The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

airbestpractices.com

October 2019

Medical Air

Get Connected!

You have a smart-connected system at your home; why not for your compressed air too? SMARTLINK is so much more! You can rest assured that a dedicated team of specialists are keeping a close eye on your compressed air, gas and vacuum systems. From monitoring efficiency and driving improvements, to 24/7 monitoring and a lightning-fast alert system. You'll always be the first to know what's going on with your equipment installation.

Become one with your most valuable asset – sign up to SMARTLINK today.

www.atlascopco.com/air-usa

FEATURES

QUALITY, SAFETY & RELIABILITY FEATURES

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION FEATURES

COLUMNS

FROM THE EDITOR | Medical Air

Quality, Safety and Reliability

First and foremost, medical air packages must deliver high quality and reliable compressed air to the critical applications in a hospital. I hope you enjoy the article from Shannon McAfee, from Pattons Medical, on the subject.

Does your plant have a compressed air quality specification for dewpoint, solid particulates and oil removal? If yes, does your plant verify compliance with the specification? Most plants do not and we are pleased to publish an article on this topic in medical applications written by Robert Stein from Trace Analytics.

Static electricity can create reliability and quality problems in production lines. How to understand and treat this problem is the subject of an article provided to us by Daniel Rebennack from SMC.

Productivity, Sustainability & Energy Conservation

Many thanks go to Festo for sharing an amazing automation story about their work with Biotest AG's new large-scale production plant for plasma fractionation. Automation in this plant includes 6,000 pneumatic valves and 250 standardized control cabinets!

Last but certainly not least, Ron Marshall provides us with another interesting article about energy and water use savings found at a technical college in Canada.

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

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

COMPRESSED AIR BEST PRACTICES® EDITORIAL ADVISORY BOARD

Industrial Energy Managers	Doug Barndt	Manager, Demand Side Energy-Sustainability	Ball Corporation
	Bhaskar Dusi	Corporate Energy Manager	CEMEX USA
	Richard Feustel	Senior Energy Advisor	Leidos
	William Jerald	Energy Manager	CalPortland
	Kurt Kniss	Energy/Reliability Engineer	Shaw Industries
	Leslie Marshall	Corporate Energy Engineer	General Mills
	Brett Rasmussen	Senior Utilities Engineer	Nissan North America
	Brad Runda	Director, Energy Excellence	Amcor Rigid Packaging
Compressed Air System Assessments	David Andrews	Director Marketing Communications	Sullair
	Steve Briscoe	VP Energy Management	Industrial Air Centers, Inc.
	Tilo Fruth	President	Beko USA
	Chris Gordon	President	Blackhawk Equipment
	Jan Hoetzel	General Manager	Airleader USA
	Paul Humphreys	Vice President Communications	Atlas Copco
	Phil Kruger	General Manager	Harris Equipment
	John Lucidi	Sales & Marketing Manager	Parker GSF Division
	Wayne Perry	Sr. Technical Director	Kaeser
	Kenny Reekie	Director, Blower & Vacuum Products	Gardner Denver
	Eric Solverson	Vice President	Total Equipment Company
	Derrick Taylor	Manager	PneuTech Products
	Jim Timmersman	Senior Auditor	Power Supply Industries
	Hank Van Ormer	Technical Director	Van Ormer Consulting
	Jeff Yarnall	Auditing Manager	Rogers Machinery
	Compressed Air & Gas Institute, Compressed Air Challenge		

2019 MEDIA PARTNERS

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

ISO 8573-1 CLASS 0 OIL-FREE

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

INDUSTRY NEWS

Douglas Autotech and Atlas Copco Steer Efficiency

Automobiles take us where we want to go – and a critical element to make that happen is a steering column.

"We make steering columns for all types of vehicles around the world," said Larry Stone, Maintenance Supervisor for Douglas Autotech, the world leader in vehicle directional technology. "Stable, high quality compressed air plays a critical role in what we do. We can't afford to be down even for a minute. We need stable, high quality air 24/7."

Adam Cartwright, Territory Manager for Evapar, Atlas Copco's Platinum Distributor, conducted an air study for Douglas Autotech. "We determined that a GA 250 VSD made the most sense because Douglas Autotech has varying capacity of air usage between their shifts. The second shift has fewer people and less air usage. The VSD turns down automatically, providing an energy reduction while precisely matching air production to demand."

Douglas Autotech chose a turnkey installation that includes a maintenance program. "We're here quarterly for maintenance services and inspections," said Cartwright. "They also included SMARTLink, which provides 24/7 monitoring. The customer can log in from basically anywhere and see how that unit is operating in that moment. They can see the percentage range in regard to capacity of air that unit is providing. They can also backtrack and review the history of percentage ranges that unit has been operating at. If you truly want to get into the details of efficiency, you can do that through SMARTLink."

"We were projecting to reduce energy consumption from the new compressor by about 53%, and we are seeing that," said Brett Barret, Engineering Technical Manager for Douglas Autotech. "That's about 20% for the plant overall. A lot of times with capital projects, the savings is kind of theoretical and you don't necessarily see that impact directly, but we actually enjoy seeing the energy bill these days."

Tamturbo
JUST AIR

NEXT GENERATION TOUCH-FREE™ TURBO COMPRESSORS

Opportunities open for select distributors!

www.tamturbo.com +1(314) 662-0188 Americas and +358 40 766 5678 Global

FREE
SUBSCRIPTION
DIGITAL EDITION FREE WORLDWIDE
PRINT EDITION FREE TO U.S. SUBSCRIBERS

Learn How To Save Energy & Improve Productivity In YOUR Industry!

Subscribe Now!

Subscribe at
airbestpractices.com

INDUSTRY NEWS

With Atlas Copco, Douglas Autotech is steering efficiency in the right direction:

- Saving over 1.2 million kilowatt hours per year
- Saving $84,000 per year in energy costs (down 53% compressor, down 20% plant overall)
- Reducing total horsepower from 500 HP to 300 HP
- Dropping pressure from 110 PSI to 98 PSI (and still dropping!)
- Monitoring operations 24/7 remotely with SMARTLink

Visit https://www.youtube.com/watch?v=54ujhhANnwk to watch the video.

About Atlas Copco Group & Atlas Copco Compressor Technique

Great ideas accelerate innovation. At Atlas Copco, we have been turning industrial ideas into business-critical benefits since 1873. Our passionate people, expertise and service bring sustainable value to industries everywhere. Atlas Copco is based in Stockholm, Sweden with customers in more than 180 countries and about 37,000 employees. In 2018, revenues were BSEK 95, approximately 10 BUSD.

Atlas Copco Compressor Technique partners with customers to turn industrial ideas into smart, connected air and gas solutions and leading edge compressed air technology. By listening to our customers and knowing their needs, we deliver value and innovate with the future in mind.

About Atlas Copco Compressors

Atlas Copco Compressors LLC is part of the Compressor Technique Business Area, headquartered in Rock Hill, South Carolina. Atlas Copco Compressors provides innovative solutions including world-class compressors, vacuum pumps, air blowers, quality air products and gas generation systems, all backed with full service, remote monitoring and auditing services. With a nationwide service and distribution network, Atlas Copco Compressors is your local, national and global partner for all your compressed air needs. Learn more at www.atlascopco.com/air-usa.

Puregas is Now Altec AIR

Puregas has announced a name change from Puregas, LLC to Altec AIR, LLC. Puregas, based in Broomfield, Colorado, began manufacturing air dryers in 1954 and has grown to become a leading equipment and service provider of air pressurization and compressed air treatment systems.

Historically focused on smaller point-of-use desiccant air dryers with air flows below 50 SCFM, the recent acquisition of MACAIR has allowed the company to expand its product line to include refrigerated and desiccant air dryers up to 3,000 SCFM. Altec AIR now offers a full range of air dryers to the air compressor

Altec
AIR

distribution market, as well as to OEMs and end-users through a nationwide sales force.

Altec AIR, previously known as Puregas, has been a subsidiary of Altec Industries, Inc. since 2003. Altec is in its 90th year as a leading equipment and service provider to the electric utility, telecommunications, tree care, lights and signs, and contractor markets. This rebrand formally announces our continued alignment with our parent company and the core values we share, including our commitment to delivering customer satisfaction through continuous improvement and teamwork.

As Altec AIR, we are committed to providing customers with the most cost-effective system options aimed at helping customers improve process quality, reduce downtime, and lower operating costs. We look forward to offering the same high-quality products and excellent service our customers have come to expect.

About Altec AIR

Altec AIR is a leading manufacturer of Compressed Air Treatment products used to remove water vapor and contaminant gases from compressed air systems. Altec AIR custom designs products and currently manufactures the world's smallest regenerative desiccant air dryer. For more information visit www.AltecAIR.com

About Altec Industries

Altec is a leading equipment and service provider for the electric utility, telecommunications, contractor, lights and signs, oil and gas, tree care, and contractor markets. The company provides products and services in more than 100 countries throughout the world.

INDUSTRY NEWS

Pfingsten Invests in RapidAir

Pfingsten announces the acquisition of Engineered Specialties, LLC, d.b.a. RapidAir in partnership with the Company's two founders, Andy and Stacy Remus.

Headquartered in Auburndale, WI, RapidAir manufactures and distributes compressed air piping systems under three different brands in addition to providing filter regulators, moisture drains, fittings, hose reels and other air compressor accessories. The Company sells its products through various channels, including its own e-commerce website, distributors, farm and ranch retailers, contractors and marketplaces.

"RapidAir's products provide significant competitive advantages over alternative compressed air piping systems in the market today. Additionally, the Company's strong focus on customer service and product availability has helped the company become a market leader," said Phillip Bronsteatter, a Managing Director at Pfingsten. "We are excited to support the growth of RapidAir through further investments in people, infrastructure, product development and marketing, while pursuing strategic add-on acquisitions."

"Pfingsten is the perfect partner for our business," said RapidAir Founder, Andy Remus, who, along with Stacy Remus, retained equity ownership in the Company. "Pfingsten's extensive experience in partnering with niche manufacturing and distribution companies, combined with its growth-oriented approach and conservative financial leverage, will allow RapidAir to make continued investments in new products and people, positioning the Company for continued growth."

Pfingsten acquired the Company, marking the ninth platform investment for Pfingsten's $382 million Fund V. For more information on RapidAir, visit www.rapidairproducts.com.

About Pfingsten

Pfingsten is an operationally focused private equity firm formed in 1989. From its headquarters in Chicago, IL and representative offices in ChangAn, China, New Delhi, India and Chennai, India, the firm builds better businesses through operational improvements, professional management practices, global capabilities and profitable business growth rather than financial engineering. Since completing its first investment in 1991, Pfingsten has raised five investment funds with total commitments of approximately $1.3 billion and has acquired 138 manufacturing, distribution and business services companies. For more information, visit www.pfingsten.com.

ABB eFinder Online Portal Locates Distributor Stock

ABB now offers the new ABB eFinder portal on the Installation Products website (formerly Thomas & Betts) to enable end users to search for and purchase products from participating distributor inventory.

- eFinder search engine is available on the ABB home page (http://tnb.abb.com) and most product web pages on its site.
- Search results identify which distributors have in-stock items and available quantities.
- End users connect with the distributor e-commerce shopping cart to complete a purchase.

The ABB eFinder portal simplifies the process of locating inventory from ABB's selection of products used for connection and transmission

of electrical power. Customers may now search online for ABB Installation Products and can purchase them from the distributor who has the products in stock. Once the product is located, the customer may buy it from the distributor by connecting directly to the distributor's e-commerce page and placing the products in an online shopping cart for the final purchase transaction.

"Customers have consistently requested a tool to find inventory availability information quickly and easily," said Matthew O'Kane, vice president digital customer experience for ABB Electrification business. "The new ABB eFinder web portal not only enables our customers to find what they need in stock, but also to purchase it by connecting directly to the distributor's website to order it online. This has made finding and procuring needed items faster and easier, especially in the event of an emergency."

The product portfolio from ABB Electrification business (Installation Products) is available on the portal. ABB eFinder provides instant access to industry-recognized brands like Ty-Rap®, Blackburn® and T&B Liquidtight Systems™. All products are available through the ABB distribution channel.

ABOUT ABB

ABB is a pioneering technology leader with a comprehensive offering for digital industries. With a history of innovation spanning more than 130 years, ABB is today a leader in digital industries with four customer-focused, globally leading businesses: Electrification, Industrial Automation, Motion, and Robotics & Discrete Automation, supported by its common ABB Ability™ digital platform. ABB's market-leading Power Grids business will be divested to Hitachi in 2020. ABB operates in more than 100 countries with about 147,000 employees. www.abb.com.

QUALITY, SAFETY & RELIABILITY

AN OVERVIEW OF MEDICAL AIR PACKAGES

By Shannon McAfee, Pattons Medical

A patient in the hospital who needs assistance breathing, either during surgery or through a ventilator, is administered medical air. Medical Air is defined in National Fire Protection Association (NFPA) Code 99 2018 in 5.1.3.6.1 to have the following characteristics:

1. It shall be supplied from cylinders, bulk containers, or medical air compressor sources, or it shall be reconstituted from oxygen USP and oil-free, dry nitrogen NF.
2. It shall meet the requirements of medical air USP.
3. It shall have no detectable liquid hydrocarbons.
4. It shall have less than 25 parts per million (ppm) gaseous hydrocarbons.
5. It shall have equal to or less than one milligram per cubic meter (mg/m^3) of permanent particulates sized one micron or larger in the air at normal atmospheric pressure.

The air is delivered through a distribution piping system that ends with a medical air outlet within the room. Outlet requirements per room are governed by American Institute of America (AIA) Guidelines for Design and Construction of Hospitals and Healthcare Facilities.

Equipment is plugged into the medical air outlet to treat the patient. Many studies have been done determining the load required for medical air compressors. The sizing can be calculated using several methods. The U.S. Typical Method is the standard calculation for medical air in the United States. To calculate by this method the following steps are taken:

1. Count all outlets that will be served by this system by occupancy.
2. Multiply by simultaneous use factor.
3. Add the sum of all occupancy.
4. Add the number of ventilators.

This sizing process attempts to size by "worst case scenario," which means all rooms would be occupied and using some amount medical air. Ventilators being the largest consumer of medical air especially adds to the total. It is highly unlikely all outlets would be used at one time in a facility; however, the facility has to be prepared and equipped for that scenario. This leaves many facilities frustrated with what they consider grossly oversized medical air compressors.

Shown is a 15-horsepower (hp) triplex scroll medical air package.

Medical Air Central Supply Systems

NFPA 99 5.1.3.6 details the requirements and the limitations of medical air central supply systems and their installation within a healthcare facility in the United States. The defining requirement 5.1.3.6.2 Uses of Medical Air states that medical air sources shall be connected to the medical air distribution system only and shall only be used for human respiration and calibration of medical devices for respiratory equipment.

Medical air cannot be used in central sterile, to run instruments, or any other use outside of patient respiration. Therefore, multiple air compressors are used within a healthcare facility, but this article will only focus on Medical Air Central Supply Systems.

Oil-free air compressors are used to eliminate the potential for hydrocarbons. The most common technologies are scroll, reciprocating, and rotary screw air compressors. In addition to the air compressor, the package normally contains aftercoolers, dryers, filters, receiver and monitoring equipment, such as a dewpoint monitor and CO monitor.

Redundancy Requirement: An Important Sizing Factor

No one point of failure is allowed to ensure patient safety. NFPA 5.1.3.6.3.9 (B) states that medical air compressors shall be sufficient to serve the peak calculated demand with the largest single air compressor out of service. In no case shall there be fewer than two air compressors.

