The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

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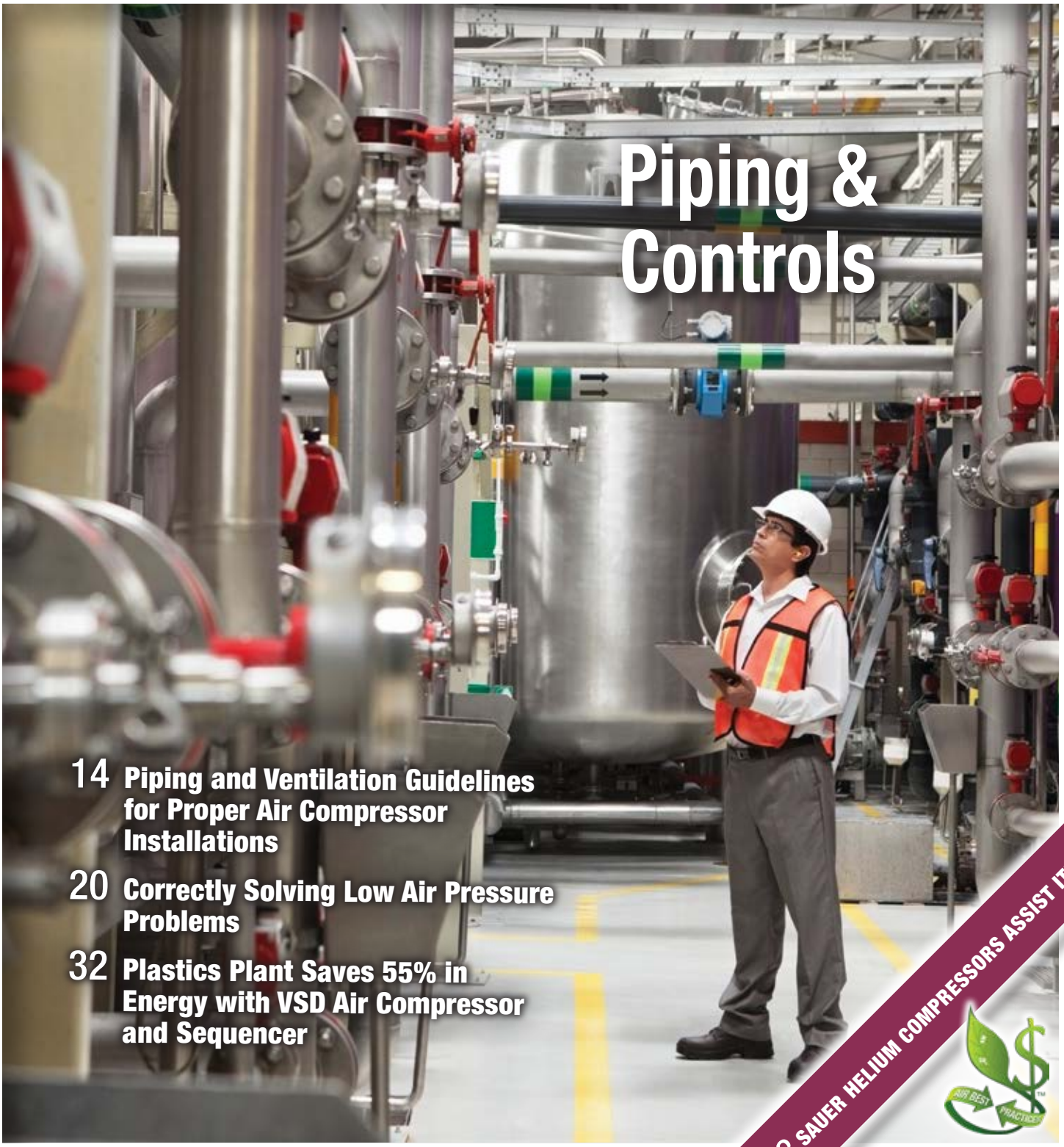
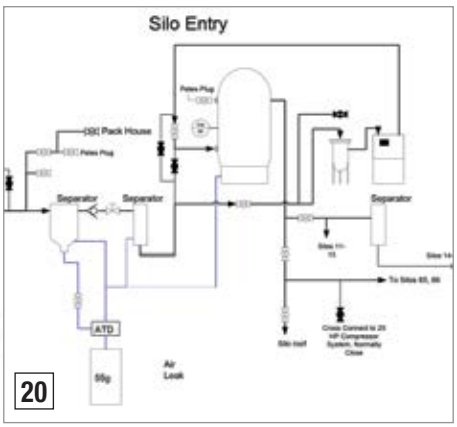


