The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

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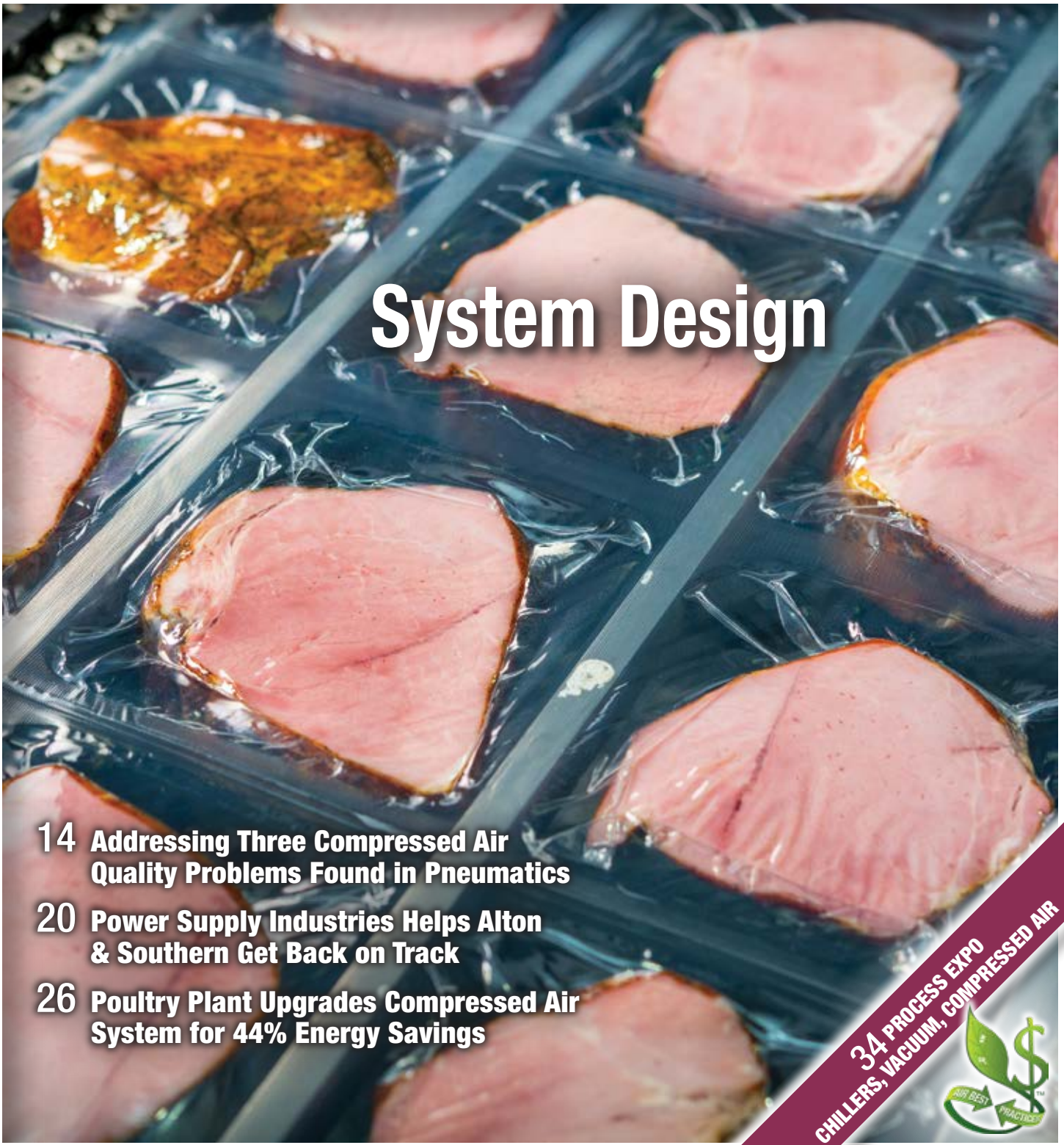
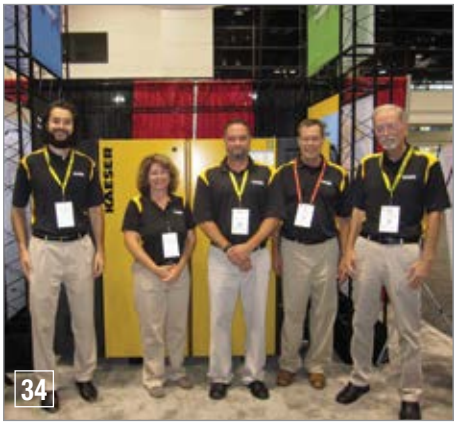


System Design

SUSTAINABLE MANUFACTURING FEATURES

COLUMNS



FROM THE EDITOR | Compressed Air System Design

Happy New Year 2018! This is a special year for us as we launch the inaugural 2018 Best Practices Expo & Conference, September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. With the simple goal being to help plants improve profitability and sustainability, we are excited to bring experts and users together to learn, share and view the latest "Best Practice" energy conservation measures (ECMs) and technologies. We are thrilled to announce ComEd® as the Utility Host and are very thankful for the overwhelming support from the compressed air industry. Please consider visiting us and registering for the event!

As modern factories automate, pneumatic circuits continue to offer great advantages to machine builders. In his article with us this month, Paul Craven from Motion Industries writes, "Two primary advantages of using pneumatics over hydraulics are 1) low initial cost and 2) design simplicity." His interesting article highlights the effects of and how to address contaminants on directional valves, flow control valves, pneumatic cylinder pistons, pressure control valves, and linear or rotary actuators.

BEST PRACTICES 2018 EXPO CHICAGO COMPRESSED AIR VACUUM / COOLING

HOSTED BY ComEd. Energy Efficiency Program

Alton & Southern Railway is a classification yard based within view of the famous Arch in St. Louis. They've been there a long time and their compressed air system used piping dating back to the 1960's. Working together for many years with Jim Timmersman, from Power Supply Industries, they have upgraded their entire compressed air system and amongst other things eliminated 1,500 cfm of leaks - just in the old piping system. We hope you enjoy this example of an audit journey spanning a 10-year period eliminating $180,000 in unnecessary annual energy costs.

An expanding plant produces over 100 million pounds of chicken and poultry products per year. The compressed air system grew with the addition of smaller air compressors over time. Ron Marshall provides us with a good system assessment story demonstrating the benefits of converting air compressor control from modulating to variable speed drive (VSD) mode.

Chillers, compressed air and vacuum system optimization was our focus at the 2017 Process Expo, produced by the Food Processing Suppliers Association (FPSA) and co-locacted with the American Meat Association (NAMA) fall conference. Our publication had the opportunity to chair an educational session on "Compressed Air and Vacuum Best Practices." I hope you enjoy our show report.

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

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

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INDUSTRY NEWS

Atlas Copco Appoints Robert Eshelman President and General Manager

Atlas Copco, a leading provider of sustainable productivity solutions, has appointed Robert Eshelman as President and General Manager of Atlas Copco Compressors LLC, effective February 2018. Eshelman is succeeding John Brookshire, who has decided to retire after 33 years of service within the Atlas Copco Group.

Robert Eshelman has been appointed President and General Manager of Atlas Copco Compressors LLC.

In his new position, Eshelman will oversee Atlas Copco Compressors' customer center in the United States and will be responsible for all Atlas Copco Compressors' sales, marketing and service operations.

"Robert has extensive experience in the compressor industry and brings over 10 years of experience in various management positions with Atlas Copco Compressors," said Vagner Rego, President of the Compressor Technique Business Area. "We're excited to have his expertise, experience and leadership as he transitions into the role of President and General Manager early next year."

Eshelman is currently the General Manager of Scales Industrial Technologies, part of Atlas Copco Group. Prior to that, he served as the U.S. Vice President and Business Line Manager of the Industrial Air Division for the U.S. market. Eshelman completed his undergraduate studies in engineering at the Georgia Institute of Technology, and his master's degree in business administration at Georgia State University.

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and services focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries. In 2016, Atlas Copco had revenues of BSEK 101 (BEUR 11) and about 45,000 employees. For more information, please visit www.atlascopco.com.

About Atlas Copco's Compressor Technique

Atlas Copco's Compressor Technique business area provides industrial compressors, vacuum solutions, gas and process compressors and expanders, air and gas treatment equipment and air management systems. The business area has a global service network and innovates for sustainable productivity in the manufacturing, oil and gas, and process industries. Principal product development and manufacturing units are located in Belgium, the United States, China, South Korea, Germany, Italy and the United Kingdom.

Cisco Air Systems Acquires Ingersoll Rand Customer Center

Cisco Air Systems has acquired the industrial air compressor Ingersoll Rand San Francisco Customer Center/Bay Area District. Cisco Air Systems will operate a branch in the Bay Area at the same location the SFCC was located, 2373 Lincoln Ave, Hayward, CA 94545.

Cisco Air Systems has been providing industrial air compressor sales, service and support in Northern California and Nevada since 1973. They've been the Master Distributor for Ingersoll Rand industrial air compressors and air treatment products, to manufacturing and food processing companies in the region since 2000. They've won the prestigious Ingersoll Rand Distributor of the Year award four times since becoming a Master Distributor in 2004, 2008, 2012 and 2016.

Cisco Air Systems' headquarters is located at their Sacramento location, 214 27th Street, Sacramento, CA 95816. They will operate four districts throughout the region to provide superior service and support to their customers – Sacramento, Bay Area, Fresno & Nevada. Cisco Air Systems was recently named a "Best Places to Work - 2017" honoree by the Sacramento Business Journal.

Kent Frkovich Cisco Air Systems' president and CEO, contributes the success of Cisco Air Systems over the years to the employees. "The employees provide great customer service and truly care about the success of the company. The employees are what make Cisco Air Systems a great company, and we welcome our new members to the team."

About Cisco

Cisco Air Systems is a regional Ingersoll Rand Air Compressor Master Distributor that provides sales, service & support to manufacturing, food processing and other industrial compressed air using companies in Northern California & Nevada. Its mission is to provide value to their customers and employees to achieve success in business and life. For more information, please visit www.ciscoair.com.

About Ingersoll Rand

Ingersoll Rand is a global, diversified company that advances the quality of life by creating comfortable, sustainable and efficient environments. It is a $13 billion global business, with products ranging from complete compressed air and gas systems and services, to power tools, material handling and fluid management systems, with brands that include Club Car®, Ingersoll Rand®, and Thermo King®, and ARO. For more information, visit www.ingersollrand.com.

DV Systems Industrial Air Compressors Now Made in the U.S.A.

DV Systems is excited to announce production of their legendary HDI Series reciprocating heavy-duty industrial air compressors has begun in the U.S.A. These heavy-duty air compressors are the real thing, built with pressure lubricated, 100% cast-iron pumps, designed for an 80% duty-cycle. These air compressors are truly built for the demands of industrial environments.

Production of heavy-duty industrial air compressors from DV Systems has begun in the U.S.A.

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The HDI Series is equipped with 2-Stage, 2-cylinder (247) or 4-cylinder (447) cast-iron compressor pumps powered by premium-efficiency North American made open drip proof (ODP) motors. These provide reliable, high duty-cycle operation. The HDI Series covers flows from 19.8 to 99.9 scfm at 145 psi, and horsepower from 5 hp to 30 hp.

The heavily weighted cast iron pumps and Low RPM enhance heat dissipation. Balanced crankshafts and precision ground journals, combined with heavy-duty ball-type main bearings, provide smooth free-running operation. Pressure lubrication ensures oil is delivered to journal bearings and all necessary components, minimizing oil carry-over and friction. The HDI Series is available in both Simplex and Duplex configurations.

About DV Systems

DV Systems is a designer of high-performance, high efficiency compressed air systems. We have been engineering and manufacturing industrial air compressors since 1954 and our commitment to a culture of innovation dates back 125+ years. Our objective is to provide reliable, innovative products and compressed air system solutions, strengthened by a commitment to exceptional customer service. DV Systems Ltd. is located in Mooresville, North Carolina and offers compressed air system solutions across the United States of America.

If you are interested in more information or becoming an authorized distributor please contact us at tel: 877-687-1982, email: usa@dvcompressors.com, or visit www.dvcompressors.com.

CAGI Updates Compressed Air and Gas Handbook Chapters

The Compressed Air & Gas Institute (CAGI) is pleased to announce updated versions of Chapters 1 & 3 of the *Compressed Air and Gas Handbook* are now available for download from the CAGI website. Chapter 1 is a comprehensive introduction to compressed air, including information on a myriad of compressed air applications. Chapter 3 provides information on compressed air treatment with information specific to applications requiring clean, dry air with details on compressed air dryers and filters. These chapters include new and updated content and images.

These updates are part of an extensive revision to the *Compressed Air and Gas Handbook,* consisting of eight chapters. As additional chapters are updated, they will replace the chapters of the sixth edition currently posted, and will be available for free download on the CAGI website.

About CAGI

For more than 100 years, the *Compressed Air and Gas Institute* has been the leading source on all matters related to compressed air. As the united voice of the industry, CAGI's activities include the development and organization of educational material including compressed air system training programs to benefit the users of compressed air systems. In addition to the Compressed Air and Gas Handbook, the CAGI

CAGI® Compressed Air & Gas Institute

website (www.cagi.org) offers many resource materials such as selection guides, videos and online training.