This means redundancy is required and one air compressor is never allowed. The smallest would be a duplex package. The redundancy also applies to filtration and dryers as well. When sizing an air compressor, it is important

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 24th, 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
Sponsored by VPInstruments

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
Sponsored by Busch USA

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
Sponsored by BEKO Technologies and Trace Analytics

APR 25

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

MAY 16

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

JUN 06

Selecting & Sizing Oil-Free Air Compressors
Presenter Tom Taranto, Owner, Data Power Services
June 6th, 2019 – 2:00PM EST
Sponsored by Nidec Motor and Atlas Copco Compressors

JUN 27

Understanding Flow for Proper Vacuum Pump Sizing
Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corp.
June 27th, 2019 – 2:00PM EST
Sponsored by Atlas Copco Industrial Vacuum

JUL 18

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

AUG 22

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

NOV 21

Air Compressor Lubrication & Maintenance
Presenter Loran Circle, Senior Consultant, Circle Training & Consulting
November 21st, 2019 – 2:00PM EST
Sponsored by Summit Lubricants

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

SPONSORED BY

VP INSTRUMENTS · BUSCH · TRACE Analytics · BEKO · KAESER COMPRESSORS Built for a lifetime. · Henderson Engineering Co. · Nidec NIDEC MOTOR CORPORATION · Atlas Copco

AN OVERVIEW OF MEDICAL AIR PACKAGES

to size with the load being maintained even with one unit out of service. Therefore, in a triplex skid, two air compressors can run with one as backup. A quad package can run three and so on. The air compressors will still all run in sequence to maintain even run life on all the air compressors.

An efficient way to meet the peak calculated demand and satisfy the redundancy requirement is with multiplexing smaller horsepower (hp) units. In the past, large industrial air compressors were installed, with large being 30- or 50-hp in medical air applications. This means if one Operating Room is put into use, or one ventilator is brought on-line, a 30-hp air compressor would be started up to meet the demand. This air compressor would run two to three minutes, meet demand, and shut off. This cycle is repeated throughout the life of the unit.

By multiplexing smaller hp air compressors, such as 10- or 15 -hp machines, a facility can reduce their electrical consumption. When a demand is created only one air compressor runs. If that one air compressor cannot meet the demand, then another air compressor can come on and so forth (with one staying off for redundancy). Therefore, the facility is running one 15-hp air compressor versus a 30-hp machine. In the majority of applications, only one air compressor handles the load.

Multiplexing also allows for expandability. Healthcare construction projects are often open-ended leaving flexibility in the services that the hospital is going to provide. Also,

Desiccant dryers use cartridges of activated alumina that need to be periodically replaced.

AN OVERVIEW OF MEDICAL AIR PACKAGES

due to budget constraints, sometimes space is left shelled for future expansion. Instead of guessing at the future or sizing for future, it is possible to put expandable panels and leave space on skids for future modules. This keeps capital costs down, and the facility will have a clearer understanding of its medical air usage.

Finally, multiplexing multiple scroll air compressors takes dramatically less space, saves considerable money on installations and has lower capital costs than Variable Speed Drive (VSD) rotary screw air compressors. Pattons Medical can have a complete medical air package with multiple scroll air compressors shipped as a complete single point connection package. In new construction, this will save the contractor any additional piping and electrical wiring for components. There would be a braze for the inlet/outlet and one wiring connection. For replacement equipment, the skids can be broken apart to fit through a 30-inch door and have unions for the connections when put in place.

The Ins and Outs of Desiccant Dryer Technology

Dryers are an integral part of the medical air compressor package and can have an impact on the sizing and efficiency. To maintain the requirement of a maximum dewpoint of 32 °F at 50 to 55 psi at any level of demand, and allow for flexibility in skid design, desiccant dryers have become the standard for medical air packages. They perform well in low-flow conditions that are common with medical air demand.

Desiccant dryers utilize towers that contain cartridges of activated alumina. The cartridge design versus loose desiccant eliminates dusting from desiccant and is sized based on demand. Therefore, the amount of air purged will be dramatically reduced requiring less demand from the air compressor. Desiccant dryers require a purge to regenerate the desiccant to continue the ability to dry the air. It is imperative for efficiency with medical air to utilize controls for demand-based purging. The dewpoint is monitored through the dewpoint sensor. In demand-based purging, the purge does not take place until the dewpoint reaches 14 °F. This almost eliminates the air compressor running for purge outside of demand. Another benefit is the dryer can be mounted horizontally or vertically to achieve smaller footprints of the overall package.

Meeting the Needs of Smaller Healthcare Facilities

During the last 15 years, smaller healthcare facilities have been built to offer less acute services. These facilities are either located on the campus of larger hospitals or found as standalone buildings.

For these applications the sizing of the medical air is the same, however, the loads are much smaller. High-pressure manifolds utilizing medical air cylinders are allowed by code to deliver medical air. This requires the owner to make a financial decision of either a larger capital cost of an air compressor or the ongoing operational cost of purchasing medical gas cylinders.

If the owner decides to install a medical air compressor, the space allotted for medical air compressors is usually quite small. The location is also much closer to patients than in a large hospital setting. This led to the scroll

type air compressors being used for medical air. Scroll units are much quieter and smaller than either of the reciprocating or screw type. By utilizing vertical tank configurations and appropriately sized desiccant dryers the skids can be as small as three by four feet.

Involve Medical Gas Specialists in the Process

It is imperative in a replacement scenario that a facility meet with a medical gas specialist to have a medical gas survey completed. This will confirm the sizing done initially for the facility was accurate and will address any changes in acuity or services since the original air compressor was installed. The medical gas specialist will confirm the outlet counts, interview respiratory therapist, and determine if there are any code issues that will need to be addressed with a replacement. Specifically, that the inlet is code compliant and the master alarm panels have the appropriate points. Oftentimes this is missed and can affect the new air compressor being certified. BP

About the Author

Shannon McAfee, Vice President of Sales and Business Development for Pattons Medical, is a chemical engineer with more than 18 years of experience in the medical gas industry.

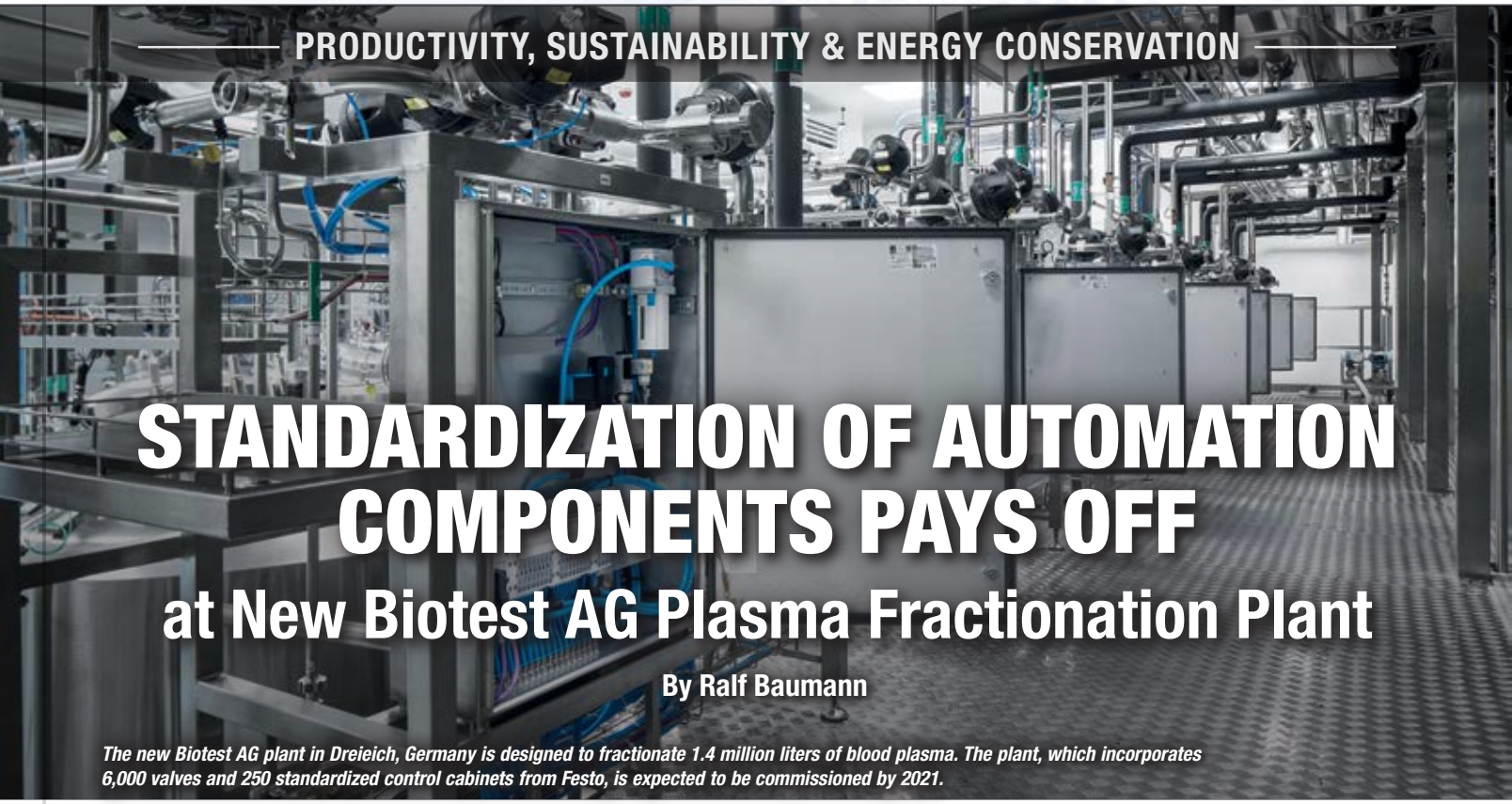
About Pattons Medical

Founded in 2008 and based in Charlotte, North Carolina, Pattons Medical sells and services medical air and vacuum equipment nationwide. Compressed air system products include scroll air compressors, reciprocating air compressors, and medical air dyers. Medical vacuum pumps include rotary claw pumps and oil-less and lubricate rotary vane vacuum pumps. It also offers an extensive line of medical air system accessories. For more information, visit www.pattonsmedical.com.

All photos courtesy of Pattons Medical.

To read similar ***Medical Air*** articles please visit www.airbestpractices.com/industries/medical.

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION



STANDARDIZATION OF AUTOMATION COMPONENTS PAYS OFF

at New Biotest AG Plasma Fractionation Plant

By Ralf Baumann

The new Biotest AG plant in Dreieich, Germany is designed to fractionate 1.4 million liters of blood plasma. The plant, which incorporates 6,000 valves and 250 standardized control cabinets from Festo, is expected to be commissioned by 2021.

Blood plasma is an indispensable resource in the production of life-saving medicines. It is also in high demand on global markets. To make more efficient use of this valuable commodity, Biotest AG developed a new large-scale production plant in Dreieich, Germany, for plasma fractionation capable of obtaining five instead of the previous three products from a single liter of blood plasma. As part of its strategy, Biotest AG worked with Festo to standardize automation components used at the plant, resulting in simplified installation and maintenance.

Ensuring Best Possible Use of Raw Materials

Blood plasma contains more than 120 valuable proteins. These include clotting factors, blood substitutes and immunoglobulins, which can strengthen the immune system of patients after an organ transplant, for example.

In order to be able to make the best possible use of this valuable raw material, companies like Biotest AG are investing in research and innovative manufacturing methods. The investment is paying off as the number of medical products that can be obtained from a liter of blood plasma has increased from three to five.

The efforts also contribute to a lasting increase in productivity, as more than 50% of the production costs are incurred in buying plasma. More efficient methods ensure optimal processing of the various products obtained from blood plasma. In Biotest's new production plant, 6,000 valves and 250 standardized control cabinets from Festo simplified the construction of the plant, as well as the subsequent maintenance including a long-term reduction in associated maintenance costs.

Shown is the interior of the new Biotest AG plant designed for highly efficient production of products obtained from blood plasma.

Increasing Product Yield and Purity

Standardization in the construction of the new Biotest plant offers benefits for both the company and plant engineers.

Engineers can purchase predefined components quickly and easily and gain access to favorable terms given the defined component pool, while for Biotest the overall cost for spare parts supply is reduced. Other benefits include a reduced training requirement for maintenance and service staff and shorter downtimes, as well as reduced maintenance workload in the event of a fault. It also means lower documentation and supply management costs.

"When it came to the construction of the new building with the modern large-scale plant for blood plasma fractionation, there were two main aspects to consider," said Matthias Mahle, Head of Technical Project Management BNL at Biotest. "The first was expansion of capacity beyond the performance limits of the existing plants, and the other was efficiency. As a pharmaceutical company working in blood plasma processing, we are competing in a globally consolidating market. We are strengthening our market position by obtaining more products from the same amount of plasma."

Biotest can manufacture a greater number of products, as well as increase the yield and its purity. Whereas the capacity limit used to be 800,000 liters, the new plant will be able to fractionate up to 1.4 million liters of blood plasma.

"With the existing systems, some of which date back to 1995, we were able to obtain three different products from the plasma. The new plant will be able to manufacture up to five products," Mahle said. "A high level of efficiency in production is essential, as the raw material – blood plasma – accounts for more than 50% of the production costs."

WE PROUDLY INTRODUCE A
NO-BRAINER

Find out why better doesn't always cost more.

- Rotary screw 5-500HP
- Made in the USA
- 65,000 sq. ft. modern manufacturing facility
- Lower energy costs
- Lifetime of reliability
- Reduce operating expenses

Contact Us to Learn More
251-250-2217 KaishanUSA.com/LearnMore
15445 Industrial Park Dr. • Loxley AL, 36551

KAISHAN

STANDARDIZATION OF AUTOMATION COMPONENTS PAYS OFF AT NEW BIOTEST AG PLASMA FRACTIONATION PLANT

Advantages of Pneumatics in Process Automation – By Christopher Haug, Festo

Pneumatic automation technology is perfect for process industries: it is robust, inexpensive and very reliable. Compressed air can be transported and stored easily and, in contrast to electricity, is simple to control. Higher thrust and tensile forces and torque values can be achieved by boosting the pressure.

With an average service life of more than one million operating cycles, pneumatic actuators will outlive any process valve. Even in the harsh environments often found in process industries, with large temperature fluctuations and high levels of dirt and humidity.

Humidity, extreme heat or cold cannot stop corrosion-protected pneumatic components – they are unaffected by temperatures between minus four and 176 °F, while special low-temperature variants can even operate down to minus 40 °F and high-temperature variants up to 248 °F. All stainless-steel component variants are extremely resistant to corrosion.

Fit It and Forget It

Pneumatics is an uncomplicated technology, making it easy to install, since it requires no monitoring or sensing functions apart from end-position sensing and monitoring of the compressed air supply. Totally true to the motto, "fit and forget".

Pneumatic drives have proved to be vibration-resistant and long-lasting. In contrast to electric drives, they consist of only a few components and are thus less susceptible to breakdowns. What is more, pneumatic drives are able to withstand continuous load and require no maintenance throughout their working life. There is no need for oil changes or lubrication top-ups.

Saving Cost and Energy

Thanks to the lower costs, it is even worthwhile to automate manually operated valves retrospectively. Particularly in comparison with electric drive technology, the broad-based use of decentral automation concepts with valve terminals results in considerable cost advantages: savings of more than 50 % are possible in some cases.

