including a 30% increase in production while using the current compressed air supply."
>
> — Hank van Ormer, Air Power USA

Current Compressed Air System Overview

The plant's current compressed air system operated as follows:

- Total average production compressed air flow: 1,500 hp or 1,243 input kW
- Total annual operating energy cost: $411,085
- Total annual operating production hours: 6,240

Plant personnel had experienced ongoing problems with its process grinder performance due to unstable compressed air pressure. This created potential problems in terms of product quality. Grinders do not work properly without the proper pressure. Additionally, plant staff wanted to address these concerns, prior to a proposed 30% increase in production, and suggested raising the header pressure from the current operating pressure of 98 psig to 125 psig. The thought behind this was if the pressure from the header to the grinder process was dropping to 63 psig, then raising the pressure to the process would give the grinders enough pressure to work through higher peak production times.

As shown in Figure 1, the plant's header system is set at 98 psig for the grinding process. When the process operated, however, the actual inlet pressure to the grinder fell to 63 psig from 98 psig. The header pressure did not fall but the pressure to the process fell significantly.

Metallic Surface Grinding: A Critical Function

Surface grinding is probably the most common of industrial grinding applications. The process is used for finishing and smoothing metallic or non-metallic materials for a polished and seamless look by removing surface impurities.

At the bicycle manufacturer, grinding is especially critical since the high-end and high-priced bicycles are used for racing rather than leisure activity. The pressure delivered to the grinders has a significant impact on the ability of a grinder operator to achieve the cosmetic and operational quality needed.

At the facility, a bicycle frame is brought to each grinding station where an experienced

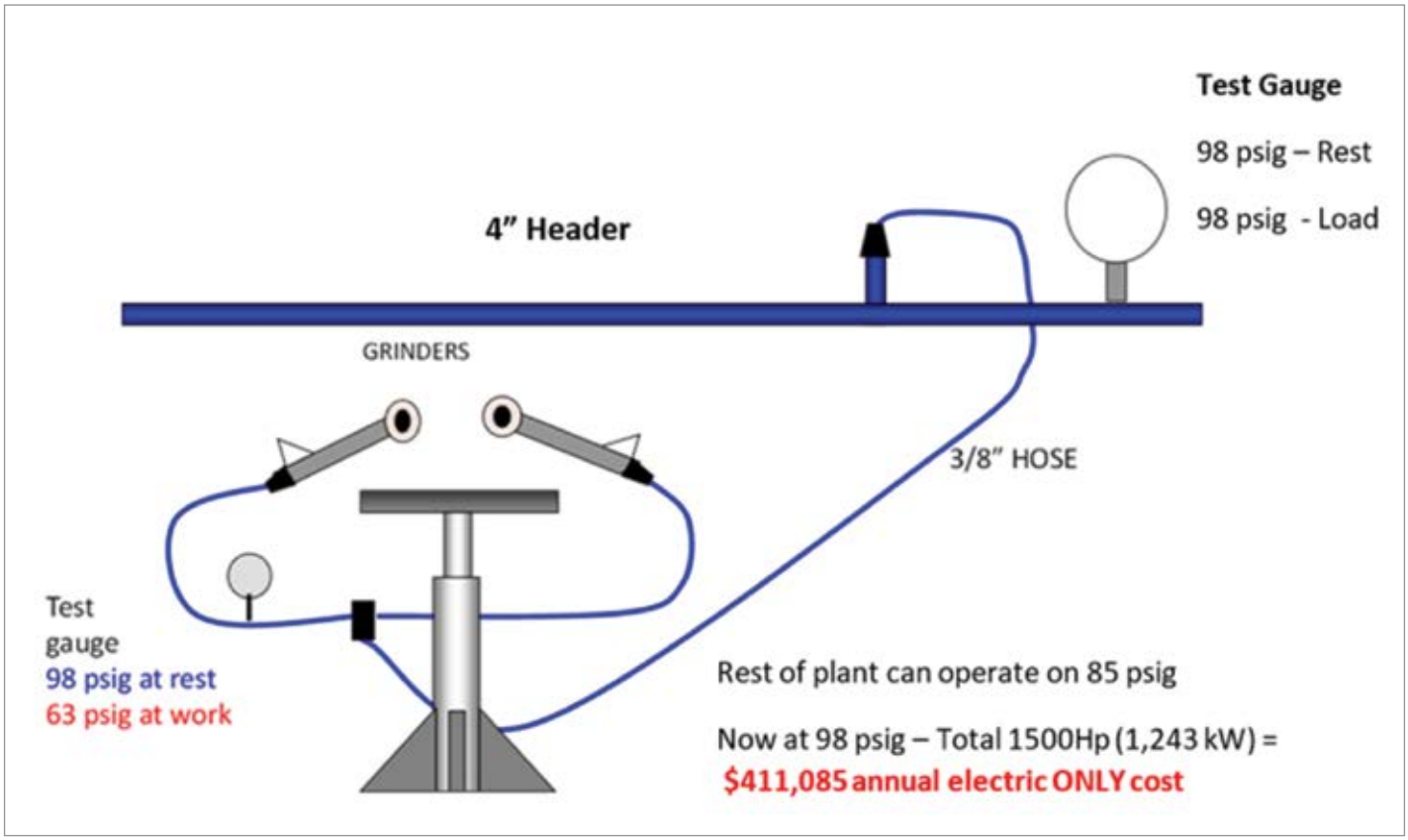


Figure 1. Current Grinding Process

BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM

3-DAY CONFERENCE & FREE 2-DAY EXPO!

SUSTAINABLE ON-SITE UTILITIES POWERING AUTOMATION

FOCUS ON OPTIMIZING THE TECHNOLOGIES POWERING MODERN PLANT AUTOMATION

- **Food Industry Multi-Million Dollar Cooling Tower Project Avoided Due to Compressed Air Leak Audit**
- **Brewery Significantly Reduces Water Consumption by Changing Vacuum Pump Technology**
- **Bus Depot Turns off Boilers Heating Shower Water by Using Free Heat Recovered from Air Compressors**
- **Automotive Plant Reduces Chiller kW Consumption with Free-Cooling**

PARTIAL LIST OF FEATURED SPEAKERS

Leslie Marshall
Corporate Energy Engineer Lead, General Mills

Doug Barndt
Demand Side Energy – Sustainability, Ball Packaging

Bruce Bremer
Former Corporate Energy Manager Facility Engineering, Toyota North America

Brett Rasmussen
Senior Energy Engineer, Nissan North America

Sharon Nolen
Manager, Global Natural Resource Management, Eastman

OPENING SESSION: Monday, Oct 14, 2019 8:30AM–10:00AM / **PLENARY SESSION:** Tuesday, Oct 15, 2019 8:00AM–9:30AM

FREE 2-DAY EXPO: OCTOBER 14-15, 12:00-6:00PM **CONFERENCE:** OCTOBER 13-16

Pre-Register at cabpexpo.com

CAPITAL & MAINTENANCE COST AVOIDANCE WHEN METAL GRINDING LOADS RISE

operator uses the grinder to smooth and polish the frame surface to remove welds where the frame is put together. Each operator is tasked with producing a seamless and uniform look to each bike frame's aluminum alloy surface. After the frame is satisfactorily smooth it is sent to the powder coating area and then to assembly. Each grinder is rated at approximately 0.3 hp and uses roughly 33 cfm at each process.

Initial Proposal: Purchase a new 300 hp Air Compressor!

An initial solution proposed by an outside source suggested the plant consider purchasing and installing a new 300 hp air compressor. It was felt a new air compressor would not only cover the 30% production increase but would provide the 125 psig "needed" at the grinding processes to operate effectively – thus alleviating the low pressure issues.

While a new compressor would certainly help with the increase in production, it would come with an increase in capital used plus energy and maintenance costs. The addition of new compressed air supply components, i.e., a 300 hp air compressor, air treatment and new piping from the new equipment to the main distribution header, would include significant capital expense of not only the cost and installation of new equipment, but also the increase of pressure and total kW in the system.