Piping & Controls

SUSTAINABLE MANUFACTURING FEATURES



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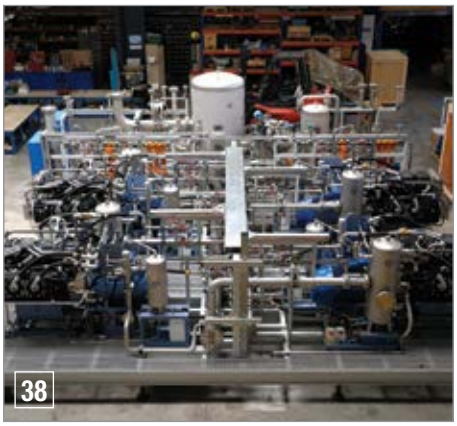

FROM THE EDITOR | Piping & Controls

Air compressor room design, ventilation and piping design is the focus of our first article, provided to us by Steve Bruno from Atlas Copco. I highly recommend this summary of best practices. This is one of those articles worth emailing to each person on your Energy Team at your different facilities.

Have you ever had low compressed air pressure problems at your plant? Has a team member ever said, "We need to buy another air compressor because pressure is too low?" Paul Edwards, from Compressed Air Consultants, provides us with an excellent case study on this topic. All too often, plants purchase or rent air compressors unnecessarily to solve low-pressure problems - when the real problem is in the piping or the dryers – or both.

Hank van Ormer continues his series of articles titled, "Mistakes in Compressed Air System Design." What happens when a fixed-speed air compressor is "short cycling"? What must one understand in order to get an oil-free centrifugal (dynamic type) air compressor to work well with a oil-free rotary screw air compressor (positive displacement type)?

The 100 psi compressed air system, supporting the injection molding lines at a plastics plant, had three modulating lubricated rotary screw air compressors consuming 2.7 million kWh per year at an annual cost of $267,000. Ron Marshall writes about how they got these air compressors "under control" by upgrading one of the older units to a more efficient two-stage VSD air compressor, and adding a 2,000 gallon storage receiver and a compressor sequencer.

The ITER (International Thermonuclear Experimental Reactor) fusion reactor, located in the south of France, is an international consortium project scheduled to be put into operation in 2020, with the aim of harnessing nuclear fusion – the sun's source of energy – under terrestrial conditions as well. Based in Kiel, Germany, Sauer Compressors has provided an interesting description of the helium compressors they supplied to ITER for cooling and helium recovery systems.

Speaking of opportunities to learn how to improve systems, please consider attending the 2018 Best Practices Expo & Conference, September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. Register at www.cabpexpo.com!

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

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

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INDUSTRY NEWS

Atlas Copco Acquires Walker Filtration

Atlas Copco, a leading provider of sustainable productivity solutions, has acquired Walker Filtration Ltd. The company is a British manufacturer of equipment for the treatment of compressed air, gas and vacuum.

Atlas Copco has acquired Walker Filtration, based in northeast England.

The family-owned Walker Filtration is based in the northeast of England. The company manufactures high-efficiency equipment for the treatment of compressed air, gas and vacuum. It has around 220 employees worldwide and revenues of approximately MGBP 30 (MSEK 330) in 2017. Walker Filtration has sales offices in Europe, USA, Australia and Japan.

