The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

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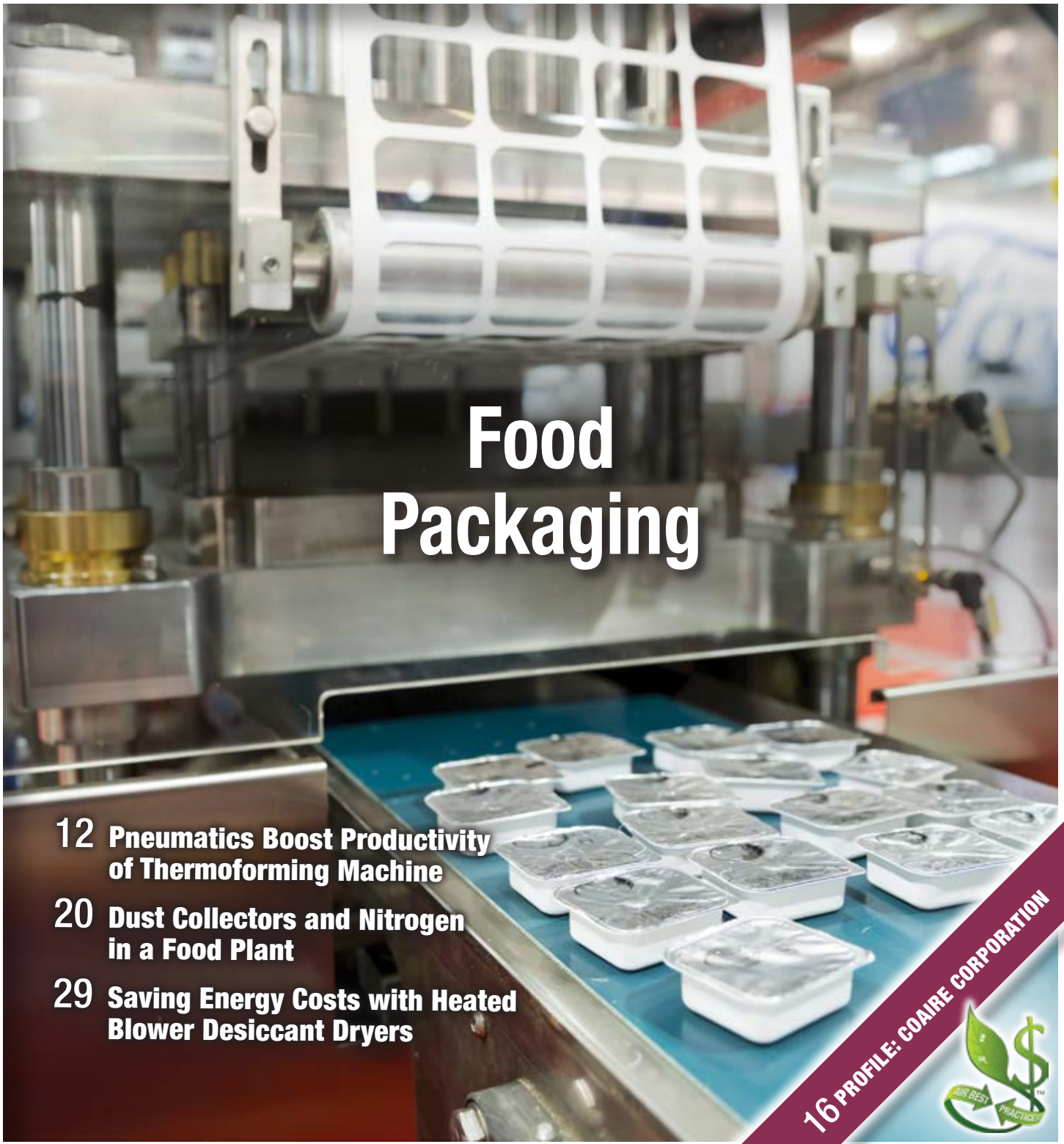
January/February 2019



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FROM THE EDITOR | Food Packaging

"Compressed Air Best Practices" can provide manufacturing plants with the following benefits and/or improvements: productivity, quality, reliability, and sustainability/efficiency. In an effort to package our content around end user benefits, we will try to categorize our articles this year in one of these buckets. While a project most often will tick off more than one of these boxes, let's see how it goes.

Our Productivity Feature focuses on the pneumatics on a Doroti Pack thermoforming machine. Aventics is a division of Emerson and their engineers helped Doroti Pack take advantage of some of the most modern advanced valve systems and pneumatic cylinders.

We have two Quality & Reliability feature stories. The first pertains to how they can be greatly affected by the presence of oil in compressed air. Oil-less scroll air compressors have gradually gained market share for this reason. They've long been used in the hospital market here and are now gaining share in industrial applications. We hope you enjoy our profile of Coaire Corporation, a manufacturer of scroll (and also rotary screw) air compressors.

Sometimes a system assessment needs to focus primarily on Quality & Reliability. This month, Hank van Ormer details a food plant he surveyed. We have extracted, from his report, how he reviews dust collectors and nitrogen systems – two very important parts of the process.

For our Sustainability & Efficiency Feature, Ron Marshall reviews "Lessons Learned" while auditing heated blower desiccant compressed air dryers. This is a useful article and starts with challenging each plant to re-examine whether or not they even need a -40°F (-40°C) pressure dewpoint for the entire plant – as opposed to 25% of the plant.

Sustainability & Efficiency is certainly tied to IoT and a plants' ability to take data from the compressed air system, make sense of it, and then take action. Mac Mottley, from Sparks Dynamics, provides a useful article on the types of data acquisition and then reviews rules-based actionable intelligence.

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

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INDUSTRY NEWS

Gardner Denver Acquires DV Systems

Gardner Denver Holdings Inc. a leading global provider of mission-critical flow control and compression equipment, announced that it has acquired DV Systems Inc., funded with cash on hand. Based in Barrie, Ontario, DV Systems is a leading manufacturer of rotary screw and piston compressors and associated aftermarket parts. DV Systems will be part of Gardner Denver's Industrials Segment.

"DV Systems is a Canadian market-leader with a history of innovative products, strong talent and excellent customer relationships," said Vicente Reynal, Gardner Denver's CEO. "This transaction is aligned with our strategy of leveraging core, mission critical technologies in attractive markets to drive ongoing profitable growth."

"We are very excited for DV Systems to be part of the Gardner Denver family," said Bogdan Markiel, DV Systems' CEO. "As part of Gardner Denver, DV Systems will be well-positioned to expand into new markets and expand the product portfolio that has made us a leader in the Canadian market."

About Gardner Denver

Headquartered in Milwaukee, Wis., Gardner Denver (NYSE: GDI) is a leading global provider of mission-critical flow control and compression equipment and associated aftermarket parts, consumables and, services, which it sells across multiple attractive end-markets within the industrial, energy and medical industries. Its broad and complete range of compressor, pump, vacuum and blower products and services, along with its application expertise and over 155 years of engineering heritage, allows Gardner Denver to provide differentiated product and service offerings for its customers' specific uses. Gardner Denver supports its customers through its global geographic footprint of 40 key manufacturing facilities, more than 30 complementary service and repair centers across six continents, and approximately 6,700 employees worldwide. For more information, visit www.gardnerdenver.com.

Atlas Machine & Supply Expands to Tennessee

Atlas recently announced its expansion into the greater Nashville area, which marks the company's seventh branch location.

The new facility meets the needs of existing and new customers in and around Nashville who purchase Sullair compressor products and related services. In addition to offices, the 3,400-square-foot facility includes a warehouse for parts storage and equipment inventory, plus a space for in-house compressor and dryer repairs.

About Atlas Machine & Supply

For over 110 years, Atlas Machine & Supply, Inc. has served manufacturers, hospitals, universities, and numerous other industrial facilities in Ohio, Kentucky, and Indiana.,,As one of the region's leading compressed air providers, Atlas is poised to assist with any compressed air system needs. For more information, visit https://atlasmachine.com/air, or contact Nashville Regional Manager Bret Jackson at (615) 431-2472.

Sauer Compressors Presence at Maryland Fleet Week

For employees of Sauer Compressors USA, the leading manufacturer of high-pressure air compressors to the U.S. Navy and its component commands, this year's Maryland Fleet Week and Air Show in Baltimore, Maryland, provided an opportunity to see a Mistral Series WP22L air compressor on the Military Sealift Command's newest expeditionary fast transport (EPF) ship, the USNS City of Bismarck (T-EPF-9).

The City of Baltimore held Fleet Week in October to celebrate the region's rich maritime

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— Bogdan Markiel, CEO, DV Systems

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INDUSTRY NEWS

The USNS City of Bismarck (T-EPF-9) visited the Port of Baltimore during Fleet Week 2018, providing Sauer USA employees a unique chance to see a Sauer air compressor onboard a Naval ship near its headquarters.

One of two WP22L compressors built for the USNS Bismarck at Sauer Compressors USA's factory just prior to shipping to Military Sealift Command.

heritage, and its role in defending the nation. Baltimore has long been home to one of the East Coast's most vital maritime ports. The Port of Baltimore handles 11 million tons of cargo every year, including break-bulk, containers, and automobiles. In addition, it is a major tourist attraction with Baltimore's Inner Harbor welcoming millions of tourists each year. Over a dozen U.S., Canadian, and British warships provided guided tours and demonstrations to thousands of residents at the event.

The USNS City of Bismarck, like its sister Spearhead-class ships, is designed to provide rapid intra-theater transport of military equipment and personnel. With its aluminum, twin-hull catamaran shell, and four powerful MTU 20V8000 M71L diesel engines, the ship can reach speeds between 35-45 knots, while carrying company-sized Marine Corps units and vehicles for naval re-supply, drug interdiction and humanitarian assistance operations.

The USNS Bismarck requires a shallow draft (less than 15 feet) while carrying a payload of up to 600 tons of equipment and personnel at a range of 1,200 nautical miles. To carry out its mission one of the most important factors in selecting propulsion equipment is weight. In particular, ship designers required an air compressor to provide the ship's starting air for the four diesel engines with a relatively light-weight and compact configuration.

For this integral role, Military Sealift Command selected Sauer Compressors' Mistral Series WP22L air compressor. It provides the ship's starting air by filling high-pressure air receivers rapidly. Like most Sauer Compressor models, the WP22L is designed to operate in the harshest Navy environments and meets all MILSPEC ratings for use on U.S. Navy vessels.

For the Military Sealift Command's Spearhead-class T-EPF program, Sauer USA designed and built WP22L air compressor packages and also maintains them. These two-stage, air-cooled air compressors are rated for 24/7 continuous duty, using direct-drive for optimum efficiency and lower maintenance intervals.

Headquartered in Stevensville, Maryland, just 35 miles from Baltimore on Kent Island in the Chesapeake Bay, Sauer Compressors USA, Inc. is the primary supplier of high and medium-pressure air and gas compressors for the U.S. Navy and the U.S. Coast Guard. With air compressor packages on the Navy's aircraft carriers, amphibious transports, guided missile frigates, destroyers, littoral combat ships, and submarines, the company's air compressors are deployed around the globe.

About Sauer Compressors USA

Sauer Compressors USA Inc. specializes in the manufacturing of medium and high-pressure air and gas compressors for naval, commercial maritime, offshore, research & development, and demanding industrial applications. In addition to air, Sauer Compressors is saturated in the CNG, N2, He, and inert gas markets. Sauer USA, located in Stevensville, Maryland, manufactures high-pressure compressors rated for continuous duty, all compressors have been field tested in the most demanding applications and extensively refined to provide true 24/7. With a reputation for reliability and life cycle product support, Sauer Compressors is the global leader in the medium and high-pressure compressor markets. For more information, visit www.sauerusa.com, or email sales@sauerusa.com.

INDUSTRY NEWS

Motion Industries Names New President

Motion Industries, Inc., a leading distributor of maintenance, repair, and operation replacement parts and a wholly owned subsidiary of Genuine Parts Company, announced the promotion of Randall (Randy) P. Breaux to President on December 12, 2018.

"Randy has an impressive history, having served in numerous management roles during his career," said Paul Donahue, Genuine Parts Company President and CEO. "His extensive experience in both industrial manufacturing and distribution, which includes his sales, marketing, and corporate background, make him an excellent choice to lead Motion Industries. We feel confident that we will continue to see great things from our talented and experienced Motion team under Randy's leadership."

Mr. Breaux was most recently Executive Vice President of Marketing, Distribution, and Purchasing for Motion Industries, and has nearly four decades of experience in the industrial manufacturing and distribution markets. At Motion Industries, he has played a key role in setting corporate direction, strategic acquisitions, growing supplier relationships, advancing marketing activities and most recently overseeing corporate operations. He joined Motion Industries in May 2011 following 21 years with ABB/Baldor Electric Company, a leading manufacturer of industrial electric motors, drives, and mechanical power transmission components, based in Fort Smith, Arkansas.