Another factor is energy consumption. Pneumatic drives require electricity only for control functions and to generate compressed air, while their actual motion is created by compressed air. While with electric drives part of the energy with which they are supplied is converted into heat and lost in gear units, pneumatic actuators operate directly on a shut-off device. They only require a piston and a drive shaft to convert the "linear" energy of compressed air into a swivel motion.

As pneumatic drives are overload-tolerant and allow higher drive forces to be achieved simply by increasing the supply pressure, it is often possible to use smaller drives with lower weight than would be possible with electric drives. Provided that the tubing connections are leak-free and components are correctly dimensioned, the result is energy-efficient solutions. Pneumatic systems from Festo can deliver high forces of up to 11,240 pound-force (50,000 N) and torque of up to 7,376 foot pound-force (10,000 N.m)

Addressing Safety Needs

Pneumatic drives have three emergency functions in the event of a power failure – open, close and stop – and allow low operating pressures. They are ideal for use in areas with a potentially explosive atmosphere, in particular when explosion-proof valves, such as NAMUR valves with appropriate coils, are used and the valves or valve terminals are located outside the explosion-hazard zone.

In these cases, the pneumatic drives in the explosion-hazard zone are supplied with compressed air via tubing, while the electrical control components can be installed in a non-hazardous zone. Pneumatic drives are ATEX-approved as standard up to zone 1.

Providing Overload Tolerance

Deposits or baked-on residues of foreign material can lead to considerably higher breakaway forces of pneumatic drives. This happens particularly when valves are actuated irregularly or not for long periods, as is the case, for example, in sewage treatment plants. The overload tolerance of pneumatic drives is a great advantage, as with pneumatics it is not a problem to increase the operating pressure and thus obtain higher forces. They will not suffer damage even if overloaded to the point where they come to a standstill and have large reserves of force for cases where high breakaway torques are required.

Ensuring Project Success

Experts at Festo can help with the calculation of compressed air consumption and the optimum dimensioning of compressed air supply networks. They can also provide assistance during the tendering phase if required. Working with a single source and with just one part number also ensures a simple ordering process, allowing projects to be completed more quickly.

About the Author

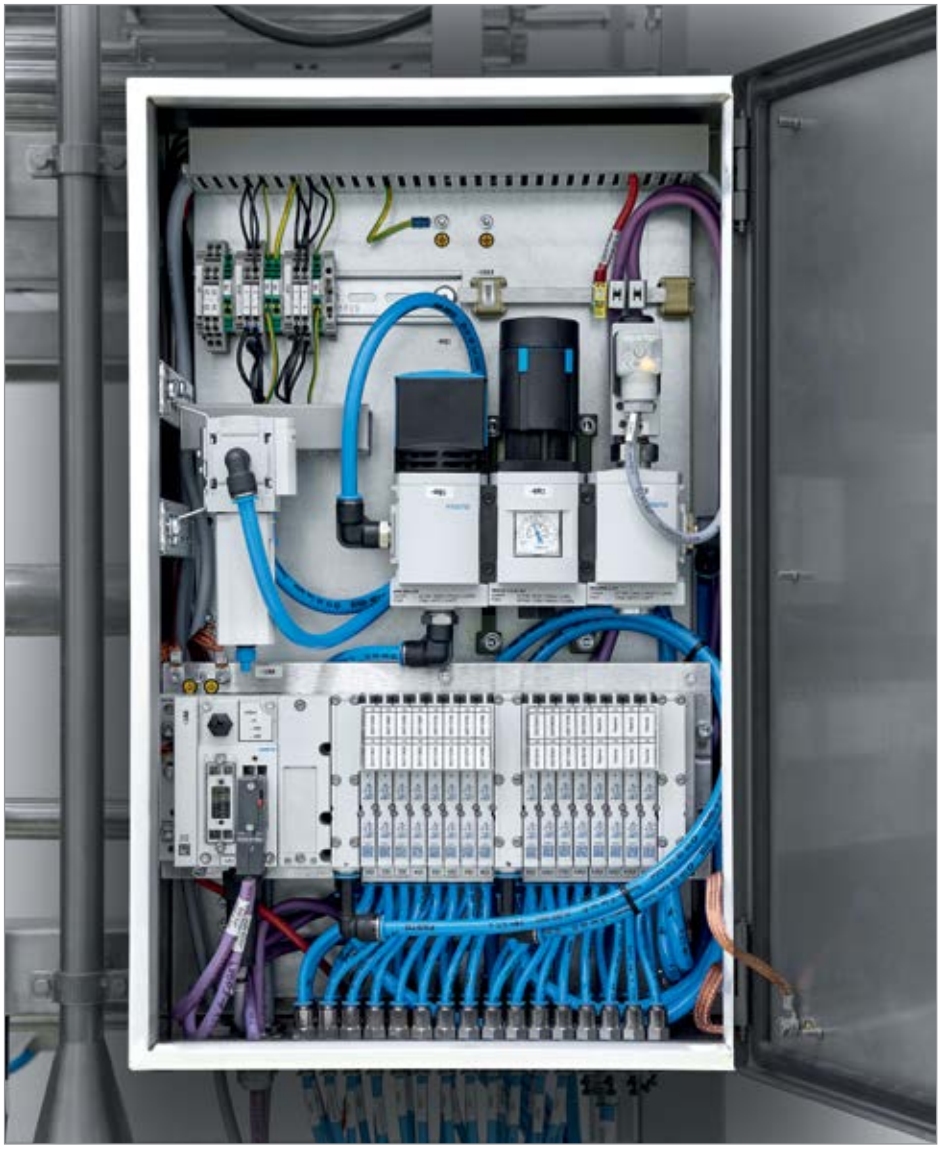
Christopher Haug is Manager International Trade Press, Festo.

Defining Standards for Automation Groups Early On

Planning of the new plant got underway in 2013, and it is expected to be fully commissioned by 2021. Although most of the plant is already installed, a lengthy process of validation and qualification must be completed before production actually starts. Following basic engineering, Festo was involved in the detailed engineering process very early on.

For Werner Gödel, Head of the EMSR Technology Department, Biotest, standards needed to be defined for certain automation product groups in order to achieve the greatest possible, long-term plant efficiency.

"One of the key questions was the level of standardization that could be achieved in order to reduce the maintenance workload, for example. The use of standard valve cabinets was an important step in this regard. Limiting



Biotest AG standardized its new plant with Festo control valves and control cabinets.

BOGE
COMPRESSED AIR SYSTEMS

BOGE AIR. THE AIR TO WORK.

Best
Of
German
Engineering

NEW FROM BOGE!
S4 Series:
Fixed & Variable Speed
Quiet · Direct Coupled · Efficient

For more information on our complete product offering please contact us:

Phone +1 770-874-1570
www.boge.com/us

BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

OPTIMIZE ON-SITE UTILITIES

Powering Automation

Research and Identify Innovations

to Enhance the Efficiency and Reliability of Your Systems

COMPRESSED AIR

- Air Compressors
- Air Compressor Controls
- Air Purification & Piping
- Condensate Management
- Measurement Instruments
- Pneumatics

COOLING

- Chillers
- Heat Exchangers
- Cooling Systems
- Cooling Towers
- Water Treatment

BLOWER & VACUUM

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

EXPO HOURS

Monday, October 14 12:00-6:00pm

Tuesday, October 15 12:00-6:00pm

Register for Your FREE EXPO Pass Today!

Includes admission to EXPO,
Opening Session and the Plenary Session

www.cabpexpo.com

Co-Sponsored by CAGI Compressed Air & Gas Institute | IVA EnergyRight

STANDARDIZATION OF AUTOMATION COMPONENTS PAYS OFF AT NEW BIOTEST AG PLASMA FRACTIONATION PLANT

the number of standards reduces maintenance workload down the road," said Gödel.

Jürgen Weber, formerly Segment Manager Pharma Germany, Festo, and now responsible for Process Industries, Southern Germany, played an active role in the definition phase for the new plant.

Issues were discussed right down to the last detail, even whether stainless steel or nickel-plated brass fittings should be used. Once Festo was defined as the standard, all seven suppliers were able to access the relevant products and pool components, such as the standardized valve cabinets, using a project-based order catalogue and order via the electronic platform.

Long-term Benefits of Close Project Coordination

For Gödel, the close coordination with Weber from Festo and Biotest's own maintenance department in the early planning phase was particularly important.

"At the end of the day, our maintenance staff are the people who have to work with the products. They were clear in their preference for Festo. The plus points were the ease of use, good support and long service life," said Gödel. "We also spoke to the plant engineers in advance and gathered opinions when looking for pool components. There was a resounding yes in favor of Festo components." BP

About the Author

Ralf Baumann is a freelance writer who writes for Festo on a regular basis.

About Festo

Festo is a leading manufacturer of pneumatic and electromechanical systems, components, and controls for process and industrial automation. For more than 40 years, Festo Corporation has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. For more information, visit www.festo.com/biotech.

All photos courtesy of Festo.

To read similar articles on ***Pneumatics Technology*** articles, please visit www.airbestpractices.com/technology/pneumatics.

QUALITY, SAFETY & RELIABILITY

Verifying Compressed Air and Gas SAFETY AND QUALITY IN MEDICAL APPLICATIONS

By Robert Stein, Trace Analytics

➤ Compressed air and gases are vital to numerous healthcare facility operations. Commonly used for breathing, sedation, and the operation of medical instruments, healthcare facilities must rely on these utilities for lifesaving and therapeutic benefits. The quality of the air and gas produced by the facility's compressed air systems is paramount to their efficacy in promoting positive outcomes for patients.

Contamination of compressed air/gas, whether from ambient air, the air compressor itself, or the piping system, is a liability for healthcare facilities that can threaten patient health and safety, and ultimately cost the facility in malpractice lawsuits.

In 1996, at least four patients died and 70 were injured due to the liver-damaging effects of trichloroethylene, a solvent commonly used to clean piping and gas tanks, contamination in their bulk oxygen tanks[1]. Hospital staff had noticed an odor shortly after tank changeover[1], a clear signal of contamination that should not have been ignored and that happens to be part of air/gas criteria per National Fire Protection Association (NFPA) Health Care Facilities Code[2] (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=99).

NFPA 99 – A Closer Look

Regulatory agencies, including the Centers for Medicare and Medicaid Services (CMS), The Joint Commission (TJC), and local authorities having jurisdiction (AHJ), mandate that healthcare facilities ensure their compressed air and gas systems are compliant with NFPA 99.

NFPA 99 lists odor, water, carbon monoxide, carbon dioxide, gaseous hydrocarbons, halogenated hydrocarbons, oil and particulates (non-viable and viable) as major contaminants to monitor and sets concentration purity requirements for medical gases as outlined in Table 1.

Kyle Jussel, experienced and certified medical gas system verifier and president of the Medical Gas Professional Healthcare Organization (MGPHO), notes that, "NFPA 99 requires that as verifiers, we perform initial testing [for these contaminants] at the source as well as

The quality of the air and gas produced by compressed air systems at healthcare facilities is paramount to their efficacy in promoting positive outcomes for patients.

each point of use. Facilities are also required to show that every accessible medical gas outlet/inlet has been tested and/or inspected according to their own risk assessment with consideration of the equipment manufacturer's recommendations, which is typically on an annual basis thereafter."

Note that NFPA 99 does not include specific criteria for viable particulates, such as bacteria, mold, and yeast. However, it may be of critical importance for healthcare facilities to verify their compressed air and gas is free of potential microbial contamination.

Understanding Regulated Contaminants

Before delving into adverse implications of contamination, it is important to understand how contamination can occur. According to Jussel, "One of the major sources of contamination that we typically see when verifying medical gas systems includes copper particulate, which usually results from installers that may not have done proper purging during their initial testing procedures. We also occasionally see evidence of burnt pipeline plugs that were never removed prior to installation. This can be easily found during the odor test that is required of verifiers per NFPA 99."

Contamination, however, is an issue not just observed during installation and verification. Jussel explains that, "Once a system has been properly installed, verified and placed into service for patient use, we have seen problems with high levels of CO, CO_2 and humidity/dewpoint. All of which can result from maintenance related issues and/or poor intake air quality."

Understanding of NFPA 99 regulated contaminants and their potential adverse effects is essential to not only complying with NFPA 99 codes for air/gas criteria but also to ensuring the quality of medical gases used in healthcare facilities once compliance has already been met. Examples are shown in Table 2.

It begs reiteration, as noted in Table 2, that contamination and/or deviations in gas purity can lead to life-threatening injuries for patients. NFPA 99 only stipulates extensive air/gas verification for newly installed, repaired, or modified compressed air and gas systems and/or based on the air compressor manufacturer's recommendations[2]. Compressed air and gas systems that do not meet these criteria, such as previously verified and/or older systems, may be exempt from additional verification per NFPA 99. NFPA 99 does, however, require air quality monitors, though monitoring may not include and/or separately identify all contaminants tested for during verification, such as halogenated hydrocarbons like trichloroethylene. Thus, it is to the benefit of healthcare facilities to continuously monitor and test their compressed air and gas systems in order to protect their patients, achieve high compressed air system efficiency to save money, and provide evidence in legal matters.

Compressed Air and Gas Verification Testing

To ensure compliance with NFPA 99, healthcare facilities must complete piping purge, piping particulate, piping purity, medical gas purity, and medical gas concentration verification testing (See Table 2).

Breath of Fresh Air

The cleanest oil-free compressors that protect your products, packaging and reputation!

"Class Zero Oil-Free Air"
All models meet ISO 8573-1 Class 0 for oil aerosol, liquid, vapor and silicone.

Premium Efficient OIL-FREE Compressors

From the makers of ROGERS K Series
Rogers Machinery Company, Inc.
rogers-kseries.com

KOBELCO KNW SERIES
Proudly Made in the U.S.A.

800-394-6151
knw-series.com

VERIFYING COMPRESSED AIR AND GAS SAFETY AND QUALITY IN MEDICAL APPLICATIONS

NFPA 99 requires testing/analysis be performed by a party other than the installer[2]. And when a system is not installed by in-house personnel, testing can be performed by an in-house American Society of Safety Engineer (ASSE) 6030-qualified employee[2]. ASSE 6030 qualified employees can complete verification testing per NFPA 99 using portable analyzers/monitors or in conjunction with a third-party laboratory. This gives healthcare facilities the ability to save money and be proactive in minimizing patient and facility risk.

There are advantages to both portable analyzer and third-party laboratory testing methods.

Microscopic analysis of particulates aids in troubleshooting contaminants.

Portable analyzers, for example, may provide quicker results and in real-time. However, laboratory testing is often of higher accuracy and quality due to more complex techniques, instrumentation, and data analysis. Thus, a testing laboratory can sometimes provide clues as to the source of contamination through description/identification of particles, hydrocarbons, oils, etc.

If using a laboratory for analysis, it is in the best interests of healthcare facilities to only use accredited testing laboratories, such as Trace Analytics, LLC, as this ensures analysts, testing equipment, methods, quality assurance, and testing data meet or exceed internationally accepted standards (e.g., ISO 17025 for testing laboratories).

Jussel remarks that, "By sending air samples in for third-party laboratory analysis, we are able to give our customers peace of mind knowing that the quality of the air that they are delivering to their patients has been tested in a redundant fashion."