"Walker Filtration is a respected company with a strong brand name and product portfolio that will play an important role to increase our presence and competence in the business of equipment for the treatment of compressed air, gas and vacuum," said Vagner Rego, Business Area President Compressor Technique.

The purchase price is not material relative to Atlas Copco's market capitalization and is not disclosed. The business will be part of the Medical Gas division in the Compressor Technique business area. To learn more about Walker Filtration, please see www.walkerfiltration.co.uk/.

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and services focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries. In 2017, Atlas Copco had revenues of BSEK 116 (BEUR 12) and about 47,000 employees. Learn more at www.atlascopcogroup.com.

CompressAir Expands Sullair Territory in Indiana

CompressAir announced they have recently been granted an expansion to their territory of sales and service for Sullair compressed air equipment. The new areas will include Benton, Carroll and Tippecanoe Counties in Northwestern Indiana.

CompressAir carries the full line of Sullair oil-flooded and oil-free air compressors, as well as compressed air dryers, filters, drains and vacuum systems. They provide quick delivery with 24/7 emergency repair and conveniently manage a large inventory of repair parts, maintain parts and fluids for a variety of needs.

Factory-trained technicians are on call to provide superior service to all makes and models of compressed air products and systems.

About CompressAir

CompressAir was founded in 1987 and is the authorized distributor for Sullair in the Northern Indiana and Southern Chicagoland areas. They are also a NWIBRT member as well as a Lockheed Martin and

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IS EVERYTHING

Gerald "Gerry" Bauer
President, EccoFab - Rockford, IL
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ComEd Trade Ally. With over 185 years of industry experience, CompressAir is a leader in providing options to help customers reduce operating costs and increase efficiency with their compressed air system. For more information please visit www.compressair.net.

John Henry Foster Earns Top Distributor Award

Ingersoll Rand's annual AIRD (Association of Ingersoll Rand Distributors) meeting was recently held in Miami. Twenty-three IR Distributors attended the meeting- all vying to take home the coveted, traveling trophy and title of "Top Ingersoll Rand Distributor" in the country.

This year the award, based on overall performance and sales of Ingersoll Rand equipment, service and warranty, was given to John Henry Foster. John Henry Foster, or JHF, has been a top performer since it became an IR distributor in 1963.

John Henry Foster was named the "Top Ingersoll Rand Distributor".

"Ingersoll Rand distributors are vital connections to our customers and keep us in tune with the ever-changing industrial market, so we can provide valuable solutions to meet end users needs," said Scott Krull, vice president and global commercial leader, Ingersoll Rand.

Ernie Pither, Vice President of JHF's Compressed Air and Tools Division attributes the win to teamwork, process and a dedicated goal of taking care of the customers. Pither stated, "Through aligned goals, process improvement activities, and working together on a common purpose (taking care of our customers) the team was able to follow their passion for the compressed air business and achieve incredible results."

About John Henry Foster

The St. Louis based company, established in 1944, is a full-service distributor focused on sales, service, parts, rentals, warranty, turn-key installations, and air/energy audits for the industrial air compressor industry. The company also provides industrial fluid pumps and vacuum pumps. With 23 outside sales representatives and 19 service technicians, John Henry Foster covers the compressed air needs of the eastern two-thirds of Missouri and the southern two-thirds of Illinois. Call today for more information 314-427-0600, visit www.jhf.com or Contact a John Henry Foster Sales Representative in your area.

Tim Breen Named 2017 GPC Manager of the Year

Motion Industries, Inc., a leading distributor of maintenance, repair, and operation replacement parts, is pleased to announce its parent company, Genuine Parts Company

(GPC), named Motion Industries president & CEO, Tim Breen, as its 2017 GPC Manager of the Year. It is the single highest individual recognition in all of Genuine Parts Company.