Motion Industries, Inc. promoted Randall (Randy) P. Breaux to President

Mr. Breaux joined Baldor in 1989, and held various sales and marketing positions in the company. Just prior to joining Motion, Baldor was acquired by ABB. At that time, he was promoted to Vice President of Integration by ABB, tasked with bringing the Baldor and ABB electric motor businesses together in North America. He served as Baldor's Vice President of Marketing from 2001-2011, played a key role in Baldor's acquisition of Dodge and Reliance Electric from Rockwell Automation in 2007, and served as an officer of the company for over 11 years.

About Motion Industries

With annual sales of $5 billion, Motion Industries is a leading industrial parts distributor of bearings, mechanical power transmission, electrical and industrial automation, hydraulic and industrial hose, hydraulic and pneumatic components, industrial products, safety products, and material handling. Through EIS, which joined with Motion Industries to form its Electrical Specialties Group in 2018, the company has broadened its offerings with process materials, production supplies, specialty wire and cable, and value-added fabricated parts for the electrical OEM, motor repair and assembly markets. Combined, total Industrial Group annual sales are approximately $6 billion.

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

Motion Industries is a wholly owned subsidiary of Genuine Parts Company (NYSE: GPC). Visit our website at MotionIndustries.com. Contact us toll-free at (800) 526-9328.

PRODUCTIVITY

PNEUMATICS BOOST PRODUCTIVITY of Doroti Pack Thermoforming Machine

By Daniel Math, Aventics

For more than 20 years, Hungarian-based Doroti Pack Ltd. has specialized in the production and servicing of state-of-the-art packaging machines. Their focus is on developing, manufacturing, producing and selling premium-quality packaging equipment, including their line of DorPack thermoforming machines which are often used for food products such as fresh meat, fish, dairy products, bakery ware, confectionery and ready-cooked foods. Dorati Pack chose to incorporate Aventics pneumatic components in latest thermoforming machine for optimal productivity and machine longevity.

Machines Engineered to Meet Unique Needs

Each DorPack thermoforming machine is individually designed to suit customers' special needs and product parameters. In addition to the main product line, the Doroti Pack engineers also developed a labeling system and other convenient accessories such as an automatic loading system.

Ranging in length from six meters to ten meters, DorPack thermoforming machines are energy-efficient and constructed in a stainless-steel design that is not only easy to keep clean

Doroti DorPack Thermoforming packaging machines are individually designed to meet the specific needs of customer and product parameters. Photo courtesy of Doroti Pack Ltd.

for hygienic operation, but is very simple to operate. The machines, measuring only one meter in width, are suitable for modified atmosphere packaging (MAP) where the atmosphere is usually a mix of carbon dioxide, nitrogen or oxygen. In addition, packaging can be done under vacuum, which extends the shelf life of the product by removing the atmosphere. This slows down the microbial deterioration of food, significantly extending the "best used by" date. Film widths for the thermoforming machines range from 420 to 600 millimeters (mm) to allow packaging for a wide variety of food sizes.

During use, the DorPack thermoforming machines perform many functions in rapid succession. Working with rolls of film material, the film transport chain inserts the film into the molding tool, with the tool clamps actuated by a pneumatic cylinder. The film is preheated and compressed in a chilled form with a vacuum or compressed air. The film absorbs the shape of the mold so that the packaging container tray is formed. The product is placed in the tray, which then goes into a second mold. This tool, also operated by a pneumatic cylinder, is then closed. With vacuum pumps, the machine can reduce the pressure to less than five mbar if needed to release the protective gas into the package, then the tray is wrapped with the top film. The product then goes to the labeling station where labels can be placed on the bottom or top of the package, sometimes printed on the spot. Next, the package is delivered to the cutting station, which is also operated by pneumatic cylinders, where it is appropriately cut and moved by a conveyor belt, which pulls the finished packages from the machine.

Pneumatics Address Food Packaging Requirements

For many years, Doroti has relied exclusively on pneumatic components and modules from

PNEUMATICS BOOST PRODUCTIVITY OF DOROTI PACK THERMOFORMING MACHINE

Aventics. As an industry sector specialist, the company knows the special requirements in the processing and packaging of food and beverages, which results in components suited for use in different hygienic zones for food packaging applications.

For its DorPack thermoforming machines, Doroti uses Aventics model PRA (ISO 15552 profile) pneumatic cylinders, fittings and accessories. The cylinders operate lifting devices and cutting devices vertically. The DorPack machines use between four and six PRA cylinders, depending on the customer's functionality requirements.

The PRA profile cylinder is capable of "ideal cushioning," providing optimized cycle times while reducing end-of-stroke "bounce," vibration and noise, all while providing a very long service life. Besides the benefits from ideal cushioning, Sandor Pallang, Owner of Doroti said, "The PRA cylinders offer good hygienic design, and no further sensor mounting is required because it fits into the cylinder profile. Based on our experience, the PRA family is also usually in stock and readily available."

With its most recent machines Doroti also started using the Aventics AV05 (Advanced Valve) system with AES (Advanced Electronics System), which offers additional Industry 4.0 capabilities that are becoming more important in the food and beverage sector.

Aventics' PRA profile pneumatic cylinders conform to ISO 15552 standards and are designed to reduce wear, noise and vibration. Photo courtesy of Aventics.

The AVENTICS AV05 Advanced Valve system can be configured online and features airflow up to 0.7 C_v. Photo courtesy of Aventics.

Designed specifically to cover a broad range of industrial automation applications, the AV series of directional control valves come in a compact housing made of high-performance polymers and provide flows up to 0.7 C_v (700 Nl/min). The valves can be controlled via D-Sub connection with 25 or 44 pins, AES valve electronics, or an integrated I/O-Link interface. The AES supports all common fieldbus and Ethernet protocols. If necessary, the smaller AV03 version with 0.3 C_v (300 Nl/min) can be integrated into the same valve manifold for applications requiring less flow, adding efficiency and saving on control costs.

The AV05 features a fast switching time of less than 13 milliseconds for all valve functions, so highly dynamic action is guaranteed for short cycles. The AV03's switching time is eight milliseconds. The AV series valves comply with IP65 protection, allowing the valve system to be installed in decentralized locations, even in environments exposed to splash water. Up to 128 coils and 10 I/O modules can be supported in one valve manifold. The valves on the DorPack machines control the cylinders, various formatting and welding processes, and other pneumatic systems.

Designed for Long Service Life and More

With a life expectancy of over 150 million cycles, the AV valves provide a long service life, and are easily adapted to an Industry 4.0 set-up if desired. For example, the AES controls easily interface with an IoT gateway or hub, such as the Aventics Smart Pneumatics Monitor, to provide data gathering and processing functionality. On request, this module can monitor the current energy consumption or the degree of wear on the pneumatic components, for example. Users can then

take the appropriate steps to optimize for increased energy efficiency, or to minimize machine downtime by analyzing component life expectancy data and practicing predictive maintenance before problems arise.

Doroti's design time for the components was reduced due to availability of online configurators. The configurators save time by easily providing the available options to be selected and arranged, including accessory items. The designer can then obtain an immediate part number for the entire factory-assembled and tested device, and get 2D/3D CAD files, illustration PDF, bill of materials, repair parts and more. The part number is loaded into the Aventics ERP system and is ready to build when the order is placed.

With the factory-assembled and tested AV05 valve manifolds being delivered ready for installation, Doroti saves time setting up its machines. In addition, the AES electronics with fieldbus connection for the valves ensures optimum communication between the controller, actuators and machine peripherals. The efficient communication reduces machine build time and troubleshooting.

The sophisticated automation design of Doroti Pack's machines enables operators to change over to different product sizes and types with one touch of a button. During a changeover, the machine controller sends the new operating parameters via AES to the AV05 valves. Immediately after the format switch, the machine accelerates to the maximum speed of 16 cycles per minute.

Success Builds Upon Success

Doroti and Aventics have a long-lasting business relationship, with a proven track record of efficient, durable packaging machines as a result. In addition, the need for preventive maintenance by the end-user has been minimal thanks to the reliability of the pneumatic components and other measures taken by the OEM. For example, Doroti equips the thermoformer on these machines with a double die to extend the time needed for die replacement. Careful design considerations such as these have made Doroti very successful in the packaging industry. BP

About Aventics

Emerson's 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.

About Emerson

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

For more information, contact Daniel Math, Sales Engineer, Aventics, email: daniel.math@aventics.com, or visit www.aventics.com/us.

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QUALITY & RELIABILITY

PROFILE: COAIRE CORPORATION and Oil-Less Scroll Air Compressors

By Mike Grennier, Compressed Air Best Practices® Magazine

➤ Compressed Air Best Practices® interviewed Sang Woo Lee, CEO of Coaire Corporation.

Good afternoon! Tell us about your background and how you got started in the compressed air industry.

I'm originally from South Korea. I moved to the United States in 1977 and served in the United States Army for six and half years. I eventually settled in Southern California in 1984. In 1986, I started a business that exported and imported Korean-made HVAC components, including scroll-type compressors for refrigeration. Over the next ten years, I learned a great deal about the advantages of scroll-type compressors in the refrigeration industry.

In 1997, I formed a three-way business partnership between myself, a fellow American, and a company in Korea called Kyungwon Century. Kyungwon at the time manufactured both rotary screw refrigeration compressors and rotary screw air compressor pumps under license from Svenska Rotor Maskiner (SRM), which is a Swedish rotary compressor pump designer and manufacturer.

In 1998, the Kyungwon refrigeration and air compressor divisions spun off from each other. The air compressor division became Coaire Technologies. At that time, I became majority shareholder of the Coaire Technologies. Ten years later, I became majority owner of Kyungwon and Coaire Corporation. Today, Coaire manufactures a full line of air compressors for industrial and commercial applications.

Sang Woo Lee, CEO of Coaire Corporation.

Why did you decide to become CEO of a company that manufactures air compressors?

I had enough experience with compressors used in refrigeration to see there was a lot of area for growth, particularly with scroll technology given that its an oil-less air compressor in addition to its efficiencies, noise level and ability to offer customers longevity. I also liked that Coaire has a long history of innovative air compressor technology. In 1968, it became the first Korean company to develop and manufacture a reciprocating air compressor. Later, it became the first Korean manufacturer of rotary screw air compressors, which occurred after it established ties with SRM to develop unique airend technology.

Since 2006, we've more than doubled the size of the manufacturing operation located near

Seoul and we've grown to the point where we now sell air compressors throughout the world using numerous production sites.

Describe Coaire's U.S. operations and how it supports customers here.

Since the late 1990s, we began assembling rotary screw air compressors at our facility in Southern California. We continue to maintain an inventory there of oil-less rotary scroll and oil-injected rotary screw compressors ready for shipment, as well as an extensive inventory of replacement parts and components.

Due to continued growth in U.S. sales, we're opening our U.S. headquarters operation in Arlington, Tex., in early 2019, where we will partially assemble air compressors.

The Arlington location is also home base for our sales group that provides sales and service support to customers throughout the United States, Canada and Central and South America. Roeland Meyer, Coaire Director of Sales, has played a key role in our success here in North America. He's been with us from the beginning and we're fortunate to have him on our team given his extensive sales experience in the compressed air industry, which dates to 1975.

Please tell us about Coaire's products and your primary focus in the marketplace.

We're focused on delivering clean compressed air for diverse applications in a wide range of industries. It's why we offer oil-less and oil-free technologies.

We offer our CSOF-Series of oil-less scroll air compressors in four models that range from 3 to 50 horsepower (hp). They are available as enclosed packages with a dryer, filter, and receiver tank integrated into one unit, as well as un-enclosed base-mounted units. These air compressors are ISO 8573-1 Class 0 compliant when incorporated with appropriate filters and air dryer.

In addition to providing oil-less air, these units are extremely quiet. Our 3 HP scroll compressors, as an example, are rated to keep sound as low as 49 dBA. This belt-driven line also includes units with anywhere from two to 10 air compressors in one package, which allows for flexibility of operation in addition to optimizing the life span of the compressors. We offer these packages in sizes ranging from 3 to 50 hp.

In keeping with our goal of providing clean compressed air, we offer our CAF Series of oil-free rotary screw air compressors that range from 50 to 400 hp. We offer belt-driven models for smaller rotary screw models. We also provide a Variable Speed Drive (VSD)

The CSOF Series of oil-less scroll compressors are available as enclosed, complete packages to provide oil-free air with minimal noise.

PROFILE: COAIRE CORPORATION AND OIL-LESS SCROLL AIR COMPRESSORS

option. Our rotary screws from 30 horsepower up use direct drive.

Our other main product line is our CAS Series of oil-injected rotary screw air compressors, which range from 30 to 400 hp. We offer two models, including our direct-driven CAS S air compressor, and our variable-speed drive CAS V machine.

We worked with Sweden-based Svenska Rotor Maskiner to design the CAS line of air compressors with our "alpha" profile airend. With this airend, we've reduced the size of the blowhole and eliminated friction between rotors, which in turn, reduces noise level and vibration. The thermal efficiency of the profile is also 9% higher than a conventional profile airend. The end result is a higher level of reliability and long life expectancy.