Audit Finds Grinding Supplied by a 3/8" Air Hose Line

Given the significant costs involved, the plant brought in a third party to conduct an audit of the compressed air system and to assist in determining the best course of action. After reviewing all supply and demand-side equipment, the audit team along with plant operators, discovered the grinding processes were being supplied by a 3/8-inch air hose line, from the four-inch piping header.

This indicated the lines to the process air could only pass a limited amount of compressed air at 98 psig, so when the

TABLE 1

	CURRENT SYSTEM	PROPOSED SYSTEM OPTION #1 (30% PRODUCTION INCREASE)	*PROPOSED SYSTEM OPTION #2 (30% PRODUCTION INCREASE)
	MAX FLOW PRODUCTION	NEW 300 HP COMPRESSOR, NEW DRYER, PIPING MODIFICATIONS AND INCREASED HEADER PRESSURE	PRESSURE REGULATORS, INCREASE PROCESS STORAGE AND PIPING MODIFICATIONS
Total system HP and input kW	1,500hp / 1,243 kW	1,800hp /1,492 kW	1,400hp / 1,160 kW
Current vs. proposed annual electric energy cost ($0.053/kWh)	$411,085	$493,434	$383,635
Annual operating hours	6,240	6,240	6,240
Annual production	956	1,242	1,242
Current vs. proposed capital equipment costs	$250,000	$650,000	$250,000

* The numbers used in this table were supplied by plant staff. This data and the calculations are proprietary and specific to the application.

CAPITAL & MAINTENANCE COST AVOIDANCE WHEN METAL GRINDING LOADS RISE

process wasn't getting enough air, the system header couldn't supply any more.

The audit team and plant staff ultimately determined the correct pressure needed at the grinding process was around 75 psig with the proposed modifications. It was suggested that each grinder process add a small 80-gallon compressed air storage vessel, pressure regulator and re-pipe the process to one-inch pipe in place of the 3/8-inch hose.

While the equipment supplier was very thorough in its evaluation and certainly addressed all the main plant concerns, what it missed was looking at all the Key Performance Indicators (KPI's) in the entire system. Sometimes bigger picture items are often pushed to the forefront and addressed first – when often a look at the smaller, but no less important indicators such as minor piping changes and pressure regulation can, in some cases, save a larger and overall more expensive capital and variable cost.

This is illustrated in Table 1, which shows some very interesting and related calculations, including plant-provided data for the KPI's in this system.

Here's a breakdown the capital and variable expenses for outlined options:

	Option 1	Option 2
Total capital expense (equipment + installation)	$650,000	$250,000
Five-year maintenance cost:	$200,000	$100,000
Total estimated expenses:	**$850,000**	**$350,000**

The capital expense includes new equipment purchased and installation costs for both options. Variable expenses, such as the maintenance costs, were calculated for a five-year period. These costs for Option 1 total $40,000 per year, while the costs for Option 2 are $20,000 per year.

Examining the Options

As shown in Table 1, Option 1 would have provided the plant with an increase of compressed air at 1,800 hp and 1,492 input kW total. It would cost the plant $650,000 to implement and an additional $200,000 in maintenance costs over a five-year period and would cover the increase in production. This option would have cost the plant an additional $82,349 annually in electric costs when compared to the baseline.

By comparison, Option 2 would provide the plant with the needed air for the production increase. This option would cost the plant

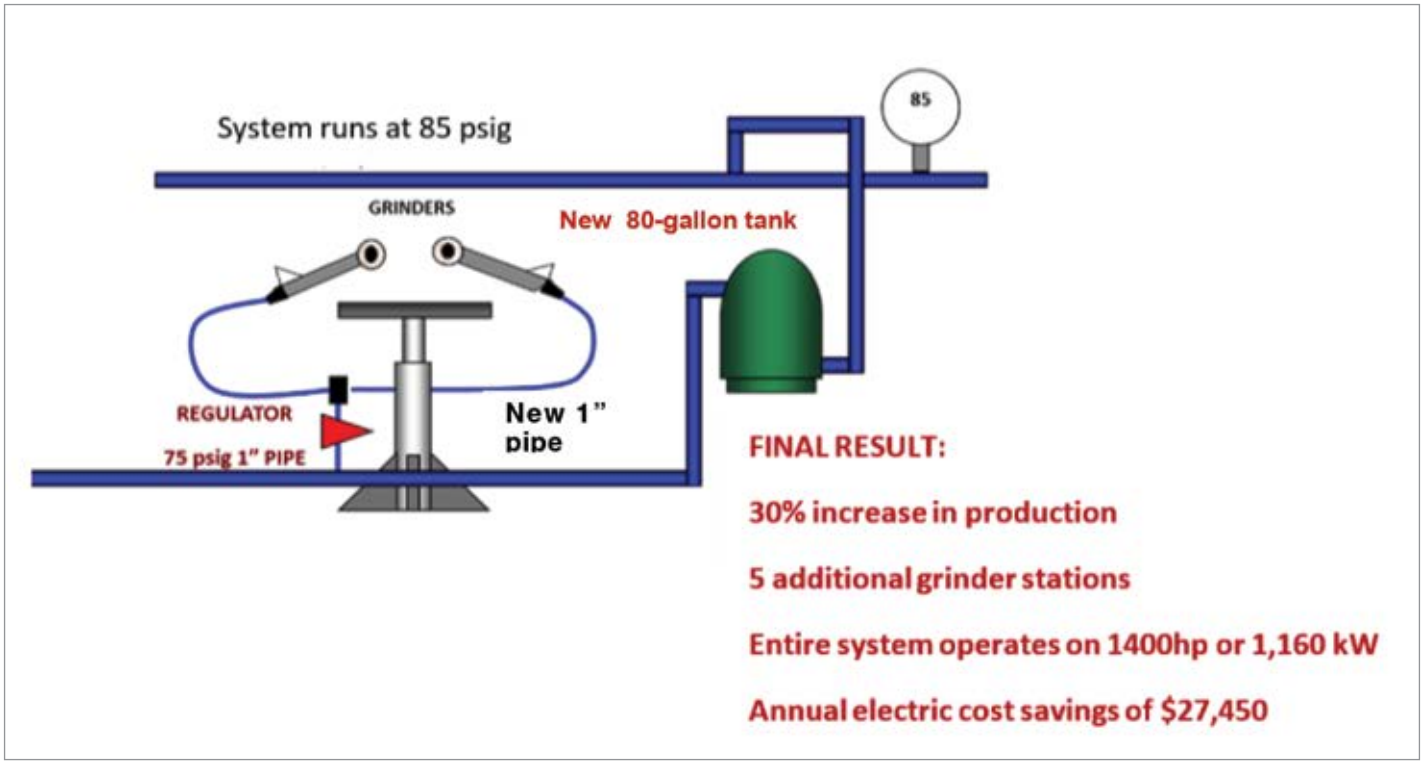


Figure 2. Corrected Grinding Process

$250,000 to implement and an additional $100,000 in maintenance costs over a five-year period. This option reduces the annual cost from the baseline $27,450/year. Option 2 also would reduce the header pressure from 98 psig to 85 psig and saved 100 hp or 83 kW. The plant would also be able to regulate the air at each grinder process to 75 psig and add five additional grinder pedestals/stands.

Meeting Increased Production Goals

After knowing the available options and associated costs, the plant moved forward with the compressed air system upgrade as described in Option 2. It included the following modifications to each grinding station:

- Removal of the 3/8-inch air feed hose.
- Added 1-inch compressed air supply piping from the header to each station.
- Increased effective compressed air storage and installed an 80-gallon storage vessel and pressure regulator at each station.

Implementation of the recommended solution gave the plant the ability to achieve its goals, including a 30% increase in production while using the current compressed air supply. It also allowed the plant to add five grinder stations/pedestals. Additionally, the entire system operates on 1,400 hp using the existing air compressors.