Mr. Breen began his career with Berry Bearing Company in 1982, and has held significant key positions since Berry Bearing was acquired by Motion Industries in 1993. Prior to becoming executive vice president & chief operating officer for U.S. operations in 2011, he led Motion Industries as a senior vice president for the Central U.S. Mr. Breen was named president in 2013 before becoming the company's president & CEO the following year.

"Each year since 1959, we have recognized one Manager of the Year out of all our associates worldwide," said Paul Donahue, Genuine Parts Company's president & CEO. "We appreciate the critical role Tim and his Motion Team play in making Motion Industries the successful business it is today, and in delivering the excellent results the team delivered in 2017. This award, the highest honor at GPC, is a significant and well-deserved recognition for Tim and the outstanding leadership he provides to the Motion Team."

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. Motion Industries has over 550 locations, including 14 distribution centers throughout North America and

Tim Breen, Motion Industries president and CEO, has been named 2017 Manager of the Year by Genuine Parts Company.

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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 www.MotionIndustries.com. Contact us toll-free at (800) 526-9328.

Further Growth for Endress+Hauser in China

Only five years after the most recent expansion in China, the Endress+Hauser Group has once again increased production capacity with a third plant in Suzhou, 100 kilometers west of Shanghai. The 16,500-square-meter facility will

Inauguration of the new plant in Suzhou, China.

help the Group meet disproportionately high growth in the Far East.

The opening of the new building, situated in Suzhou Industrial Park, a 450-square-kilometer campus home to more than 20,000 companies, was celebrated today in the presence of representatives from government and business, as well as customers and employees. The new plant will give the centers of competence for flow measurement engineering, liquid analysis and temperature measurement engineering additional capacity.

"The roughly 44 million euros investment underscores the tremendous significance of the Chinese market," said Dr. Bernd-Josef Schäfer, Managing Director of flow measurement technology specialist Endress+Hauser Flowtec, headquartered in Reinach, Switzerland. The spacious, modern and well-lit production halls and offices provide the ideal conditions for continuing to fulfill the requirements of the Chinese market and the wishes of the customers.

New Flowmeter Calibration System Sets New Benchmarks

Apart from an extensive portfolio of measurement instruments, Endress+Hauser also offers a wide range of global services allowing customers to optimize their processes along a plant's entire life cycle. The result is increased productivity and competitiveness through features such as the fully traceable calibration of measurement instruments.

To date, the Endress+Hauser facility in Suzhou has been capable of calibrating flowmeters with nominal diameters between 2 and 1,200 millimeters. The Group's largest and most modern calibration facility is now setting new benchmarks. In the future, the company will be able to calibrate electromagnetic flowmeters in China with a nominal diameter of up to 3,000 millimeters with a maximum measurement uncertainty of ±0.05 percent. That corresponds to a variance of only 100 milliliters for 200 liters of medium – or one champagne glass for a bathtub full of water.

Water and Wastewater Industries Driving Growth

Electromagnetic flowmeters with large diameters are commonly used in the water

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and wastewater industries. One of China's most important goals is the improvement of water supply across the entire country. Over the last few years, Endress+Hauser has established itself in this growth market through high-quality measurement instruments reliably and precisely measuring the flow of water in treatment plants and distribution stations.

"In order to react quickly and flexibly to regional changes and growth opportunities in local markets, and to stay constantly close to our customers, we are continually expanding production facilities around the world," explains Matthias Altendorf, CEO of the Endress+Hauser Group, reflecting the Group's sustainable growth strategy. "This is particularly important in a highly-dynamic market like China."

Group Boasts Strong Presence in China

Endress+Hauser has been active in China with its own sales center since 1995. Today there are more than 420 sales employees in Shanghai, Beijing and 11 other offices. The flowmeter plant in Suzhou opened in 2004, followed by a second plant for the manufacture of level, pressure and temperature measurement engineering and liquid analysis. Around 290 employees work in production in Suzhou, supplying other countries in the Asian region in addition to the Chinese market.