Please explain why Coaire offers oil-free and oil-less air compressor technologies.

Modern oil-free rotary screw air compressors use pressurized oil to lubricate the rotor shaft bearings, which by design, means there is a very small possibility of oil contamination migrating into the compression chamber.

An oil-free rotary screw air compressor with variable speed drive is typically higher in purchase price than an oil-less scroll air compressors, but these units offer greater duty cycle, plus they deliver a higher volume of air than scroll-type air compressors. However, screw air compressors may not be suitable for many critical applications given the requirements for oil-free air, such as those found throughout the medical industry.

On the other hand, an oil-less scroll air compressor uses sealed, greased bearings located completely outside the compression chamber so there is little to no possibility to contaminate the compression chamber and compressed air with oil. A packaged

Coaire's CAS oil-injected air compressors feature an "a" profile airend, engineered for reliability and quiet operation at high speed.

unit with multiple scroll compressors also offers redundancy, which is essential in many applications. They also go a long way toward achieving energy savings with the use of sequencing control because the unit sequences the start up of the series of air compressors, which minimizes the in-rush or starting electrical current and diminishes the impact of peak load.

Where do you see growing demand for redundancy in air compressors and oil-free air?

Like other companies we see growth in the medical and pharmaceutical industries, which is why oil-less scroll air compressors are preferred if not required. Healthcare facilities in particular design their compressed air systems around the NFPA 99 (National Fire Protection Agency) Standard for Healthcare Facilities (2005 Edition). NFPA 99 defines a medical air compressor in part as a compressor that is designed to exclude oil from the air stream and compression chamber.

Given the current NFPA code and the advantage of built-in redundancy, it's easy to see why a small scroll air compressor package with multiple compressor pumps is an attractive option to a healthcare facility. The demand for compressed air in hospitals also varies throughout each 24-hour period. The ability to bank multiple small air compressors with anywhere from 3 to 50 hp compressors offers the ability to closely match air demand by turning off unneeded air compressor horsepower, which is yet another distinct advantage because it saves energy.

Are you developing products to capture growth opportunities like these?

Yes. In fact, we're now rounding out our oil-injected rotary screw air compressors with small models ranging from 5 to 25 HP. We call these our "mini-screw" air compressors. In addition to medical applications there is increased demand for rotary-type air compressors in a wide range of industrial applications that require compact units in the 5 to 25 hp range. In addition to the need for compact packaging, we're seeing that sound quality and low maintenance, along with high quality compressed air, are desirable features in many markets.

It sounds like you've got a lot of exciting things going on at Coaire.

We definitely do. The market timing is right for us to accelerate our efforts with new and improved products that provide efficiency, ease of maintenance and long-term reliability. Some of the products on the near horizon include a new 10 hp oil-less scroll air compressor, as well as a compressor management system and an energy management system. These types of products lead us to our primary goal, which is to help distributors become energy management leaders since selling air compressors might not be enough to succeed in today's business environment.

Thank you Coaire for your insights. BP

For more information, please contact Roeland Meyer, email: roelandm@coaire.com; tel: 817-600-7038, or visit www.coaire.com.

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QUALITY & RELIABILITY

Reviewing Dust Collectors and Nitrogen in a FOOD MANUFACTURING PLANT

By Hank van Ormer, Van Ormer Consulting

This major food manufacturing plant in the Midwest uses compressed air and onsite nitrogen generation to operate multiple snack production and packaging lines. The plant spends an estimated $430,344 annually on energy to operate its compressed air system based on an average rate of 4.5 cents per kWh.

Projects focused on the demand side of the compressed air system at the food packaging operation allowed the plant to reduce its compressed air flow by 689 scfm for an annual energy cost savings of $54,671. The airflow reduction projects addressed open blows, the repair of nitrogen leaks and the use of air vibrators to keep product moving.

Due to space constraints, this article will show the reader observations our team made on the compressed air demand side of the system and provide insights into these airflow reduction measures.

Compressed Air System Assessment

The plant operates two compressor rooms with its Core Room providing compressed air for the plant's production area and a nitrogen generation pressure swing adsorption (PSA) unit, while the second room supplies air to the bakery operation.

The compressed air system in the Core Room consists of three 250-hp oil-free, fixed-speed rotary screw air compressors, which are piped together with two 400-hp, oil-free Variable Speed Driven (VSD) driven rotary screw air compressors. The five units collectively send their compressed air to two large pneumatic refrigerated dryers.

The bakery compressor room has two 250-hp, oil-free rotary screw compressors with split-stream HOC (heat-of-compression) "drum" type compressed air dryers built into the package.

The compressed air systems in both rooms operate 8,600 hours per year. The load profile (or air demand) of the system is relatively stable during all shifts. Overall system flow ranges from 4,000 scfm to 6,200 scfm with an average flow of approximately 5,200 to 5,500 scfm.

As shown in Table 1, the average system flow for the Core Room is 3,627 scfm with an average air compressor discharge pressure of 105 psig and an average system pressure of 93 psig. Total input power for the Core Room is 748 kW with specific power of 4.85 scfm/kW.

The electric cost of compressed air per unit of flow is $79.81/scfm per year and the cost for air per unit of pressure is $1,447.38 psig per year. The annual cost of electricity for the Core Room per year is $289,476.

The average system flow for the bakery compressor room is 1,968 scfm with an average air compressor discharge pressure of 90 psig and an average system pressure of 80 psig. Total input power for the bakery is 364 kW with specific power of 5.40 scfm/kW. The electric cost of compressed air per unit of flow is $71.58/scfm per year and the cost for air per unit of pressure is $704.34 psig per year. The annual cost of electricity for the bakery compressor room per year is $140,868.

Combined, the annual cost of compressed air for the plant's production area and bakery operation is $430,344.

An analysis of air compressor use shows the units in both areas of the plant function quite well. As is often the case when making compressed air assessment, our team finds that an air compressor might be using 100 percent of its rated kW capacity but providing much less airflow than required. This is not the case at this food plant as shown in Table 2 since actual demand in airflow (load) matches the units' electrical consumption.

Dust Collector System Review: A Must at Food Plants

It's always important to analyze dust collectors in any food plant. In this plant, we reviewed compressed air use for twelve dust collectors and found the feeds to be well sized, and each had sufficient storage between it and the collector. Demand controls were also working well and the bags are sloughing off properly. Additionally, the units were not running on timers but there were no problems pulling low pressure in surrounding lines and also low pressure to the collector.

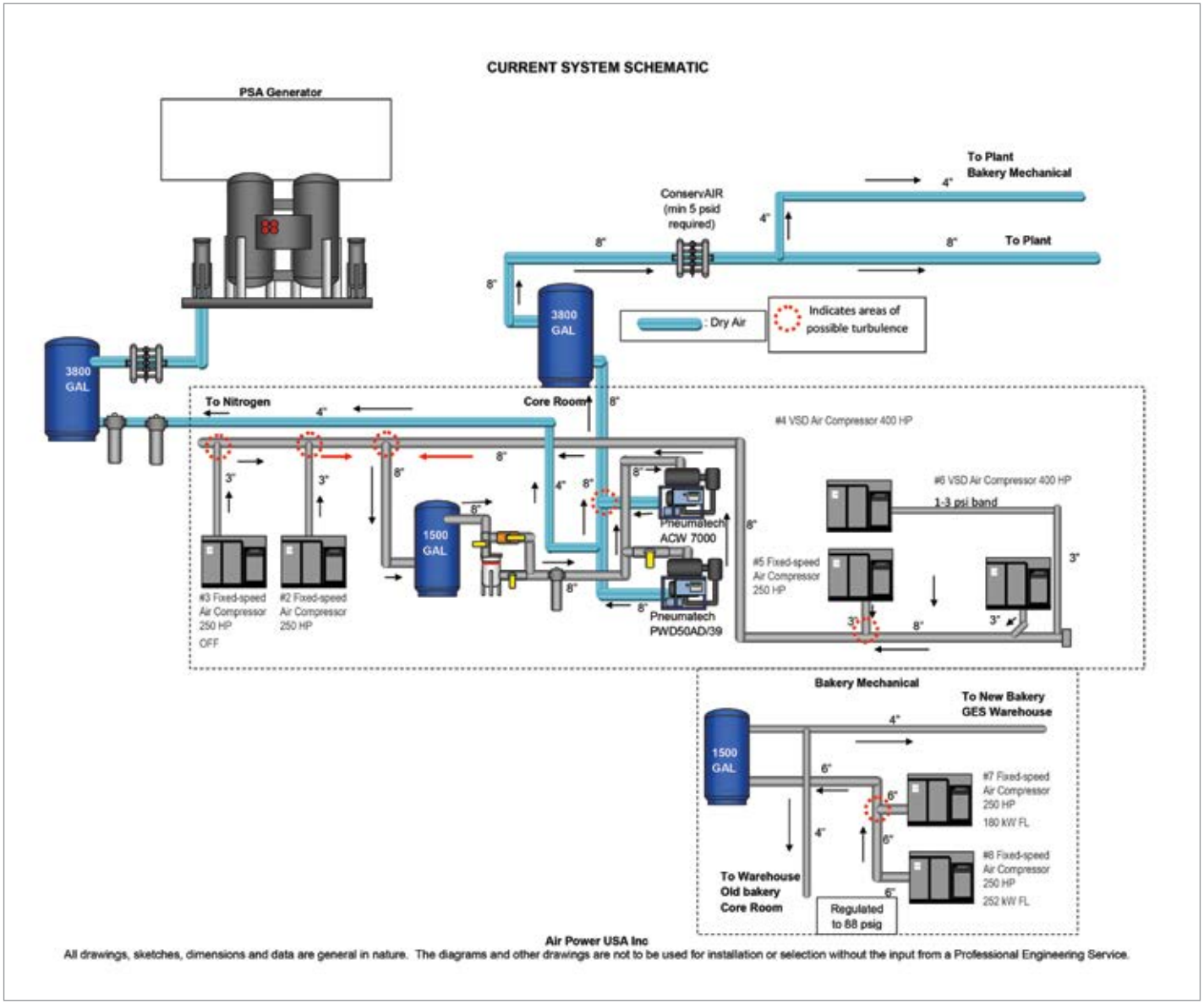
REVIEWING DUST COLLECTORS AND NITROGEN IN A FOOD MANUFACTURING PLANT

In a typical pulse jet dust collection system, the dust is collected on the bag or fingers and when the cake of dust is of appropriate thickness and structure – a pulse or pulses of compressed air – is used to hit or shock the bag and knock the cake off. When the cake is removed correctly from the dust collector, the system removes dust from its assigned environment and has a normal bag life. When the cake is not removed effectively, the dust collector does not remove dust effectively from its assigned environment and bag life can be significantly shortened.

When the feeds and installation are operating properly, the dust collector air usage will operate with less overall demand and better performance with a demand controller. The demand controller, when used without proper compressed air feed conditions, may use more air and decrease bag life and performance.

Proper operation of dust collectors is critical to minimizing cost and maximizing system effectiveness. There are many sizes and most, if not all, use a pulse of compressed air controlled by a timer. Operators set the timers based on appropriate settings for proper cake removal and bag life.

Dust collection system designs specify the air inlet pressure to the manifold and pulse valves necessary for effective dust removal.



The food packaging plant's compressed air system is comprised of two compressors rooms designed to supply air to production and bakery areas.

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REVIEWING DUST COLLECTORS AND NITROGEN IN A FOOD MANUFACTURING PLANT

The pulse valve sends a given volume or weight of air to the bag at a predetermined velocity to strike and clear the cake. The actual amount or weight of air is dependent upon the pulse nozzle being fed compressed air at a pre-determined and steady pressure.

The dust collector must receive the correct pressure (or close to it) and a steady repeatable pressure level for each pulse, particularly if timers are used to control the pulses. The operator may experiment to find the "right timing sequence" at a desired feed pressure. But if this pressure varies, then performance may not be satisfactory.

A problem that often occurs usually comes from the pulsers hitting the bag when the cake is not ready to flake off, or the cake has gone too long between pulsing and grown too thick and heavy to clean effectively. This causes not only short bag life, but also very poor performance. There are usually several basic causes for this:

- Incorrect timer settings for the operating conditions. The actual requirement for the optimum timer setting may well change as various product runs change or even based on seasonally. These settings have to be set carefully to begin with and monitored regularly.
- Lack of sufficient storage or compressed air supply near the inlet manifold to supply the required pulse air without collapsing the inlet pressure. With too low an inlet pressure, the mass weight of the air pulse is too low, which then becomes ineffective in removing the cake.
- Too small a feed line to the dust collector will have the same effect as lack of air supply.
- Too small, or incorrect regulator, which is unable to handle the required "rate of flow" required by the dust collectors.