Precision Air Systems Appointed Sullair Distributor

Sullair, an industry leader in innovative compressed air solutions since 1965, is pleased to announce Precision Air Systems, Inc. has been appointed the authorized distributor for Sullair Commercial and Industrial Products for Santa Barbara and San Luis Obispo counties. These two counties were previously an area with no assigned distributor.

"Precision Air Systems continues to be an excellent partner for Sullair and we are excited about their growth into Santa Barbara and San Luis Obispo," according to Tim Sohnlein, Sullair's director of sales, Commercial and Industrial Products "Their expert sales and service capabilities will be a tremendous asset in ensuring customers receive the compressed air solutions best suiting their application."

Precision Air Systems, Inc. carries the full line of Sullair oil flooded compressors from 5 hp to 600 hp, plus the complete line of oil free and centrifugal compressors up to 30,000 hp. Additionally, they offer the complete Sullair air treatment system. This includes compressed air dryers/filters/drains, industrial vacuum systems, flow controllers and Genuine Sullair Replacement Parts.

"Our team at Precision Air Systems is very excited to represent the Sullair line in the Central California Coastal area," says Tom Duncan, Precision Air Systems' vice president and general manager. "We have represented Sullair in the Central Valley for close to 18 years, and have no doubt that they produce the most energy-efficient machines available in the compressor industry today. It's our

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opinion that Sullair Compressors are the best in the industry for being a quality and rugged compressor. Their commitment to the lubricated, oil-free and centrifugal product lines, combined with our expertise in service and knowledge, provide tremendous growth opportunities for both companies well into the future."

About Precision Air Systems, Inc.

Located in Bakersfield, CA, Precision Air Systems offers guaranteed performance system installations and turnkey projects as part of their full-service approach to servicing industrial air compressor customers. Precision Air Systems 4808 Ortiz Ct., Building C, Bakersfield, CA 93308 (661) 631-2295. For more information, visit www.precisionairsystems.com.

About Sullair

Sullair was founded in Michigan City, Indiana in 1965, and has since expanded with a broad international network to serve customers in every corner of the globe. Sullair has offices in Chicago and facilities in the United States, China and India — all ISO 9001 certified to assure the highest quality standards in manufacturing.

For more than 50 years, Sullair has been on the leading edge of compressed air solutions. We were one of the first to execute rotary screw technology in our air compressors. We made history by teaming up with Dow Chemical to produce one of the industry's longest-lasting compressor fluids. And our machines are famous all over the world for their legendary durability. As the industry moves forward, Sullair will always be at the forefront with quality people, innovative solutions, and air compressors built to last. We have centered our operations around three key pillars: innovation, durability and people. For more information, visit www.sullair.com. Sullair is A Hitachi Group Company.

Mikropor Appoints Jeff Crutchfield Area Manager

Mikropor America Inc., announces the addition of Jeff Crutchfield as area manager of Mikropor America, Inc. "Jeff's customer-centric approach, and diversified experience fosters a great strength to our Area Management team," said Nitin G. Shanbhag, Mikropor America Inc.'s president.

Jeff Crutchfield has been appointed area manager of Mikropor.

Crutchfield is a compressed air industry veteran with over 25-years of experience. He has worked in various roles, such as draftsman, product development/designer, inside sales and distributor management. His involvement with previous organizations include, Sullair, Boge Compressors, KMC Controls and Compressed Air Technologies.

"I am very excited and proud to be part of the Mikropor America team. The innovation of products with measurable savings is quite a game changer," said Crutchfield.

For further information, please contact Mikropor America at 219-878-1550, or visit us online at www.mikroporamerica.com

About Mikropor

Mikropor America Inc., headquartered in Michigan City, Indiana, a subsidiary of Mikropor Inc., offers a broad range of engineered solutions for the compressed air industry such as: Refrigerated and Desiccant Air Dryers, Nitrogen Generators, Air/Oil Separators, Compressed Air Filtration, Air Intake Filters, Oil Filtration, and aftermarket replacement filtration elements for compressed air. With foundation in 2011,

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our 75,000-square-foot facility was established to locally serve our North America's customer base of Distribution and OEM partners. Mikropor America Inc. is also a member of the Compressed Air and Gas Institute (CAGI).

Mikropor Inc. (www.mikropor.com), for over 30 years the Mikropor name has been recognized as the "best in class" serving the industrial filtration markets, including air compressor equipment, compressed air purification, power generation, gas turbine, dust collection, clean room and HVAC. Mikropor proudly has over 600 employees and 4 world class manufacturing facilities located in Ankara, Turkey. Mikropor is ISO certified, technology-driven and committed to engineering innovations satisfying customer expectations for product quality, reliability and extreme value.

FS-Elliott Nominated as Finalist in 2017 MEED Awards

FS-Elliott, a leading manufacturer of oil-free, centrifugal compressors, has announced their office in Saudi Arabia has been nominated for three MEED Awards in the categories of Industrial Company of the Year, Manufacturer of the Year, and Supplier of the Year. The MEED Awards recognize and honor contractors, consultants, suppliers, service providers and clients who have been instrumental to the extraordinary infrastructure growth in the Gulf Coast Region.

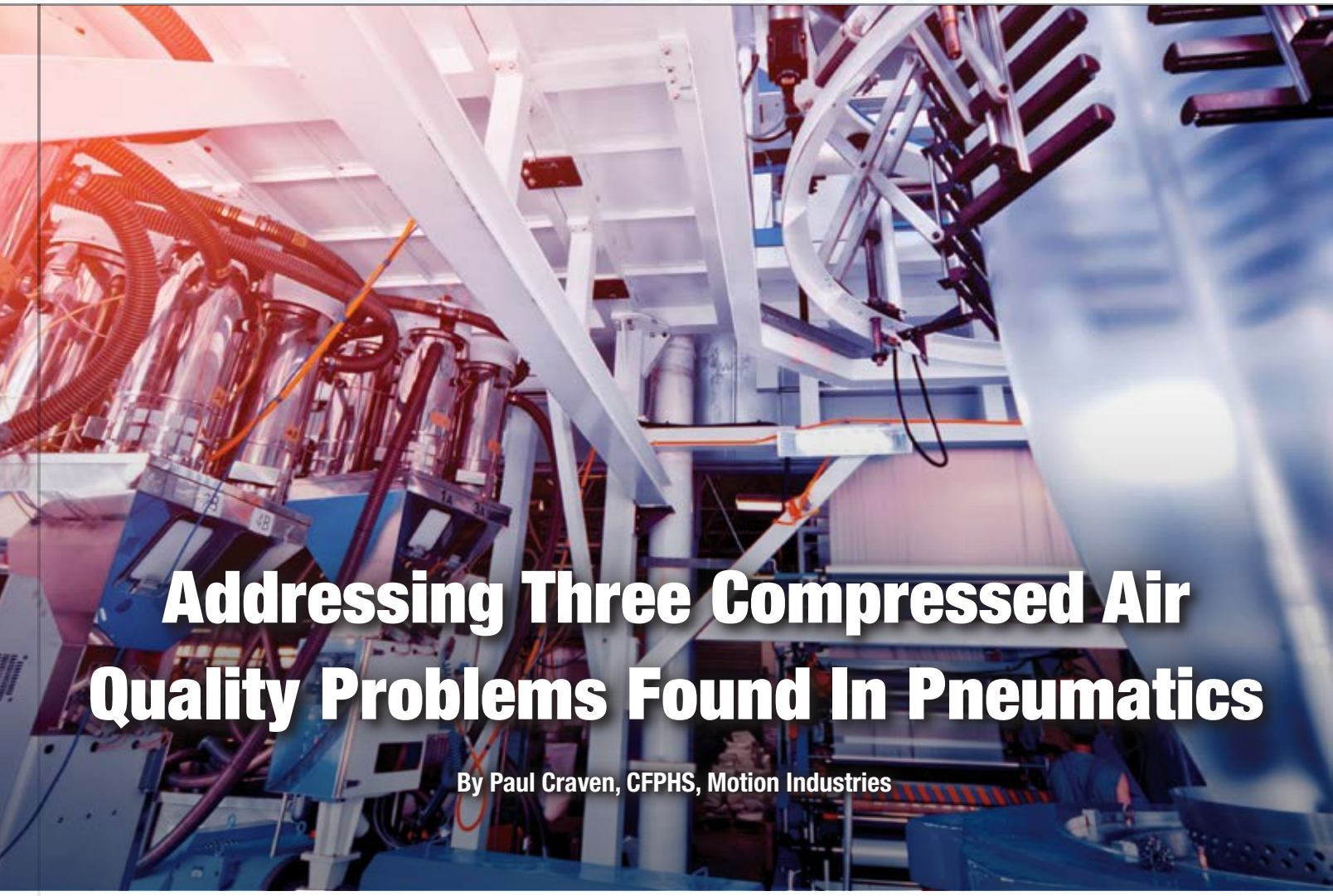
Located in Support Industries Area, Jubail, FS-Elliott Saudi Arabia began in 2008 as a joint venture between FS-Elliott and GAS Arabian Services to provide locally packaged, energy efficient compressed air solutions to

customers in the Middle East region. Their fully equipped facility, part of GAS Arabian Services' 5,000 square meter complex, is responsible for packaging and servicing the entire range of FS-Elliott centrifugal compressors. This facility is also responsible for specializing in rotor balancing, air-end overhaul, on-site services and equipment upgrades. As a result of this joint venture, FS-Elliott Saudi Arabia Ltd. has provided support to over 250 operating installations, the majority of them located in Saudi Arabia.

"We are honored that our achievements have been recognized with such prestigious award nominations," stated Mina Ghattas, manager of sales and operations, FS-Elliott Saudi Arabia Ltd. "FS-Elliott Saudi Arabia is well aligned with the Saudi Arabia 2030 Vision as we were the first to offer packaging services for integrally geared, centrifugal air compressors in KSA and the GCC. Most recently we received Saudi Ministry of Commerce and Industry registration allowing our organization to ship compressor packages with a Saudi certificate of origin, duty-free to any country within the GCC," added Ghattas.

About FS-Elliott

FS-Elliott is a global leader in the engineering and manufacturing of oil-free, centrifugal air compressors with operations in over 90 countries. Building on a 50-year tradition of excellence, FS-Elliott combines an unwavering commitment to quality with the desire for advancing technology to bring value to our customers, allowing them to increase their productivity and lower system operating costs. For more information, please visit www.fs-elliott.com.



Addressing Three Compressed Air Quality Problems Found In Pneumatics

By Paul Craven, CFPHS, Motion Industries

➤ Introduction

There are three essential ways to transmit power in heavy industry today: Mechanical, Electrical and Fluid Power. Under the umbrella of fluid power, you have hydraulics and pneumatics as the two fundamental technologies. Both use a form of fluid – hydraulics as a liquid and pneumatics as a gas, to transmit power from one location to another. It is extremely important to keep the liquid or the gas clean as it flows through the fluid conductors and works its way from the reservoir in hydraulics and the receiver tank in pneumatics, through the directional valves and on to the business end of the system or the actuator. Chevron states: "Particle contamination is the number ONE cause of lubricant-related failure in equipment. An estimated 82% of wear is particle-induced, with abrasion wear accounting for two thirds of the figure. It's no secret, hydraulic fluid contamination is the leading cause of hydraulic system failures."

Facilities spend an enormous amount of money on oil analysis programs and work very diligently for proper filtration placement to make sure their hydraulic systems and

"The demand side of a compressed air system is often the most neglected part of the machine set in an entire facility."

— Paul Craven, CFPHS, Motion Industries

mechanical devices, such as gear reducers, run trouble-free for years. But what about pneumatics? No one pays much attention to the quality of their air because compressed air is free, right? It doesn't spill on the ground so even the reliability, environmental and safety departments don't pay much attention to it. However, the energy costs to run the compressors in a facility "can" be the second highest cost behind the raw materials to make the product!

Pneumatics

Most pneumatic circuits run at low power, usually around 2 to 3 horsepower. Two primary advantages of using pneumatics over hydraulics are 1) low initial cost and 2) design simplicity.

Figure 1: Severe Corrosion. (Image courtesy of Motion Industries.)

ADDRESSING THREE COMPRESSED AIR QUALITY PROBLEMS FOUND IN PNEUMATICS

Because pneumatic systems have much lower operating pressures than hydraulics, the components can be made of inexpensive materials and often mass-produced with processes such as injection molding and/or die-casting. Typically, engineers look at this "first cost" and might not consider operating costs can be sometimes five to ten times higher due to the cost of the horsepower to compress the air.

Also, when a gas is compressed, the temperature increases and holds water vapor. When the gas moves down the lines it cools, causing the air to become saturated with water and eventually leads to moisture somewhere downstream. So you could say heat indirectly contributes to poor air quality on the downstream components.

Why Do Pneumatic Components Fail?

The Effects of Poor Air Quality on Demand Side Components

[As we move through this article I am assuming that all precautions have been taken on the supply side of your compressed air system. The downstream components I will discuss are meant as a precautionary measure, and not as the first line of defense!]