Figure 2 illustrates the corrections to each grinding station as identified and implemented by plant personnel by the compressed air system audit. This was the "punch line" more production with reduced air demand by 500 cfm, or 100 hp less! It did not need a new air compressor!

With the implementation of Option 2 the plants annual electric cost total was $383,635 rather than the proposed Option 1 of $493,434, which represents an annual cost avoidance of $109,799 per year and an operating energy reduction of $27,450 per year.

Final Thoughts

It's important to note other recoverable compressed air costs should always be considered, e.g., air system maintenance, water costs, and equipment lifecycle. Usually, the electric cost of these is between 50-75 percent of the total "variable compressed air costs." Productivity, maintenance costs and product quality are often more than 30% of the identified electric costs.

For this plant, Option 2 will always be ahead of the game when factoring in variable cost comparisons. In the real world, all costs whether fixed or variable, need to be accurately reported. Developing a clear lifecycle cost program is much more complicated than described in this article – but it demonstrates the moral to this story: Always follow the trail to the end conclusion and look at all the variables. BP

For more information contact Hank van Ormer, email: hank@airpowerusainc.com or call at 740-862-4112.

To read more ***End Use System Assessment*** articles, please visit www.airbestpractices.com/system-assessments/end-uses

PRODUCTIVITY, SUSTAINABILITY & ENERGY-SAVING

A CASE FOR KPI MEASUREMENT in Compressed Air Management

By Ron Marshall, Marshall Compressed Air Consulting

John, the facility manager at a metal processing and assembly facility, had a complex building management system that tracked the performance of many building systems including his compressed air system. From his desk the system looked to be producing some strange readings, and he suspected a measurement error on the flow meter measuring total compressed air output. When he compared the air compressor amps to flow, there were times when the system showed no air compressors running, yet the flow meter was still reading significant output into the plant. Replacement of the meter did not correct the situation.

Subsequent investigation by a compressed air auditor revealed an unexpected cause of the problem: John's company had not followed one of the rules of a good energy management system, which is capturing the readings in a complete measurement boundary.

This article discusses the challenges faced by this particular facility and the need for accurate Key Performance Indicators (KPI's).

Background

Compressed air is an expensive utility to use to transmit energy to industrial machines. If one measures the power input to a system's air compressors and compares the power output delivered by various compressed air consuming machines or tools, we usually find that typically only one tenth of the energy input is transferred to the output of the tool. Part of the problem is physics, making compressed air creates heat, and the energy within the heat is lost to the atmosphere, but a significant part of the problem is the way compressed

Figure 1: This pressure gauge is an example of a simple KPI with upper and lower limits.

> "In measuring compressed air systems and comparing to typical benchmarks, a good compressed air auditor (or energy manager) can very quickly determine if a particular system has the potential for improvement."
>
> — Ron Marshall, Marshall Compressed Air Consulting

air operators make and use (or abuse) their compressed air.

All industrial facilities use some form of compressed air, and in most, the air compressors consume a significant amount of the total energy bill. A facility with a good energy management system is likely to identify their compressed air system as a significant energy user (SEU). If the facility were using an energy management standard, such as ISO 50001, they would be required to assess and track the energy consumption of all their SEU's. In the case of the metal processing facility, they were measuring the output of more than 250 devices within the plant, including building heaters, RTU's, dust collectors, and also tracking the consumption of their electricity, natural gas and water.

The results of their energy management efforts to date have been impressive. Since 2012 this facility achieved a 25% reduction in their electrical costs, enough to win a prestigious award from their local energy utility. Knowing there were problems with their compressed air measurement system, and knowing good potential efficiency gains could be achieved in better measuring their performance, John called in a compressed air auditor to have a look. And it paid off with significant potential savings identified.

KPI's and How They're Valuable

A good definition of KPIs appears in Wikipedia, "A performance indicator or key performance indicator is a type of performance measurement. KPI's evaluate the success of a particular activity." The definition makes the following points:

- Often success is simply the *repeated, periodic achievement* of some levels of operational goal.
- Sometimes success is defined in terms of *making progress* toward strategic goals.
- Accordingly, choosing the right KPI's relies upon a good understanding of what is important.
- What is deemed important often depends on the department measuring the performance.
- KPI assessments often lead to the identification of potential improvements, so performance indicators are routinely associated with performance improvement initiatives.

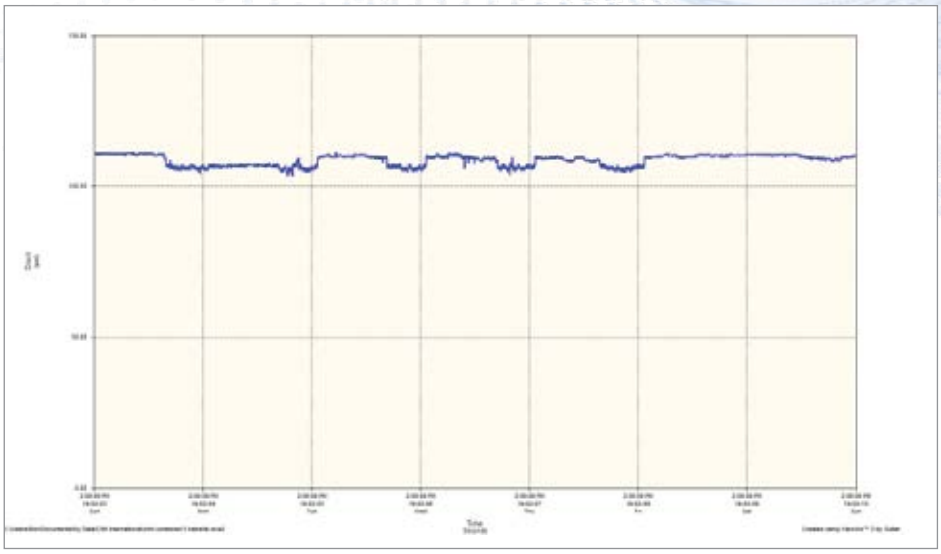


Figure 2: A simple-time based pressure chart is used to determine system performance.

And from Klipfolio.com a very important point about key performance indicators:

- A key performance indicator is only as valuable as the action it inspires,
- One of the most important, but often overlooked, aspects of KPIs is that they are a form of communication. As such, they abide by the same rules and best-practices as any other form of communication. Succinct, clear and relevant information is much more likely to be absorbed and acted upon.

Key performance measurement is important to compressed air systems due to the high cost of operation. An industry norm is for very little performance measurement on these systems, but we know through experience that a significant number of compressed air systems run very inefficiently with high levels of waste. We also know owners and operators of these system are often unaware of the problems. Measuring key performance of these systems raises awareness of the problems and brings it to the forefront. Thus a good system of measuring and evaluating compressed air-related KPI's could lead to substantial improvements in the cost of operation, reliability and quality of compressed air.

What KPIs are Most Important?

By far, the most important thing to care about in a compressed air system is air pressure. In fact it is so important many users will sacrifice energy efficiency for good system pressure.

A CASE FOR KPI MEASUREMENT IN COMPRESSED AIR MANAGEMENT

In a typical system there are usually hundreds of pressure measurement devices throughout the facility showing the state of the air pressure, which is also an indication of its importance.

And more importantly, as taught by the Compressed Air Challenge in their Fundamentals training seminars, compressed air producers should ensure they have "a clean dry stable flow of compressed air, delivered at the appropriate pressure, in a cost effective manner." Further, the owners and operators of the systems need to minimize waste caused by leakage, artificial demand and inappropriate use of compressed air.