All of these situations cause restricted airflow. They occur because, prior to the installation or prior to some operational change, the proper "rate of flow" was not identified for the dust collection action. Feed line sizing, regulator sizing, and air supply all require

TABLE 1: COMPRESSED AIR SYSTEM CHARACTERISTICS

MEASURE	ALL SHIFTS CORE ROOM	ALL SHIFTS BAKERY
Average System Flow	3,627 scfm	1,968 scfm
Average Compressor Discharge Pressure	105 psig	90 psig
Average System Pressure	93 psig reg.	80 psig reg.
Input Electric Power	748 kW	364 kW
Annual Operating Hours of Air System	8,600 hrs	8,600 hrs
Specific Power	4.85 scfm/kW	5.40 scfm/kW
Electric Cost for Air /Unit of Flow	$79.81 /scfm yr	$71.58 /scfm yr
Electric Cost for Air /Unit of Pressure	$1,447.38 /psig/yr	$704.34 /psig/yr
Annual Electric Cost for Compressed Air	$289,476 /year	$140,868 /year
	$430,344 /year	

Based upon on a blended electric rate of $0.045 per kWh and 8,600 hours/year.

TABLE 2: COMPRESSED AIR USE PROFILE

UNIT #	COMPRESSOR MANUFACTURER/MODEL	FULL LOAD		ACTUAL ELEC DEMAND		ACTUAL AIR FLOW	
		DEMAND (KW)	AIR FLOW (SCFM)	% OF FULL KW	ACTUAL KW	% OF FULL FLOW	ACTUAL SCFM
Core Room All Shifts: Operating at 105 psig discharge pressure for 8,600 hours							
2	250 HP Air Compressor	191.26	984	65%	125	61%	608
3	250 HP Air Compressor	191.26	984	100%	193	100%	984
4	400 HP/VSD Air Compressor	327	1524	OFF			
5	250 HP Air Compressor	191.26	984	100%	200	100%	984
6	400 HP/VSD Air Compressor	350	1524	67%	230	69%	1051
			TOTAL (Actual):		**748 kW**		**3,627 scfm**
Bakery All Shifts: Operating at 90 psig discharge pressure and 8,600 hours							
7	250 HP Air Compressor	181.45	984	100%	182	100%	984
8	250 HP Air Compressor	181.45	984	128%	182	100%	984
			TOTAL (Actual):		**364 kW**		**1,968 scfm**
			SYSTEM TOTAL (Actual):		**1,112 kW**		**5,595 scfm**
System specific power = 4.71 scfm/kW							

an identified "rate of flow." The "average flow rate" cannot be used.

"Flow rate" is the average flow of compressed air in cubic feet per minute either required by a process or delivered to the system. "Rate of flow" is the actual rate of flow of compressed air demand in cubic feet per minute. Even relatively small air demands in cubic feet can have a very high "rate of flow" if they occur over a very short time period. Dust collectors have this characteristic.

The sequence controllers can have a very significant impact on the required "rate of flow." For example, a dust collector system with six pulsing valves can use 3.5 cubic foot (cu. ft.) over one-half second for each pulse.

The impact of these two different "rates of flow" would show similar differences in regulator sizing, etc., if they were used on the feed line flow. The high flow velocities entering the manifold and controls for the pulse valves will create extra pressure loss through the balance affecting the performance of the pulse cleaner. The same sort of effect would show up in air receiver sizing to minimize system and feed line pressure drop if that is a question.

Quality Pressure Gauges Recommended

We typically recommend a quality pressure gauge be installed near the dust collector entry for every feed line. Observe the pressure gauge, which the pulser hits. If the pressure drop is too high (over 10-20 psig), start looking for the cause. Get the specification on the dust collector, cfm per pulse, feed line pressure time per pulse, cycle time between pulses, etc. Then calculate the rate of flow, check line size and storage to determine if more storage is needed.

Significant amounts of air (10 to 15 cfm or more) can be lost when the control diaphragm

REVIEWING DUST COLLECTORS AND NITROGEN IN A FOOD MANUFACTURING PLANT

and/or connections fail. Such leaks are very difficult to find and repair.

Proper sizing and installation of appropriate storage for dust collectors offers opportunities to convert high volume short-term demand to lower average rate of flow. The regulator should be installed after the receiver whenever a short high demand pulse is not required (less than one minute).

Adding appropriate storage may not only be a direct energy issue but one of air quality. Proper control of the dust collectors will protect surrounding systems from falling pressure at nozzle blow. This should also enhance the dust collector performance and extend bag life. Dust collectors are a significant source of leaks that are hard to detect. Often the pulse control diaphragms leak. An electronic airflow alarm can signal this problem visually and remotely.

After the system is stabilized and reconfigured, review each dust collector operation to ensure proper bag sloughing, working demand controls, and ensure there no negative effects on adjacent equipment.

Addressing Open Blows, Achieving Optimal Blow-Off

An audit and thorough evaluation of the compressed air systems in both areas of the plant revealed the ability to reduce airflow by several means. One project involved the repair of open blows.

Turbulent compressed air blasts straight out of a given pipe or tube. It not only wastes huge amounts of compressed air, but also violates Occupational Safety and Health Administration (OSHA) noise and dead-ended pressure requirements. Air jets and air flow-inducing nozzles used in place of open blows can reduce noise level, lower compressed air use, and most often improve blow-off operation in both productivity and quality.

The plant installed appropriate Venturi amplifiers and controls. It also began clearing more holes with mechanical means and reducing the use of blower-supplied air for clearing. The corrective measures reduced airflow demand by 305 scfm and the amount of energy consumed by 539,644 kWh for an annual savings of $24,284.

There are a number of air-jets and airflow-inducing products available. A test of one nozzle may vary somewhat from another nozzle of the same manufacturer, but not significantly. Here are important points to remember:

- In blow-off, thrust from pressure (psig), is required to loosen the objects to be removed.
- Thrust dissipates very rapidly once the air has left the "blow-off" device.
- In blow off, volume of total air (cfm), compressed air plus induced air, is critical to carrying the blown-off material away within the air stream.
- Use expensive compressed air only as a last resort; mechanical, hydraulic, etc., will always be more energy economical and often safer.
- All blow-off air should be regulated to the lowest effective pressure. Higher

VENTURI INDUCER NOZZLES IN PLACE OF OPEN BLOW

	LOCATION	QTY	TYPE/ SIZE	UTILIZATION % WHEN LINE IS RUNNING	UTILIZATION % WHEN LINE IS NOT RUNNING	CURRENT APPLICATION		PROPOSED APPLICATION			NET SAVINGS (CFM)
						AIR FLOW CAPACITY (CFM)	NET USAGE (CFM)	RECOMMENDED VENTURI NOZZLE	AIR FLOW CAPACITY (CFM)	NET USAGE (CFM)	
1	Air bar / Feed from 1 side / at TC3 seater	1	3/4 air bar	100%	100%	40	40	Mechanical brush	0	0	40
2	curl 6' long pipe Measured 100 scfm	1	3/4	100%	0	165	40	Blower	0	0	140
3	bottom of belt	1	1/2 bar from 10' long, 3/8 hose	100%	100%	40	40	Mechanical brush	0	0	40
4	at sheeter blow off bottom of brush	1	5' air bar	100%	0	41	35	Clean mechanical	0	0	35
5	PC Seasoning	6	Blow off	45%	0	200	500	Blower	0	0	50
6	Packaging bar	20+	Air bar	100%	0	118	100	5-7 scfm each per bar, reduce holes to only over product			100
TOTAL											305

Shown is the application of Venturi inducer nozzles and the cfm savings for each application.

pressure means higher flow, which may not be needed; higher-pressure air costs more to produce. Blower pressure air is cheaper.

- Use Venturi air amplifier nozzles whenever and wherever possible – properly selected and applied for needed thrust and volume, this will usually reduce blow-off air at least 50%, freeing up more air flow for other more valuable applications.
- All blow-off air should be shut off (automatically) when not needed for production.
- When blower-generated air is available or apparently economically feasible, always compare the net energy cost to alternatives.

Better Nitrogen Control, Better Air Vibration Method

A second airflow reduction project focused on the plant's use of nitrogen (N_2) as applied on most of its bagger systems, except for one product. The team observed 20 baggers in one area.

Nitrogen is generated on site with a 580-scfm maximum generator with automatic controls. Liquid N_2 is used as backup. Nitrogen use is 320 to 350 scfm of N_2. The purity level is 99.7 to 99.8 percent. Average compressed to N_2 generation ratio is about 5 to 1. Every 350 cfm of N_2 requires an average flow of 1,750 scfm, plus about 1,500 or more purge air every 60 to 65 seconds. Often when the line is stopped the N_2 is still running. During a site visit, approximately seven baggers were left on with the line not running, which amounted to 3 to 20 cfm of air each.

The plant implemented automatic shut off controls to address the issue. It turns off N_2 when it's not required. It also installed control valves to regulate the amount of N_2 used. The corrective measures reduced airflow demand by 300 scfm and the amount of energy consumed by 530,800 kWh for an annual savings of $23,886.

Finally, the plant implemented a better method of using air vibrators to keep product or packaging moving or separated, e.g., keeping lids separated prior to sealing. If a plant employs air vibrators that use about 10 cfm each, they will require about 2.5 hp or more to produce the same as a similar electric vibrator, which might use about 0.25-hp input energy. The corrective measures reduced airflow demand by 84 scfm and the amount of energy consumed by 144,480 kWh for an annual savings of $6,501.

Conclusion

The food packaging operation achieved its main objective of implementing cost-effective methods to reduce demand for compressed air in key production areas and the plant bakery – and saved costs in the process. The operation continues to assess and implement methods to further reduce demand for compressed air and improve its supply operation to achieve additional savings. BP

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SUSTAINABILITY & EFFICIENCY

LESSONS LEARNED: SAVING ENERGY COSTS with Heated Blower Desiccant Dryers

By Ron Marshall, Marshall Compressed Air Consulting

Experienced auditors become wary when they see desiccant dryers installed in customers' plants. These dryers are required when a plant needs instrument-quality compressed air, or when compressed air piping is exposed to freezing temperatures. However, while desiccant dryers can gain this level of quality, the energy cost of stepping up from a dewpoint of 35 ˚F to a level of -40 ˚F increases quite considerably. To attempt to reduce the energy costs of drying to these low levels, heated blower desiccant styles may be used. This article describes three common desiccant dryer types, as well as some experiences, good and bad, with heated blower types.

Types of Desiccant Dryers

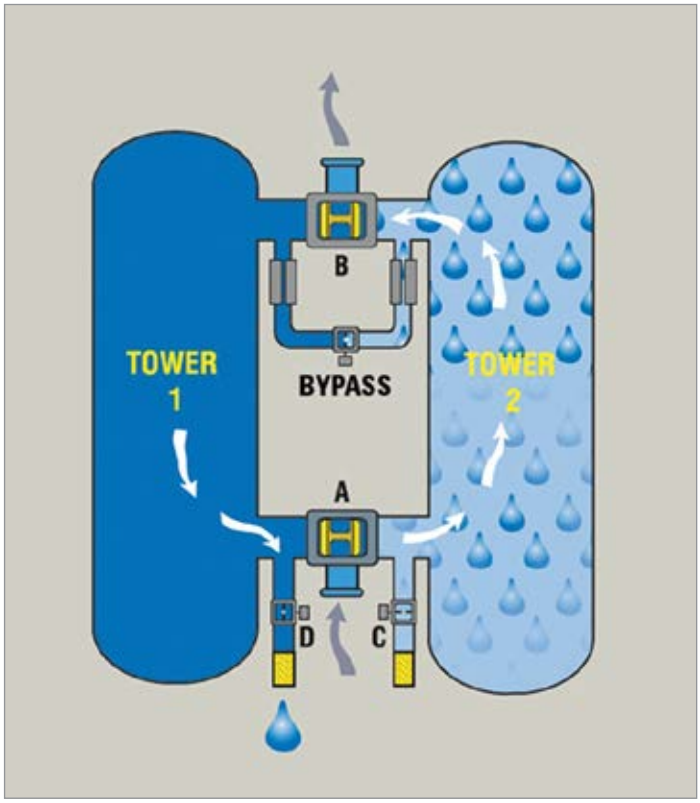
Before discussing heated blower dryers, it's important to review common types of desiccant dryers starting with the heatless style, which is the simplest type. There are other less common desiccant styles, but this article will not discuss them.

All typical desiccant dryers have two pressure vessels filled with desiccant beads and a system of controlled valves that directs the compressed air flowing through the dryer through one or the other vessel. The desiccant beads only have a certain capacity for removing water vapor from the compressed air (adsorption) before they become saturated. Once they reach capacity, the moisture must be removed from the beads in a regeneration cycle, or the dryer will fail to do its job in removing enough water to pull the compressed air dewpoint down to low levels.

Just before desiccant capacity is reached, the dryer is designed to switch the flow of compressed air to the other regenerated vessel full of desiccant and to start the regeneration process on the saturated bed of desiccant. To regenerate the desiccant, the vessel being processed is blown down to atmospheric pressure, and a flow of already dried compressed air is passed through the beads. When this dry compressed

A heated blower style desiccant dryer takes up considerable floor space, but the use of ambient air for purge saves energy. (The surrounding dust hints at problems to come.)