So how does poor air quality affect the downstream or demand side components, such as directional valves, flow control valves, pressure control valves, and linear or rotary actuators?

Typically, there are three primary component "killers" in your compressed air system: moisture, particulates and dry (unlubricated) air. "Wait, does my air need to be wet or dry – make up your mind." Hang in there and I will explain! Contamination is defined as any foreign substance in the fluid or gas impeding performance.

Moisture

Figure 1 shows severe corrosion on a double-acting pneumatic cylinder piston. This cylinder is in operation in a pulp and paper mill, whose paper machine has very high humidity on the wet end.

This corrosion, caused by moisture over time, will become dislodged and get pushed through the other components. This in turn will cause a multitude of problems, such as sticking spools in the directional control valves, plugged orifices in pressure control, and flow control valves causing malfunctions. As the name implies, these downstream components "control" the operation of the actuator and tell it what to do.

Again, this moisture can be generated from several places: the heat of compression at the compressor, ingression from the production lines, and fluid conductors going from inside of the facility to outside and back to the inside. Keep in mind we are concentrating on the downstream side of the system – NOT the supply side – so hopefully in the design phase, someone thought about a dryer at the compressor's discharge.

What Do We Do About Moisture?

In-line coalescing filters, in-line desiccant dryers, and water separators are just several products commercially available to remove this water from the demand side of the system.

Coalescing Filters

Coalescing filters should always flow from the inside of the filter element to the outside of the filter element. This allows for the oil and water droplets to collect on the fibers of the filter element and meet at crossover points and become larger and larger droplets (the process of coalescing) as they travel downward and outward to the base of the filter element. The large droplets drop off the base of the filter element into the sump area of the filter housing and ultimately into an automatic float

Figure 2: Particulate Ingression Point. (Image courtesy of Motion Industries.)

drain where the liquids are drained out of the system.

Desiccant Filters

Point-of-use desiccant filters dry compressed air through adsorption represents a purely physical process where water vapor (adsorbate) is bound to the drying medium (adsorbent) through binding forces of molecular adhesion. Adsorbents are solids in spherical and granular form, and are permeated by an array of pores. The water vapor is deposited onto the internal and external surface of the adsorption medium, without the formation of chemical compounds taking place; therefore the adsorption medium does not have to be replenished, but only periodically regenerated.

Water Separators

Oily condensate from the compressed air system enters the oil/water separator under pressure, and is allowed to expand in the specially designed centrifugal inlet chamber. During a six-stage process, the water and oil are separated, allowing the cleaned water to be safely discharged to the foul sewer through the outlet, while the drained oil is collected in an external oil container where it can be disposed of according to legal requirements.

Particles

Just like moisture, particles can come from many places in a complete system. They can be ingressed through dirty filters on the inlet of the compressor, they can be ingressed from the product during normal production, and they can be self-generated from components wearing internally. **Figure 2** shows a typical ingression point on a double-acting pneumatic cylinder due to poor maintenance practices.

These particles flow thorough the fluid conductors and if the facility does not have properly placed filtration, the particles will become lodged in the piston seals and rod gland seals and act like emery cloth on the rods and barrels, causing severe scoring, leaks and premature failures.

Figure 3 shows heavy scoring on the rod, causing the rod gland seal to leak due to the particles lodged in the soft parts.

Figure 4 shows the same scoring on the inside of the cylinder barrel due to the particles lodged in the soft parts. Remember, due to

Figure 3: Particles lodged in the rod gland seal and matching scoring on the rod. (Images courtesy of Motion Industries.)

ADDRESSING THREE COMPRESSED AIR QUALITY PROBLEMS FOUND IN PNEUMATICS

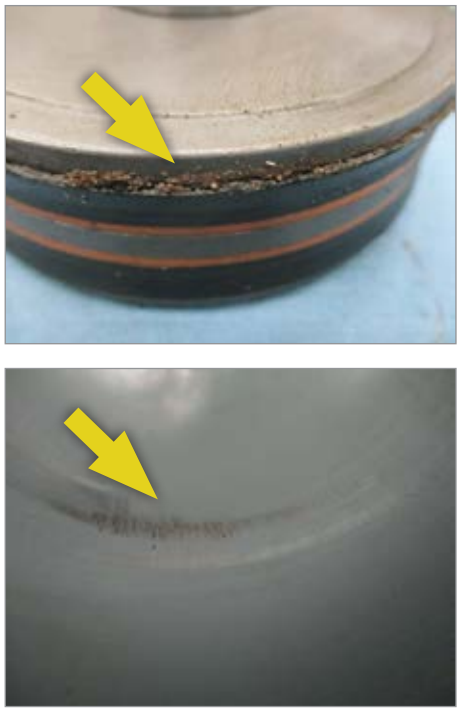


Figure 4: Particles lodged in the piston seals and matching scoring marks in the Barrel. (Images courtesy of Motion Industries.)

the low operating pressure of pneumatics, these cylinder barrels are typically made of aluminum and can be easily damaged.

What Do We Do About These Particles?

There are several commercially available products to remove these particles from the demand side of the system. Air filters are designed to remove airborne solid contaminants, pipe scale, rust, pipe dope, etc. These may plug small orifices or cause excessive wear and premature failure of pneumatic components.

Dry (Unlubricated) Air

The only reason I mentioned this type of failure is because many manufacturers of the newer products, such as pneumatic cylinders, send these components out pre-lubricated on the soft parts inside the cylinder and is lubricated for the life of the unit. However, the previously mentioned moisture has a tendency to wash this lubrication out, meaning the soft parts are now moving dynamically exposed to the dry air and no lubrication. This exposure will cause the seal to dry out, crack and prematurely fail. These cracks in the seal allow air to bypass internally, and cause the cylinder to slow down and eventually just stop. Due to the low cost of these components, the cylinder is typically replaced with no regard to the root cause of the failure. One day I heard a statement: "50-cent failure, 50-cent analysis as to why it failed."

Demand Side Component Placement

When setting your key performance indicators to measure the performance of your demand side components, it is important to know a few important things: 1) the operating pressure vs. the required operating pressure, 2) the rate of flow vs. the required rate of flow, and 3) the direction of flow vs. the required direction of flow.

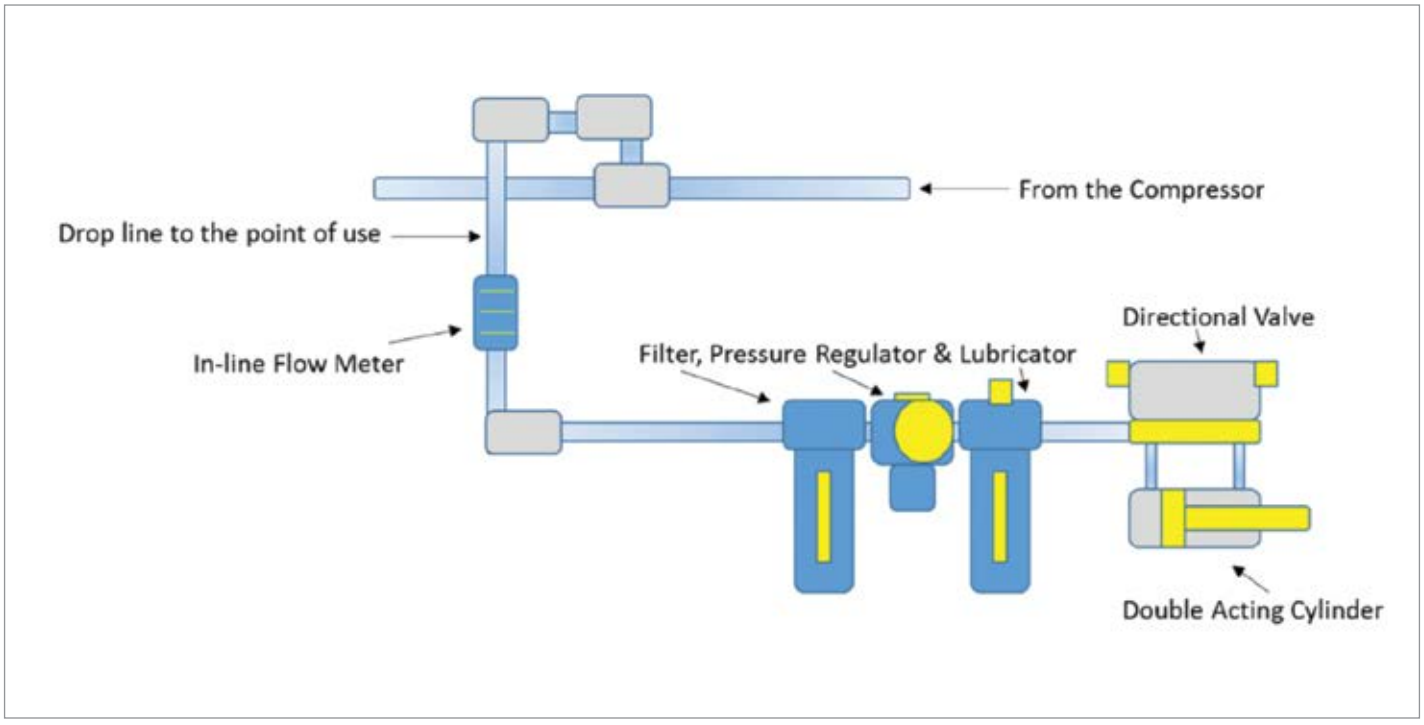


Figure 5: Demand Side Component Placement. (Image courtesy of Motion Industries.)

Demand Side Score Card				
Function	Pressure	SCFM	Inches	Seconds
Cylinder Extend	45 PSI	10	12	0.345
Cylinder Retract	40 PSI	10	12	0.283

Figure 6: KPI Score Card.

Figure 5 shows an example of typical component placement to measure the KPIs for proper operation. From the drop line you have an in-line flow meter, a particle and or water removal filter, a pressure regulator, a lubricator, a directional valve and the cylinder.

Setting and Measuring Your KPIs

Having the KPIs listed and posted at the point of use is important for predictive maintenance checks and logical troubleshooting.

Figure 6 shows an example of the KPIs charted for easy access by the operator, the PdM technician or the system troubleshooter.

Conclusion

The demand side of a compressed air system is often the most neglected part of the machine set in an entire facility, yet according to the Department of Energy just 10 quarter-inch leaks can cost as much as $39,967 in energy costs to compress the air that is being wasted. Spending just a little time to set your KPIs and installing some inexpensive components on the system's downstream side can extend the life of your components and reduce unwanted production interruptions. BP

Paul Craven, CFPHS, manages Motion Industries' Service Center in Pensacola, FL. For more information visit www.MotionIndustries.com, or see the Mi Energy Services video at https://www.motionindustries.com/miHow2.jsp#PBBckvpvEYA.

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

POWER SUPPLY INDUSTRIES HELPS Alton & Southern Get Back on Track

By Wes Lucko, Compressed Air Best Practices® Magazine

Variable speed and fixed speed Gardner Denver air compressors installed at the Alton & Southern Railway in St. Louis.

Alton & Southern Railway is a classification yard. A classification yard is a railway yard found at some freight train stations, used to separate railway cars onto one of several tracks. Hump yards are the largest and most effective classification yards, often sorting several thousand cars a day. The heart of these yards is the "hump"—a lead track on a small hill where an engine pushes the cars over. Single cars, or a block of coupled cars, are uncoupled just before or at the crest of the hump, and roll by gravity onto their destination

The new compressed air piping system being cutover to the retarders at Alton & Southern Railway.

tracks in the tracks where the cars are sorted, called the "fan."

The speed of the cars rolling down from the hump into the fan area must be regulated based on various factors. Information such as whether the cars are full or empty, heavy or light freight, and varying number of axles determines individual speed conditions. It is also important to know the number of cars already on the classification tracks, and varying weather conditions, including temperature, wind speed and direction.

Concerning speed regulation, this work is done by mechanized "rail brakes," called retarders. Their job is to brake the cars by gripping the wheels. They are operated either pneumatically or hydraulically, with Alton & Southern Railway's system using the former. Considering much of Alton & Southern Railway's compressed air piping system dated back to its 1960's installation date, there were leaks. As of 2012, it was determined one and a half compressors were running at 100% capacity just to maintain leaks. This equated to about 1,500 cfm at a cost of roughly $180,000 in electricity annually.

Alton & Southern Railway's journey towards optimizing the compressed air system took roughly 10 years, beginning back in 2004 when the low air alarm began firing consistently. Their equipment at the time consisted of three 250-horsepower, 1100 cfm compressors, running full load with the low air alarm still persisting. This is when they brought in Jim Timmersman, the lead compressed air auditor from Power Supply Industries, to troubleshoot the system. Timmersman worked with Alton & Southern Railway's budgeting constraints over the years implementing changes along the way. Timmersman focused on their compressed air dryers, flow controllers, piping, storage, and finally their air compressors.

Compressed Air Dryer

A major factor for the infrastructure's inefficiency was the introduction of compressed air dryers had not taken place for several years during the rail yard's operation. Much of the compressed air piping developed major erosion issues due to improper dew point conditions. Heatless dryers were eventually installed, though poorly maintained. This caused a 15 psi pressure drop and continued unstable dew point conditions. They were replaced with heated purge desiccant dryers providing a dewpoint of -40 °F. This merely scraped the surface when it came to tackling the entire project. This all played into the major process of lowering the plant pressure from 140 psi, to the optimum operating point being between 90 – 100 pounds.