TABLE 1 - NFPA 99-2018 AIR QUALITY TESTS AND SPECIFICATIONS

NFPA 99 SECTION	TEST DESCRIPTION	TEST GAS (ES)	THC, PPMV	HH, PPMV	CO, PPMV	CO_2, PPMV	H_2O, PPMV/ DEW POINT °F	O_2 VOL%	N_2 VOL%	N_2O VOL%	OIL & PARTICULATES MG/M3	ODOR
5.1.12.4.6	Piping Purge Test	Source gas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No pronounced or objectionable odor
5.1.12.4.12	Medical Air Purity Test	Air	25 (T)	2	10	500	1544 / 35 (P)	19.5-23.5	N/A	N/A	N/A	N/A
5.1.12.4.11	Medical Gas Concentration Test	Air	N/A	N/A	N/A	N/A	N/A	19.5-23.5	N/A	N/A	N/A	N/A
5.1.12.4.11	Medical Gas Concentration Test	N_2	N/A	N/A	N/A	N/A	N/A	≤ 1	≥ 99	N/A	N/A	N/A
5.1.12.4.11	Medical Gas Concentration Test	N_2O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	≥ 99	N/A	N/A
5.1.12.4.11	Medical Gas Concentration Test	O_2 USP	N/A	N/A	N/A	N/A	N/A	≥ 99	N/A	N/A	N/A	N/A
5.1.12.4.7	Piping Particulate Test	N_2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A
5.1.12.4.8	Piping Purity Test	N_2 and Source Gas	± 5 (H)	± 5 (H)	N/A	N/A	500 / 10 (P)	N/A	N/A	N/A	N/A	N/A

THC= Total Gaseous Hydrocarbons, CO= Carbon Monoxide, CO_2= Carbon Dioxide, H_2O= Water, O_2= Oxygen, N_2= Nitrogen, N_2O= Nitrous Oxide

(T) Includes Methane

(H) Excludes Methane, difference allowed between nitrogen and source gas

(P) Referenced at 50 psi

Jussel goes on to explain that, "Not only was the medical air system tested upon start-up/verification, but it is also being supervised on a continuous basis by the air quality monitors required by NFPA 99. The results of which can also be compared to the third-party laboratory analysis that we provide on an annual basis."

In addition to providing objective assurance for healthcare facilities, third-party laboratory testing may also be cheaper in the long run. Portable analyzers can be expensive if maintained by the healthcare facility themselves, requiring calibration and frequent maintenance. Ultimately, healthcare facilities should determine their verification and continuous testing needs based on facility-specific risk assessments.

Reviewing data graphically can illuminate important trends.

Utilization of Proper Air Treatments

Utilization of proper air treatments is crucial to meeting air/gas quality requirements set forth by NFPA 99.

To combat water contamination, desiccant dryers are commonly used in healthcare facilities to remove water from the compressed air/gas as NFPA 99 requires dryers be designed to provide air at a maximum dewpoint of less than 32 °F at 50-55 psi[2]. While refrigerated dryers are effective dryers for many applications, they often cannot provide air below a 35 °F dewpoint, especially at low-flow conditions, which are common in hospitals, as condensate is not removed as effectively by the centrifugal separator. Dryer systems are often redundant, with NFPA 99 requiring duplexed systems, to prevent water contamination in the event of a malfunction. Desiccant dryers can release particulates into the compressed air system as desiccant dust is created as a result of the constant movement/friction of the desiccant as air flows through.

VERIFYING COMPRESSED AIR AND GAS SAFETY AND QUALITY IN MEDICAL APPLICATIONS

This illustrates how the compressed air system and air treatments themselves may produce contaminants which must be continually monitored for and controlled.

A series of filters can be used to remove particulates, originating either from the ambient air or the air compressor itself. It is important to note that a point-of-use filter is vital to ensuring that the compressed air/gas is particle-free upon use. Condensed oil, another contaminant analyzed for NFPA 99 verification testing, can originate within the air compressor, when oil lubricated systems are employed, and/or from the ambient air. To remove condensed oil, coalescing filters can be employed. For gaseous contaminants, such as volatile hydrocarbons and carbon dioxide, activated charcoal filters/towers and catalytic converters can be employed, respectively.

TABLE 2 - EXAMPLES OF POTENTIAL ADVERSE EFFECTS OF CONTAMINANTS/PURITY DEVIATIONS ON PATIENTS[3,4,5,6,7,8,9,10,11,12,13,14,15,16,17]

CONTAMINANT/PURITY DEVIATION	POTENTIAL ADVERSE EFFECTS
Odor	Often due to microbial, water, oil, and/or hydrocarbon contamination (see effects below)
Water	Microbial growth Ventilator shut-down Pipe corrosion → Particulate contamination Respiratory infections Respiratory difficulty/flare-ups (especially for patients with Chronic Obstructive Pulmonary Disease and/or Asthma)
Carbon monoxide	Headache Dizziness Nausea/Vomiting Coma Death
Carbon dioxide	Rapid breathing/heartrate Fatigue Nausea/Vomiting Coma Death
Gaseous hydrocarbons	Headache Dizziness Toxicity (pulmonary, cardiac, hepatic, etc.)
Halogenated hydrocarbons	Headache Dizziness Toxicity (pulmonary, cardiac, hepatic, etc.) Coma Death
Oil	Chemical pneumonia Respiratory distress Headache Nausea
Particulates	Respiratory distress (e.g., asthma attacks) Respiratory infections Heart attacks
Purity deviations	Negated therapeutic effects Inadequate sedation Respiratory distress Coma Death

Air treatments not only remove contamination, but they also allow a compressed air system to work more efficiently, saving money by prolonging air compressor life and allowing the system to work faster. Employing air treatments and performing air compressor maintenance, in combination with compressed air/gas testing, allows healthcare facilities to ensure the quality of this utility and therapeutic.

Testing Frequency and Trend Analysis

NFPA 99 requires verification testing for new, modified, or repaired compressed air systems and subsequent testing per manufacturer's recommendations, often annually. However, this testing frequency may not be sufficient to ensure compress air/gas quality year-round. Some facilities may opt to test quarterly as seasonal changes can alter the quality of the compressed air/gas. For example, high water concentrations are more common in the summer than in the winter.[3] Other facilities may test before and after performing compressor maintenance, to ensure contamination was not introduced as a result of the repairs.

It is important to understand that testing only provides data for the compressed air system at the moment of sampling. To best optimize testing to ensure compressed air/gas quality, trend analysis can be employed. Trend analysis can utilize air quality monitoring data, obtained from monitors required per NFPA 99, in conjunction with third-party laboratory testing data to provide a detailed picture of air quality over time. Compressed air systems are dynamic – changes in seasons, system wear and tear, and other factors can all impact air/gas quality. Gathering sufficient data over time accounts for seasonal and maintenance changes and allows healthcare facilities to establish baseline quality levels for contaminants. Facilities can then

best determine air compressor maintenance/cleaning schedules, potentially saving facilities time and money. In addition to establishing a baseline, healthcare facilities can set action and alert levels, which can allow the facility to anticipate contamination issues before they set off monitor alarms and/or threaten patient safety.

Ensure Patient Safety with Testing and Monitoring

NFPA 99 Health Care Facilities Code is an important standard for ensuring the quality and safety of compressed air and gases used in healthcare facilities. Deviations in air purity and/or contamination could jeopardize patient safety. To comply with NFPA 99 and protect patients, healthcare facilities should employ air treatments and perform routine compressed air/gas testing and monitoring. BP

About the Author

Robert Stein is a U.S.-appointed expert on the ISO 8573 Compressed Air Testing Technical Committee and holds a Bachelor of Science in Chemistry and Archaeology and a Master of Science in Forensic Chemistry. Experienced in analytical chemistry and microscopy, he currently serves as the Quality Manager at Trace Analytics, LLC. The author wants to thank Kyle Jussel, President of Medical Air Testing & Services, Inc. and MGPHO, for providing great insight and quotes for this article.

About Trace Analytics, LLC

Trace Analytics, LLC is an ISO 17025 accredited laboratory specializing in compressed air and gas testing for healthcare facilities. Using validated sampling and analytical methods, their laboratory tests for air and gas purity, particles (0.5-5 microns), water, gaseous contaminants (e.g., carbon monoxide, carbon dioxide, total hydrocarbon content, and halogenated hydrocarbons), oil aerosol, oil vapor, and microbial contaminants. For over 30 years, they've upheld the highest industry standards of health and safety, delivering uncompromising quality worldwide in accordance with NFPA 99 requirements. Trace Analytics, LLC also works with experienced service distributors, such as Medical Air Testing & Services, Inc., to allow for easy, reliable, and affordable testing. For more information, visit www.aircheckLab.com.

All photos courtesy of Trace Analytics.

References

1 Moss, E. and Evans, F. Hospital Deaths. Anesthesia Patient Safety Foundation. Retrieved July 27, 2019 from https://www.apsf.org/article/hospital-deaths/

2 NFPA 99 Healthcare Facilities Code (2018)

3 Water Vapor. Trace Analytics, LLC. Retrieved August 2, 2019 from https://www.aircheckLab.com/aircheck-academy/breathing-air/sources-of-contamination/water-vapor/

4 Mould, damp and the lungs. European Respiratory Society. Retrieved July 28, 2019 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5709805/

5 Allen, E. E. (2018). Medical Gas System Safety. The Doctor's Company. Retrieved July 20, 2019 from https://www.thedoctors.com/articles/medical-gas-system-safety/

6 Moss, E. Medical Air. Anesthesia Patient Safety Foundation. Retrieved July 21, 2019 from https://www.apsf.org/article/medical-air/

7 Carbon Monoxide Poisoning. Centers for Disease Control and Prevention. Retrieve July 19, 2019 from https://ephtracking.cdc.gov/showCoRisk.action

8 Pietro, M. (2018). Humidity levels and COPD. Medical News Today. Retrieved July 21, 2019 from https://www.medicalnewstoday.com/articles/323657.php

9 Carbon Dioxide OSH Answers Fact Sheets. (2019). Canadian Centre for Occupational Health and Safety. Retrieved August 1, 2019 from https://www.ccohs.ca/oshanswers/chemicals/chem_profiles/carbon_dioxide.html

10 Toluene OSH Answers Fact Sheets. (2019). Canadian Centre for Occupational Health and Safety. Retrieved August 1, 2019 from https://www.ccohs.ca/oshanswers/chemicals/chem_profiles/toluene.html

11 Trichloroethylene OSH Answers Fact Sheets. (2019). Canadian Centre for Occupational Health and Safety. Retrieved August 1, 2019 from https://www.ccohs.ca/oshanswers/chemicals/chem_profiles/trichloroethylene.html

12 Brown, K. W. and Armstrong, T. J. (2019). Hydrocarbon Inhalation. StatPearls. Retrieved July 21, 2019 from https://www.ncbi.nlm.nih.gov/books/NBK470289/

13 Breathing Air Quality, Sampling and Testing. Environmental Health Laboratory, department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington. Retrieved July 28, 2019 from https://deohs.washington.edu/sites/default/files/images-envhlth/topic/BreathingAirQualitySamplingandTesting_Technical.pdf

14 Francis, J. Breathing Gas Contamination. Divers Alert Network. Retrieved August 1, 2019 from https://www.diversalertnetwork.org/health/PSA-GasContamination/index.html

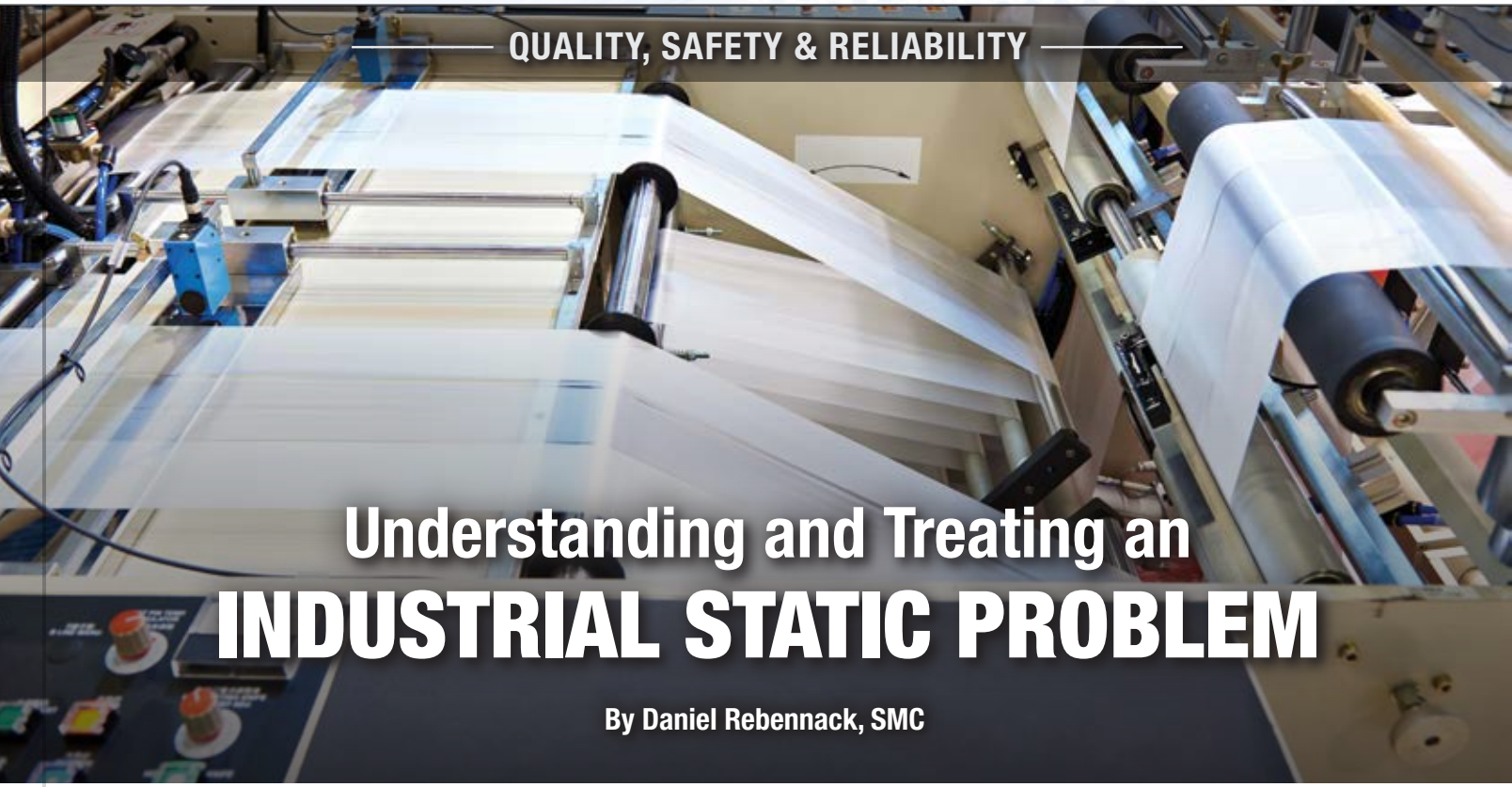
15 Particle Pollution and Your Health. U.S. Environmental Protection Agency. Retrieved July 28, 2019 from https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1001EX6.txt

16 Health and Environmental Effects of Particulate Matter (PM). U.S. Environmental Protection Agency. Retrieved July 27, 2019 from https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm

17 Moss, E. Medical Gas Contamination An Unrecognized Patient Danger. Anesthesia Patient Safety Foundation. Retrieved August 2, 2019 from https://www.apsf.org/article/medical-gas-contamination-an-unrecognized-patient-danger/

To read similar ***NFPA 99 Medical Air Standards*** articles, please visit www.airbestpractices.com/standards/nfpa-99-medical-air.