LESSONS LEARNED: SAVING ENERGY COSTS WITH HEATED BLOWER DESICCANT DRYERS



A typical heatless dryer. (Source: Compressed Air Challenge.)

air is expanded to atmosphere, its dewpoint falls considerably, allowing it to better remove the adsorbed moisture from the saturated beads. This cycle operates on a typical 10-minute cycle, with the towers alternately drying and regenerating. This regeneration process on a fixed-cycle dryer will consume about 15 to 20 percent of the dryer flow rating.

It is important to understand that the purge is 15 to 20 percent of the *rating of the dryer,* not the flow going through it. This makes a difference if the dryer is lightly loaded, for some reason. This means if the dryer is only half loaded, for example, a fixed-cycle desiccant dryer will be consuming not 15 to 20 percent of the average flow, but 30 to 40 percent. It is very common to find facilities where the dryer is consuming most of the compressed air the air compressors produce. This makes a compressed air auditor very suspicious of desiccant dryers.

Because this purge consumption robs the air compressors of capacity, designers of the past came up with different versions of desiccant dryers that use less air, one of which is the externally heated purge style. Similar to the fixed-cycle heatless dryer, some already dried compressed air is used to regenerate the desiccant, but by first running the air through an electric heater and then sending through the saturated bed.

This change in design allows a smaller flow of compressed air to be used, about 7.5% of the rating of the dryer, freeing up more compressed air to be used to feed compressed air demands, and reducing the overall electrical operating cost. This type of dryer is slightly larger than a heatless design, but operates on a four-hour cycle.

Further design developments produced the heated blower style of dryer. It uses blower-powered ambient air passed through a heater element to provide hot regeneration air to condition the desiccant. This dryer does not use compressed air for the regeneration process, allowing all of the compressed air produced by the air compressors to pass through to feed plant demands. There is, however, a cooling flow that needs to be considered.

The problem is that very hot desiccant does not remove moisture from compressed air. Therefore, when heated style dryers finish the heating cycle, an amount of compressed air is passed through the desiccant to remove the heat. In externally heated dryers about 7.5% of the rating of the dryer flows during the cooling cycle, typically lasting about one hour of the four-hour cycle. For heated blower style dryers the cooling purge is usually specified as 2% of the dryer rating, but here we need to read the fine print. This 2% is actually a flow of 8% for one hour every four hours for an average of 8%. This 8% may have unintended consequences during peak demand periods where air compressors are at maximum capacity, possibly requiring additional air compressor capacity.

Newer designs of blower style desiccant dryers use a built in closed-cycle cooling loop where the blower recirculates the internal air through the desiccant to remove the heat, there is no compressed air cooling. In this design there will be some sort of heat exchanger built into the loop using ambient air, or cooling water to remove the heat.

Typical Operating Costs

Since compressed air is expensive to generate, the cost of using it to generate a purge flow is high. In addition, if 15 to 20 percent is coming off the top of your air compressor's capacity you will need to purchase 15 to 20 percent larger air compressors for the same compressor room flow output. The use of heaters, and lower levels of compressed air for regeneration, frees up more air compressor capacity and results in lower operating costs.

For example, the following table is an estimate of the cost of operating the four types of dryers in fixed-cycle mode, fully loaded:

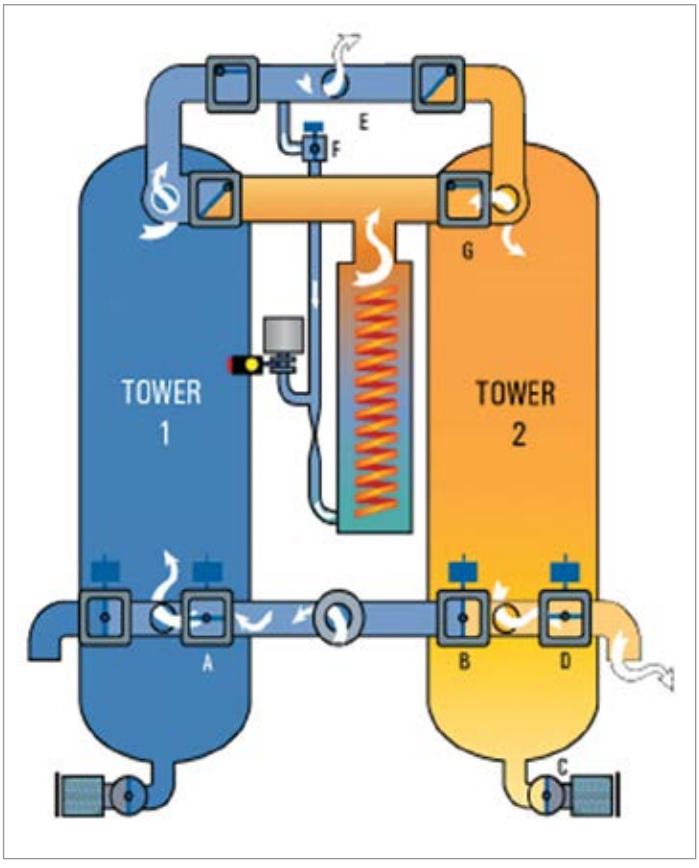
Note the operating costs calculated assume the dryer is 100% loaded at maximum capacity. Air compressor efficiency is assumed to be 20

kW per 100 cfm and power costs are 10 cents per kWh. Annual costs assume 8,760 hours of operation. This table shows considerable annual savings can be gained by using more sophisticated heated style dryers.

Important Characteristics

In real life you would not usually see an air dryer at exactly 100% load at the standard rating of 100 psi input pressure, 100 ˚F inlet and ambient temperature. Usually the dryer loading is less than the rating, so the operating costs could reduce with lighter loading.

For example, a dryer that is only passing 75% flow, with inlet temperature at 80 ˚F, is only processing about 40% of the designed water vapor. This is because air that is 20 degrees cooler than designed contains only roughly 50% of the water vapor compared to the 100 ˚F dryer rating. For a fixed-cycle desiccant dryer, operation with lower moisture load does not affect operating costs, yet it will still consume the same amount of purge air. But with heated dryers, because the desiccant contains less moisture, and the heaters are controlled on temperature (to avoid overheating the desiccant), the heating element duty cycle will reduce, lowering electrical operating costs.

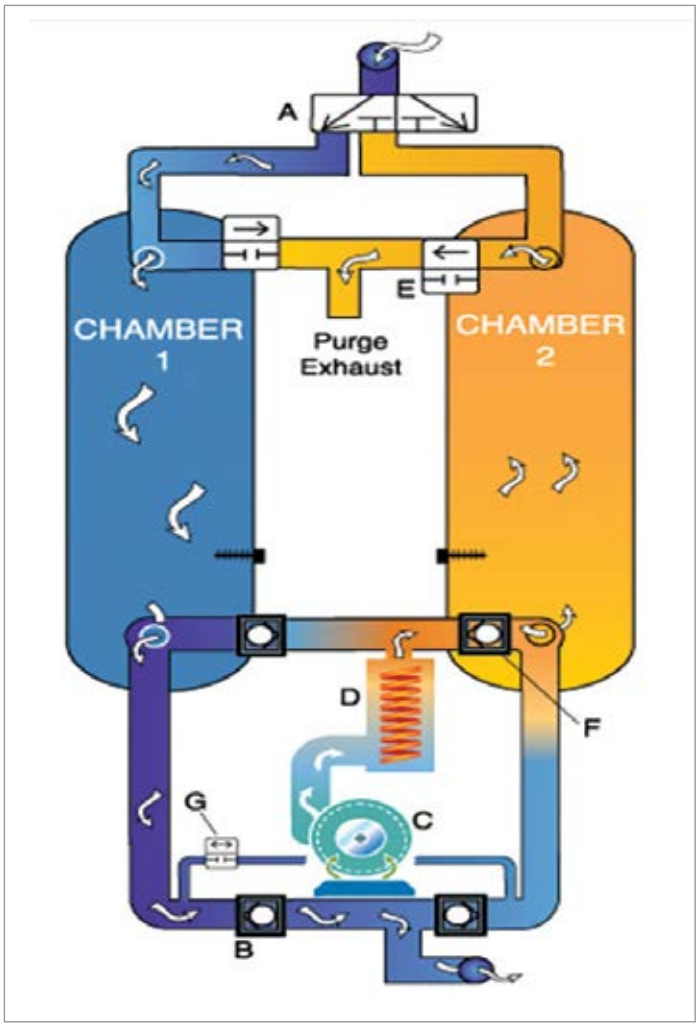


A typical externally heated dryer. (Source: Compressed Air Challenge.)

LESSONS LEARNED: SAVING ENERGY COSTS WITH HEATED BLOWER DESICCANT DRYERS

For partly loaded air dryers some significant savings can be gained using dewpoint-dependent switching. With this scheme, a dewpoint probe measures the compressed air at the dryer discharge and will delay the purge operation should the produced dewpoint be lower than the dryer rating. The dryer control will wait until the dewpoint rises to the dryer setpoint and then activate a regeneration cycle. For lightly loaded dryers this produces a reduction in energy consumption, but the different styles of dryers react differently to light loading.

For heatless desiccant dryers, the reduction in purge tends to be proportional only to the reduction of flow, not the reduction in moisture load due to the lower inlet temperatures. But for heated style units, the dryer reacts to both reductions. This means some energy is saved due to flow reduction, and additional energy is saved due to the lower moisture load in the cooler inlet air, resulting in more energy savings when compared with heatless styles. Using the previous example, the operating cost turndown of the dryer would be roughly 20 to 25 percent for a heatless desiccant dryer, but 50 to 60 percent for heated variant if operating on dewpoint control.



A typical heated blower dryer. (Source: Compressed Air Challenge.)

Lessons Learned in Real-world Applications

Over the years some lessons have been learned, some good, some bad, when dealing with blower style dryers. Here are some of the most interesting ones:

Paper Plant 1

A paper plant installed a blower style dryer with dewpoint-dependent switching. Despite this, the plant experienced wet air in their instrument air system. A quick look at the dryer showed the produced dewpoint was well below its rated -40 °F air quality. Staff suspected an unintended bypass between the undried mill air and the dried mill air system. But, looking more closely at the dryer operation an auditor noticed free water pouring out of the after-filter of the dryer. The auditor also noticed the dewpoint controller read the same temperature no matter what, even if it was taken out of its housing and waved around in a steamy room. The probe had failed at a low temperature reading, meaning the dryer never would purge if set to dewpoint-dependent switching mode, even though the desiccant was fully saturated.

An investigation found the probe had failed because it became flooded with water. The water came from a failed after-cooler on a water-cooled system air compressor that was leaking cooling water into the compressed air. Further investigation revealed the dryer was installed in a room with excessive steam leaks. When cooling took place using ambient air, excessive moisture was introduced into the dryer desiccant. Lessons learned:

- Ensure any dewpoint control is working and calibrated.
- Always design in a way to remove free water before it reaches the dryer inlet filters.
- Keep the ambient conditions free of dirt and excessive moisture.

Paper Plant 2

Data from a compressed air audit at another paper plant showed very large notches in their pressure profile occurring every four hours. These notches were big enough to cause severe pressure fluctuations that affected production. The data showed the notches lined up with the dryer regeneration operations, occurring just after the heating operation ended.

DRYER TYPE	PURGE %	PURGE CFM	EQUIVALENT KW	HEAT/BLOW KW	ANNUAL KWH	COST $
Heatless	15%	150	30	0	262,800	$26,280
Externally Heated	7.5%	75	13	6	166,440	$16,644
Blower with CA cool	2%	20	4	12	140,160	$14,016
Blower no CA cool	0%	0	0	13.2	115,632	$11,563

Typical cost to operate various styles of fully loaded dryers.

An investigation found that someone had adjusted the dryer cooling purge to an excessive level. This dryer design had a simple ball valve as the cooling air control. A tag had been placed on the valve with instructions to set it to 40 psi on the purge pressure gauge, but the tag had disappeared. We suspect someone had seen this partially open valve and decided to open it fully, causing excessive cooling air to flow. This adjustment was returned to normal and the excessive pressure drop disappeared. But since the cooling purge was still about 8% of the dryer rating, sometimes an extra air compressor still needed to be loaded every four hours to feed this additional flow.

Further along in the history of this dryer, the fuses for the heaters started to blow every few hours of operation. Investigation revealed the dusty environment where the dryer was installed had allowed dust to plug up the blower inlet filter, causing the heaters to overload. Lessons learned:

- Always ensure the dryer is adjusted according to specifications.
- Compressed air system capacity must be sized to account for cooling purge.
- Dusty ambient conditions can overload the blower inlet filter.

Chemical Plant

A chemical plant had a large blower purge air dryer that was sized for three air compressors, however the third air compressor was never installed. Dewpoint control was purchased as an option but had failed, and the customer never had it repaired.

This dryer consumed so much cooling air that one 100 horsepower (hp) air compressor had to run to feed the flow, and the high flow caused pressure problems in the plant. The unit ran on a fixed cycle, even though it was lightly loaded, and the purge regeneration cycles could have been turned off for significant time if the dewpoint control had operated correctly.