But how do we know we are achieving these objectives? This is where measurement comes in, as any auditor of compressed air systems knows. Without some sort of measurement the system cannot be properly managed. In measuring compressed air systems and comparing to typical benchmarks, a good

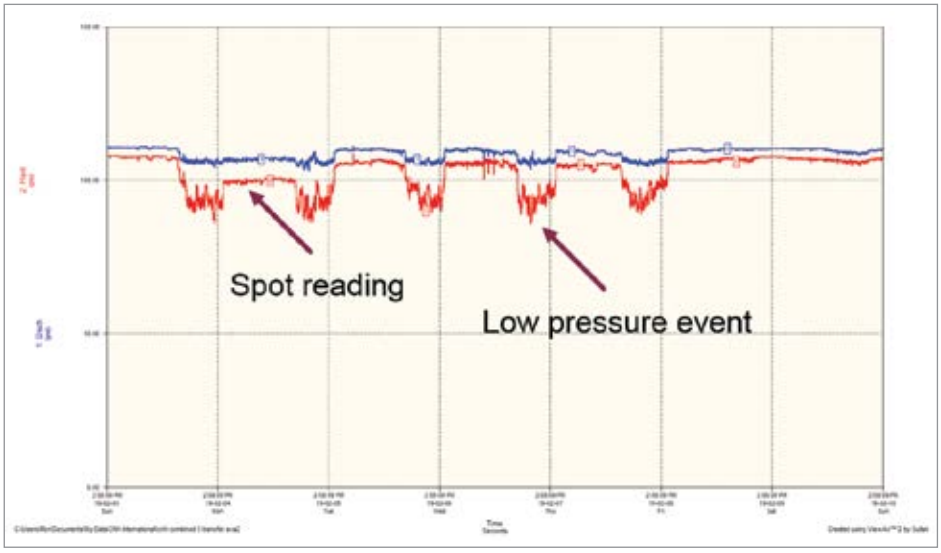


Figure 3: Added measurement at the correct point shows the pressure goal not being met.

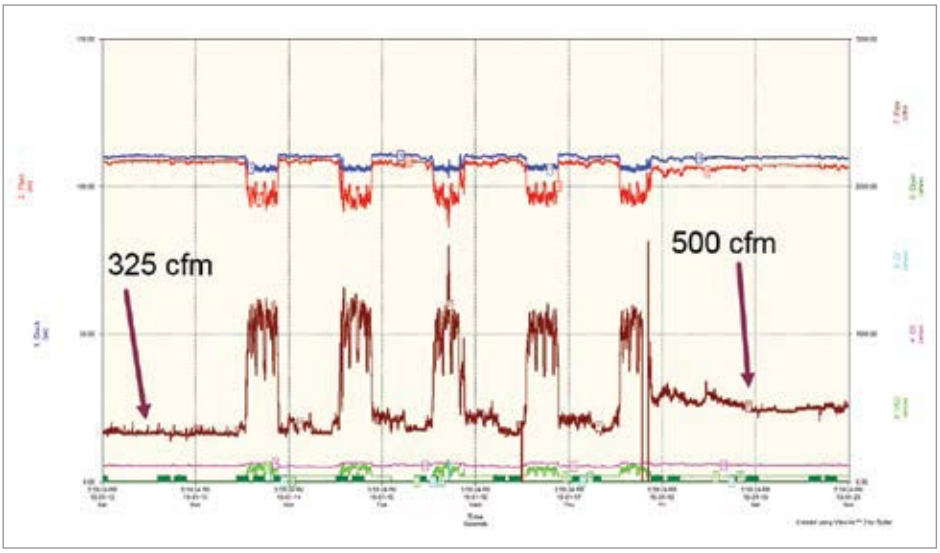


Figure 4: Added flow and amps traces show additional system problems.

compressed air auditor (or energy manager) can very quickly determine if a particular system has the potential for improvement. Often this involves placing temporary meters on the air compressors, but more valuable is a good permanent system of monitoring that allows operators to ensure their system is running correctly, and stays that way in the long term.

Measuring Pressure Performance: An Example

Let's look at some ways to measure pressure performance. The simplest way could have system operators regularly spot check the pressure gauge on their particular production machinery, an example of which is shown in Figure 1.

If the needle on the gauge is sitting between the high and low marks, all is good. But if the operator isn't always looking at the gauge, he may miss times where this key parameter is out of normal range. A better way of monitoring to ensure pressure performance is to data log and plot the pressure over time. An example of this is depicted in Figure 2. This is a pressure chart of a typical week in the metal processing and assembly plant.

The plant's goal was to always have the pressure at critical assembly tools above 90 psi, which is the rating of the tools. We can see from the chart it appears this goal was met over this measurement period, but was it? In this time the plant was reporting trouble at the tools. If we dig further we find this measured pressure is at the discharge of the air compressor, not the tools.

As shown in Figure 3, an additional trace with a measurement of the actual pressure at the input of the tools shows the pressure is indeed falling below 90 psi. If operators took a spot reading at the wrong time, they would miss the low-pressure events that occurred later, during a peak production period. It is interesting to note that despite the hundreds of measurement points in their building, and the importance of air pressure to the plant assembly tools, the compressed air pressure was not a parameter being monitored.

Installing some additional metering for flow and air compressor/dryer amps gives more information about this system. We can see in Figure 4 the pressure issues are being caused by transient high-flow events, and a large pressure drop is occurring across some components at high flow (this was determined to be an air dryer filter).

Power consumption appears to be excessive for the level of flow, the system is consuming an average of 27 kW per 100 cfm while producing 500 cfm. This differs from an optimum value of about 20 kW per 100 cfm. And it is interesting to note there appeared to have been a step change in low-level flow during non-production hours at the beginning and end of the measurement (weekend flow).

Despite an extensive system of monitoring this site was having pressure problems, had high levels of system waste, and poor compressed air production efficiency. The compressed air management system had no clear target KPI's and lacked a good system of communication to energy managers to make them aware of these problems.

In all fairness, confusion is not uncommon about key performance in the industry. In an

A CASE FOR KPI MEASUREMENT IN COMPRESSED AIR MANAGEMENT

attempt to improve this problem the Canadian Standards Association developed the CSA C837 standard "Monitoring and Energy Performance of Compressed Air Systems". To learn more, visit: https://www.airbestpractices.com/standards/energy-management/new-csa-c837-16-compressed-air-efficiency-standard.

Unexpected Challenges Add Difficulty

Unexpected challenges often pop up with measurement systems These can make KPI calculation and analysis more difficult. The most common ones:

- Dewpoint spikes – Sometimes the failure of the air dryers, or poor system design, will cause water to reach thermal mass flow meters. Since this flow meter type cannot work on wet compressed air the KPI calculations will be in error.
- Placement of flow meter – Sometimes flow meters are not installed to manufacturer's specifications, causing measurement error. Most flow meters installed on compressed air systems are thermal mass devices placed on the output of the system after the dryer. If the dryer is a desiccant style unit, this placement will not capture the purge flow into the dryer making it look like the air compressor is consuming more power than it should. This placement would not capture flows consumed by leakage or drainage waste in the compressor room. For this reason it is important to use both calculated flow (based on compressor status) and measured flow as a comparison, and sometimes install flow meters that measure directly at the discharge of each air compressor.
- Highly varying flows – If a flow meter is placed on the discharge of a load-unload air compressor, and the data is plotted, the result will be a thick fuzzy line that is hard to interpret. In these cases applying a moving average on the data is required to bring system trends to light.
- Change in flow direction – Sometimes, depending on the placement of a flow meter, the flow direction will change. An example of this might be the flow into and out of a receiver that is placed on the discharge of an air compressor that is not running. The flow meter will capture flow in and out of the receiver as the system pressure changes. Most thermal mass flow meters have no way of telling the direction of flow, so negative flow will be recorded as positive flow, and this will throw the off calculation of KPI's. Similar things can happen if a flow meter is installed in a looped piping