QUALITY, SAFETY & RELIABILITY



Understanding and Treating an INDUSTRIAL STATIC PROBLEM

By Daniel Rebennack, SMC

Most people have encountered examples of static electricity from an early age. Perhaps you have been shocked when grabbing a door handle or touching noses when you kiss someone. Maybe you have seen sparks in your cat's hair while petting him. In school, you might have experimented by rubbing a balloon on your head and then watching your hair stand up as you lifted the balloon. All of these examples follow the same principles of the generation and discharge of static electricity.

In this article, we discuss problems associated with static electricity in industrial manufacturing operations and how to effectively address them.

How Static Electricity Occurs

At the atomic level, materials have a balance of positively charged protons in the nucleus and negatively charged electrons in the shell. Balance requires the same number of each. A static charge occurs when that balance shifts due to the loss or gain of one or more electrons from the atom or molecule. The primary mechanism for this loss or gain, among several possibilities, is friction. When two materials, similar or dissimilar, contact one another, even if the contact is slow or brief or gentle, there is friction between the adjacent surfaces. Electrons can be transferred, leading to an imbalance for the donor and recipient atoms or molecules. The separation of two surfaces previously in contact with one another can also result in electron transfer.

Some materials, called conductors, can easily pass along electrons, flowing from atom to atom. These materials, especially when in contact with a large conductive mass called a ground, can shed excess or quickly regain deficit electrons by conduction, rebalancing the charge to neutral. Non-conductive materials, called insulators, do not easily move electrons from one point to another.

Bar ionizers, such as SMC's IZS41, come complete with built in high voltage power supply and ion emitters, as well as user settings and feedback controls.

An imbalanced condition initially created by friction can persist for a long period of time, until some later mechanism introduces material that can accept or donate electrons. This can be a person, an object or path to ground, or an airborne particle.

Undesirable Conditions Created

Rebalancing can occur abruptly, such as the shock we have personally experienced. In an industrial setting, the rebalancing can result in all sorts of undesirable conditions. Small electronic pathways can be damaged. Raw materials and finished goods can become contaminated. Plastic webbing can cling to itself or handling equipment. Conveyed products can be repelled from one another, causing misfeed, misalignment, or drops. Operators can be discomforted or injured based on the severity of the shock. Further, the rebalancing can be incomplete or temporary, resulting in an accumulation of defects and unwanted conditions.

Neutralizing Static with Ionizers

A range of static neutralizing products called ionizers are available, including from SMC. Ionizers create positively and/or negatively charged particles called ions by subjecting ambient air molecules to very high voltages, concentrated at the sharp points of needle-like emitters.

Some product forms include bars, fans, and nozzles. Each ionizer creates the ions and then propels them toward the target imbalanced material, using either compressed air or forced air from a fan. Once the ions come in contact with the undesirably charged material, electrons are traded, neutralizing the imbalance. The result of neutralized static is a more successful production operation and operator comfort.

The presence of a static imbalance is generally obvious in a factory setting, although the underlying mechanisms may not be. It can be difficult to understand how to grasp the magnitude of the problem or arrange treatment. A basic troubleshooting outline can help direct the approach:

- Identify the failure mode.
- Identify the materials encountered.
- Identify the process causing static-related problems.
- Describe the optimal outcome following static neutralization.
- Within the area, select the ideal location for treatment.
- Using a handheld meter, measure the magnitude and polarity of charge.
- Select an ionizer type that is most suitable for the treatment space.
- Install and orient the ionizer.
- Adjust ionizer to most suitable settings, if settings are available.
- Observe treatment and compare results to expectation.

Identify the Failure Mode

The failure mode is the evidence of a static problem, and identifying it usually requires the least amount of effort. It may be labels not

Shaw Moisture Meters (USA)

The world renowned Model SADP portable dewpoint meter - an easy to use hygrometer for fast, reliable trace moisture measurement.

CLICK HERE FOR MORE INFORMATION

We are delighted to announce our US sales, service and calibration facility is now open.

PLEASE CONTACT US AT
USA@shawmeters.com

SHAW MOISTURE METERS

SHAW MOISTURE METERS, EXPERTS in DEWPOINT MEASUREMENT
Shaw Moisture Meters (USA) | 399 River Road | Hudson | MA 01749 | USA
call: 978-333-7140 | email: USA@shawmeters.com | visit: www.shawmeters.com

Proudly Presenting the 2019 Expert Webinar Series

COMPRESSED AIR BEST PRACTICES airbestpractices.com

Join **Keynote Speaker**, Loran Circle, Senior Consultant, Circle Training & Consulting, to discuss air compressor lubrication and maintenance procedures. Lubricant selection and maintenance can affect the overall operation and dependability of an air compressor. Mr. Circle will review the functions and properties of lubricants for various applications. Attendees will learn how to select and maintain lubricants. This webinar will also explain how to effectively diagnose and resolve common lubricant issues like an overheating air compressor.

Loran Circle, Senior Consultant, Circle Training & Consulting

Our **Sponsor Speaker** is Jasween Jagjit-Webb, Market Manager for Air Compressor Lubricants, Summit. Her presentation, "Extending the Life of Your Lubricant," will discuss how to choose a lubricant to match air compressor types. She will also review the importance of consistent oil analysis.

Jasween Jagjit-Webb, Market Manager for Air Compressor Lubricants, Summit

Receive 1.0 PDH Credit.

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

November 21, 2019 – 2:00 PM EST

SPONSORED BY:

SUMMIT

UNDERSTANDING AND TREATING AN INDUSTRIAL STATIC PROBLEM

adhering to a package. Perhaps an electronic component or assembly is not functioning properly during a quality check. Plastic webbing might cling to itself during travel over rollers. In some cases, plastic bottles jump off a conveyor line, or molded parts misfeed when exiting a hopper.

Identify the Materials

Non-conductive materials are the most likely to accumulate charge, and plastics are the most commonly affected in an industrial setting. Less obvious materials such as glass and natural fibers for textiles can carry a static charge. Different materials can be ranked into what is called the triboelectric series. On one end of the series are materials that favor excess positive charge. At the other end are materials that tend toward a negative charge. When two dissimilar materials contact each other, the relative distance between them in the series can predict the magnitude of the charge, or the likelihood a charge will be imparted. Having an awareness of the series can help to predict static issues and therefore take precautions. In existing conditions, the origin of the charge may be more easily pinpointed.

Identify the Processes

While observing potential processes causing static, pay attention to friction or separation, non-conductive materials, and the location of the failure mode. These factors will often point to the source of static. Sometimes a charge is acquired in one step, while the failure symptom

The SMC IZF Series fan ionizers use ambient air instead of compressed air to distribute neutralizing ions across a medium distance.

is not observed until later. Packaging issues are generally apparent in close proximity to the charge-generating operation. Electronics, in contrast, may not show symptoms of static damage until a functional test is completed.

Describe the Optimal Outcome of Treatment

A reversal of production errors is typically all one would seek. Some operations may have differing degrees of tolerance for static. Setting a performance limit may lead to optimizing treatment any number of ways. Examples may be changing settings, adding another device, orienting the ionizer differently or relocating it entirely. On the other hand, if the installation is ineffective, it will lead to a reevaluation of the process.

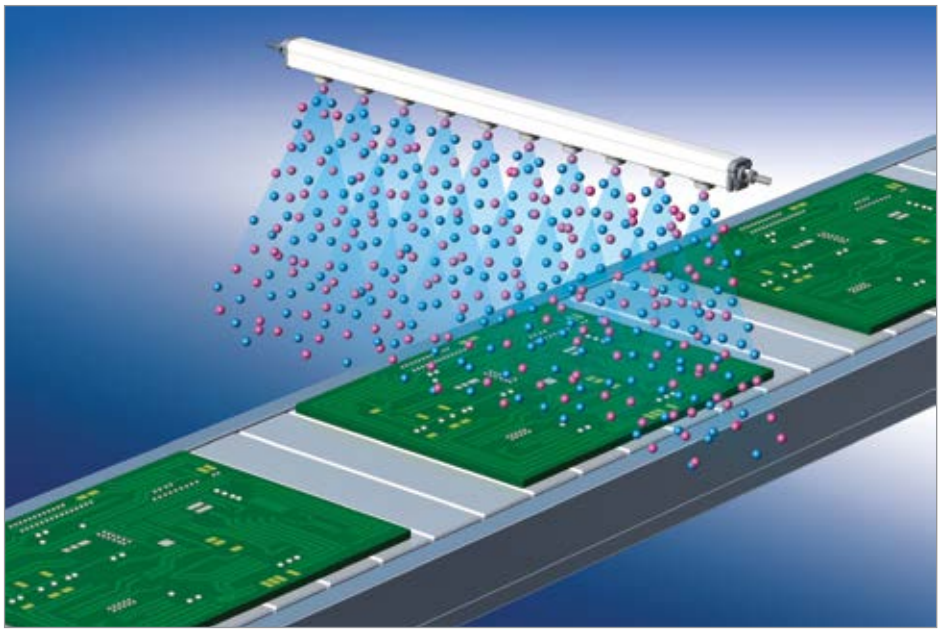
Set the Ideal Treatment Location

As indicated above, multiple areas may be identified initially as requiring treatment. Some may be eliminated from consideration, depending upon the tolerance for failure. For example, dusty packages may be unsightly, but may not need to be cleaned until right before filling or labeling. As another example, handling friction may immediately generate more static, but an intolerable failure mode may not be present. Often, the ideal treatment location will be just before the next process changes the product's state or direction.

Measure the Magnitude and Polarity of Charge

Handheld meters can verify the presence, magnitude, and polarity of charge. They are useful devices for both diagnosis and evaluation of treatment. Magnitude of charge is important because some static-induced behaviors will not abate until charge falls below a threshold. Polarity is important because some devices can create ions having an opposing charge. Treating with an opposing charge will reduce the static imbalance more quickly than treating with balanced ion generation.

UNDERSTANDING AND TREATING AN INDUSTRIAL STATIC PROBLEM



Remote ionizer bars like the IZT40 from SMC come in multiple lengths and create a long curtain of air to cover a long or wide target area. These ionizers separate the power supply and controls, allowing them to be installed in tight spaces.

Select an Ionizer Type

There are different types of ionizers. Guns introduce ions to a triggered jet of compressed air. They are manually operated and typically used for cleaning. Nozzles are suitable for small targets, such as a surface intended for label adhesion, or small molded parts. The air shape is typically an expanding cone of air projecting past a single emitter.

Fans blow ambient air past multiple ion emitters, across a medium distance. They save energy because they do not require a compressed air supply and are convenient when the infrastructure is not present. However, ambient air is not as clean and may introduce contaminants.

FREE SUBSCRIPTION
DIGITAL EDITION FREE WORLDWIDE | PRINT EDITION FREE TO U.S. SUBSCRIBERS
You'll get FOUR ISSUES of each supplement this year!

EVERY ISSUE CONTAINS BEST PRACTICES FOR:
- Industrial Vacuum
- Vacuum Generation
- Industrial & Aeration Blowers
- Blow-Off Air

EVERY ISSUE CONTAINS BEST PRACTICES FOR:
- Plastic Injection & Blow Molding
- Chemical Plants & Refineries
- Measurement
- Metal Fabrication & Machining

Subscribe at blowervacuumbestpractices.com or coolingbestpractices.com

Bars create a long curtain of ionized air and are suitable for covering a long or wide target area. Multiple lengths are available, with the number of emitters and air jets dependent on bar length. They can be positioned longitudinally or transversely to the target object's path, depending on the time required to reduce the static magnitude below the desired threshold.

Install and Orient the Ionizer

Proper orientation ensures the generated ion stream covers the intended area. There may be limitations due to machine structure, but the nearer the ions are generated to the unbalanced material, the more quickly it will be rebalanced. With improper orientation, the ions may wander off, may be siphoned off by adjacent grounded objects or may recombine with ions of opposite charge before reaching the target. Placing an ionizer with compressed air purging closer to the target may allow a decrease in purge pressure, which will be an energy savings.

Adjust Ionizer Settings

Fan ionizers may have speed settings. Lower fan speed will be quieter and less disruptive to loose items. Higher speed will provide faster neutralization and a greater coverage area. Bar ionizers will have a greater range of controls. Ion polarity, pulse frequency, and balance may be adjustable. Some bars have alarms with sensitivity settings for emitter cleaning. Purge air pressure can be adjusted for bars and nozzles.

Observe Treatment and Compare with Expectations

Since ions are invisible, it is useful to measure the output to confirm ion generation is operating. Observation of the target process will confirm how effective treatment is. Observation and comparison comprise the feedback loop that leads to satisfaction or optimization. Fast-moving targets, such as web feeds and conveyed packages, may not be exposed to treatment long enough to eliminate static. Additional or reoriented ionizers may be required. Controls may need adjustment. If results are satisfactory, reducing purge pressure might be permissible for an energy savings. Alternately, production rates may be increased. BP

About the Author

Daniel Rebennack has worked in the automation industry for nearly 30 years in various capacities. Most of his initial work was in design and process engineering. Pneumatics became his focus after joining SMC 19 years ago. At SMC, he has held positions as a Design Engineer and Product Manager.