A ball valve controlling the cooling purge had also been misadjusted causing too much air into the dryer. The associated filters for this dryer had not been maintained to specifications resulting in about an 8-psi pressure differential across the filters and dryers.

The customer started a program of replacing this dryer with heated blower dryers with closed cycle cooling purge. This change allowed one air compressor to be turned off, saving significant energy and improving the pressure profile. More details on this system is in this article (https://www.airbestpractices.com/system-assessments/air-treatmentn2/oversized-dryer-causes-pressure-issues-chemical-plant.) Lessons learned:

- Ensure the dewpoint control is operating correctly and is calibrated.
- The dryers must be adjusted to proper cooling flow.
- Newer dryer designs can save energy.

Meat Processing Plant

A meat processing plant purchased a blower style dryer as a replacement for a system that had refrigerated dryers in series with a fixed-cycle heatless dryer. The dual system had excessive pressure loss across the components. The replacement of the two types of dryers with a well-sized, single-blower purge dryer with dual parallel inlet and outlet filters improved the pressure drop, leading to better air compressor control and more stable plant pressure. The new dryer consumed much less energy than the previous system.

The plant personnel decided to run the dryer exhaust outdoors so that moisture expelled by the dryer would not be fed back to the intake of the air compressors. After a while during one cold November they started to notice problems with the compressed air dewpoint. Investigation revealed the moisture contained in the purge exhaust froze when it reached outdoor temperatures, plugging up the dryer exhaust. Additionally, the piping used to run the exhaust outdoors was to small causing higher than desired pressure loss. The installers failed to account for the high velocity of ambient air, which was not compressed air flowing through the vent circuit. Improvements had to be made to run the exhaust to a more temperate environment. Lessons learned:

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SUNDAY, OCTOBER 13, 2019

9:00AM–3:00PM	Exhibitor-Only Pre-Registration
9:00AM–6:00PM	Exhibitor Move-In
3:00PM–6:00PM	Conference Registration Open
6:00PM–8:00PM	Welcome Reception

MONDAY, OCTOBER 14, 2019

7:00AM–11:00AM	Exhibitor Registration and Move-in
8:30AM–10:00AM	Opening Session
10:15AM–12:15PM	Conference Session #1
12:00PM–6:00PM	**EXPO FLOOR OPEN**
1:30PM–2:30PM	Energy Treasure Hunt Workshop #1
2:45PM–4:45PM	Conference Session #2
TBD	Networking Event!!

TUESDAY, OCTOBER 15, 2019

8:00AM–9:30AM	Plenary Session
9:45AM–11:45AM	Conference Session #3
12:00PM–6:00PM	**EXPO FLOOR OPEN**
1:30PM–2:30PM	Energy Treasure Hunt Workshop #2
2:45PM–4:45PM	Conference Session #4
5:00PM	Energy Treasure Hunt Raffle Winners Announced!!**

WEDNESDAY, OCTOBER 16, 2019

7:00AM–12:00PM	Exhibitor Move-out
8:00AM–10:00AM	Conference Session #5
10:15AM–12:15PM	Conference Session #6

4 TRACKS PER CONFERENCE SESSION

TRACK 1:
COMPRESSED AIR SUPPLY STRATEGIES

TRACK 2:
COMPRESSED AIR DEMAND REDUCTION

TRACK 3:
BLOWER & VACUUM OPTIMIZATION

TRACK 4:
COOLING SYSTEMS & ENERGY MANAGEMENT

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LESSONS LEARNED: SAVING ENERGY COSTS WITH HEATED BLOWER DESICCANT DRYERS

- Replacing standard dryers with well-sized units can improve system operation.
- If purge venting is moved to remote location, ensure piping is properly sized and the vent mufflers are not located in freezing conditions.

Food Processing Operation 1

A food processor purchased a blower purge dryer to condition the air for their processing equipment located in a cool processing area. The dryer was purchased with dewpoint-dependent switching. The associated air compressors are water cooled, and the plant cooling water was very cold, running about 40 ˚F to 45 ˚F throughout most of the year.

Since the output compressed air temperature of the air compressors runs about 50 ˚F (20% of rated moisture load) and the flow processed by the dryer averages about 50%, this dryer was very lightly loaded in terms of moisture. During a compressed air assessment of this system, the dryer was found to run through its regeneration cycle only once every two or three days rather than once every four hours for a typical fixed-cycle unit. This saved considerable energy.

Turning off the cooling purge using a selectable switch on the dryer made further improvements. With long cycles, the dryer desiccant cooled properly by simple radiation. Lessons learned:

- Lower temperature inlet flow for a blower purge dryer can save additional energy.
- Sometimes, when cycle times are spaced far apart, the cooling purge does not need to operate. If you have these conditions, and the option installed, turning the cooling off can save cooling air.

Food Processing Operation 2

A produce processor purchased a blower purge dryer with dewpoint-dependent control to condition the air in the plant, especially for color sorters, where the compressed air comes in contact with the food product. The plant piping was exposed to freezing conditions in some areas of the plant. For the most part the dryer worked well due to lighter loading conditions. The dryer regenerated on average every 12 hours, rather than every four hours.

A compressed air assessment found that during the dryer regeneration cycle one additional air compressor would start and run. A flow meter was installed, which found the dryer was consuming excessive purge flow. An investigation revealed the dryer had been incorrectly assembled and one valve was leaking. Two control valve functions were swapped

This dryer regenerates infrequently due to lower moisture loading and dewpoint control.

that reversed the function of the dryer pressurization and cooling purge, causing excessive air cooling to flow through the four-hour regeneration cycle. The valves were corrected and the operation of the dryer went to normal, requiring one less air compressor during regeneration phase of the dryer. Lessons learned:

- Light loading reduces regeneration cycle times.
- Dryer functions should be monitored to ensure expected operation, especially when commissioning is done.
- Installation of a flow meter can detect problems with air dryers.

Conclusions

Use of blower purge style air dryers can reduce operating costs, especially with conditions of light loading and reduced moisture load due to cooler air compressor discharge temperatures. These units are quite complex, however, and need to be correctly maintained and monitored to make sure they stay in correct working order. Researching these dryers and monitoring them during plant compressed air assessments can result in many lessons learned. BP

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

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

SUSTAINABILITY & EFFICIENCY

LEVERAGING DATA ACQUISITION to Drive Actionable Intelligence

By Mac Mottley, Sparks Dynamics

In most industrial plants, data is everywhere. It resides in flow through pipes, pressure in tanks, vibration on rotating equipment, temperatures in heat exchangers, and electrical energy power consumption in motors. If we can acquire this data and make sense out of the patterns we can take actions to make our plants more efficient and reliable.

While this article focuses on compressed air systems, data acquisition methodologies and analysis techniques can be utilized on all types of plant utility, process, and production systems. The common thread is that data has to be acquired in some way and then some type of intelligent analysis performed to derive knowledge that is beneficial to the operation.

Types of Data Acquisition

Here's an overview of the various types of data acquisition:

System Failure – This type of data acquisition is the observation that something has stopped or failed in the manufacturing facility with no warning. Unplanned outages and downtime are expensive both from a lost production standpoint and the probability that the repair of the equipment will be expensive versus having done the proper preventive, predictive or condition-based maintenance. A good example is when production stops based on low air pressure and when the maintenance personnel visits the air compressor room and finds the machine shut down based on high air temperature, vibration, or motor/drive failure. An after-action evaluation can be completed and a root cause analysis performed, but the damage has already been done.

Clipboard Recording – A clipboard hangs by the equipment with a data sheet

Shown is a typical data acquisition and control panel with a power meter and flow sensor.

that needs to be filled out periodically by maintenance personnel. At least once every shift the sheet is filled out from air compressor panel information supplemented by system gauges and perhaps power/amp meters. These sheets are typically collected at the end of the day and filed in the maintenance manager's office. Sometimes they are looked at and sometimes they're not. If problems have occurred in a certain area they may be focusing on those readings and looking for a sign that might signal another failure. These types of maintenance personnel are typically responsible for a large utility plant that can include boilers and chillers and maybe even power generation, which means expertise in specific systems may be limited. With the reduction in maintenance and engineering departments, combined with the retirement of experienced plant operators, this methodology may no longer be feasible.

Dedicated Temporary Data Acquisition – Temporary data loggers can be installed on equipment during some type of audit period. An auditor or consultant typically installs this temporary monitoring system for a week and measures amperage through a current transformer, and can also add a 3-phase voltage reading to get a true power reading. The system also measures pressures throughout the plant. An insertion flow meter could be added as well to get a definitive specific power measurement. This data is downloaded to an Excel spreadsheet where the auditor can perform an analysis of system demand and corresponding energy consumption patterns. Recommendations can be made to address current inefficiencies in the system. The problem with this approach is it is only a snapshot and compressed air systems are dynamic over time. This methodology will not provide any means for future analysis or comparative performance of pre- and post-energy conservation efforts.

Primary SCADA System Components

A SCADA system typically consists of the following main elements:

Supervisory servers/computers

This is the core of the SCADA system, gathering data on the process and sending control commands to the field connected devices. It refers to the computer and software responsible for communicating with the field connection controllers, which are RTUs and PLCs, and includes the HMI software running on operator workstations.

Remote terminal units

Remote terminal units, also known as (RTUs), connect to sensors and actuators in the process, and are networked to the supervisory computer system. RTUs are "intelligent I/O" and often have embedded control capabilities in order to accomplish basic logic operations.

Programmable logic controllers

Also known as PLCs, these are connected to sensors and actuators in the process, and are networked to the supervisory system in the same way as RTUs. PLCs have more sophisticated embedded control capabilities than RTUs, and are programmed in one or more IEC 61131-3 programming languages.

Distributed control system (DCS)

Distributed control system (DCS) is a control system for a process or plant usually with a large number of control loops, in which autonomous controllers are distributed throughout the system, but there is central operator supervisory control. The DCS concept increases reliability and reduces installation costs by localizing control functions near the process plant, with remote monitoring and supervision.

Human-machine interface

The human-machine interface (HMI) is the operator window of the supervisory system. It presents plant information to the operating personnel graphically in the form of system diagrams, which are a schematic representation of the plant being controlled, and alarm and event logging pages. The HMI is linked to the SCADA supervisory computer to provide live data to drive the data readings on the graphical user interface (GUI), alarm displays and trending graphs. In many installations the HMI is the graphical user interface for the operator, collects all data from external devices, creates reports, performs alarming, sends notifications, etc.

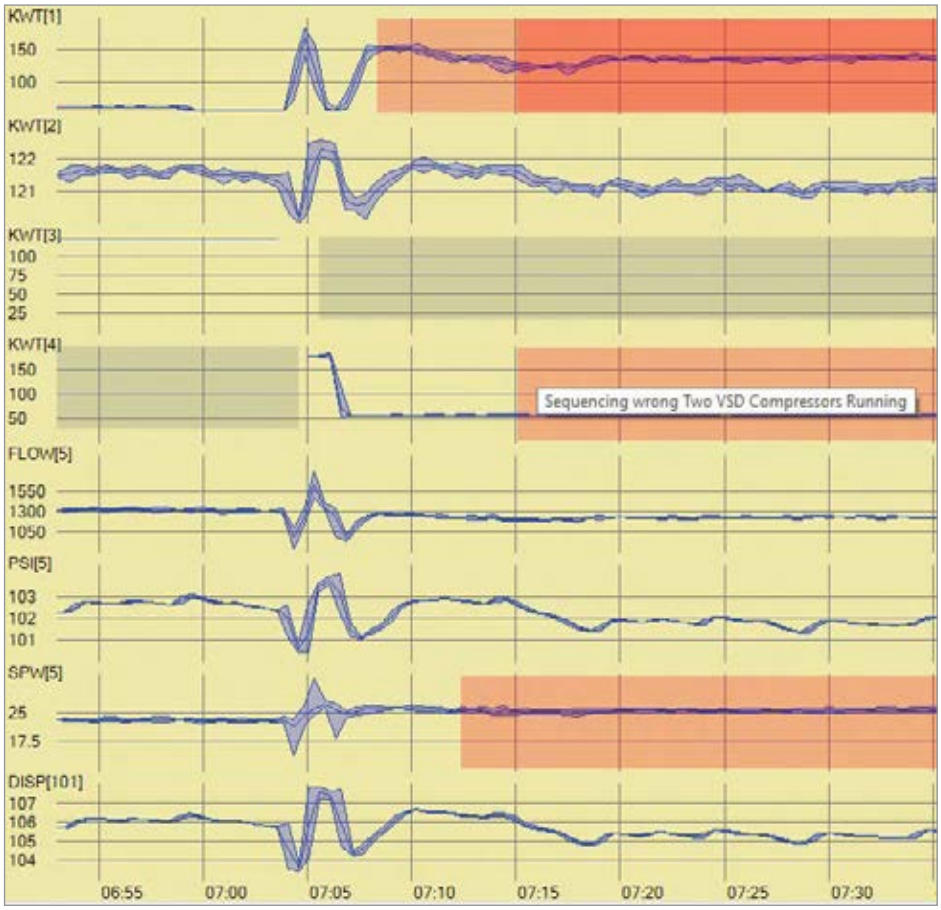
Historian

An historian is a software service within the HMI, which accumulates time-stamped data, events, and alarms in a database, which can be queried or used to populate graphic trends in the HMI. The historian is a client that requests data from a data acquisition server.