Compressed Air Flow Controller

The next project Timmersman brought to the table was the introduction of a compressed air flow controller. Flow controllers adjust to system changes instantaneously. They can allow air compressors to accelerate and catch up to air demand, while maximizing the advantage of the available part load performance. They can also prevent pressure degradation if an operating compressor fails, and may eliminate compressed air related work stoppages and production interruptions.

Ultimately, the plant pressure was reduced from 140 psi to 105 psi, where the air compressor's output was reduced from 140 psi to 128 psi. This allowed the high-pressure machines to continue operating at a high pressure to build storage, yet allow the plant to work on the lower pressure. This also effectively reduced the low-air alarm threshold to 88 psi, allowing at least one compressor to shut off most of the time.

POWER SUPPLY INDUSTRIES HELPS ALTON & SOUTHERN GET BACK ON TRACK

The new heated purge desiccant dryers located inside the air compressor building.

One 5,000-gallon compressed air tank located at the top of the hump yard where demand from the retarders is greatest.

Compressed Air Piping and Storage

By 2007, all three air compressors were back to 100% capacity load, the low air alarm began flashing again and a fourth "portable" compressor was purchased and tied into the system as needed. The piping was merely too old and the leaks far beyond repair. Timmersman noted, "An entirely new piping system was required to fix the problem." Ameren Missouri was contacted whose utility incentive program, Act On Energy, is designed to help pay for upgrades, if certain energy consumption reductions were met. The rebate amount was $178,000, if completed in 2007. This was not in Alton & Southern Railway's budget. By 2012, it was determined one and a half compressors were running just to maintain leaks. With the current demand profile of 3,000 cfm, 1,500 cfm was being wasted due to the issue. Alton & Southern Railway decided it was time to pull the trigger.

The first step was to design the new layout of the piping. The initial header was a gradual reduction from 6 inches, to 4 inches, to 2 inches. This was replaced with a 6-inch header with 4 and 2-inch lines branching off of it for the required application. The implementation of the new header alone would mean a gain of 6,000 gallons just in piping.

Second, was the strategic placement of compressed air storage. A new air building was constructed, housing a 20,000-gallon storage tank; while the old air building still housed 11,000 gallons worth of storage. Secondary storage comprised of two 5,000-gallon tanks. One 5,000-gallon storage unit was planted at the top of the hump yard closest to the master retarders where demand is the greatest. The second 5,000-gallon tank was located in the lower field known as the "fan," where the rail lines separated into multiple tracks. This is where secondary retarders are located, acting as a failsafe for controlling the car speed if the main retarder were to fail.

Secondary storage refers to using air receivers in the distribution system, in addition to the primary air receivers in the supply side. Sometimes this storage is dedicated to a certain end-use application, while other times it is located to provide additional general storage at the end of a distribution line or loop. Secondary storage can help:

- Maintain more stable pressures at points of use
- Improve the speed, thrust or torque of an application
- Reduce the rate of pressure drop in the system during demand events
- Control demand events (peak demand periods) in the system by reducing both the amount of pressure drop and the rate of decay.

For some systems, it is important to control the rate of compressed air flowing to refill a secondary receiver (the control is called metered recovery). If the rate is not controlled, filling the receiver will become a demand event, potentially causing system problems due to a high rate of flow.

The following formula is typically used to size storage receivers to act as secondary storage:

$$V = \frac{T \times (C - S) \times Pa}{P1 - P2}$$

Where:

V = Receiver volume, ft^3

T = Time allowed for pressure drop, minutes

C = Intermittent demand, cfm

S = Rate of flow through the needle valve, cfm

Pa = Absolute atmospheric pressure, psia

P1 = Initial receiver pressure, psig

P2 = final receiver pressure, psig

A total of 7,000 feet of piping was installed, equating to over a mile's worth of infrastructure. Many parts of the original piping line were entirely inaccessible due to it being underground. Not only did much of the original line need to be dug up, but also the new line needed to be implemented in such a fashion to allow for better access for routine maintenance. A series of trenches were developed with access points running the entire length of the system, as to diagnose any future complications. With the construction and installation complete, and the old line unearthed and ready to be dismantled, there was minimal delay in cutover to the new system. This was paramount in order to keep the hump yard in operation.

Variable Speed Drive Air Compressor

The Gardner Denver VS235 was installed as the new trim air compressor, with two fixed speed 300 horsepower Gardner Denver's running as the baseline machines, tied together with the sequencer. With storage totaling a whopping 47,000 gallons and leak free piping, the demand profile dropped from 3,000 cfm to 1,200 cfm.

Timmersman stated, "The VSD was chosen specifically because the retarders can go a half hour with no cars coming down the hill, then spike with the demand event of trains coming with over a 100 cars." Thus, the VSD reduces artificial demand when little to no compressed air is needed. Variable speed compressors can efficiently and reliably handle the varying air demand found in most plant air systems. These compressors speed up and slow down to match air supply to air demand as it fluctuates. The right variable speed compressor in the right application delivers significant energy savings and a stable, consistent air supply.

POWER SUPPLY INDUSTRIES HELPS ALTON & SOUTHERN GET BACK ON TRACK

Power Supply Industries: Invested in Energy Conservation

Compressed Air Best Practices ® Magazine sat down with Scott Bertelsmeyer, Adam French and Jim Timmersman from Power Supply Industries (PSI).

Good afternoon. Nice to hear from you! How is your business and what is driving your growth?

It's nice to hear from you Wes. As you know, our business is doing well. We now have roughly 50 employees based in three locations; our headquarters here in Fenton (St. Louis), Missouri, and the Illinois branches in Decatur and Peoria.

The growth of PSI has come due to our successful business strategy shift, which started 16 years ago, to make energy conservation in compressed air systems, the focal point of our business model. Quality and reliability are now a given. Our clients have increased the importance of energy management within their companies, and we meet the expectations of Energy Managers interested in "system-buying" and leveraging utility incentive programs.

How has PSI changed in order to excel at meeting the demands of Energy Managers?

PSI was founded in 1983 on the premise, we still maintain today, of being a full-service air compressor sales and service company. What has changed has been what our clients define as "full-service." PSI has always excelled at being the company you could trust to service and maintain compressed air equipment, and re-build it if necessary. We have always represented and installed the highest quality compressed air system equipment.

Reflecting what the market demanded, in those earlier years we were very supply-side oriented. During site visits, we spoke to clients about the features and benefits of our Gardner Denver air compressors and dryers - in the compressor room. Our clients wanted us to focus on the reliability and purity of their compressed air systems. This is what we did.

Scott Bertelsmeyer, Jim Timmersman and Adam French at the Fenton, Missouri, headquarters of Power Supply Industries.

When we decided to truly focus on energy conservation, we started by investing in the technical training of our staff. We had to shift our focus outside the compressor room, learn to optimize the demand-side of the compressed air system, and then know how to implement best practices in controlling compressed air flow and air compressor sequencing.

Isn't optimizing the demand-side of the compressed air system easy-just fix some leaks?!

Good one. As you know, fixing a few compressed air leaks can actually increase the leak rate in a plant, as air will simply escape faster (at higher pressure) from the remaining leaks! We started as always, with our staff, and hired expert auditors like Jim Timmersman, who launched the PSI Energy Services Group. His team developed formal leak management programs, for example, annual programs designed to receive utility incentive funding and "maintain the gain" in a factory.

We had to develop knowledge of inappropriate uses of compressed air and how to manage them. If a plant is using vacuum generators, for a "pick and place" application, can we optimize this? This led us to our investment in Process Air Solutions.

Why did PSI invest in Process Air Solutions?

It was a natural consequence of our decision to focus on energy conservation. Once we made that shift outside the compressor room, we were constantly faced with situations on the factory floor requiring low-pressure air. How should this factory produce low-pressure air at high volumes to blow-off breadcrumbs or metal shavings? How should this printer keep the sheets from sticking together? Is this bottler using the right nozzles to dry the moisture off the bottles? If regulating 100-psi compressed air doesn't make sense for a 15-psig application, what kind of blower should they use? How much do we know about blowers?

Ed Ball and Greg Cannon manage Process Air Solutions as a separate business and can expertly answer all these questions and more. They focus on applications ranging from 50 psi all the way down to vacuum. We have become a market leader in low-pressure air knife blow-off systems. They advise leading corporations on how to apply their Vortron centrifugal blowers and air knives to their low-pressure processes. As a result of their audits and implementations, the blower and air compressor horsepower they turn off are astounding, and frankly exciting. Many of their implementations yield results where 1/10th the horsepower is now being used.

What role have utility incentives played?

The role of our local Utility Energy Programs has been significant. The rebates have motivated factories to focus on energy conservation when many wouldn't have before. The custom incentive programs may provide

30% to 50% rebates off of the total project cost, making the ROI's on energy conservation projects, like compressed air, very attractive.

The retro commissioning programs from the local utilities are also very effective because they will defray typically 50% to 80% of the costs of an energy efficiency study. This removes the risk and obstacles to conduct a much-needed system assessment in a factory. Without the study, projects don't get done.

Power Supply Industries has been intensely involved, as a Program Ally, since the utility program was started. We were named their over-all "Business Program Ally of the Year" every year from 2008 to 2017, because we executed so many energy conservation projects receiving rebates with our customers. It's been and continues to be an excellent program.

What are some lessons learned as a result of this journey towards energy conservation?

We've become very conscious of the difficulties factories have filtering real from fictional energy conservation opportunities. This is why trust remains the biggest asset we build over time with our clients. Today, our clients are bombarded with the message saying reduce compressed air demand out in the plant, and you will automatically see equivalent energy savings. There are a lot of companies talking "install this and you will see up to 50% energy savings." We constantly remind our clients that plants don't save energy unless the air compressors use less energy – and demand-side savings only translate if the air compressor and pressure/flow controls allow it.

The biggest cultural and behavioral change came when we committed to visiting the plant enough to understand how they use compressed air. We may visit a client eleven times now before we receive a purchase order. We are conducting a walk-through, taking measurements, conducting a system audit of the demand-side and then presenting the survey. This is about doing more business with your existing clients in a win/win manner. We are now working on their entire piping system, and doing projects once a year to incrementally improve their system.

We became a leader in the Midwest in understanding how to deploy air storage and flow controllers. The "flow and pressure" control techniques are what allow us to truly leverage demand-side improvements. By controlling how we supply compressed air, we can maximize air compressor performance and efficiency. Combining these three elements; demand-side optimization, flow and pressure control and air compressor control, is what we, and our customers, now define as "full-service."

Thank you for your time today and congratulations on the growth.

For more information on Power Supply Industries, please visit www.psiind.com

The VSD air compressor handles the intermittent demand, from the retarders, very efficiently.

Conclusion

With an initial demand profile of 3,000 cfm at 140 psi, where 1,500 cfm was going toward compressed air leaks in the piping underground, they now have an average flow of 1,200 cfm at 105 psi due to the changes to the piping, drying and storage systems. The three original 250-horsepower, 1,100 cfm, fixed-speed air compressors ran continuously and were supplemented by an additional portable 300 hp electric air compressor. They were replaced by two fixed speed 300 hp and one Gardner Denver VS235 air compressor. The VS235 supplies compressed air, when needed, to the rail yard's inconsistent demand events.

The benefits are plentiful. By eliminating the wasteful compressed air leaks and reconfiguring the entire system, Alton & Southern Railway saved a total of $182,748 in annual electricity costs. Ameren Missouri provided a significant utility incentive rebate of $234,971, making the ROI on the project attractive.

Ultimately, the installation provides newer, more reliable air compressors, brand new piping infrastructure and an easily accessible system for easy maintenance reducing routine costs across the board.

You don't need any ***train***-ing to see these benefits. BP

For more information contact Jim Timmersman, Lead Compressed Air Auditor, Power Supply Industries, email: jim.timmersman@psiind.com or visit www.psiind.com

To read similar articles on ***Compressed Air Piping and Storage,*** please visit www.airbestpractices.com/system-assessments/piping-storage

Poultry Plant Upgrades Compressed Air SYSTEM FOR 44% ENERGY SAVINGS

By Ron Marshall, Marshall Compressed Air Consulting

A Canadian poultry plant has upgraded their aging compressed air system for their new expansion, making it significantly more energy efficient and also solving ongoing pressure problems. The project has given the facility a much better system overall and increased system capacity enough to cover additional compressed air load. This article describes what was done to improve their compressed air system.

Background

The company is a farmer owned cooperative that has been operating for over 50 years. The production output of the facility is currently over 100 million pounds of chicken and poultry products per year. The plant and the compressed air system has grown from a smaller size over the years as the production facility got bigger and added more compressed air powered tools and machines.

"Overall the power utility confirmed the reduction in operating costs for this system was 44 percent (not including end use reduction) saving about $24,000 per year in compressed air operating costs at the present plant loading."

— Ron Marshall, Marshall Compressed Air Consulting

As a result, before the last expansion the plant had four small compressors sized between 25 and 40 hp running in various modes of operation. The compressed air was conditioned using particulate filter and non-cycling refrigerated air dryer.