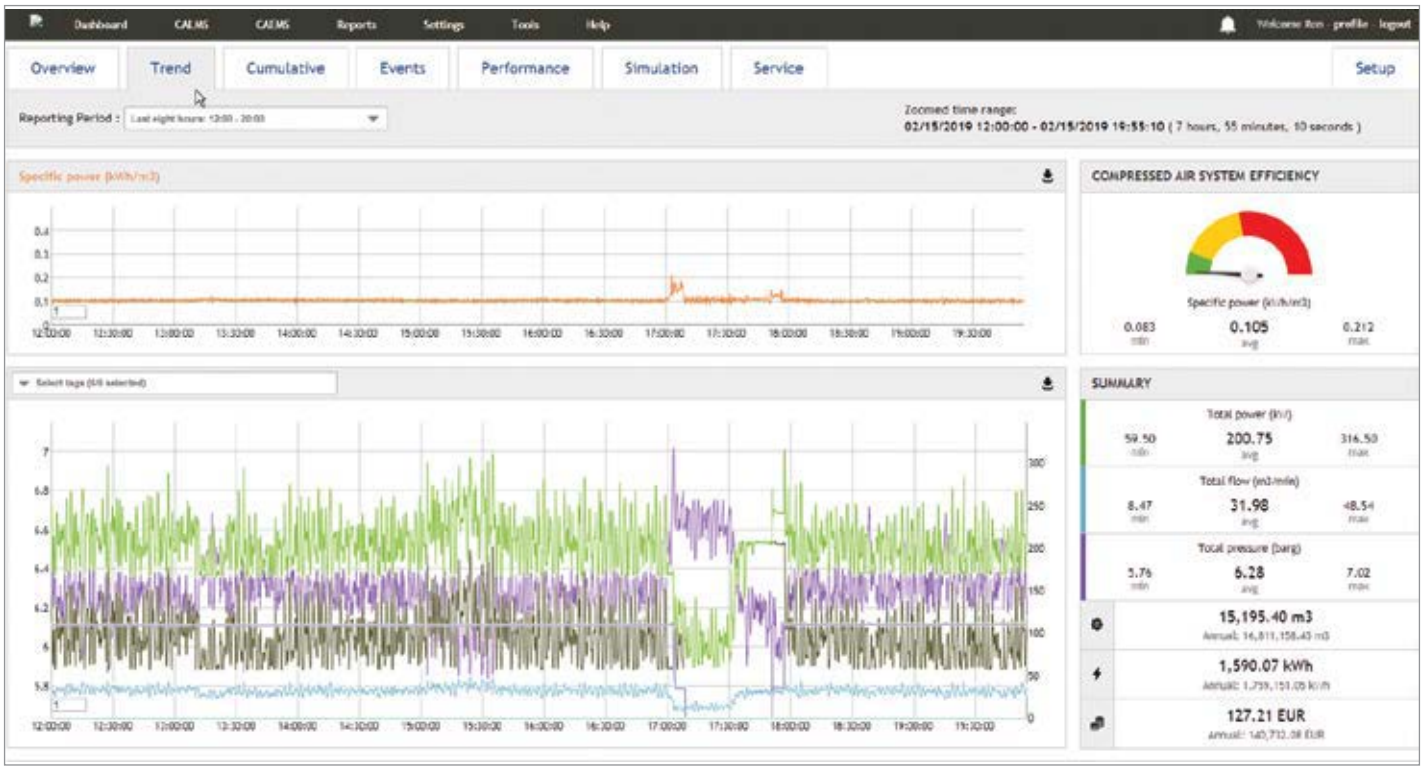


Figure 5: A main dashboard should show important KPI's in a time-based manner (Source: CALMS.EU).

BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM

3-DAY CONFERENCE & FREE EXPO!

SUSTAINABLE ON-SITE UTILITIES
POWERING AUTOMATION

YOU FOCUS ON SUSTAINABILITY

What's Your kW/ H_2O Use per Unit of Production?

OPTIMIZE THE TECHNOLOGIES POWERING MODERN PLANT AUTOMATION

96 SESSIONS IN FOUR CONFERENCE TRACKS

Track 1: Quality & Safety Management | Track 2: Maintenance & Reliability
Track 3: Energy Conservation / IoT Monitoring | Track 4: Water Conservation / Energy Management

SPONSOR

CAGI Compressed Air & Gas Institute

REGISTER AT WWW.CABPEXPO.COM

SUPPORTING ORGANIZATIONS

Compressed Air Challenge

TN Department of Environment & Conservation

A CASE FOR KPI MEASUREMENT IN COMPRESSED AIR MANAGEMENT

system. For this reason special calculations will be required to process the data. There are flow direction switches that can be used to correct this situation. There are also flow meters available that can measure flow direction to solve this issue.

Example Monitoring System

This metal processing and assembly plant in the story has an excellent building management system on which to build a much-needed dashboard screen that displays important compressed air KPI's. Over the years the author of this article put together quite a few moderately successful compressed air monitoring systems, but the biggest challenge faced is communicating the data from the system to the user in an understandable way.

To be honest, watching the parameters of a compressed air system is boring, like watching paint dry. In a properly running system there will be a whole lot of nothing to be concerned about most of the time. In a busy plant, the operators and managers of the compressed air systems have many other tasks to capture their attention and efforts; they can't usually afford the time to constantly watch their compressed air system. A successful monitoring system, therefore, needs to be simple to use, create understandable data, and have a system of warning so problems with the system can be quickly detected.

Because compressed air users have become more interested in energy efficiency some innovative companies have started to develop tools that can be used to monitor important compressed air KPI's and have created either local or web-based platforms with dashboard and data analysis tools.

One example dashboard product that tracks various compressed air parameters is shown in Figure 5. This system uses the same terminology as the CSA standard C837-16. Users can tell at a glance how their system has been performing through user selectable measurement periods. Instantaneous values, parameter minimum and maximum, energy and flow are all displayed for the information of the viewer. The system has a good warning