LEVERAGING DATA ACQUISITION TO DRIVE ACTIONABLE INTELLIGENCE

Dedicated System Permanent Data Acquisition – In this scenario a permanent sensor and data acquisition/control system is installed. This typically includes a panel located in the equipment room and it runs on a Modbus network backbone. The panel typically has a processor that can provide control capabilities, as well as network gateway functionality. It can access data from power meters, flow meters, pressure transducers, temperature sensors, and dewpoint monitors connected to the network. Certain air compressor manufacturers have webserver capability built into their control panels so the data in the panel can be accessed on the network, perhaps on a computer sitting in the maintenance manager's office. Most air compressor control panels have Modbus connectivity options that allow data to be monitored on the data acquisition panel as well. This data can be accessed locally at the plant level, or can be streamed to a cloud network for database management and storage. Domain experts can analyze the data streams to determine system inefficiencies and potential maintenance issues. Or, software analytics programmed by domain experts can be used to evaluate the data running in real time for 24/7/365 blanket protection.

Plant-wide Supervisory Control and Data Acquisition (SCADA) – This is a control system architecture that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management and other peripheral devices, such as programmable logic controllers (PLC) and discrete PID controllers, to interface with the process plant or machinery. The operator interfaces, which enable monitoring and the issuing of process commands, such as controller setpoint changes, are handled through the SCADA computer system. However, the real-time control logic or controller calculations are performed by networked modules, which connect to the field sensors and actuators. This type of control is typically known as a distributed control system, or DCS.



This data resulted in a table showing an anomaly automatically detected by software analytics running in near real time. Improper sequence control results in a specific power bump from 23 to 26 (kW/100 cfm) resulting in approximately $4/hr additional power expense, which equates to $35,000/yr if not corrected.

SCADA and Compressed Air

In large industrial manufacturing or process facilities that have employed a SCADA system, compressed air systems are typically included as they are a critical utility of the plant. KPIs are measured, as well as control panel information, and these data streams are processed and recorded in the system historian. There may be few alarm points, such as pressure and machine running status, but there is typically no ongoing analysis performed by domain experts or software that does a deep dive of all of the system operating parameters. However, open data communication protocols can integrate this data with other analytics platforms.

Open Platform Communication Unified Architecture (OPC UA) is a machine-to- machine communication protocol for industrial automation developed by the OPC Foundation, which is the world's leading interoperability standard for secure and reliable data exchange in industrial automation and other applications. It ensures the seamless flow of information between devices and software applications of different manufacturers. The current OPC UA standard

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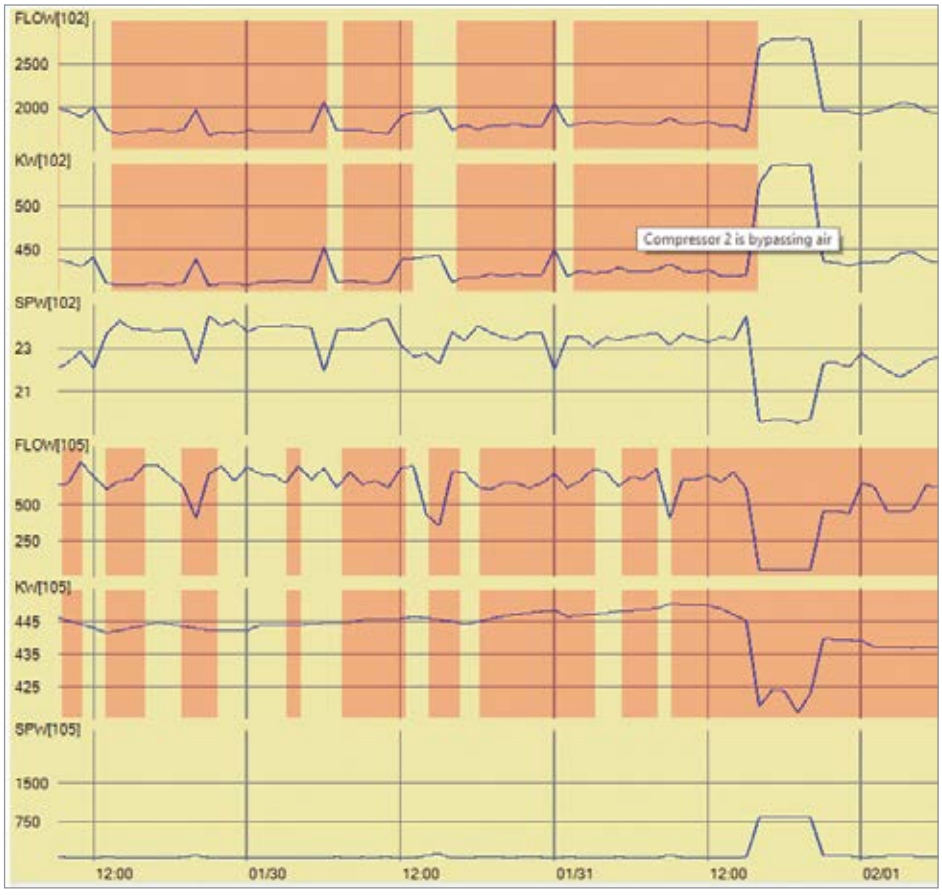
is platform-independent, leveraging advanced security and data modeling technologies to deliver future-proof, scalable and extensible solutions. Most process control and system automation platforms have an OPC UA server capability that allows data collected by these systems to be accessed by other software systems running an OPC UA client.

Processing Data with Analytics to Derive Actionable Intelligence

Now, let's focus on permanently installed data acquisition systems and SCADA data acquisition that can integrate with analytics software to detect system anomalies, inefficient patterns, and potential reliability issues.

In order to generate knowledge of big data systems an intelligent analysis of the data patterns is needed. A domain expert with years of industrial compressed air experience can look at data trends, but that becomes problematic with large amounts of data on a 24/7 basis. Most of the time if a system has been optimized or installed properly there is nothing to detect. However, over time these systems change – air compressor sequencing is changed or control-disabled, leaks occur in the system, heat exchangers start to foul, vibration levels start to rise due to imbalance or bearing wear, air compressors will enter short cycle operation, etc.



Three centrifugal air compressors are run in modulation mode and will bypass air to avoid throttled surge. In this case, two 700 horsepower (hp) air compressors were bypassing approximately 300 scfm in one case (Compressor 102) and 1,300 scfm in another case (Compressor105). This approximates to 400 HP/300 kW in waste, or over $200,000 per year based on electric rates.

It would be nice to have an energy engineer and service technician with 30 years of experience sit in the air compressor room and do nothing but watch data 24/7 and provide recommendations for energy optimization and predictive maintenance. With this type of service the compressed air system would always be running at peak efficiency and never have any unplanned down time. Obviously that is impractical but it's a reality when using software analytics integrated in real time to data streams.

Artificial Intelligence – Rules Based versus Machine Learning

Rules-based systems use domain experts to write exact expressions and turn them into code that analyzes data, while modern machine learning is based on statistical analysis of data. In computer science, a rule-based system is a set of "if-then" statements that uses a set of assertions, to which rules on how to act upon those assertions are created. In software development, rule-based systems can be used to create software that will provide an answer to a problem in place of a human expert.

Machine learning artificial intelligence systems use statistical modeling and probabilistic determinations – an example is video analytics where algorithms process large amounts of video image pixel data to identify patterns of interest that are then scanned by neural networks to make a positive match with a percentage of certainty. But for the type of time series system data we are processing, rules-based analytics will result in much better results. If we know the thermodynamic properties and how a compressed air system should perform based on factory specifications and site conditions, we can write rules that provide notification when something moves out of the performance envelope.

Rules-based Analytics with Compressed Air and Chilled Water Systems

The following examples illustrate issues that can be surfaced with rule-based analytics as applied to compressed air and chilled water systems.

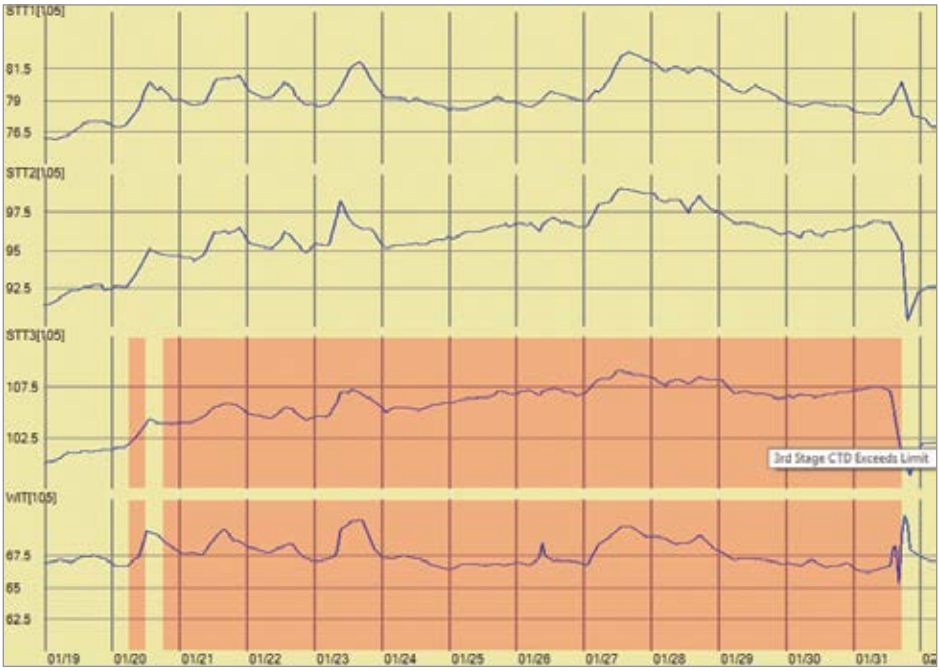
Example 1 – Compressor Sequencing

A government facility uses four oil-free rotary screw air compressors to provide sitewide compressed air. The system was engineered to operate one or two smaller baseload machines, dependent on demand, with one larger Variable Speed Drive (VSD) air compressor as the trim machine and one VSD unit serving as a spare that would alternate weekly.

An analytic was written that would alarm if both VSD machines were running at the same time creating a control problem and also an analytic that would alarm if the specific power exceeded a certain level during the system "on" state. During a service call one air compressor was serviced, but the system was not put back into the proper automatic sequence after the service technician left.

Example 2 – Centrifugal Compressor Bypassing Air

A manufacturing facility uses three centrifugal air compressors to provide sitewide compressed air. The air compressors are tied into the site SCADA system. The system was originally engineered to operate two air compressors, dependent on demand, with one as a spare that would alternate weekly. Yet this facility has been downsized and now the compressed air system is oversized. An analytic was written that would alarm if the centrifugal air compressors were running in an inefficient state where they were bypassing air and energy consumption charts that original software had generated for modeling purposes to compare potential optimization options.



As shown, if the third-stage discharge temperature of a centrifugal air compressor minus the entering cooling water exceeds 35 ˚F it triggers an alarm that signifies poor CTD performance and a potential fouled cooler.

Example 3 – Centrifugal Air Compressor Cooler Problem

A manufacturing facility was running a centrifugal air compressor on an open cooling tower. The cooling system was chemically treated but there had been fouled cooler problems in the past. An analytic was written that would alarm if the discharge temperature of any of the three stages minus the entering cooling water temperature surpassed 35 ˚F while the air compressor was running. This would identify excessive cold temperature differences (CTDs) and potential cooler problems.

Conclusion

There is a great deal of data available in industrial environments today. If analyzed properly, the data can provide valuable actionable intelligence to enhance energy efficiency and plant reliability. Installing dedicated systems to acquire compressed air data, or gleaning this data from existing SCADA systems through open platform communications, can provide information to domain experts who can then use it to write software analytics. Doing so will identify areas of inefficiency and potential service problems. The return on investment for these types of systems is often rapid and substantial when large savings are realized through energy cost reductions and avoided production downtime. BP

About the Author

Mac Mottley is the CEO of Sparks Dynamics. All photos courtesy of Sparks Dynamics. For more information, visit www.sparksdynamics.com.

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

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— Jason Smith, Corporate Environmental Engineer, Blount International (feature article in April 2018 Issue).

"The average weekend air demands have dropped from 800 scfm to 485 scfm. Based on the established compressed air cost of 27¢/1000 cubic feet, the initial timer adjustments will lower the compressed air costs from $187,920 to $113,441 per year."

— Russell Morine, Compressed Air Systems Evaluation Specialist, The Baker Group (feature article in June 2018 Issue).