Initial Assessment

Supply side measurement of the system was initially done in 2001, when the plant was much smaller, by placing amp and pressure loggers on the compressed air equipment to assess the production efficiency and determine if any problems existed. At the time only two 25 hp screw compressors were being used, both of which were running in modulation. Figure 2 shows the plant pressure was unsatisfactory, varying between 72 and 132 psi and the power consumption was very flat, even with varying load.

Modulation Complicates Estimates

Modulation control of screw compressors is problematic for system auditors because the amp or power input changes very little for a large change in flow. In properly assessing a system, in the absence of flow meters, the auditor must try to accurately estimate the flow of each compressor based on the reduction of amps when the compressor starts modulating to reduce its output. This estimate is important because it often determines the size of any replacement compressor. Typically, the auditor uses a curve similar to Figure 3 and does a straight-line approximation based on the amp information at various points along the system profile. Unfortunately, due to their age and poor condition, the actual system compressors at this location do not exactly follow a curve such as this. In addition to this, there is something else happening to the compressors. Due to the system flows exceeding the capacity of the compressors, the compressors are often

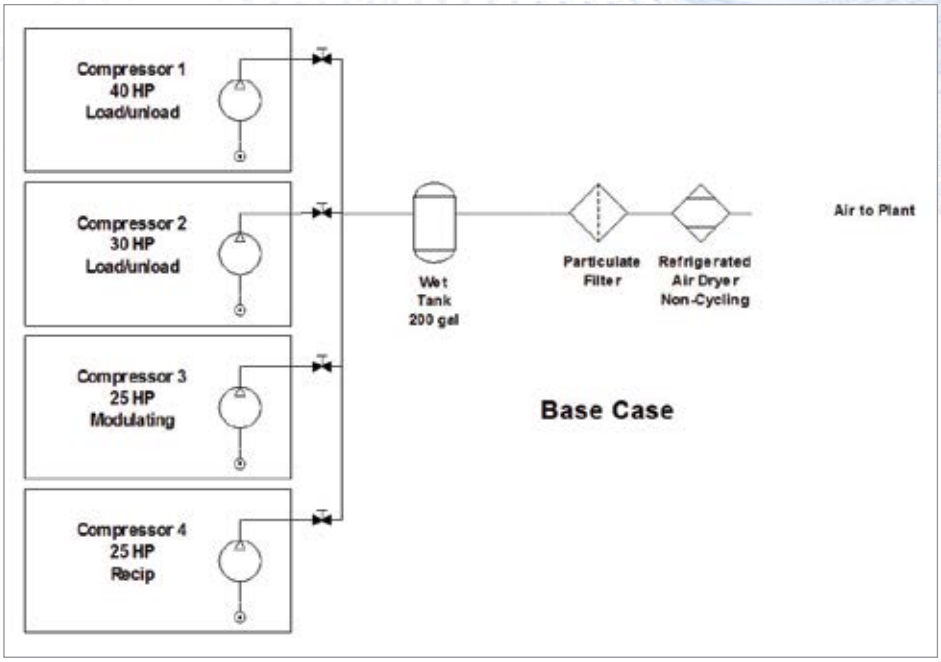


Figure 1: The as found system configuration used multiple smaller compressors

POULTRY PLANT UPGRADES COMPRESSED AIR SYSTEM FOR 44% ENERGY SAVINGS

running in a condition called 'drawdown.' This happens when the compressor is at maximum output capacity, but the system demand pulls the pressure lower than the compressor set point. This condition also causes reduced amps/power. This means an amp reading lower than full load conditions can mean two things; 1) the compressor is at full load and in drawdown, or 2) the compressor is modulating and at reduced capacity. This complicates the estimating process and makes flow estimating inaccurate.

At the time of the assessment, based on the amp readings, the system flow was estimated at 260 cfm peak and 120 cfm average. Power consumption was estimated at 43 kW consuming about 374,500 kWh per year. System specific power was estimated at 36 kW/100 cfm, a normal reading for an optimized system would be around 20 kW/100 cfm.

Plant Adds Fixed Speed Units

After this first assessment the plant did not decide to fully optimize their system, they simply added another 40 hp compressor, replaced a 25 hp unit with a 30 hp unit, and altered the compressor control settings to ensure any base compressors ran fully loaded and one compressor trimmed in load/unload mode. They also tied in another 25 hp reciprocating compressor for backup duty. As time went on another system assessment was done, this time with a flow meter installed. The new readings showed operating with load/unload control rather than modulation, did actually make the system more efficient. It now only consumed 47 kW for an average flow of 160 cfm, resulting in a system specific power level of 29 kW/100. However, this was still a higher level compared to optimum. The pressure profile was quite a bit better than previous readings, but there were times when the pressure fell to 90 psi due to peak system demands.

Full Optimization

About the time of this second assessment, the plant started making plans for an additional production expansion which required more compressor capacity. Plant management

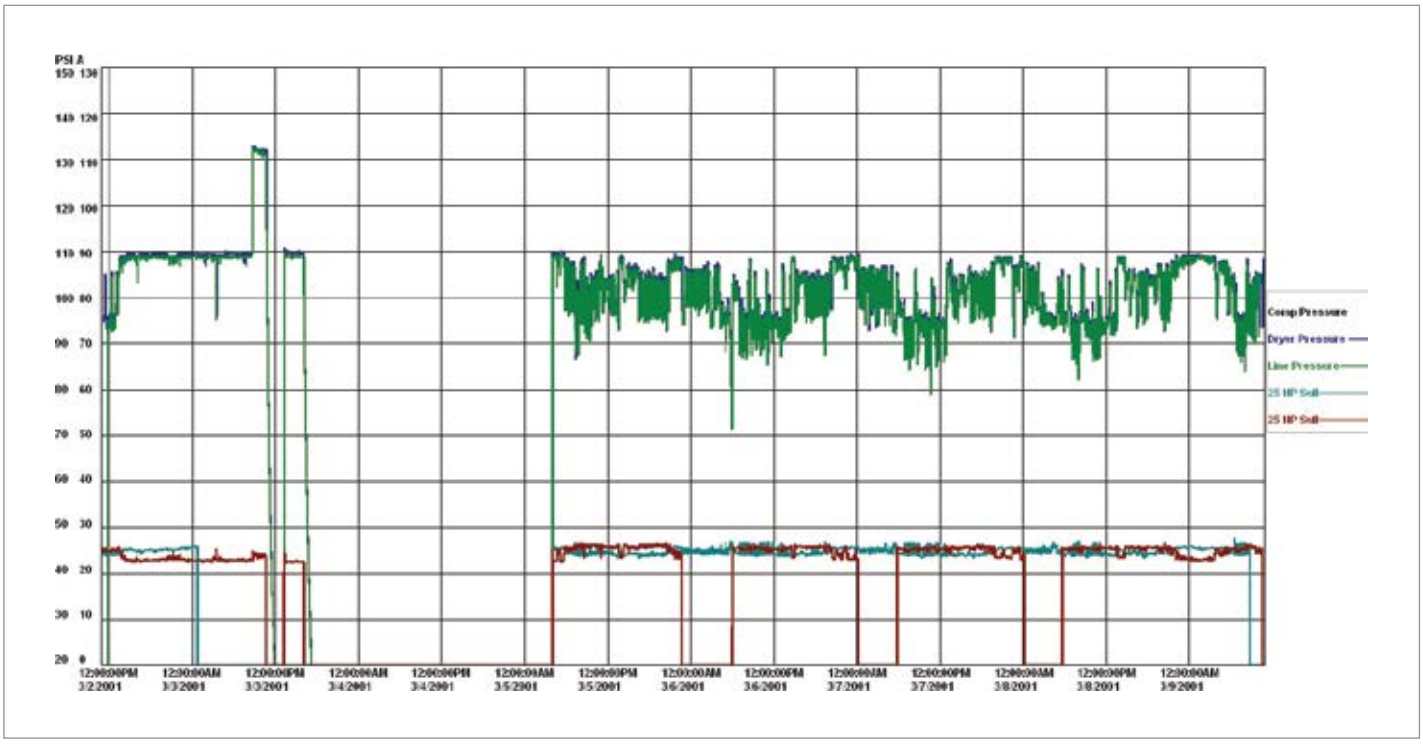


Figure 2: The original smaller system used two modulating compressors

decided to strive for full optimization by upgrading their system to include a new variable speed 100 hp VSD unit. Since there were utility incentives available, management also considered some other items:

- A cycling air dryer was chosen to reduce the power required during loads that were less than the full capacity of the dryer. Since average flows were 120 cfm and the actual dryer capacity was to be 500 cfm, the dryer was on average only 24 percent loaded. A non-cycling dryer would have consumed almost full power during these low load periods.
- A mist eliminator coalescing filter was installed before the dryer to remove oil carryover and free water from the airstream before it entered the air dryer. Compared to a standard filter, this ME style has between ½ psi and 3 psi pressure differential over the life of the element instead of between 3 to 10 psi for a standard filter. This reduced differential allows lower compressor discharge pressure, reducing the overall compressor power consumption.
- Airless condensate drains were installed to reduce the compressed air wasted by old style timer drains.
- A pressure/flow controller was installed to reduce the plant pressure to a minimum level, but allow an adequate compressor control band to switch compressors in and out as the demand changed. Most of the installed machines in the plant do not use pressure regulators. For these machines, and for leakage, every one psi in reduced average system pressure results in a corresponding 0.9 percent reduction in flow. This reflects back into reduced compressor power consumption due to the reduction of artificial demand.

Project Results

The power utility required a verification logging for this project before paying out the incentive. Once again data loggers were placed on the compressed air system to determine the power, flow and pressure characteristics and to ensure the expected savings had materialized.

POULTRY PLANT UPGRADES COMPRESSED AIR SYSTEM FOR 44% ENERGY SAVINGS

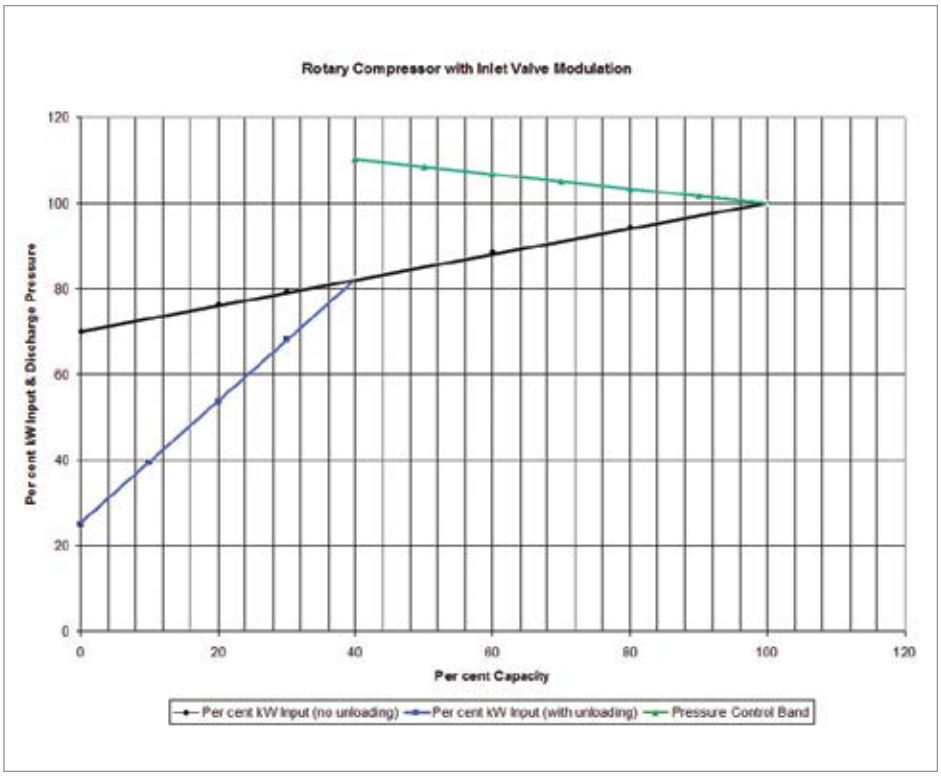


Figure 3: Curve used to estimate a typical modulating compressor output flow (Sources Compressed Air Challenge)

The captured readings showed plant pressure was much better regulated after the upgrade, but had some low pressure events due to compressor pressure settings issues (this was corrected). Overall, with the exception of a few occasional peaks, the 100 hp VSD compressor carried the whole plant with the 40 hp compressor coming on at full load during occasional peaks. Due to the plant expansion, the average flow had increased substantially to about 220 cfm. The average power consumption during this period was measured at 44.1 kW. System specific power was now about 20 kW/100 cfm, a reduction in power consumption per unit of compressed air produced of 44 percent. The actual energy consumed by the system was 343,600 kWh, slightly lower than conditions when the two 25 hp compressors were running, yet producing about 40 percent more compressed air.