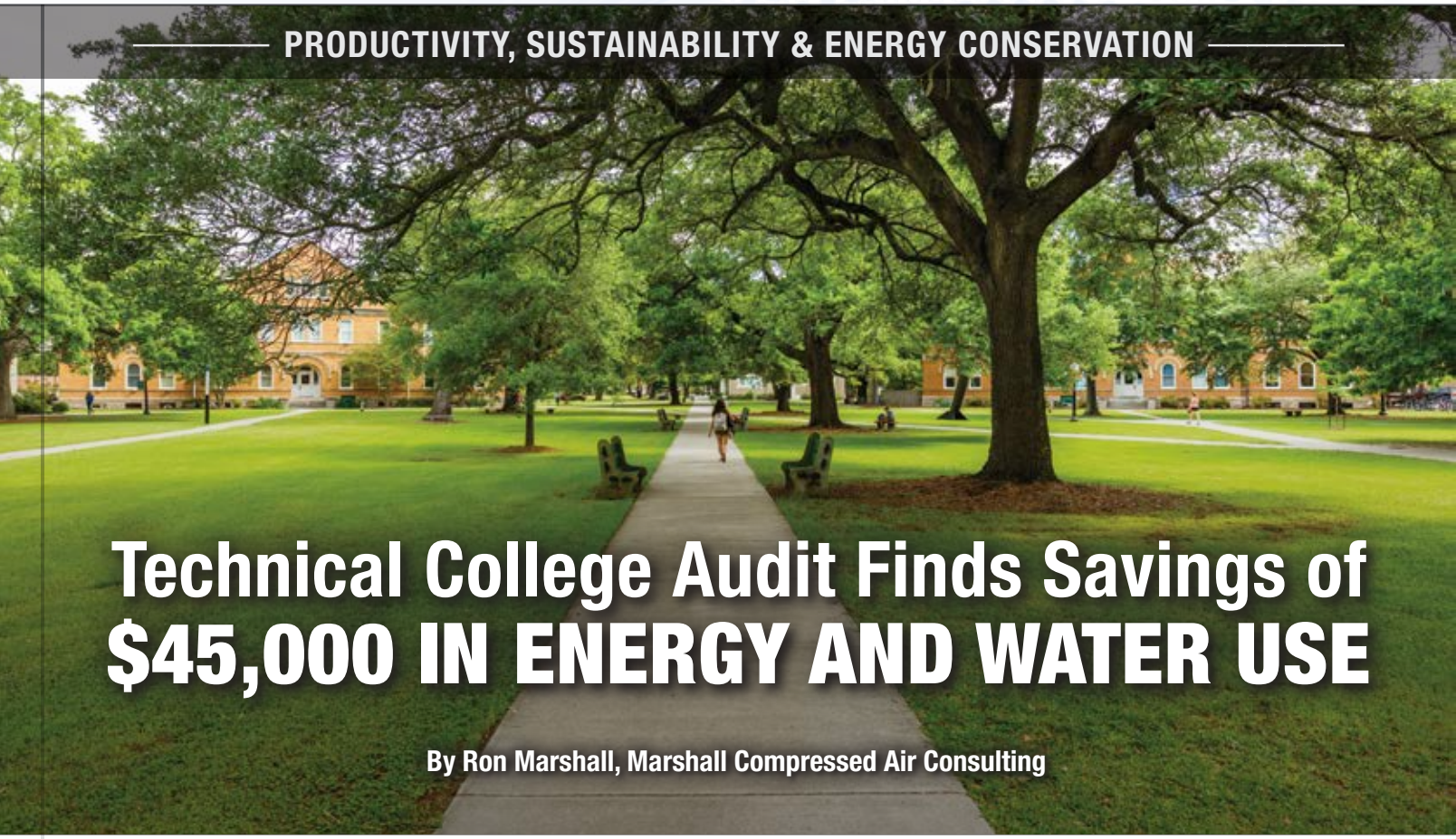
About SMC Corporation of America

SMC Corporation of America is a part of a global organization that supports customers in every industrialized country and is the U.S. subsidiary of SMC Corporation based in Japan. Since its establishment, SMC has been a leader in pneumatic technology, providing industry with technology and products to support automation based on the guiding principle of "contributing to automation labor savings in industry." Over the past 50-plus years, SMC's products have become established as a recognized international brand through sales, technical, supply and after sale services in world markets. Subsidiaries and joint ventures have been setup in a total of 53 countries. Production facilities are in 30 countries. In addition, a sales network extends throughout 83 countries, with local services in 500 locations. SMC offers technology accumulated through the years, engineers that bring it to life in new products, production capacity which can deliver a variety of products in a short time, and an extensive sales network in the United States and throughout the world. For more information, visit https://www.smcusa.com/.

All photos courtesy of SMC.

To read similar articles on ***Pneumatic Technology*** please visit www.airbestpractices.com/technology/pneumatics.

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION



Technical College Audit Finds Savings of $45,000 IN ENERGY AND WATER USE

By Ron Marshall, Marshall Compressed Air Consulting

As part of an energy reduction effort, a Canadian technical college hired a compressed air auditor to do a leakage audit of their large campus, which houses over 30 mixed use buildings, including laboratories, research facilities, shops and classrooms. The audit found very few leaks, the reduction of which would achieve minimal savings; however, a few surprising items of interest were noticed during the study that showed very good potential for operating cost savings of 64% with an estimated $45,000 per year in reduced energy and water costs. This article discusses some of the findings and how savings can be achieved on lightly loaded compressed air systems.

Supplying Compressed Air to Multiple Buildings

The campus under study has been in existence since the 1960s and is now among the largest colleges of its type in Canada. More than 48,000 students are enrolled annually at the college. The courses offered are designed for the workplace, including degrees, diplomas and certificates spanning Applied and Natural Sciences, Business and Media, Computing and Information Technology, Engineering, Health Sciences and Trades, with most subjects requiring hands-on learning with compressed air-powered tools and machines. Also, on campus are applied research activities to help bring new products to the marketplace and address industry-specific problems; this function also requires compressed air to run assembly and testing apparatus.

The campus, and the original location of the school, started out small and expanded greatly over the years. One by one, as various areas of instruction were added, specific buildings designed for the instructional activities were constructed, the number now totaling over 30 separate buildings. In most of the buildings, among other utilities, there are at least one 100 psi compressed air system. The systems are made up of reciprocating, scroll, and lubricated screw air compressors, which were chosen to match the desired duty of the compressed air uses within the buildings. Most of the systems use refrigerated air dryers, but one main powerhouse system supplies buildings containing laboratories and research facilities with instrument-quality air processed by a desiccant air dryer.

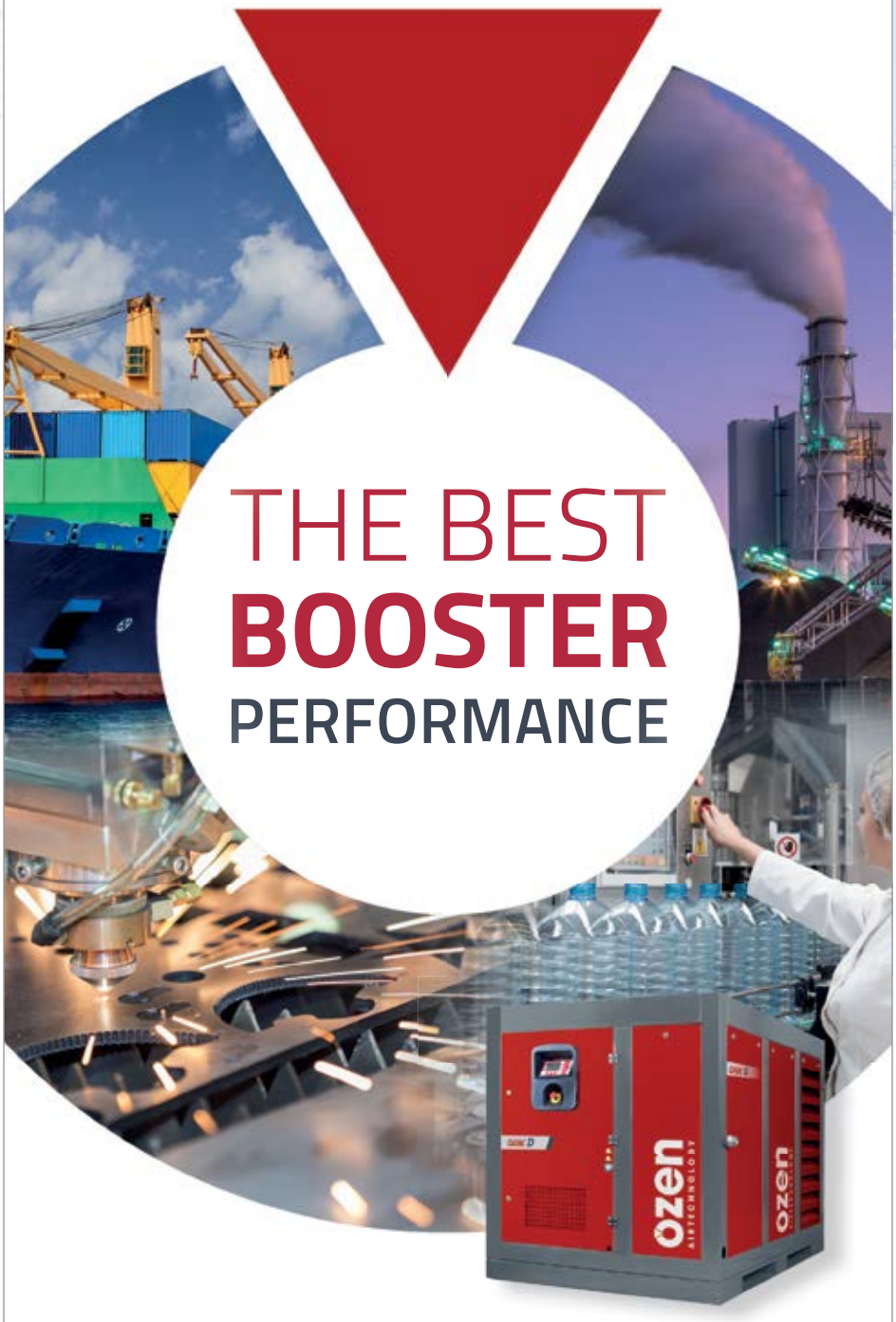
Unlike industrial sites, where the air compressors supply typical eight-hour shift oriented on cyclical loads, perhaps five days per week, 52 weeks per year, this college operates more or less on a classroom cycle, based on the school semesters. This means high peaks might be experienced due to demand in training shops when practical hands-on learning activities are going on, but most of the time, when students are in the classrooms, or during evening and weekend hours, there is very little compressed air demand. During these downtimes the air compressors in this facility are still active, providing pressure to the buildings, yet feeding only compressed air operated HVAC controls

and the small flow caused by leakage in the various distribution pipes, connected hoses, valves, fittings, and energized machines.

This light loading presents a problem in terms of efficiency for some of the installed air compressors. One of the characteristics of lubricated screw air compressors running in load/unload mode is that they typically need to run for a period of time in the unloaded conditions before turning off after a load cycle. This run time is chosen to prevent excessive starts that may burn out the air compressor motors, usually adjusted so that the unit never starts more than six times per hour. But in the unloaded condition air-cooled lubricated screw type air compressors will consume between 25 and 40 percent of full load power while producing no air, a very inefficient way to produce compressed air. Depending on the installation characteristics, usually the air compressor storage receiver being the most critical component, a lightly loaded screw air compressor may even spend most of its lifetime in the unloaded condition, wasting significant energy and wearing out the air compressor prematurely.

Use of Hour Meters Reveals Inefficiencies

As a part of the leakage study, the compressed air auditor requested a list of all the air compressors and dryers on campus. From this list particular systems were chosen based on the air compressor size and type, with the screw units being of the most interest. Since there were quite a few buildings with compressed air systems, and scheduled audit time was short, the auditor needed some way to prioritize the expenditure of time. Once the key air compressors were identified, the auditor next focused on the operating hours of the air compressors; loaded and running hours were taken by site staff and these were used to determine which campus compressed air



OABC D screw booster compressors are designed for demanding industrial conditions that require continuous delivery of medium pressure compressed air. Seamlessly working around the clock, they provide up to 580 psi of compressed air.

With their high Overall Equipment Efficiency, they are the ideal option to replace the piston boosters that fall short of your needs. At the end of five years, they generate savings of up to 15-20% in the "Total Cost of Ownership."

ozen
AIR TECHNOLOGY
EXCLUSIVELY COMPRESSED AIR SOLUTIONS

www.ozenairtech.com

TECHNICAL COLLEGE AUDIT FINDS SAVINGS OF $45,000 IN ENERGY AND WATER USE

systems were consuming the most air, and the most power.

Most modern air compressors have internal timers within the onboard controls that track the number of hours the unit has been loaded and the total number of hours the air compressor has been running. Using these timer readings, spaced between certain known times and dates, a rough calculation of the air compressor flow output, energy consumption, average power and specific power can be calculated. This is like a mini-audit, only one using no measurement instruments.

An example of this method is as follows for the air compressor designated as GA18+FF on the campus. This unit is a 25-horsepower (18 kW) lubricated screw air compressor with an internal air dryer within the air compressor enclosure. This unit was found to have 1,672 loaded hours and 11,083 running hours in its lifetime when it was surveyed initially. This is the first hint of inefficiency. A screw air compressor with a loaded-to-running ratio of less than 10% will be very inefficient, however, an initial hour meter survey cannot be relied upon because these are lifetime hours, and the machine could have been running under different conditions, even in a different location through most of its previous life.

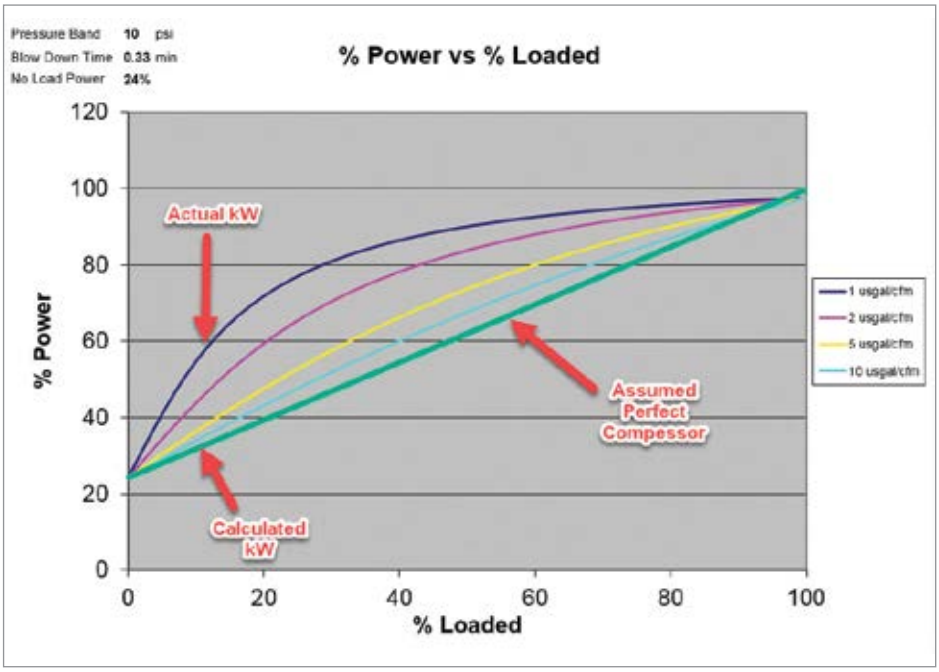


Figure 1: Calculation of average power from hour meter readings can be inaccurate if a lubricated screw air compressor has limited control storage receiver capacity. Simple calculations use a straight-line approximation line as seen with the green line. But the actual power depends on the amount of storage and the width of the pressure band setting. For an air compressor with one gallon of storage per cfm running at 10% capacity the calculated power would be 30% of full load when the actual power would be 58%.

Taking the hour meters again exactly a week later confirmed the air compressor operating was inefficient. The new readings were 1,685 loaded hours and 11,218 running hours. Doing simple subtraction, we can calculate that during this period the air compressor was loaded for only 13 hours, yet it ran for 135 hours out of the 168 hours of elapsed time during the week. Subtracting loaded from running hours we can see that 122 hours of operation was spent in the unloaded condition where the air compressor was consuming power but producing no air.