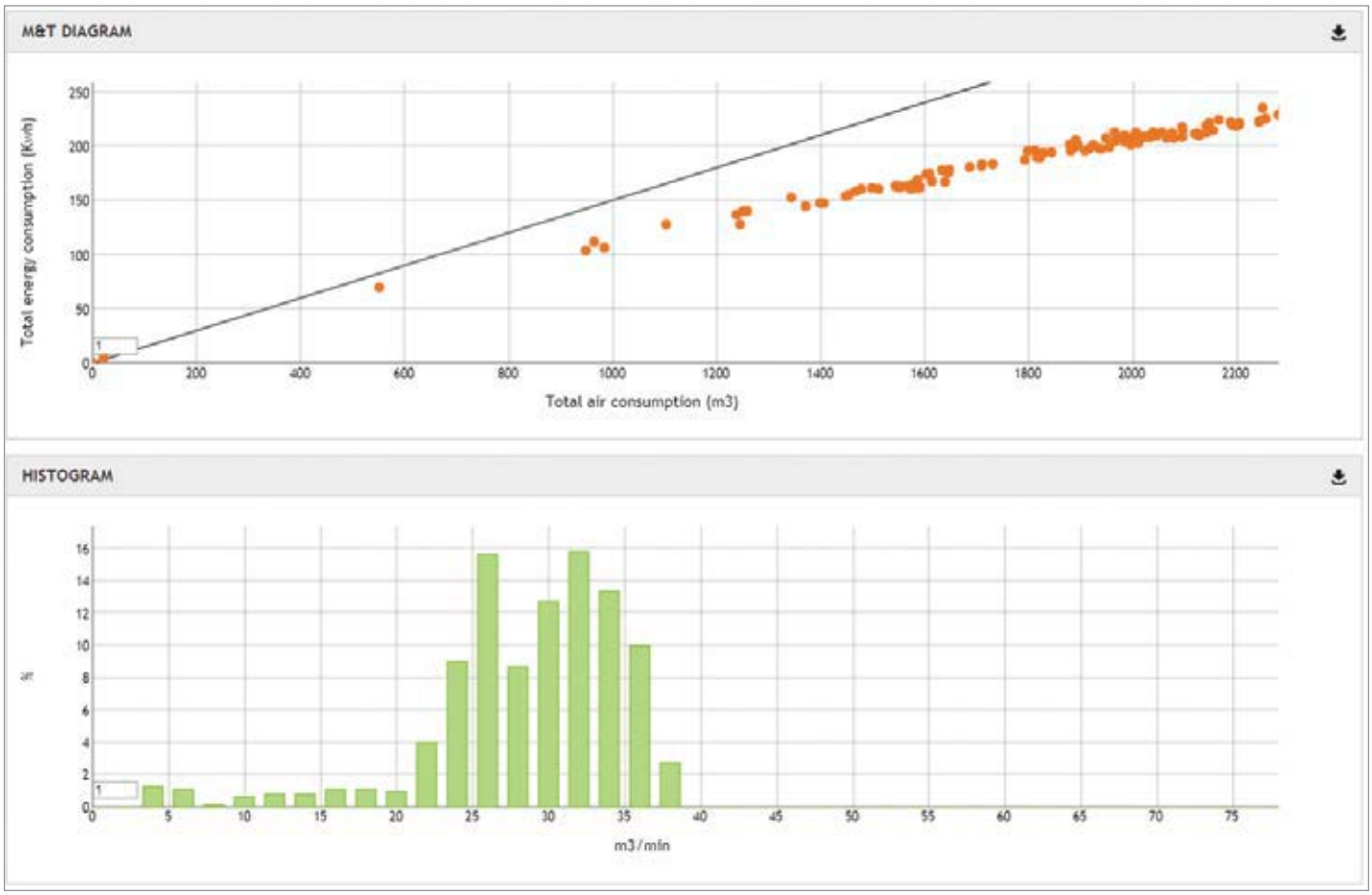


Figure 6: Analysis tools are important to help detect problems and predict savings due to other energy efficiency measures (Source: CALMS.EU).

system and a well-developed reporting structure, which is important to users.

Shown in Figure 5 is a screen from this system with some analysis tools that can be used to track the system curve, which is the energy versus air consumption. A perfect system has a proportional energy response with a change in flow, with the terminus of the trend line at zero, similar to the data shown in Figure 6.

An inefficient system would have a plot that looks like a shotgun pattern, with very poor energy response to change in flow. This system curve can be used to predict the savings that could be gained by reducing compressed air leakage, changing pressure, or changing the way the compressed air is produced (more efficient compressors or control). This dashboard and analysis system is designed with the user in mind, but has tools and analysis methods that can be used by advanced auditors to help with energy conservation measures, including leakage detection and management module.

Conclusions

Having a tool for monitoring compressed air systems is a valuable asset for plant energy managers, but it is important the output of this system is clear and simple to use. A best practice is to monitor the specific power of a system to ensure the production of compressed air is and remains efficient.

Tracking flow and energy consumption over time and comparing measurement periods can tell plant operators how the compressed air system is trending in terms of the appropriate or inappropriate use of compressed air and levels of waste. It is important to have a system that raises the operator's attention if the KPIs start to show abnormal readings. In this way adjustments and improvements can be made in a timely manner. BP

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

To read more ***System Assessment*** articles please visit
www.airbestpractices.com/system-assessments

ENERGY CONFERENCE & EXPO

West

SANTA CLARA
June 5-6, 2019

Santa Clara Convention Center | California

The **Association of Energy Engineers** invites you to join energy professionals from commercial, industrial, and government sectors to attend **AEE West** - **Energy Conference and Expo**. The region is home to the biggest technology companies, that demand energy efficient solutions, new energy initiatives and the development of clean energy technologies.

west.aeecenter.org

Presented By

Association of Energy Engineers

Gold Sponsor

wsp

Silver Sponsor

TRIACTA
SUBMETERING BEYOND MEASURE

An Energy Conference and Expo from the Presenter of EMC® for over 35 years

Association of Energy Engineers | 3168 Mercer University Drive | Atlanta, Georgia 30341 | (770) 447-5083

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Kaeser Introduces Redesigned SM Series Rotary Screw Air Compressors

Kaeser Compressors' new SM Series Rotary Screw Air Compressors – available in the SM 7.5, SM 10, SM 15, and SFC 8 models – are the latest examples of the company's ongoing commitment to product developments designed to reduce customers' energy costs, improve overall performance, and extend service life.

The new SIGMA 06 airend with increased intake capacity, combined with IE4 motors on the 10 and 15 horsepower (hp) models, delivers up to 10% more flow than prior versions and as much as 43% more flow than comparable competitive models. Specific power (compressor efficiency) has improved up to 10% over prior models and is up to 23% better than comparable competitive units.

The product update also includes a dual-flow fan combined with an external facing cooler, resulting in approach temperatures as low as 7 °F. This improves the effectiveness of downstream dryers and filters in removing contaminants that impact product quality and tool life. The die-cast, sickle-shaped blade of the dual-flow fan reduces noise and cools both the drive motor and interior of the machine for greater reliability.

Sigma Control 2™ comes as standard for all models, combining reliable energy efficient control with access to operating and maintenance information. A built in web server and communications ports allow easy remote monitoring.

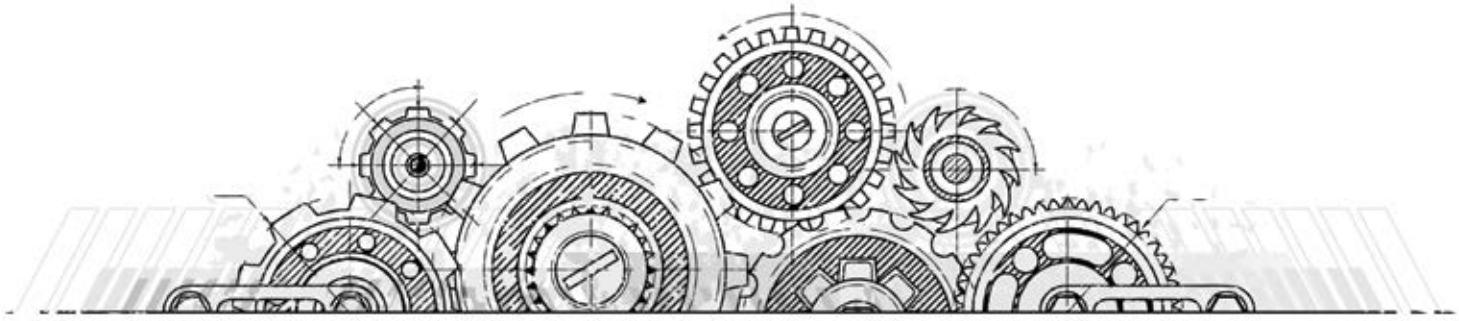
The SFC 8 models feature a separate drive cabinet with dedicated cooling to protect the frequency converter and maintain optimum operating temperature. Both the SFC control cabinet and Sigma Control 2 are tested and certified as individual components and as a complete system to EMC directive EN55011 for Class A1 industrial power products.

The SM Series is available in 7.5 to 15 hp with flows from 19 to 55 scfm and pressures up to 217 psig. To reduce floor space and installation time, the models are also available with integrated dryers and as AIRCENTERS with an integrated dryer, filter, and storage tank. For more information, visit us.kaeser.com/sigma.

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.

Kaeser Compressors' line of new SM Series Rotary Screw Air Compressors.



RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Compressed Air Systems Launches New Rotary Screw Air Compressor Line

Compressed Air Systems has expanded its line of CAS Cube family of rotary screw air compressors.

Compressed Air Systems (CAS) has launched a new line of rotary screw air compressors to complement its existing line of rotary screw air compressors. The new models, available from 5 to 10 horsepower (hp), are manufactured with the growing market of tire, mechanical, paint and body shops in mind.

This new addition to the CAS Cube family lineup has a compact footprint measuring 22 inches wide and 25 inches deep and is built with all standard CAS control/safety features.

As a UL- and CSA-certified control facility, CAS manufactures controls to exacting standards. All rotary screw air compressors come standard with features such as the Smart Contact Controller, high air pressure limit switch, high oil sump temperature switch, high oil discharge temperature switch, high air temperature switch and an easy-to-use and access gauge panel.