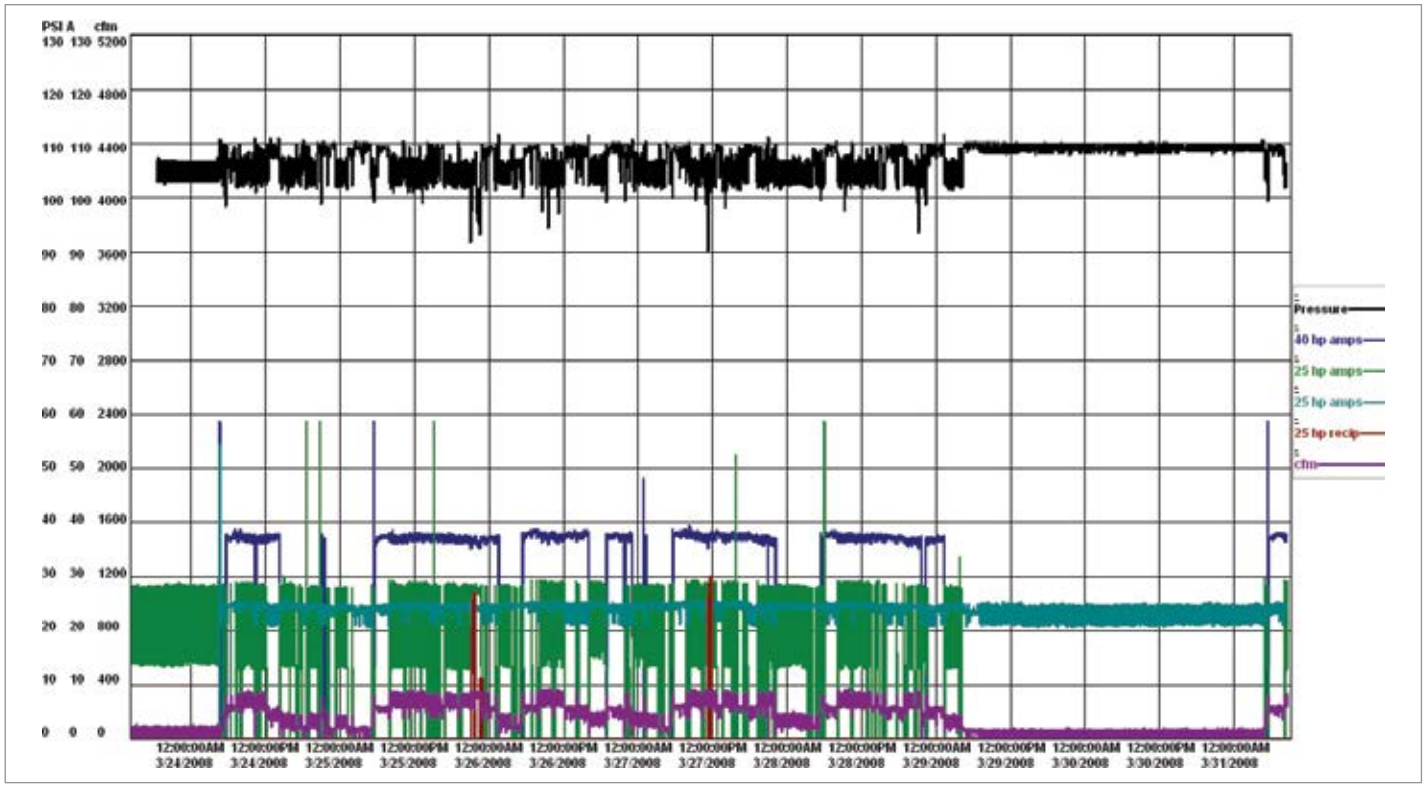


Figure 4: Adding another compressor and changing operating mode improved pressure and efficiency

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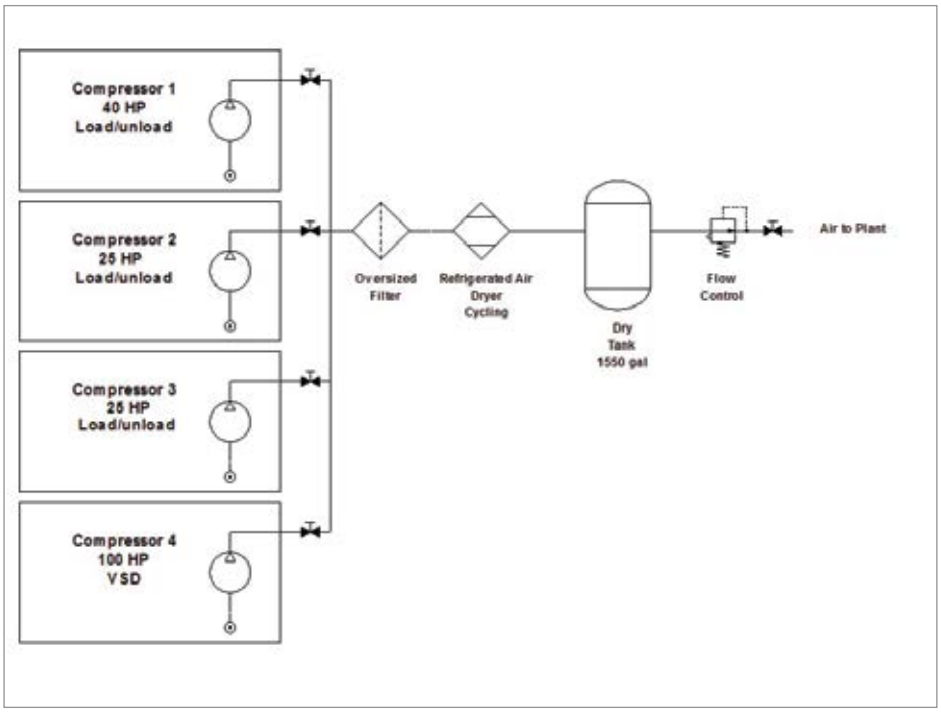

Figure 5: Final configuration after improvements

Potential End Use Improvement

One downside to this project is the lack of attention to end uses and waste. When verification was being done the compressed air auditor noticed a few items that could be addressed that could potentially reduce their overall system energy consumption:

- The plant experienced a number of motor failures on production machinery due to water entering the motor housing during sanitation washdown. Some of these motors were modified by connecting them to a supply of compressed air to pressurize the motor enclosure to prevent the moisture from entering. This is seen as an inappropriate use of compressed air consuming about 40 cfm of average compressed air.

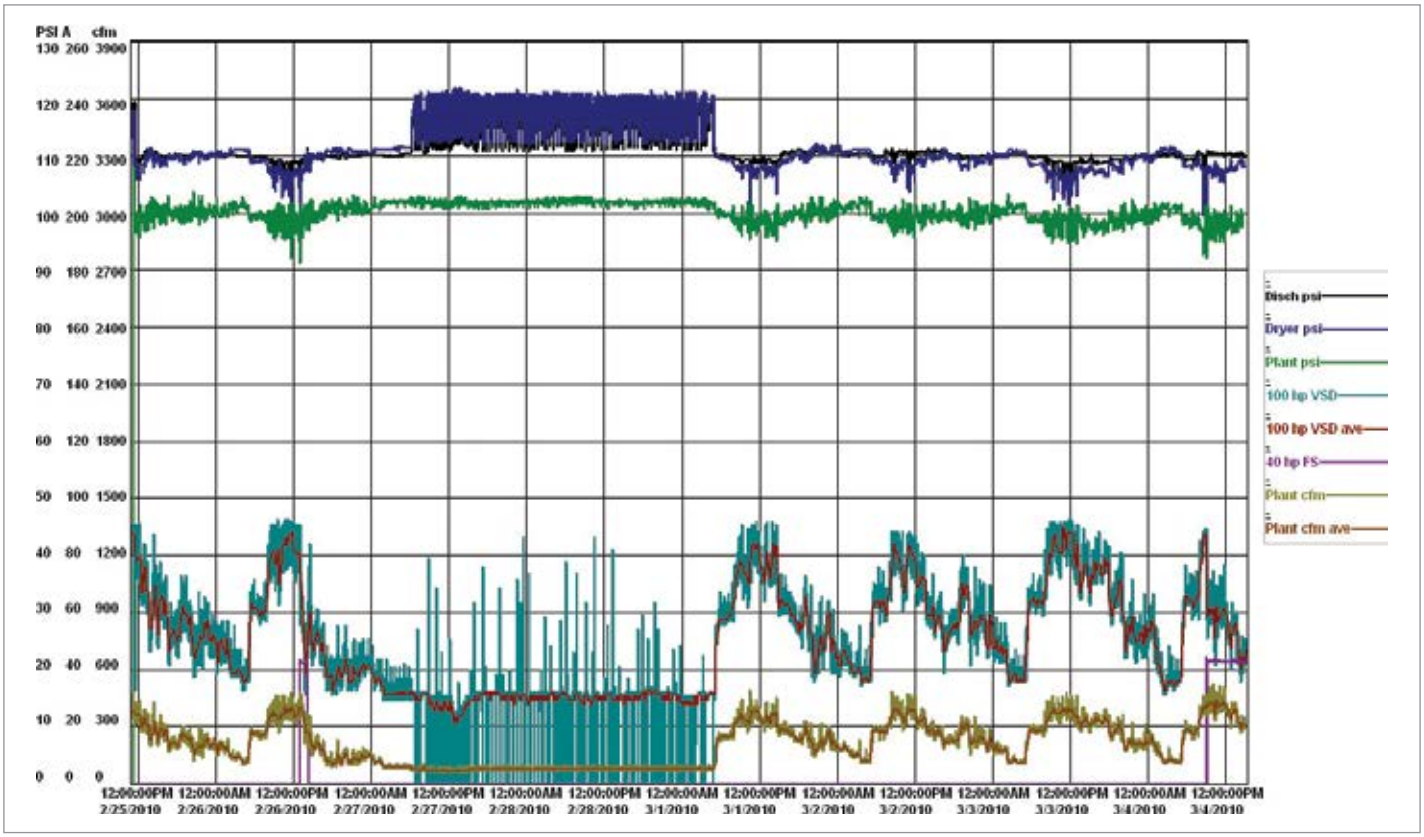

Figure 6: Final Operating Profile

- Compressed air leakage levels had increased from the initial assessment due to lack of maintenance. The leakage could be seen on the installed flow meter during non-production hours. This was flagged and the plant reduced the leakage level by implementing a leakage detection and repair program to their maintenance program.
- The pressure/flow controller initially installed was pneumatically controlled with a pilot regulator. As can be seen on the final pressure profile (Figure 6) the regulation of the plant pressure has a number of sags during high flows. This can be improved by installing an electronically controlled pressure/flow controller. The use of this better controller would allow the further reduction of plant pressure, saving more energy due to the reduced flow.

Conclusion

This project showed the optimization of the supply side of the system could save energy, especially when converting compressor control from modulating to VSD mode. Not only was the compressor control improved, but energy savings were gained by addressing air dryers, filters, drains and reduction in plant pressure. Further reductions were also gained by addressing some end uses and leakage reduction after the verification took place.

Overall the power utility confirmed the reduction in operating costs for this system was 44 percent (not including end use reduction) saving about $24,000 per year in compressed air operating costs at the present plant loading. The utility paid out an incentive of $30,000 making the project simple payback of about 4 years. The project not only saved energy, but better stabilized plant pressure, allowing production machinery to operate without pressure dropouts. BP

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

To read more about ***Air Compressor Control System Assessments*** please visit, www.airbestpractices.com/system-assessments/compressor-controls

SHOW REPORT
CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2017 PROCESS EXPO



By Rod Smith, Compressed Air Best Practices® Magazine

The 2017 edition of Process Expo was held in October at McCormick Place in Chicago. Produced by the Food Processing Suppliers Association (FPSA). The American Meat Association (NAMA) also co-located their fall conference at Process Expo 2017. Our publications are honored to work together with Process Expo as well as have our magazines present in the literature bins, and contribute to the conference portion of the event.

The FPSA announced over 500 exhibitors covering more than 220,000 square feet of exhibit space. Attendance was announced at nearly 14,000 visitors "We would like to thank our exhibitors, attendees, sponsors, partners and all of the FPSA committees for their hard work and dedication in making this year's PROCESS EXPO an important gathering for the food and beverage processing industry," said Tom Kittle, Chairman, FPSA.

PROCESS EXPO delivered an exciting and informative four-day event at the McCormick Place Convention Center attracting a qualified group of attendees who took advantage of the various educational tracks including food safety, hygienic design and FSMA regulations. Attendees were also able to see three full working production lines right on the show floor, and even explore state-of-the-art technology in the Virtual Reality Showroom.

There was also plenty to celebrate at PROCESS EXPO this year. Cakes and awards were presented to SPX Flow, Inc., and G.J. Olney, Inc. for their 100th anniversary of membership with the FPSA. PROCESS EXPO also welcomed IFFA/Messe Frankfurt officials with a Beer Garden reception complete with oompah music. The FPSA's newest initiative, the FPSA Women's Council, held a leadership breakfast with a keynote presentation from Jane Grote Abell, board chair and member of the founding family of Donatos Pizza.