From these hours we can do a rough estimate of the power consumption of the air compressor and the flow output. Typically, the full load power of an air compressor can

	cfm	FL kW	% Load	% Unload	ave cfm	ave kW ld	Ave kW ul	tot kW	sp	kWh	cost	dryer kW	kWh	dryer cost
GA37VSD	220	43			158	31.8	0	31.8	20	115,927	$ 11,593			
GA55	300	64	52%	42%	158	32	12.2	44.2	28	225,855	$ 22,586			
									water		$ 16,299			
Total										341,782	$ 50,477			
GA10FF	60	13	6.3%	41%	4	0.80	1.83	2.63	70	22,997	$ 2,300	0.8	7,008	$ 701
GA11FF	60	13	2.9%	1%	2	0.37	0.03	0.40	23	3,474	$ 347	0.8	7,008	$ 701
GA18+FF	100	21	0.6%	2%	1	0.12	0.13	0.25	44	2,232	$ 223	1.3	11,388	$ 1,139
GA55	300	64	2.7%	1%	8	1.73	0.15	1.89	23	16,526	$ 1,653		-	$ -
GA18+FF	100	21	9.0%	85%	9	1.90	6.23	8.12	90	71,157	$ 7,116	1.3	11,388	$ 1,139
GA22FF	120	26	1.8%	10%	2	0.47	0.90	1.37	62	11,989	$ 1,199	1.3	11,388	$ 1,139
G7 FF	40	9	7.7%	63%	3	0.66	1.86	2.52	81	22,050	$ 2,205	0.5	4,380	$ 438
					29					150,424	$ 15,042	6	52,560	$ 5,256

Figure 2: Based on simple calculations using the loaded and running hours taken one week apart, the specific power (yellow), energy (kWh) and operating cost (orange) can be roughly calculated. These calculations allowed the auditor to focus on the systems with the highest cost.

be estimated by taking the nominal hp and multiplying by a factor of 0.85, in this case for a 25-hp unit the full load power would be estimated at 21 kW. For the unloaded condition, an air-cooled air compressor with fans would consume about 35% of full load power, or in this case about 7.4 kW. Screw air compressor flow output can be roughly estimated by multiplying the nominal hp by a factor of four, or in this case about 100 cfm (4 x 25 hp). For better estimates, or if an actual measurement is desired, consult the manufacturer. The calculations for this air compressor are as follows:

- Average energy at full load = FL kW x FL hrs = 21 kW x 13 hours = 273 kWh.
- Average energy at unload = 7.4 kW x 122 hrs = 903 kWh or 77% of the total energy in the period.
- Total energy = 273 + 903 = 1,176 kWh or an average of 7 kW over the 168-hour duration.
- Flow output = FL hrs / elapsed hrs x rated flow = 13/168 x 100 = 7.7 cfm.
- Specific power = kW/100 cfm = 7.0 / 7.7 x 100 = 90 kW/100 cfm.

Note these are only rough estimates and do not account for the fact that cycling losses could cause even more inefficiency if the air compressor was installed with a very small receiver. Figure 1 shows how the calculated value would be about 30% of full load at 10% loading, but the actual power consumption with one gallon per cfm storage size would be 58% of full load. This should be considered when interpreting this rough calculation.

The previous calculations show this GA18+FF air compressor is running very inefficiently (not even considering the internal non-cycling dryer power). A typical air compressor running optimally would have a specific power number, which is a rating somewhat like an air compressor "gas mileage rating," of between about 20 and 25 kW per 100 cfm, depending on its discharge pressure and the size of the air compressor. Usually smaller air compressors have higher specific power levels that larger units, the rated specific power of most popular brands of air compressors can be found in the Compressed Air and Gas (CAGI) data sheet found on most manufacturer`s websites.

Specific Power Varies Widely

Figure 2 shows the survey results of some selected air compressors from the facilities. It can be seen that specific power varies widely for the various systems from a low of 20 for systems with VSD air compressors to a high of 90 kW/100 cfm for a lightly loaded unit with very small storage. Projecting similar operation over a period of a year (52 weeks) the estimated annual costs have been calculated in Figure 2. Some of the systems are operating at less $350 in power costs per year, yet others are costing thousands of dollars per year. It can quickly be seen that spending leak detection hours on a system with an average flow of under four cfm and a good specific power would not be very fruitful. But addressing the air compressor control issues has a very big potential for savings.

Armed with this new knowledge the compressed air auditor focused his attention on the systems with the largest flows and annual costs. By far the largest one was in the campus central power house where an apparent flow of 158 cfm was being consumed by the system.

TECHNICAL COLLEGE AUDIT FINDS SAVINGS OF $45,000 IN ENERGY AND WATER USE

Examining Central Powerhouse System Opportunities

The campus has a central powerhouse where hot and chilled water are produced for use in the various buildings for heating, cooling and hot water. In the basement of the powerhouse are the main air compressors that feed the instrument air used by the powerhouse systems, and for use in laboratories in three connected buildings.

Two air compressors run in alternate duty, one 50-hp, air-cooled VSD unit runs in winter months, and a larger 75-hp, water-cooled screw air compressor running in load/unload mode operates in hotter summer months. Both feed into a 330-cfm rated heatless desiccant dryer with dewpoint dependent switching control. The dewpoint control is designed to reduce the constant 50 cfm purge of an uncontrolled dryer to a less costly level proportionate to the lower average loading of the dryer.

The VSD air compressor was purchased to be the lead unit, with the 75-hp unit intended to run as backup. Unfortunately, the basement location of the air compressors has very little ventilation causing the air-cooled VSD unit to overheat in warmer weather and trip off, so the large water-cooled air compressor is required to run. This larger machine is much less efficient and uses metered city water, which costs almost as much as the air compressor energy consumption.

The air dryer dewpoint dependent switching was found to be faulty. Even though the dryer was processing only 47% of its rated flow, the dewpoint on the dryer never reached the minus 40 ˚F rating of the dryer, the reading on the installed dewpoint meter showed between minus 9 ˚F and minus 15 ˚F. This high dewpoint meant the dryer continued to consume the 50 cfm rated purge flow, making the percentage purge contribution to the total compressed air flow 32%, rather than the normal 15 to 20 percent of a properly controlled desiccant dryer. The dryer desiccant had recently been changed to try to correct the problem. A dewpoint probe calibration problem is suspected.

Analysis of the rough calculations in Figure 2 shows continuous use of the VSD air compressor would be much desired since it has much better specific power and does not use expensive cooling water. In terms of leakage reduction, the remaining approximately 100 cfm of compressed air flows into the three connected laboratory buildings, representing the largest compressed air cost of the campus. A leakage survey of these buildings, however, found minimal leakage. It is suspected that the compressed airflow is consumed by hidden leakage, perhaps corroded piping, or through abandoned uses, or compressed air consumption on equipment not being used, but left pressurized.

Because of this significant but unknown use the auditor recommended further investigation, and the installation of flow meters for each building feed so the source of compressed air demand can be isolated. In this case the easiest compressed air waste to fix is the excessive air dryer purge.

The powerhouse is currently installing a heat recovery system on the VSD air compressor as an energy efficiency project. The air compressor manufacturer offers an oil-to-water heat exchanger that can transfer the heat of compression to a water flow. Since the powerhouse produces all the hot water for the campus, preheating the water is thought to be the perfect use for the heat, which will supplement the natural gas fuel. A side benefit of this heat recovery system is that it will take away most of the heat that is currently overheating the poorly ventilated air compressor room.

High Energy Costs with Internal Refrigerated Dryers

Most of the screw air compressors on site have internal refrigerated air dryers (dryers installed within the air compressor enclosure) running in non-cycling mode. Normally refrigerated air dryers consume only a small percentage of the total compressed air system energy, but for lightly loaded systems the total energy consumed by the dryer can even exceed the air compressor energy. Dryers installed inside the air compressor enclosures are typically slightly larger in capacity that normal external dryers, in order to deal with internal enclosure heat.

	ave cfm	tot kW	sp	kWh	cost	dryer kW	kWh	dryer cost
GA37VSD	158	31.8	20	115,927	$ 11,593			
GA55	158	44.2	28	225,855	$ 22,586			
			water		$ 16,299			
Total				341,782	$ 50,477			
GA10FF	4	2.63	70	22,997	$ 2,300	0.8	7,008	$ 701
GA11FF	2	0.40	23	3,474	$ 347	0.8	7,008	$ 701
GA18+FF	1	0.25	44	2,232	$ 223	1.3	11,388	$ 1,139
GA55	8	1.89	23	16,526	$ 1,653		-	$ -
GA18+FF	9	8.12	90	71,157	$ 7,116	1.3	11,388	$ 1,139
GA22FF	2	1.37	62	11,989	$ 1,199	1.3	11,388	$ 1,139
G7 FF	3	2.52	81	22,050	$ 2,205	0.5	4,380	$ 438
	29			150,424	$ 15,042	6	52,560	$ 5,256

Figure 3: For air compressors with internal refrigerated dryers, the operating costs of the dryer (brown) sometimes exceeded the cost of operating the air compressors (orange). A significant operating cost with the water-cooled air compressor was the metered city water, which approached the total electrical cost of operating the air compressor.

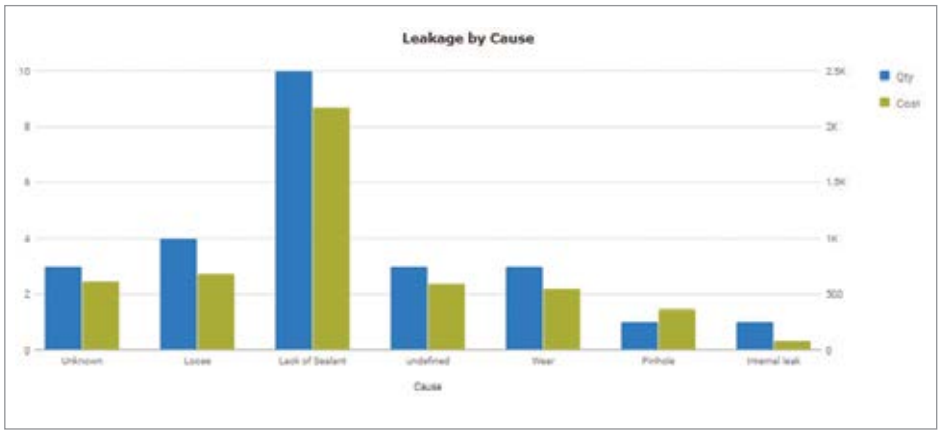


Figure 4: A small number of leaks were found, accounting for about $5,000 per year in electrical costs. By far the largest cause of leaks was poor sealant and loose fittings.

Figure 3 shows the estimated dryer cost compared to the cost of air compressor operation. This estimate confirms that four of the system consume more energy than the associated air compressor. Of the $22,000 in annual operating cost for the smaller compressed air systems, about 22% of the energy is being consumed by non-cycling refrigerated dryers.

The air compressor manufacturer does offer a cycling option for the internal dryers that could reduce the dryer cost if modifications can be made.

A leakage survey identified additional energy savings opportunities. In survey conducted using an ultrasonic leak detector in a select number of buildings found about 25 leaks. Based on 10 cents per kWh, the savings that could be gained if these were repaired (and the air compressor control optimized), resulting in a savings of approximately $5,000 per year. This would be enough to pay for the cost of the leak assessment. This potential savings is small in comparison to the savings that could be achieved by improving the air compressor and air dryer control for the various systems.

Recommendations for Approximately $45,000 in Savings

In looking at the analysis in Figure 1 we find some of the air compressors have excellent specific power numbers, leading to reduced operating costs. This is a clue to the potential savings if the systems are to be improved.

Visual inspection of the systems, for example in two automotive shop buildings, showed large storage was installed that allowed the screw air compressors to run almost fully in start/stop mode, greatly reducing the specific power levels, and the operating costs. Adding storage to the poor performers is a simple solution to improve the efficiency of most of the screw air compressor systems. Some recommended solutions:

- Install large storage to enable start/stop operation.
- Convert air dryers to cycling mode where possible.
- Replace older air compressors with start/stop units with cycling dryers.

It should be noted the reciprocating and scroll air compressors at this campus have no unloaded run time and would be a good choice for future replacements.

- Turn off the air compressor when classes are not in session.
- Correct the dewpoint-dependent switching on the desiccant dryer.
- Install heat recovery on powerhouse VSD or improve the ventilation.
- Continue leakage investigation on powerhouse system.
- Install an air compressor flow and energy monitoring to ensure system efficiency.

It is estimated that system improvements at this site could yield an operating cost saving of 64% estimated at $45,000 per year in reduced energy and water costs.

This article shows how unexpected potential savings can be gained by allowing an experienced compressed air auditor to assess compressed air systems. Unexpected potential air compressor control and air dryer savings can often detect, and the possible savings for these far outweigh the small savings potential of a simple leakage survey. Often compressed air system operators are unaware their air compressors are wasting power in the unloaded condition, but there are ways to improve the situation. BP

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

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

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

JORC SMART-GUARD-D-LUX Addresses Bacteria Growth in Condensate Drains

Stagnant water can be dangerous because it provides a better incubator than running water for many kinds of bacteria and parasites. This can also be the case with stagnant condensate in compressed air systems.

Level sensing drains have condensate reservoirs in which the condensate is collected. If the drain is oversized or if the volume of condensate is too small, then the upper "triggering" discharge level is not reached for longer periods of time, resulting in potentially harmful bacteria growth inside the drain. Bacteria in drains fitted underneath filters or at the end of a drip leg can subsequently move into the filters and further contaminate the compressed air system.

Hospitals in Scandinavia approached JORC to see if we could develop a zero air loss drain that would also periodically blow out any remaining condensate in the drains' reservoir. Effectively, the request was for a zero air loss drain that self-cleans itself every hour (or up to every 99 hours – adjustable to suit the individual preference).

The JORC SMART-GUARD-D-LUX.

The SMART-GUARD-D-LUX offers many selectable features, one of them is the BIO feature. The zero air loss drain will discharge condensate as per its normal zero air loss operation and with the BIO feature you can set the drain to open the valve and clean out the reservoir (for instance once per hour or once per day etc.).

For applications in the food processing industry or hospitals the BIO feature is a true solution to help protect compressed air systems against harmful bacteria growth resulting from stagnant condensate sitting in the condensate drain. The SMART-GUARD-D-LUX also includes a digital display of the condensate level inside the reservoir, offering a visual check of what's going on inside the drain.

Old style oil/water separators also have reservoirs in which the condensate is collected. Compressed air users should check for smells in their oil/water separators.

About JORC

In 1991, Marc and Joke de Bie founded JORC Industrial, in the garage of their home in Heerlen, the Netherlands. In 1997, Eugene and Diane White founded JORC Industrial LLC. Today, through a combination of focus and ambitions the company has grown into an independent global manufacturer and a specialist in compressed air condensate management products. For more information visit www.jorc.com.

New VPStudio 2.4 Software for All VPFlowScopes

VPInstruments announced the release of their new VPStudio 2.4 software. VPStudio 2.4 is compatible with all VPFlowScope flow meters and can be used for their entire product line: VPFlowScope M, VPFlowScope Probe, DP, In-line flow meters and the VPFlowTerminal. The software can be used for the configuration of your flow meter, to download data log sessions and export them to CSV.

VPStudio 2.4 has the benefits of auto detection, a universal interface and better protected and more organized data files. The device meter can be connected via USB, or via the USB to RS485 converter, and it will be connected automatically. The configuration interface is simplified and identical for all flow meters. The software's interface is more intuitive and easier to understand. Data log files are retrieved from your flow meter and safely stored in the projects database module within the software. This way your data files are better protected, more organized and available even when your flow meter is not connected.

VPStudio 2.4 is compatible with all VPFlowScope flow meters.

TECHNOLOGY PICKS

The VPFlowScope product line provides a complete solution for compressed air flow measurement. It covers the entire compressed air system. Thanks to the built-in pressure sensor and temperature sensor, it is a powerful tool to detect what is really going on in your system. Detect excessive consumption, pressure losses, and temperature issues at the same time. Use if for compressor performance measurement, cost allocation and condition monitoring of pneumatic machines. Thanks to the bi-directional sensitivity, it is able to measure in compressed air ring networks.

About VPInstruments

VPInstruments offers industrial customers easy insight into energy flows. We believe that industrial energy monitoring should be easy and effortless, to enable insight, savings and optimization. VPInstruments' flow meters are calibrated on state-of-the-art calibration facility. Our calibration equipment is maintained under our ISO 9001 Quality Management System and is traceable to National Standards. Let us open your eyes and start saving energy. For more information, visit www.vpinstruments.com.