CAS also paid attention to noise levels on the new packages to ensure that an open frame, non-enclosed compressor system is as quiet, or even quieter than its enclosed counterparts. Several new models achieve noise ratings as low as 71 dBA. The packages will be marketed at prices in the same range as a similar sized reciprocating air compressors. The air compressors are built to help CAS distributors grow and maintain their market share.

About Compressed Air Systems

Compressed Air Systems was founded in 1980 as a compressor sales and service company migrating into manufacturing in the late 1980's. By 2019 CAS has grown into multiple facilities and over 70 full time employees in Grand Prairie, Texas, as well as joint ventures around the globe. For more information, visit www.compressed-air-systems.com.

New MiTM 30-Gallon Diesel Air Compressor/Generator Combination Unit

MiTM Corporation's new diesel 30-gallon air compressor/generator combination unit offers the convenience of two machines in one, making it ideal for industrial applications that require electrical power and compressed air.

MiTM Corporation's diesel 30-gallon air-compressor/generator is well suited for applications that need electrical power and compressed air.

TECHNOLOGY PICKS

The new machine features a 9.1 hp Kohler KD420 diesel overhead valve engine with electric start and glow plugs for easy starting in cold temperatures. The unit includes a 3,000-watt generator and two-stage air compressor with a powder coated ASME coded 30-gallon receiver tank.

With a brushless alternator and a total harmonic distortion of less than 6%, the powerful generator features 100% copper windings, comes standard with 120 volt and 240 volt receptacles and provides power for industrial and contractor needs.

The built-in air compressor features a splash lubricated compressor pump, large canister intake filter, regulator and two gauges for tank and outlet pressure and a 16 1⁄2-inch flywheel. It's built to provide high capacity airflow to power a multitude of air tools.

For more information, visit www.mitm.com.

Yaskawa America Introduces the GA800 High Performance Drive

The Drives & Motion division of Yaskawa America, Inc. is excited to release the new GA800 Variable Speed Drive for sale and shipment immediately.

The Yaskawa GA800 drive provides the ultimate combination of power, ease of use, flexibility, and performance. Designed to control traditional and emerging motor technologies through 600 HP, the GA800 handles applications ranging from simple fans and pumps to high performance test dynamometers requiring precise regulation. In addition to its robust and powerful design, the GA800 provides highly flexible network communications, embedded functional safety, and easy-to-use tools featuring mobile device connectivity.

As Yaskawa's new industrial general purpose AC drive product, the GA800 will address every application handled by its predecessor, the A1000 drive, and more.

Key features of the GA800 include the following:

- High-resolution multi-language display with Setup Wizards and Data-Logging
- Bluetooth and DriveWizard Mobile for convenient and easy interaction

The new Yaskawa GA800 Variable Speed Drive

- Programming without main power through an embedded USB port
- Advanced Open Loop Vector produces impressive torque and near tripless operation
- Integrated brake transistor (up to 125 HP) for cost-effective heavy braking
- Embedded Safe Torque Off minimizes downtime for applications requiring occasional intervention (SIL CL3, PLe, Category 3)
- Standard conformal coating helps resist contamination

The G800 drive is available in 240 VAC Three Phase (1 to 150 HP) and 480 VAC Three Phase (1 to 600 HP) models. The GA800 is designed for use around the world, and carries agency certifications for all major geographical regions.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

About Yaskawa America, Inc.

Yaskawa America's Drives & Motion Division manufactures industrial automation equipment, including low and medium voltage variable speed drives, servo motors and amplifiers, machine controllers, spindle drives and motors, and low voltage industrial switch products. The company's Motoman Robotics Division makes industrial robots that can weld, assemble, cut and handle goods for manufacturers.

Yaskawa products are used in a wide variety of industries, including automotive, building automation, machine tool, material handling, metal forming, packaging, pumping, water/wastewater treatment, plastics, rubber, solar, irrigation, and textile. Yaskawa America, Inc. employs more than 1,000 people in its headquarters in Waukegan, IL, its manufacturing facilities in Buffalo Grove, IL and Oak Creek, WI, and in offices across the United States. For more information about GA800 and other Yaskawa products visit our website at www.yaskawa.com.

BOGE BLUEprotect Protection From Pests in Grain Storage

BOGE has introduced BLUEprotect, a simple and effective method to provide better protection from pests for grain stored in silos.

The number of starving people in the world is increasing, but at the same time large amounts of grains are going to waste on the way to the consumer, BOGE reports. It is in the poorer regions of the world in particular that the greatest losses arise shortly after harvesting.

According to BOGE, a large part of the grain stored worldwide falls victim to pests, such as granary weevils, parasitic fungi, mice and rats. With BLUEprotect, BOGE uses nitrogen from the ambient air. This removes the oxygen from the silo and therefore takes away the means of survival for pests and fungi. The method is carried out without chemical agents and is therefore harmless in food production and does not cause environmental damage.

BLUEprotect is based on this simple principle where BOGE feeds a mix of gases into the grain silos – consisting of almost pure nitrogen with a maximum of 1% residual oxygen. The nitrogen drives out the oxygen, thereby removing aerobes, and thus the means of survival for pests and fungi. At the same time, the effect of breathing losses is minimized, and the risk of smoldering fires is decreased.

For BLUEprotect, BOGE uses nitrogen from the ambient air. An air compressor produces compressed air close to the silo. It then reaches

COMPRESSED AIR BEST PRACTICES®
www.airbestpractices.com

Advertising & Editorial: Rod Smith
rod@airbestpractices.com
Tel: 412-980-9901

Subscriptions & Administration: Patricia Smith
patricia@airbestpractices.com
Tel: 412-980-9902

A Publication of: Smith Onandia Communications LLC
37 McMurray Rd. Suite 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.

TECHNOLOGY PICKS

a membrane filter via a dryer and combined filter, which separates the nitrogen from the oxygen and feeds it into the silo. After use, the nitrogen is re-absorbed into the ambient air. This makes BLUEprotect an attractive method of pest control wherever the use of chemical agents is not permitted or desirable – for example, in ecological farming or in the supply chain for breweries. Malting plants, for instance, have to ensure no chemical residues are left behind in the barley; these could later find their way into the beer with the malt when brewing.

The processing is straightforward for the user. BOGE arranges all plant components in a container. As such, BLUEprotect can be placed flexibly, without special prior knowledge and in different types of silos. BOGE analyzes the starting position with the customer to record the initial nitrogen requirement. An essential precondition is a sufficiently airtight

BOGE BLUEprotect is based on the principle that pests that threaten grain stored in silos cannot survive without oxygen.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

silo. For a test run, BOGE offers a rental container if required, with which the airtightness of the silo can be clearly ascertained after a few days.

About BOGE

As one of Germany's oldest manufacturers of compressors and compressed air systems, BOGE KOMPRESSOREN Otto Boge GmbH & Co. KG offers more than 100 years' experience. The company is also one of the market leaders. Whether for high speed turbo air compressors, screw air compressors, piston air compressors, scroll air compressors, complete systems or individual devices, BOGE meets the most diverse requirements and highest standards, with precision and quality always at the forefront. The family company, which operates internationally has a workforce of 850 employees, approximately 490 of whom work at the headquarters in Bielefeld, and is managed by Wolf D. Meier-Scheuven and Thorsten Meier. With its numerous sales offices and subsidiaries, BOGE offers its international customers comprehensive services and supplies its products and systems to more than 120 countries worldwide. For more information, visit https://us.boge.com/en-us.

New Norgren Excelon Plus Air Preparation FRL

The latest IMI Norgren® air preparation equipment for industrial applications, the Excelon® Plus modular filter/regulator/lubricator (FRL), delivers great performance and enhanced safety in a unit that is 20% smaller and 35% lighter.