The Food Processing Suppliers Association (FPSA) is a global trade association serving suppliers in the food and beverage industries. The Association's programs and services support member's success by providing assistance in marketing their products and services, overall improvement in key business practices and many opportunities to network among industry colleagues. Programs and services to achieve these objectives include PROCESS EXPO (industry leading trade show), electronic media marketing, education, market intelligence, research, and advocation of critical industry issues such as food safety, sanitary design of equipment, and global trade. FPSA members are organized in vertical industry councils which focus on specific needs and concerns that are unique to each industry sector. FPSA councils currently represent the Bakery, Beverage, Dairy, Prepared Foods and Meat sectors.

The exhibition portion had at least 500 companies exhibiting and during the hours allocated, I did my best to visit as many compressed air, vacuum and cooling system booths as possible. All three plant utilities, of course, play critical roles in the production and packaging of food and beverage products.

CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2017 PROCESS EXPO

Pierre Lantheaume and James Hupp presented dry claw and dry screw vacuum pumps at the Leybold booth (left to right).

Our publications organized a ProcessU session titled, "Vacuum and Compressed Air Best Practices." Speakers were Troy Bridges (pictured) from Busch Vacuum Pumps and Systems and Wayne Perry from Kaeser Compressors.

Vacuum Pump Systems

Primary meat packaging is an important part of Process Expo and a big application for vacuum pumps. Applications include vacuum chamber machines, form-fill-seal machines and modified atmosphere packaging (MAP).

Over 2.5 million Busch R 5 oil-lubricated rotary vane vacuum pumps are in operation worldwide-and primary meat packaging may be the largest market segment. The technology is widely known for reliability and energy efficiency – whether in a 24/7 application or being used intermittently. A market leader in primary packaging, the robust design includes recirculation oil lubrication and a ultimate pressure range from 0.075 to 15 Torr (2.8 to 1,030 acfm) at 60 Hz pumping speed. Units may be fitted with an optional gas ballast valve so vapors can be pumped without condensing. At the Busch booth, Gary Lane and Troy Bridges were talking about the latest R 5 models; the R 5 RA 0040F has a pressure range to 0.075 Torr and 28 acfm. The R 5 RA 0630B has a pressure range of .5 Torr and 455 acfm.

Leybold's U.S. subsidiary is based in my hometown of Pittsburgh so I'm always pleased to see them. James Hupp and Pierre Lantheaume said the Company is encouraging clients to consider the benefits of dry technology and experiencing good results. "Leybold offers a broad range of dry claw and dry screw pumps to customers who like the idea of an oil-free technology." They commented applications like freeze-drying are adopting dry vacuum pump technology.

Becker is a leading manufacturer of vacuum pumps and at Process Expo the team was focusing on their U 5 Series designed for primary packaging. This oil-lubricated line of rotary vane vacuum pumps has four models with an ultimate pressure capability of 0.1 mbar absolute (0.075 Torr) and 60 Hz. Nominal air flow range of 49.4 to 141.3 cfm. The units come with an adjustable standard gas ballast providing a water vapor tolerance of 7 mbar at 85 ˚C operating temperature. An optional gas ballast is available for <3 mbar. At the Becker booth, Sales Manager Darin Ladd said, "A significant feature is the faster (vs. the competition) pump down time for the evacuation of chambers of <100 liters. This helps our clients run their product lines at faster speeds." Becker also says

the new U 5 line has optimized motor power, reducing the kW energy consumption of the units.

Compressed Air Systems

Compressed air comes into direct and indirect contact with food products. In order to ensure product safety standards are met, having a well-designed system with a well understood specification for compressed air quality is very important. At Compressed Air Best Practices® Magazine, we believe food industry plants should consistently verify whether or not they are meeting the compressed air specification they established. We also believe the percentage of food industry factories actually doing this is not what it should be - even though the compressed air industry offers all the technologies to do it.

Kaeser Compressors was exhibiting, as is their usual focus, complete compressed air systems. For the longest time, Kaeser has educated end users to understand the whole system from intake air quality (make sure it's not near the loading dock and full of hydrocarbons), to their rotary screw air compressors (lubricated AND oil-free), to the air purification equipment and condensate management products, and finally to the piping system. Their aluminum SmartPipe™ system always gets a lot of attention! The Kaeser Chicago team, led by Rod Miotti, said booth traffic was very solid. Technical Director Wayne Perry was as usual counseling folks on complete compressed air system designs-helping them ask the right questions with regards to their own unique systems.

- What is our compressed air demand profile, do we have the right air compressors, controls and piping/storage systems installed to reliably match demand at the lowest total lifecycle cost?
- Based upon the existing piping system and applications, should air purification products be centralized or decentralized?
- What pressure dewpoint specification do we need, should we have more than one specification? What dryers are required?
- What levels of liquid oil, oil vapor and particulate filtration do we need?

Steve Wojcieszek next to a Thermal Care AccuChiller.

Gary Lane and Troy Bridges next to the R5 RA 0040 vacuum pump model capable of .075 Torr and 28 acfm (left to right).

Dan Brandenburg and Isabella Naujokat at the Delta T Systems booth (left to right).

CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2017 PROCESS EXPO

Josh Lancaster, Darin Ladd and Jim Duggan at the Becker booth (left to right).

Bill Delmer and Jeff Wadington at the Dimplex Thermal Solutions booth (left to right).

Michael Stephanski, Tracy Carter, Rod Miotti, Rob Baumann and Wayne Perry at the Kaeser Compressors booth (left to right).

Chillers and Cooling Systems

Thermal Care is a Niles, Illinois based process cooling system manufacturer with a broad range of cooling equipment. I haven't spent a lot of time with them, but they have caught my attention from afar because they appear to have a uniquely comprehensive ability to address the entire cooling system for a customer. The Thermal Care product line includes evaporative cooling towers, adiabatic fluid coolers and custom tank systems (including pump reservoirs). The company has been on a strong growth trajectory and presents itself as a true systems company. We like companies aware of and able to help plants with the whole system! At Process Expo, for example, one market target was the visitors from brewery, winery and distillery applications. I liked an informative application brochure from Thermal Care opening with, "What are the right questions to ask?" This application brochure from Thermal Care suggested:

- What is the total number of barrels (bbl) produced at one time?
- What is the liquid weight your tanks are holding?
- What is your starting temperature (temperature of the wort before cooling) and ending temperature (the desired temperature after cooling)?
- What is the length of time available to achieve the desired temperature?

Thermal Care Director of Industrial Markets, Steve Wojcieszek, explained Thermal Care application engineers are able to walk clients through the entire cooling system (from cooling tower to the process chiller) and help them minimize total lifecycle costs. These brewery chiller specialists help clients size up their 1 to 240 ton refrigerated glycol chillers available in portable and central systems. These glycol chillers are typically sized to provide 20 °F to 80 °F glycol and are used in the cold crashing and fermentation of beer requiring 28 °F glycol for 33 °F beer. This is making me thirsty. Very interesting to me was they also offer pump reservoir closed loop systems for 250 to 6,000 gallons, featuring air-to-water heat exchanges or cooling towers and powerful PLC control system for single point operation of chillers and towers. From my experience in the chiller and cooling industry, this represents an uncommon (in a very positive way!) total system design capability.

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CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2017 PROCESS EXPO

Clare Lamperski, from Compressed Air Best Practices® Magazine, making sure the literature bins are stocked at Process Expo!

The ProcessU Session on "Compressed Air and Vacuum Best Practices" was well attended.

Wayne Perry, Technical Director, Kaeser Compressors making a point during his presentation.

Dimplex Thermal Solutions is a global cooling system company and owns the well-known Koolant Koolers product line of process chillers, made in Wisconsin. The Company has an impressive array of technologies and we will touch on just a few. In the booth, Bill Delmer and Jeff Wadington said their wash-down units are commonly used by food processors and packagers. The portable J Series cover a range from 1/8 to 2 tons and offer temperature stabililty at 3 ˚F for fluid setpoints in the 50-80 ˚F range. These air-cooled closed loop units use R-134a and features include stainless steel construction and effective drainage – all to prevent bacterial growth.

Dimplex Thermal Solutions also presented a line of low temperature specialty closed loop or flow-through chillers. Applications include pre-cooling milk to the pasteurization process. These chillers are built to withstand harsh environments at dairies (ambients from -20 ˚F to 95 ˚F) while still maintaining precise temperature control, with optional cooling capabilities all the way down to – 20 ˚F. Leaving fluid temperatures are 26 ˚F.

New to me but not to the market, Delta T Systems is an interesting Wisconsin-based manufacturer of variable speed process chillers able to provide tight temperature control to within ± 5 ˚F (˚C). Launched in 2017, their VS Series chiller line features variable speed hermetically sealed refrigeration compressors able to operate efficiently between 10% and 100% of rated capacity. Their marketing literature claims energy savings of up to 50% over traditional "fixed speed" chillers using hot gas bypass refrigeration regulation systems. The system features an electronic expansion valve and variable speed condenser fan regulated by refrigerant suction and condenser inlet temperature sensors. The standard operating range is from 0 ˚F to 80 ˚F (-18 ˚C to 27 ˚C) and pump capacity is from 2 to 72 gpm.

Conclusion

I hope this show roundup has provided readers with a glimpse of what was happening at the 2017 show with regards to vacuum, chillers and compressed air systems. The 2019 PROCESS EXPO is scheduled for October 8-11, 2019 at the McCormick Place Convention Center in Chicago, IL. For additional information, visit www.myprocessexpo.com. BP

To read more about ***Food Industry Applications,*** please visit www.airbestpractices.com/industries/food

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Gardner Denver Launches GDN2 Series for Nitrogen Generation

Gardner Denver, a leading innovator in the industrial equipment industry since 1859, has announced the launch of a line of nitrogen generators, the GDN2 Series. Safe, reliable, economical, and on-demand, these nitrogen generators are the ideal solution for many mission-critical applications. With seven purity levels and available output flows up to and over 18,000 scfh, the GDN2 Series can tackle any factory's nitrogen needs. Gardner Denver generators eliminate the risks related to nitrogen storage, reduce downtime through on-demand production and payback in one to two years.

In many applications, oxygen is the enemy. Oxygen can cause food to spoil, rubber to deteriorate and steel to rust. The best way to combat the negative effects of oxygen is to supplant it with nitrogen, considering the air is 78% nitrogen. With the launch of the GDN2 Series, factories now have an alternative to high-priced bottled nitrogen, typically providing significant financial savings with an ROI of 18 months or less.

The GDN2 Series of nitrogen generators use Pressure Swing Adsorption (PSA) technology. With this technology, a GDN2 Series unit can reach levels of 99.999% purity. GDN2 nitrogen generators have two adsorption chambers filled with Carbon Molecular Sieve (CMS). CMS separates oxygen and nitrogen by adsorbing the oxygen from the compressed air stream and letting the nitrogen pass. When operated within design conditions, and protected from contamination, CMS has a useful service life exceeding 10 years.

The GDN2 Series of nitrogen generators use Pressure Swing Adsorption technology.

Every GDN2 unit is American Made in southeast Michigan. In addition to guaranteeing a quality product, this location ensures a quick turnaround for any nitrogen generator orders. The GDN2 is also supported out of American locations. Therefore, wherever end-users are located, they will have superior availability for maintenance and replacement items.

For more information about the GDN2 Series, please visit www.gardnerdenver.com/industrials/about-us/news/gdn2-series-launched-(americas)/

About Gardner Denver

Gardner Denver (NYSE: GDI) is a leading global provider of mission-critical flow control and compression equipment and associated aftermarket parts, consumables and services, selling across multiple attractive end-markets within the industrial, energy and medical industries. Its broad and complete range of compressor, pump, vacuum and blower products and services, along with its application expertise and over 155 years of engineering heritage, allows Gardner Denver to provide differentiated product and service offerings for its customers' specific uses. Gardner Denver supports its customers through its global geographic footprint of 37 key manufacturing facilities, more than 30 complementary service and repair centers across six continents, and approximately 6,100 employees world-wide. For more news and information on Gardner Denver, please visit www.gardnerdenver.com.

Kaeser Industrial Screw Compressors Now Come with Sigma Control 2

Kaeser is a leader in industrial compressed air communications, and fully committed to providing solutions for Industrial Internet of Things (IIoT) connectivity in Smart Factories. As such, their breakthrough integrated compressor package controller, Sigma Control 2, now comes standard on Kaeser's full range of industrial belt and direct drive compressors, from 3 hp to 700 hp.

TECHNOLOGY PICKS

Kaeser's industrial screw compressors now come standard with Sigma Control 2 all the way down to 3 hp.

Kaeser's rotary screw compressor packages are equipped with a host of sensors for monitoring performance and health. These sensors feed data directly to the integrated Sigma Control 2 controller for data collection, analysis, and control. Additionally, the built-in Ethernet connection enables seamless integration into plant control/monitoring systems.

For more information, visit www.kaesernews.com/sc2. For more information or to be connected with your local authorized Kaeser representative, please call (877) 596-7138.

About Kaeser

Kaeser is a leader in reliable, energy efficient compressed air equipment and system design. We offer a complete line of superior quality industrial air compressors as well as dryers, filters, SmartPipe™, master controls and other system accessories. Kaeser also offers blowers, vacuum pumps, and portable gasoline and diesel screw compressors. Our national service network provides installation, rentals, maintenance, repair, and system audits. Kaeser is an ENERGY STAR Partner.