Parker Hannifin Pneumatics Announces Redesign to Wilkerson Series

Parker Hannifin's Pneumatic Division in North America announced a new design for the Wilkerson 08/18/28 Series of modular air preparation products. The Wilkerson Series is Parker's line of compressed air treatment products including filters, regulators, lubricators and accessories.

The Revision B updates to these products refresh the design for robust, lightweight construction with a powder-coated finish in modern colors. Revision B updates also expand additional accessory options and are backwards compatible with the original Revision A mounting. Today's broad line of Wilkerson products is the result of continuing product innovations and technology advancements which frequently become industry standards.

"We're dedicated to designing and manufacturing innovative products with features and operating characteristics that meet quality, performance, reliability, serviceability, safety and value requirements," said Alex Bakos,

Revision B updates the design for robust, lightweight construction with a powder-coated finish in modern colors.

PRESSURE PROGRAM

1-HOUR COMPRESSED AIR TRAINING

Compressed Air, It's Not Free, is a one-hour awareness training program developed by the Compressed Air Challenge (CAC) with the flexibility to be customized to the specifications of your operations. There are three options for partnering with the CAC on the awareness training. Each training package provides detailed step-by-step instructions to properly prepare for and execute the training.

For more information please visit www.compressedairchallenge.org/training today!

20+ YEARS OF TRAINING AND RESOURCES

TRAINING • EDUCATION • EFFICIENCY
COMPRESSED AIR CHALLENGE

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

product sales manager for Parker Hannifin's Pneumatics Division. "Design updates to the Wilkerson Series products will optimize them with lighter weights, improved flow on some models and a simplified regulator design."

Along with the Revision B updates, Parker will discontinue the 1/8-inch ports for the 08 Product Series, however the 1/4-inch ports can be used for the same series and options.

For more information, visit parker.com/pneumatics or contact your distributor.

About Parker Hannifin

Parker Hannifin is a Fortune 250 global leader in motion and control technologies. For 100 years the company has engineered the success of its customers in a wide range of diversified industrial and aerospace markets. Learn more at www.parker.com.

Gardner Denver Introduces the Intelli-PAK Oil/Water Separator

Gardner Denver is pleased to announce the launch of our latest oil/water separator line, the Intelli-PAK. This oil/water separator has been engineered to provide the most effective and user-friendly oil/water separator on the market. The simplicity of the unit's maintenance and clean-up is due to the fact that the cartridge utilizes smart technology connections. Once disconnected, the internal valves close allowing for a quick and mess free replacement. When the cartridge is full, simply dispose of the cartridge in accordance with local regulations.

Unlike some of the alternative oil-water separators on the market, Intelli-Pak units have no need for expensive pumps, sensors or pre-separation filters. Additionally, the design of the Intelli-Pak cabinet offers an internal diffusing system allowing pressurized drain lines from the compressed air system to be plumbed directly into the unit eliminating the need for customized manifolds to be fabricated in the field. For more information, visit www.gardnerdenver.com/gdproducts.

The Gardner Denver Intelli-PAK oil/water separator.

About the Gardner Denver Industrials Segment

Gardner Denver Industrials Segment delivers a broad range of compressors and vacuum products, in a wide array of technologies, to end-user and OEM customers worldwide in the industries it serves. Products ranging from versatile low- to high-pressure compressors to customized blowers and vacuum pumps serve industries including general manufacturing, automotive, and wastewater treatment, as well as food & beverage, plastics, and power generation. Gardner Denver Industrials Segment, part of Gardner Denver, Inc., is headquartered in Milwaukee, Wisconsin, USA. Gardner Denver was founded in 1859 and today has approximately 6,500 employees in more than 30 countries.

Continental Introduces New Heavy-Duty Air Hose

The technology company Continental has introduced a new heavy-duty air hose for the construction and mining markets.

Named Super Rock Drill 600 HT, the air hose is specifically designed for applications that

TECHNOLOGY PICKS

require a high working pressure hose in a high temperature environment. "This is a hand-built hose that is exceptionally applicable to customers and markets that operate in hazardous environs," said Laszlo Dobo, product manager for Continental's industry hoses. "The material in the heavy-duty air hose provides an ideal solution on construction sites, mines and quarries." The hose offers a 600-psi working pressure and complies to ARPM (Association for Rubber Products Manufacturers) guidelines on a 4:1 safety factory. The EPDM rubber provides good ozone resistance in outside applications.

The Super Rock Drill 600 HT is characterized as a heat-resistant CPE tube, ARPM class B which is medium oil resistance and withstands an operating temperature of 275F (135C). The black industry hose has spiral plied wires for high working pressure at high temps and will be supplied with industry standard yellow EPDM cover to resist ozone. All Continental hoses are available for customers and dealers through a variety of North American distribution channels. For more information visit www.continental-industry.com.

About Continental

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent, and affordable solutions for vehicles, machines, traffic and transportation. In 2018, Continental generated preliminary sales of around €44.4 billion and currently employs around 244,000 people in 61 countries and markets.

About ContiTech

ContiTech is one of the world's leading industry specialists. The Continental division offers its customers connected, environment-friendly, safe and convenient industry and service solutions using a range of materials for off-highway applications, on rails and roads, in the air, under and above the ground, in industrial environments, for the food sector and the furniture industry. With around 47,000 employees in 42 countries and sales of some 6.3 billion euros (2018), the global industrial partner is active with core branches in Asia, Europe and North and South America.

The Super Rock Drill 600 HT.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

EXAIR New Hot Tap Digital Flowmeter

EXAIR's new Hot Tap Digital Flowmeters allow installation when compressed air piping is under pressure. By eliminating the need to isolate and remove pressure from the pipe, these compressed air flowmeters reduce installation time while maintaining safety. Hot Tap Digital Flowmeters incorporate two valves that the measuring probes pass through. A sound muffler that also collects chips from the drilling process eliminates installation debris from entering the airstream and minimizes noise exposure. Measuring compressed air is the first step toward identifying high compressed air use areas, compressed air leaks and optimizing air use.

This new flowmeter allows for installation under pressurized compressed air piping.

Each meter ships with the necessary hardware and tools for installation including drill bit, drill guide, chip capturing muffler, and hex wrenches. The Hot Tap feature is available on 2 inch through 8 inch flowmeters. They are available in standard units which display airflow values on a bright LED screen, with optional data logger to capture and manipulate the data, or with wireless capability to transmit the data securely over a wireless network. Airflow values are expressed in Standard Cubic Feet per Minute or Cubic Meters per Hour.

Hot Tap Digital Flowmeters for schedule 40 iron pipe and Type L Copper are now available in sizes 2, 2-1/2, 3, 4, 6 and 8 inch. They are CE and RoHS compliant and can also be ordered for schedule 80 or 10S pipe. For more information call EXAIR Corporation at (800) 903-9247, e-mail techelp@exair.com or visit www.exair.com/78/hottap.htm.

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

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.

Compressed Air Best Practices® is a trademark of Smith Onandia Communications, LLC. Publisher cannot be held liable for non-delivery due to circumstances beyond its control. No refunds. SUBSCRIPTIONS: Qualified reader subscriptions are accepted from compressed air professionals, plant managers, plant engineers, service and maintenance managers, operations managers, auditors, and energy engineers in manufacturing plants and engineering/consulting firms in the U.S. Contact Patricia Smith for subscription information at tel: 412-980-9902 or email: patricia@airbestpractices.com. REPRINTS: Reprints are available on a custom basis, contact Patricia Smith for a price quotation at Tel: 412-980-9902 or email: patricia@airbestpractices.com. All rights are reserved. The contents of this publication may not be reproduced in whole or in part without consent of Smith Onandia Communications LLC. Smith Onandia Communications LLC. does not assume and hereby disclaims any liability to any person for any loss or damage caused by errors or omissions in the material contained herein, regardless of whether such errors result from negligence, accident, or any other cause whatsoever. Printed in the U.S.A.

ENVIRO/TECH INK
Enviro/Tech is a registered trademark.

SFI
Certified Chain of Custody
Promoting Sustainable Forestry
www.sfiprogram.org
SFI-00993

TECHNOLOGY PICKS

GfG Instrumentation Introduces RAM 4021 Respiratory Airline Monitor

The RAM 4021 supplied air monitor is designed to monitor for carbon monoxide in compressor supplied breathing air applications.

The monitor meets all OSHA standards for both Grade D & E respiratory air. The unit incorporates an accurate and reliable chemical cell sensor, liquid crystal display and a programmable alarm system. The unique AutoCal feature permits the unit to automatically self-calibrate when test gas is applied, thus eliminating any adjustment controls. An optional high-pressure regulator is available for cascade systems and SCBA tank filling stations allowing inlet pressures to 5,000 psi. An oxygen cell can also be added if oxygen monitoring is required. Also available with dew point sensors in combination with the CO sensor. CSA Certified models are available.

About GfG Instrumentation

GfG Instrumentation is a world leader in gas detection for the protection of life and property. We are committed to meeting and exceeding the needs of our customer's requirements, delivering the highest quality products and best customer service in the industry. We are dedicated to the continual improvement of our products and services by focusing on the satisfaction of our customers, and the effectiveness of our Quality Management System. For information contact GfG Instrumentation, Inc. at 1194 Oak Valley Drive Suite 20, Ann Arbor, MI 48108, 800-959-0329, e-mail us at info@goodforgas.com or visit www.goodforgas.com.

RAM 4021 Respiratory Airline Monitor meets all OSHA Standards for both Grade D & E respiratory air.

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

ADVERTISER INDEX

THE MARKETPLACE

JOBS & TECHNOLOGY

SALES LEADER

APO Pumps and Compressors LLC, is a seeking dynamic Sales Leader to join our team. This position is responsible establishing and implementing sales plans and strategies to effectively manage and grow existing accounts while developing new opportunities for Compressed Air and Pump Systems.

Primary Responsibilities

- Direct sales responsibility managing major target accounts.
- Work with strategic suppliers to develop sales initiatives to achieve defined goals.
- Lead a team of Inside and outside sales representatives as a manager, leader and mentor. Manage team performance against quotas and sales forecasts, execute operating plans and ensure sales objectives are met.
- Lead and participate in training on products and applications.
- Drive revenue and contribute to the continued growth through consistently achieving individual and team quotas.
- Monitor daily activity of sales representatives including targeting specific customers to achieve objectives and manage sales support activities.
- Establish and report on metrics to measure performance of the inside sales activities; correct deficiencies where necessary.
- Interact with senior management recommending courses of action to further enhance sales.
- Direct marketing strategies and implement programs to enhance APO presence in market.
- Ensure effective control of sales, results, and takes action to guarantee that achievement of sales objectives falls within designated budgets.

Qualifications, Education and Experience

- 8+ years knowledge and experience applying and selling compressed air and/or pumping systems
- Experience with compressed air systems and/or pumps – 8 years preferred
- Proven ability to meet sales goals
- Proven ability to communicate effectively (written and verbal) and provide recommendations for sales growth
- Experience utilizing CRM to drive sales growth
- Must possess a valid driver's license for a minimum of 12 months with a clean driving record
- Bachelor's Degree

No regular overnight travel

To learn more about us visit www.apopc.com. To apply send your resume to: kburk@connected-hr.com

S600
Compressed Air Purity Analyzer

- All-in-1 device measures: oil vapor, particle, dew point
- Measure pressure and temperature additionally
- Integrated data logger for analysis later
- Software guided measurement to generate reliable results
- Portable and compact design

www.suto-itec.com SUTO

Job & Product Marketplace Advertising Information

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

Ad dimensions are 2.36" wide x 3.91" tall. We can help you design the ads. Send us your logo, product photo, and text to rod@airbestpractices.com. We recommend 20-50 total words of text.

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

AHR EXPO®

CO-SPONSORS
ASHRAE
AHRI

The World's Largest HVACR Marketplace

Orlando FEB 3-5, 2020

REGISTER NOW! FREE for a limited time @ **AHREXPO.COM**

THE MARKETPLACE

TECHNOLOGY

High Efficiency Compressor Controllers

Control Rotary Screw, Vane, Scroll or Recip Compressors

Save Energy controlling up to FOUR compressors and qualify for **Utility Rebates**.

- Automatic Lead/Lag Control-up to FOUR Compressors
- Accurate Pressure Control with Pressure Transducers
- Compressors and Vacuum Pumps from 1 to 250 hp

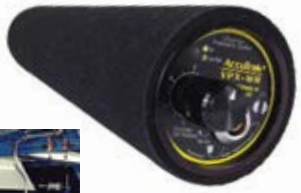
Thousands of Installations Worldwide. Call for Application Engineering.

Standard Pneumatic Products, Inc.
Tel: 203-270-1400 • **Toll free:** 800-979-9156
Email: sales@stdpneumatics.com
www.stdpneumatics.com

Superior® AccuTrak®
Ultrasonic Inspection Systems

The Ultimate Air & Gas Leak Detector

MADE IN USA



AccuTrak® VPX-WR

Find Compressed Air Leaks Fast!
- Also any Gas, Refrigerant or Vacuum.
- Rugged Design for Harsh Environments
- Sealed to Resist Water, Oil, Dust & Chemicals
- Professional's Choice for Air Leak Surveys

SuperiorSignal.com/CA

COMPRESSED AIR SENTRY SYSTEM ALARM

NEW

Private Label Options Available

- **Detects Pressure Loss & Dryer Failure**
- **Remote DewPoint and Pressure Sensor**
- **Strobe Lamp and Horn Alarm**
- **4-20mA Outputs/Relay Contacts**

Edgetech Instruments
TEL: (978) 310-7760
H2O@Edgetechinstruments.com
www.Edgetechinstruments.com

RIEM ITALY

Oil-Free "Z Series" non-OEM Spare Parts.

Made in Italy. New or Rebuilt Airends, Coolers, Drums, Maintenance/Overhaul Kits. Full 1-Year Warranty on all Products.

RIEM INTERNATIONAL INC.
330 Industrial Drive, Anderson, IN
sales@rieminternational.com
765-606-1187 • www.rieminternational.com

Sauer Compressors USA

Your Partner for Oil-Free Gas Compression

- Compression of any gas or gas mixture
- 100% oil-free piston compressors
- Gas-tight design with magnetic coupling
- Exclusively engineered for your project

HAUG Sauer Compressors

Sauer Compressors USA
sales@sauerusa.com | 410.604.3142 | www.sauerusa.com

prevost

CONNECTED TO INNOVATION

PREVOST PIPING SYSTEM

Save money & go leak free

Compressed air, nitrogen & vacuum

Wide selection of sizes

10 year zero leak guarantee

Quick & easy installation

Full range of connection & installation accessories

800-845-7220 • sales.corp@prevostusa.com • prevostusa.com

The first line of defense against invasive oil carryover

Delivering constant oil-free compressed air

Our promise

- **OIL FREE COMPRESSED AIR**
  Continuously produced from *any compressor type* down to 0.003 mg/m³ or lower
- **GERM FREE COMPRESSED AIR**
  Generates amicrobic and spore free air in accordance with ISO 8573-7
- **INDEPENDENT OF CONDITIONS**
  Stable residual oil content throughout the year, in any climate
- **PARTIAL LOAD OPERATION**
  Maximum process reliability regardless of production fluctuations
- **FAILSAFE OPERATION**
  Valves automatically close to prevent contamination in the event of failure

Additional components available:
METPOINT® OCV & METPOINT® BLD

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

Truth in Compressed Air
Reliable | Efficient | Innovative

BEKO

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 operation and maintenance costs down.

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

Built for a lifetime is a trademark of Kaeser Compressors, Inc. ©2019 Kaeser Compressors, Inc. customer.us@kaeser.com