Safety elements of the new Excelon Plus include padlock features on both the shut-off valve and regulator to prevent tampering, and a double safety lock on the bowl to prevent it from being removed when in use. A rotating shut-off valve isolates the system from air as needed. An innovative Quikclamp design speeds installation and simplifies removal.

The Excelon Plus filter extracts more than 96% of water from compressed air. For easier maintenance, a new filter assembly allows the filter element and bowl to be removed together for faster, cleaner service. This system also reduces the clearance required for maintenance to just one inch, freeing up valuable machine real estate.

Excelon Plus regulators have a large, flush mounted, integrated pressure gauge that is easy to read and less vulnerable to damage. Lubricators are available in Micro-fog® and oil fog to meet various design and tool specifications.

Components are available individually or in a standard combination FRL unit with a single part number, pre-assembled and ready to install. For better air prep in your plant or machine, visit https://www.imi-precision.com/us/en/imi-norgren/excelon-plus or call 800-514-0129.

About IMI Precision Engineering Branded Companies

As world leaders in pneumatic motion and fluid control technologies, IMI Precision Engineering works closely with customers to gain a deeper understanding of their engineering needs, and then connects people, products and expertise to give customers' equipment and business a clear advantage. IMI Precision Engineering offers a world-class portfolio of high-performance products with brands including IMI Norgren, IMI Buschjost, IMI FAS, IMI Maxseal and IMI Herion. The IMI Precision Engineering reputation rests on the innovation and technical expertise of our 6000-plus people and our ability to deliver exceptional local service. IMI Precision Engineering are part of the $2.65 billion annual turnover engineering group IMI plc, and have a sales and service network in 50 countries, technical centers in the USA, Germany, UK, China and India as well as manufacturing facilities around the world.

The Excelon® Plus modular filter/regulator/lubricator (FRL)

BEST PRACTICES

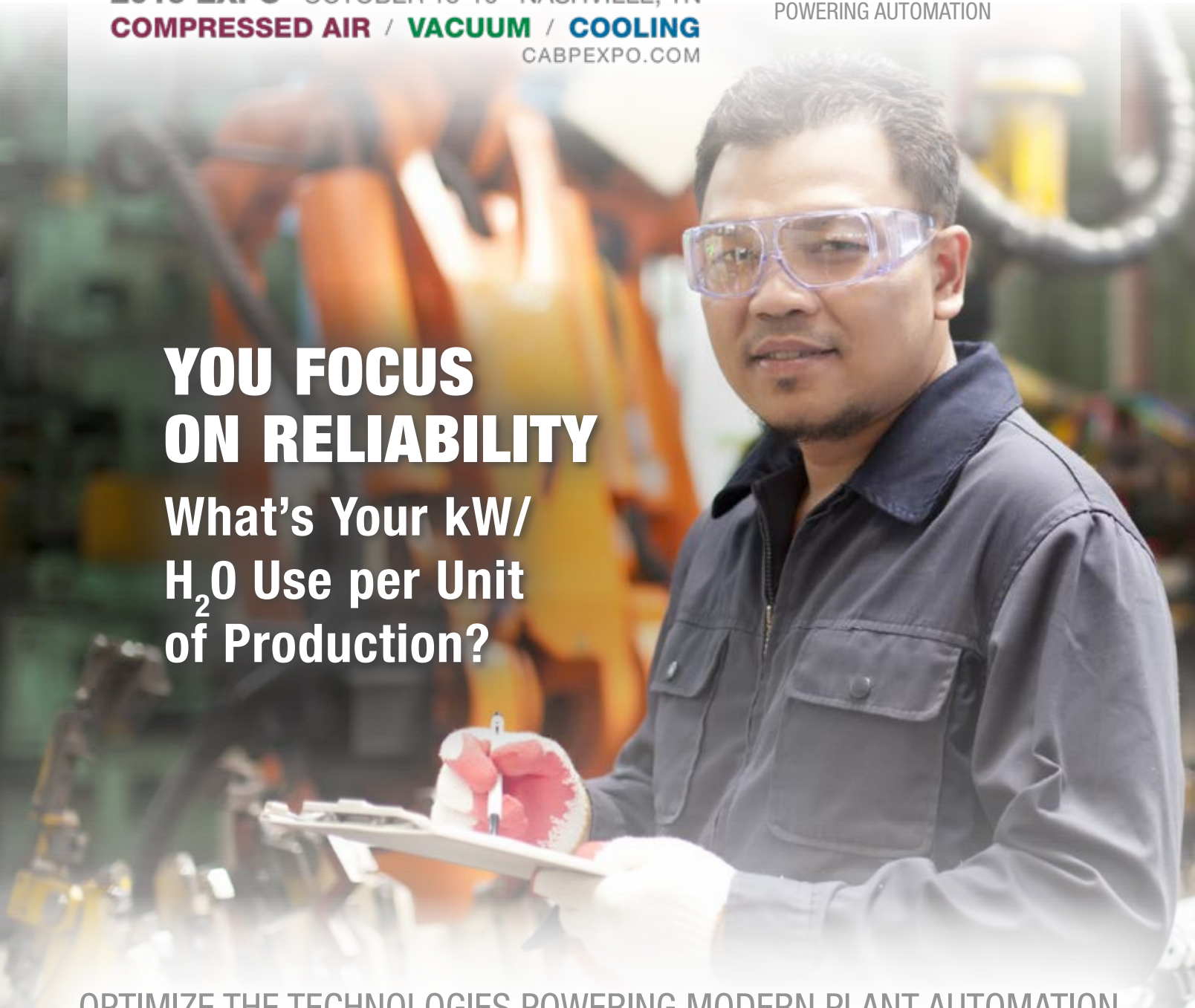
2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM

3-DAY CONFERENCE & FREE EXPO!

SUSTAINABLE ON-SITE UTILITIES POWERING AUTOMATION



YOU FOCUS ON RELIABILITY

What's Your kW/ H_2O Use per Unit of Production?

OPTIMIZE THE TECHNOLOGIES POWERING MODERN PLANT AUTOMATION

96 SESSIONS IN FOUR CONFERENCE TRACKS

Track 1: Quality & Safety Management | Track 2: Maintenance & Reliability

Track 3: Energy Conservation / IoT Monitoring | Track 4: Water Conservation / Energy Management

SPONSOR

CAGI Compressed Air & Gas Institute

REGISTER AT WWW.CABPEXPO.COM

SUPPORTING ORGANIZATIONS

Compressed Air Challenge

TN Department of Environment & Conservation

THE MARKETPLACE

TECHNOLOGY

Let Us!
help you to do it the right way

Our promise

All BEKO TECHNOLOGIES equipment is designed and tested to meet the strict quality guidelines of our company. There are no compromises to the quality or reliability of any of our products.

METPOINT®

The key to successful optimisation of compressed-air systems is data. Our **METPOINT®** range of measurement equipment provides the data base for the evaluation and assurance of compressed-air quality and for identification of hidden cost drivers. Our measurement equipment can also be employed for extension of plants and for early elimination of malfunctions.

With **DRYPOINT® RA**, operating costs can be reduced by almost half, over a period of five years. In return-on-investment calculation, the full potential of the new refrigeration-dryer generation is proven: the dryers pay off within an operation time of only six months. The comprehensive RA model range of products allows optimum adaptation of compressed air processing to individual operating conditions.

DRYPOINT® RA

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

BEKO

Truth in Compressed Air
Reliable | Efficient | Innovative

Compressed Air That Means Business

Because it's your business on the line

Kaeser understands the importance of keeping production running and energy costs low. That's why all of our compressed air equipment is engineered to be *Built for a lifetime*™.

Premium quality motors, coolers, and airends give reliable performance day in and day out. Simple maintenance access, fewer wearing parts, and smart controls keep your plant running day in and day out.

If you're tired of downtime, frequent maintenance, and rising energy costs, leave your compressed air business to us.

Visit www.us.kaeser.com/cabp to learn more.

Solving your system challenges.

100
1919 – 2019
TRADITION & INNOVATION

KAESER COMPRESSORS®

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