Atlas Copco Begins Production of MDG Rotary Drum Dryer

After years of testing and development, Atlas Copco, a leading provider of sustainable productivity solutions, will begin production of a groundbreaking new air dryer technology by the end of this year.

Unlike other dryers in the industry, the MDG rotary drum dryer is a revolutionary technology guaranteeing a stable pressure dew point (PDP) of -40 ˚F, at almost zero energy cost.

The MDG air dryers deliver cost-effective dry and oil-free air, with incredible power efficiency. They have a total power consumption below 0.2 kW in all operational conditions. Its simplified design takes up less floor space, has no heating elements, no blower and no loss of compressed air. With fewer moving parts, the dryer requires less maintenance, while offering more reliability than other dryers with -40 ˚F PDP performance.

"With the MDG dryers we now can provide the ultimate energy-efficient solution for customers who are looking for high quality of compressed air, and who are interested in the lowest total cost of ownership," said Philip Ernens, Atlas Copco Oil-free Air division's president.

For more information on the MDG rotary drum dryer, please visit www.atlascopco.com/en-us/compressors/products/air-dryers/desiccant-air-dryers/MD_ND.

The MDG rotary drum dryer guarantees a stable PDP of -40 ˚F.

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TECHNOLOGY PICKS

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and services focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries. In 2016, Atlas Copco had revenues of BSEK 101 (BEUR 11) and about 45,000 employees.

About Atlas Copco Compressors LLC

Atlas Copco Compressors LLC is part of the Compressor Technique Business Area, and its headquarters are located in Rock Hill, S.C. The company manufactures, markets, and services oil-free and oil-injected stationary air compressors, air treatment equipment, and air management systems, including local manufacturing of select products. The Atlas Copco Group, celebrating its 140th anniversary in 2013, is among the Top 100 sustainable companies in the world and a member of the Dow Jones World Sustainability Index. Atlas Copco has also been recognized by Forbes, Thomson-Reuters and Newsweek, among others, for its commitment to innovation and sustainability. Atlas Copco Compressors has major sales, manufacturing, production, and distribution facilities located in California, Illinois, Massachusetts, North Carolina, South Carolina, and Texas. www.atlascopco.us

VPInstruments Improves VPFlowScope DP

VPInstruments introduces several smart improvements on the VPFlowScope® DP. The VPFlowScope DP is the ultimate measurement tool for wet compressed air flow measurements. We incorporated three enhancements to make the flow meter even more robust to wet conditions.

The probe of the instrument is now of an all laser welded stainless 316 design. Filters have been improved. Furthermore, drainage is enhanced by enlarged ports and tubes. With these new features the VPFlowScope DP has even a higher quality, longer lifetime and lower maintenance requirements.

The VPFlowScope DP with its unique design, enables you to take measurements in the discharge pipe of a compressor under 100% saturated conditions. The VPFlowScope DP is thereby the perfect device for compressor efficiency monitoring.

The VPFlowScope DP enables you to take measurements in the discharge pipe of a compressor under 100% saturated conditions.

About VPInstruments

VPInstruments offers industrial customers easy insight in energy flows. We believe industrial energy monitoring should be easy and effortless, to enable insight, savings and optimization. VPInstruments products are recommended by leading energy professionals worldwide, and offer the most complete measurement solution for compressed air flow, gas flow and electric energy consumption. Our monitoring software VPVision can be used for all utilities, and enables you to see where, when and how much you can save. Our products can be found all over the world. We serve all industrial markets, for example; automotive, glass manufacturing, metal processing, food and beverage and consumer goods. We can also help your industry. Let us open your eyes and start saving energy. For more information, please visit www.vpinstruments.com.

ISA-60M Oxygen Monitor from ENMET

Maintaining the quality of breathing air in a Magnetic Resonance Imaging (MRI) facility is vital to the health and safety of patients, MRI technologists and hospital maintenance staff. MRI systems use compressed (liquid) helium, a nontoxic, odorless, colorless nonflammable gas, to cool down the superconductive magnets in MRI scanners. There is a potential risk of the helium being released from the MRI system. This can be due to equipment malfunction, power

TECHNOLOGY PICKS

outage or some form of extreme magnetic or vibrational disturbances. If helium escapes from the MRI system, helium gas can be released into the atmosphere of the MRI room, and will quickly displace oxygen, reducing the concentration of oxygen in the atmosphere to unsafe levels.

Reduced oxygen levels can cause fatigue, confusion and disorientation without individuals even being aware. If oxygen levels are further reduced, fatalities may result in minutes. This puts the technician, patients and anyone in or entering the MRI room in danger.

ENMET has been providing MRI facilities with oxygen deficiency monitors since MRI machines first came into use. Our ISA-60M oxygen monitor and alarm systems with remote MRI-5175 oxygen sensor transmitters have been installed in MRI facilities worldwide. The MRI-5175 is installed inside the MRI room and will continuously monitor oxygen levels, and communicate through a 4-20 mA output, plus RS-485, to the ISA-60M controller. The ISA-60M is mounted in the control room for MRI operators to observe during MRI scanning procedures.

If the oxygen in the atmosphere goes below unsafe levels, visual and audible alarms will indicate dangerous conditions and alert staff. When designing an MRI room, consider incorporating ENMET's ISA-60M with an MRI-5175 to provide more confidence in keeping patients and staff safe. Contact our ENMET Sales Team today for more information.

For more information on ENMET, please visit www.enmet.com.

The ISA-60M and MRI-5175 continuously monitor oxygen levels and communicate through a 4-20 mA output.

Aventics Smart Pneumatics Monitor Provides Gateway for IoT Solutions

Aventics Smart Pneumatics Monitor allows predictive maintenance and 100% machine uptime. The Aventics Smart Pneumatic Monitor (SPM) module provides the user with reliable information on the state of wear

The SPM acts as a gateway when used with the Aventics AES fieldbus system supplying information to a local IT network.

of actuators, valves and other devices, as well as the energy efficiency of pneumatic systems. This is done without the need to involve machine control. Predictive maintenance minimizes the risk of unplanned machine downtimes, and significantly lowers operating costs.

Together with the Aventics AES fieldbus system, the SPM module detects in advance when critical limits will be reached and provides users with the key information for early intervention. In addition, the sensor data collected via the I/O modules provides a multitude of other options to optimize other important areas. For example, the pneumatic systems' energy efficiency. In line with the IoT concept, the system records local data independently of the control. It prepares and supplies the information via standard interfaces wherever it is required, whether in a local IT network or in the user's cloud solution.

The SPM module features pre-installed analysis modules for condition monitoring and energy efficiency analyses allowing for the simple creation of individual analyses. It is easy to program using the supplied open source interface Node-RED.

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SPM basic equipment and connections:

- eSom/3517 with TI AM3517 32-bit ARM Corte @600MHz
- Linux OS with VPN and firewall
- Graphical interface for parameterization and programming
- Optional LTE modem (TSM, UMTS, HSPA)
- 10/100 Mbps Ethernet LAN, 10/100/1000 Mbps Ethernet LAN, USB 2.0, DVI/HDMI, RS232/RS485 bundled to RS422, real-time clock
- 12-24 VDC power supply
- Communication protocols: OPC UA Server, OPC UA Client, Modbus Master, Modbus Slave, MQTT, S7 RFC1006, cloud connectors: SPA, Microsoft Azure IoT

See additional information on Industry 4.0 on the Aventics Smart Pneumatics web page.

About Aventics

Aventics is one of the world's leading manufacturers of pneumatic components, systems, and customer-specific applications. The pneumatic engineering company provides products and services for industrial automation, additionally focusing on the sectors of commercial vehicles, food and beverage, railway technology, life sciences, energy, and marine technology. By integrating electronics, the use of innovative materials and prioritizing trends such as machine safety and the Internet of Things, Aventics is a pioneer in intelligent and easy-to-use solutions.

With over 150 years of expertise in pneumatics, Aventics employs around 2,000 associates worldwide. In addition to production sites in Germany (Laatzen), France (Bonneville), Hungary (Eger), USA (Lexington), and China (Changzhou), Aventics is represented in more than 90 countries through direct sales and dealers. The Aventics Group has received multiple certifications, including ISO 9001 and ISO/TS 16949 for quality, ISO 50001 for energy management, and ISO 14001 for environmental management. Further information is available at www.aventics.com/us.

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TECHNOLOGY PICKS

New EXAIR Digital Flowmeters

EXAIR's new Digital Flowmeters, with wireless capability, use a Zigbee® mesh network protocol to measure and monitor your compressed air use, trends, and historical data. Each meter has a range of 100' (30 meters), and transmits data to an Ethernet connected gateway. Each meter and gateway are configured for security, and have a 128-bit encryption for the wireless transmissions. Measuring compressed air is the first step toward identifying high compressed air use areas, compressed air leaks and optimizing air use.

Each meter ships with the wireless to Ethernet gateway, power supplies and installation tools. Compressed air monitoring is made easy by downloading the EXAIRlogger™ software for the Digital Flowmeters. With this software customers can graph the data, aggregate it to identify air use trends, or use it with other analytic software to effectively monitor air and save money. Airflow values are expressed in Standard Cubic Feet per Minute or Cubic Meters per Hour.

Digital Flowmeters with wireless capability for schedule 40 iron pipe are now available in sizes ½", ¾", 1", 1-1/2", 2", 2-1/2", 3" and 4". They are CE and RoHS compliant, and can also be ordered for schedule 80, 10S or Type L copper pipe.

For more information, visit www.exair.com/index.php.

EXAIR Digital Flowmeters have a range of 100 ft.

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Siemens Introduces Sinamics V20 Smart Access Web Server Module

Siemens announces the launch of its Sinamics V20 Smart Access web server module, designed to mount directly onto the drive, transforming a mobile device or laptop into a virtual operator panel for drive control. By providing a Wi-Fi hot spot, the wireless connection on this module facilitates setup, programming, commissioning, production monitoring and maintenance on a variety of machines and production equipment.

A simple, embedded graphical user interface (GUI) enables easy use of the Sinamics V20 in every phase of operation. No separate app is required, nor is a written operator manual needed. This makes operation of the new server module and subsequent drive control highly intuitive and easy-to-learn.

Smart Access provides convenient access to the Sinamics V20, up to 100 meters away, even when the drive is located in difficult-to-access installations. Utilizing WPA2 security, the web server module offers full flexibility with both iOS and Android operating systems. It also offers full flexibility with commonly used HTML5-capable web browsers, such as Chrome, Safari, Internet Explorer and others. A built-in, multi-color LED provides quick communication status readout. Security features enable limit/restrict operator access and control functionality.

In use, the Sinamics V20 Smart Access module requires only a few steps to set-up and no installation or download of additional software is needed. The onboard Quick Set-up Wizard provides users a fast and easy commissioning procedure. This enables all of the following: motor data can be entered and checked, connection macros for digital inputs/outputs can be activated, application macros can be selected and activated for pumps, fans, compressors and other devices plus the common and frequently used parameters on the drive can be set for motor start, acceleration, deceleration, min./max. speed, etc.

Smart Access allows monitoring of the drive status including speed, current, voltage, temperature and power, as well as drive servicing, with an overview of alarms, faults and individual values. Fault codes can be transferred via e-mail to a local service provider, while the immediate status of all digital and analog inputs and outputs can be checked at a glance. Parameter adjustment, motor test functions and full data back-up, storage and sharing with fast firmware downloads can all be accomplished via the web server.

Siemens Digital Factory (DF)

Siemens Digital Factory (DF) offers a comprehensive portfolio of seamlessly integrated hardware, software and technology-based services in order to support manufacturing companies worldwide in enhancing the flexibility and efficiency of their manufacturing processes and reducing the time to market of their products.

Siemens Corporation

Siemens Corporation is a U.S. subsidiary of Siemens AG, a global powerhouse focusing on the areas of electrification, automation and digitalization. One of the world's largest producers of energy-efficient, resource-saving technologies, Siemens is a leading supplier of systems for power generation and transmission, as well as medical diagnosis. With approximately 351,000 employees in 190 countries, Siemens reported worldwide revenue of $88.1 billion in fiscal 2016. Siemens in the USA reported revenue of $23.7 billion, including $5.4 billion in exports, and employs approximately 50,000 people throughout all 50 states and Puerto Rico. For more information, visit www.siemens.com.

Sinamics V20 Smart access mounts directly onto the V20 drive and transforms a mobile device or laptop into a virtual operator panel.

THE MARKETPLACE

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E.A. Nelson Company is looking for a Field Service Technician in the Florence, AL and Shoals area. Experience with rotary screw and reciprocating air compressors, and air dryers is preferable. Technician will travel to job sites performing routine compressor maintenance, troubleshooting and repairs. Must have strong electrical knowledge of three phase power, and ability to read schematics. Candidate must properly communicate with customers. Compensation will be determined based on experience. Competitive benefits and relocation expenses are available.

Please send resume to dfowler@eanelson.com. To learn more, visit www.eanelson.com.

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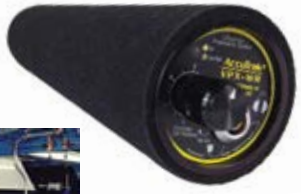

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