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

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— From September feature article; "From Wastewater Agitation to Air Compressor Controls – Food Processor Finds 74% Savings Potential"

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TECHNOLOGY PICKS

Atlas Copco Launches Latest High-Efficiency Oil-Injected Screw Compressor

Atlas Copco, a leading provider of sustainable productivity solutions, recently launched the latest air compressor range in the smart AIR solutions portfolio. The GA 110-160 VSD+ oil-injected screw compressor range features a new state-of-the-art compression element and was designed to provide triple benefits when it comes to efficiency, encompassing energy, service and uptime.

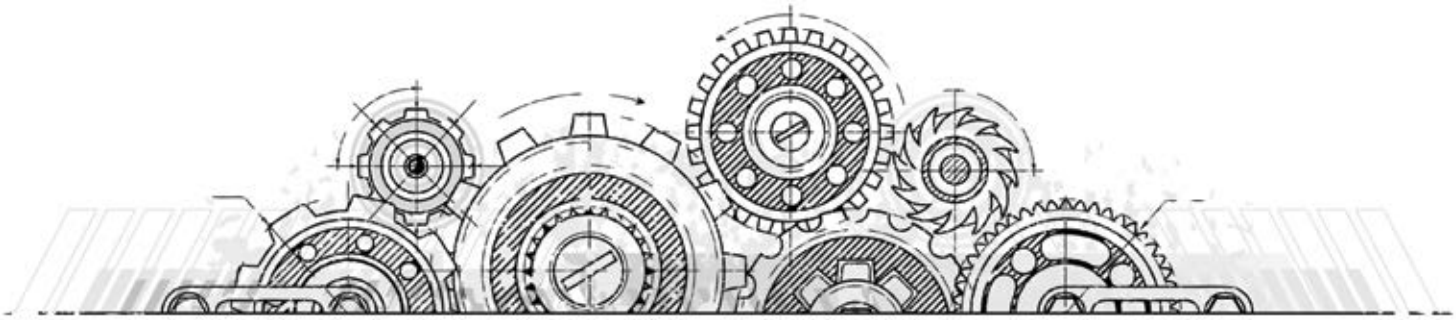
"While simple in design, the latest generation of GA compressors is advanced in engineering, thanks to the large number of in-house, newly designed and patented components," said Octavian Radencovici, Product Marketing Manager – Large Oil Injected Screw Compressors for Atlas Copco Compressors USA. "This is the biggest advancement in oil-injected compressors, in this category, within the last decade. It is the ultimate solution for efficiency, reliability and serviceability."

The new models in the range are, on average, 12 percent more efficient than the previous industry-leading generation. Further design advancements include Smart Injection technology, ensuring that just the right amount of oil is working with the element, coupled with the highly efficient, ultra-premium, oil-cooled, IE5 permanent magnet motor. Optimum efficiency is achieved through a highly efficient drive train, low internal pressure drops and precise control. Another great enhancement of the new range is the pressure/flow bandwidth capability, which ensures maximum efficiency across a wide range of load demands without idling or losing efficiency or uptime.

When it comes to service, the new GA 110-160 VSD+ range is the first in its category that has true one-person, basic-service, capability without the need for any heavy lifting equipment. All components are designed for ease of service and technician safety with the most commonly serviceable parts grouped together for ease of access. "According to OSHA, back strains are the most reported injury by service technicians, and eliminating work-site injuries is vital, especially when servicing compressors in oil refineries or petrochemical plants," added Radencovici. "The most difficult task a technician has to perform on a regular interval is changing the air/oil separator element, which can weigh more than 100 pounds. This job typically requires the removal of a large and heavy 100-pound separator lid, which is mounted to the vessel with 26 half-inch bolts. Our new GA design replaces the heavy separator element with three smaller cartridge separators, each with smaller and lighter access lids."

The new GA 110-160 VSD+ features a patented portal design, which enables full access to all components when more extensive maintenance

The new Atlas Copco GA 110-160 VSD+ oil-injected screw air compressor



RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

is required. All four panels on the compressor can be easily removed to aid the process. These design features reduce the average service time by 50 percent compared to similar designs. The service intervals for the new GA 110-160 VSD+ have increased from 4,000 hours to 8,000 hours. And, Atlas Copco provides customers with a tip-to-toe, five-year, Warranty Plus program on the complete machine.

Energy and service efficiency are nothing without uptime. The design and protection features of the new GA 110-160 VSD+ were designed for the most rugged, harsh environments, increasing the working life of the element. Its IP66 drive train offers complete protection from dust and moisture, ensuring reliable operation even in the toughest environmental conditions. With high efficiency and reliability in the toughest conditions, these compressors are well suited for the mining industry, metal processing and power plants.

Thanks to the new compact design, the industry leading footprint of the machines in this range are up to 30 percent smaller than the previous generation, and remarkably, the plug and play integrated dryer will only add 8 inches to the overall footprint thanks to the new vertical, modular design. In addition, the integrated dryer substantially reduces the installation and operating costs normally incurred with an external dryer.

The new Elektronikon® Touch controller is a 100 percent touch screen model, working integrated smart algorithms to further reduce energy consumption. It is Atlas Copco's most intuitive controller to date and easily connects to the new Optimizer 4.0 central controller. This enables a compressed air system to be optimized through selection of the most efficient combination of machines and auxiliary equipment. The new GA 110-160 VSD+ can be connected and monitored onsite or remotely via Atlas Copco's SMARTLINK technology. SMARTLINK is Industry 4.0 compatible, enabling digital integration of the compressed air system with other intelligent networked devices to improve equipment performance, enhance predictive maintenance and further increase energy efficiency.

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers through its innovative compressors, vacuum solutions, generators, pumps, 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 2017, Atlas Copco (excluding Epiroc AB) had revenues of BSEK 86 (BEUR 9) and about 34,000 employees.

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

Kaeser Introduces DHS Electronic Air Main Charging Valve

Kaeser's new DHS electronic air main charging valve offers monitoring and alarm capabilities, ensuring dryers and filters perform to specification.

Kaeser's new DHS air main charging valve.

TECHNOLOGY PICKS

Removal of moisture, particulates and hydrocarbons from a compressed air system is vital in order to protect pneumatic equipment, minimize downtime, and reduce scrap and inferior product. As an electronically controlled intermediate control, the DHS unit acts on a pressure signal to prevent high velocity conditions that will occur when system pressure is low. This maximizes contact time in air treatment components and makes them more effective. It also increases the bead and filter life of desiccant dryers by reducing dusting in the desiccant bed.

DHS units feature high visibility LED indicators to communicate status at a glance. They can also be wired to dryers and drains and will close to prevent contamination from getting downstream in case of a failure, or shutdown. Users interested in remote monitoring/control can connect the DHS unit to plant monitoring systems, or an existing Kaeser Sigma Air Manager 4.0.

DHS models are available in eight sizes from 1-inch ball to 8-inch butterfly valves to accommodate nearly any system. For more information, visit us.kaeser.com. To connect with a local authorized Kaeser representative, call 877-417-3527.

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. For more information, visit us.kaeser.com.

VPVision Software Offers Easier, More Complete Energy Management

VPInstruments has introduced its latest release of its VPVision energy monitoring software designed to make energy management easier and more complete.

According to VPInstruments, VPVision represents the next step in controlling factory efficiency and energy management by overviewing all energy usage patterns flowing through any installation. VPVision provides advanced web-based energy monitoring and can be accessed from any

PC, tablet or cell phone. It is the cornerstone of any energy management environment under ISO 50001 certification.

In addition to minor improvements in the system, the customizable report functionality of VPVision has been greatly improved and expanded. Improvements include a new layout and added features, such as specific power for overall system efficiency in $kW/m^3_n/min$ or Wh/m^3_n. New features also include:

- **Consumption overview:** An overview of total consumption per user/division. Users can also identify changes as total consumption values are also compared with values of the previous period.
- **Key Performance Indicator (KPI) module:** Users can monitor efficiency and optimization targets better with a new performance indicator module in VPVision's reports. They can select their own KPIs, track changes by comparing a KPI with the previous period, and see performance in one glance with pre-defined colors for a KPI.
- **Compressor analysis module:** Compressors can now be defined more accurately, including type of compressor, load/unload cycles and stages, resulting in improved analysis of compressor performance.
- **Alarm module:** A new alarm report module features an alarm log and statistics. VPVision had already featured an optional alarm functionality including definition of thresholds alarm levels and emails for out of bounds alarms.

With its automated report function, VPVision, users hardly need to look at the system itself anymore. Instead, important information is provided via email on a regular base.

RESOURCES FOR ENERGY ENGINEERS

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About VPInstruments

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

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, visit www.vpinstruments.com

ASP Extends Limited Warranty for Condensate Drains and Oil Water Separators

Air System Products, LLC, a business unit of Filtration Group, has extended the limited warranty terms on its line of condensate drains and oil water separators (OWS) from one to two years for all new products shipped after August 31, 2018.

"Our products are designed to be reliable and built to last," said Bill Niblock, Business Unit Leader for Air Systems Products. "Our customers have long expected our drains and separators to perform for multiple years. The longer warranty period, with routine maintenance and proper service intervals, demonstrates our confidence that these products will continue to operate well into the future." The new terms are as follows:

Products manufactured by Air System Products, LLC, are warranted to be free from defects in material and workmanship, under proper use, installation, application, and maintenance in accordance with the manufacturer's written recommendations and specification for a period of two years from the date of shipment from the factory. The manufacturer's obligation under this warranty is limited to,

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

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

TECHNOLOGY PICKS

and the sole remedy for any such defect shall be, the repair or replacement (at manufacturer's option) of unaltered products returned to manufacturer within said period.

This is the only authorized Air System Products warranty and is in lieu of all other express or implied warranties or representation, including any implied warranties of merchantability or fitness, or of any other obligations on the part of the manufacturers. Warranty claims must be submitted and shall be processed in accordance with Air System Products, LLC's established warranty claim procedure. In no event, shall Air System Products, LLC, be liable for business interruptions, loss of profits, personal injury, costs of delay or any other special, indirect, incidental, or consequential losses, cost, or damages.

Routine maintenance, media replacement and minor adjustments to the Air System Products, Inc. oil/water separators are not covered under this warranty. Prior to performing any possible warranty service or replacing a possible warranted part, please contact your local Air System Products, LLC, distributor. Failure to comply with this procedure will result in denial of warranty claim. Additionally, the use of third party or counterfeit media or replacement parts will negate the terms of this warranty.

About Air System Products, LLC

Since 1981, Air System Products, LLC, has been manufacturing efficient, reliable, cost effective products and systems for the air and gas compressor market. Located near Buffalo, NY, Air System Products is a leading manufacturer of condensate drains and oil/water separators with a valued reputation for the continuous introduction of reliable and innovative products coupled with strong after sales support. For more information, visit Air System Products at: www.airsyspro.com

About Filtration Group

Filtration Group, an affiliate of Madison Industries, is making the world safer, healthier and more productive by creating innovative solutions that deliver outstanding customer value. With a passionate team, global footprint and leading technology, Filtration Group is driving innovation and developing unparalleled filtration solutions. Filtration Group serves a highly diverse set of customers with offerings that span life science, process technologies, fluid and indoor air quality applications. One of the fastest growing companies in the industry, Filtration Group serves its customers from 107 facilities in over 28 countries. For more information, visit www.filtrationgroup.com and www.madison.net.

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UPSTATE SOUTH CAROLINA

I&M Industrials, Inc. was established in 1967 and is known as one of the most successful air compressor distributors in the Southeast. Seeking a qualified service technician for the Upstate of South Carolina. The candidate may reside anywhere within the territory.

Candidate needs to be self-driven and travel within area is required. Experience within the compressed air industry is preferred; however, a candidate with a refrigeration background is also desired. Gardner Denver factory training will be provided in addition to in-house training and OJT with qualified technicians.

Compensation and relocation to be determined. Send confidential resume to Robb Templeton at RTemp@iandmindustrials.com. For more information visit www.iandmindustrials.com

REGIONAL SALES MANAGER – EAST

ENERGAIR, a world leader in supplying auditing equipment and energy efficient master controls & monitoring systems to the compressed air industry, is looking for a Regional Sales Manager for the territory **EAST of Mississippi river.** The successful candidate will be responsible for achieving regional sales goals through business development with new and existing distributor partners.

The Regional Sales Manager may reside anywhere within the territory and will be expected to travel extensively when not working from his or her home office. Experience in the compressed air industry is preferred.

Interested? Please send your resume with cover letter to nicolas.dedeken@energair.com

SERVICE MANAGER

Seeking an experienced and professional Service Manager to join our team in Charlotte, NC. Focus on training our distributor network in the operation and maintenance of Ozen Air Technology products. Other duties will include warranty implementation, troubleshooting and maintaining high levels of customer satisfaction.

REGIONAL SALES MANAGERS

Recruiting experienced Regional Sales Managers with proven track records to assist our distributors in expanding their business through the sale of our products. Experience in the compressed air industry is preferred.

To learn more about Ozen Air Technology visit http://www.ozenairtech.com. Send resume with cover letter to: Info@OzenAirTech.com.

Job & Product Marketplace Advertising Information

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

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

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

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