Laboratory analysis specialist Analytik Jena also maintains a strong presence in China with around 100 employees. The Endress+Hauser subsidiary has operated four locations in the Middle Kingdom since 2001 with a focus on analytical instrumentation and life sciences business.

About The Endress+Hauser Group

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. The Group employs 13,000 personnel across the globe, generating net sales of more than 2.1 billion euros in 2016.

For further information, please visit www.endress.com/media-center or www.endress.com.

Guardair Appoints Mark J. Wysk Director of Global Supply Chain

Guardair Corporation, the largest U.S. manufacturer of OSHA compliant safety air guns and pneumatic vacuums, is pleased to announce the addition of Mark Wysk as the new director of global supply chain. Mark brings 30 years of industrial purchasing management experience, including international sourcing, tool industry knowledge, and materials expertise.

In his new role at Guardair, Mark will support manufacturing through innovative sourcing strategies and optimizing cost-saving opportunities in conjunction with annual operating plans. His focus is building and strengthening partnerships providing true strategic relationships. "Mark's expertise in improving productivity, quality and efficiency of supply chain operations is a tremendous asset as we continue to grow," states Tom Tremblay, Guardair Corporation's president. "We are thrilled to have him join our team."

Mark was most recently the corporate director of procurement at Simonds International. Prior to that, he held the position of senior manager of global sourcing for Lenox. Mark holds a MS in Engineering Management and a BS in Mechanical Engineering, both from Western New England College. He currently serves as the president of the Institute for Supply Management of Western New England and has published articles in Supply Chain World Magazine and Cutting Tool Engineering.

About Guardair Corporation

Guardair Corporation is a leading manufacturer of best-in-class pneumatic tools and gasket cutters. Founded 75 years ago, the company operates three distinct brands: Guardair Safety Air Guns & Pneumatic Vacuums, AirSpade, and Allpax. The Guardair Safety Air Guns & Pneumatic Vacuums brand offers air guns, syphon spray guns, compressed air-powered vacuums, and pneumatic accessories. AirSpade is the leading manufacturer of pneumatic soil excavation tools, and Allpax is the largest manufacturer of gasket cutters in America. Guardair Corporation has earned a reputation for durable products maximizing safety, productivity, performance, and operator comfort. For more information, please visit www.guardair.com.

Piping and Ventilation Guidelines for PROPER AIR COMPRESSOR INSTALLATIONS

By Steve Bruno, Atlas Copco Compressors

While we cannot always create an ideal installation due to budget, floor space or time restrictions, it's worthwhile to review some best practices for installing a compressor in a new plant or making improvements to your existing system.

Air Compressor Room Design

Location

Creating a designated compressor room allows for better control of the compressor's air quality in addition to ensuring the compressors are kept at the proper temperature through the use of HVAC or ventilation. While current compressors have been engineered to be much quieter than previous models, they can still produce a significant amount of noise. Placing compressed air equipment in a designated

Figure 1: Servicing the air compressor.

room helps to significantly reduce noise levels in employee work areas.

Ideally, your compressor room should be located as close to its point of use as possible. Most companies try to locate the compressor room in a centralized location to minimize the distance air must travel to reach all of its processes. This also helps minimize the amount of compressed air piping, pressure drop and potential leak points.

Within the compressor room, it's important to position compressors and equipment with enough space around the machines for proper ventilation. If the equipment is too close together, hot air from one compressor may be drawn into the compressor sitting next to it.

Clearance

Always consult your compressed air manufacturer for proper clearance required in cooling and equipment maintenance. For example, compressors with canopies may have doors swinging on hinges or doors needing to be completely removed. Each of these options will require a different type of clearance. Another example takes into consideration large maintenance issues, requiring the use of larger tools such as hoists or jacking equipment. These special circumstances need enough clearance height and floor space for maintenance personnel to access the machines.

Condensate disposal

Because condensate contains concentrated contaminants from compressed air and oil-injected equipment, it should never be drained into the sewer without first separating or filtering the contaminants from the water. Remember to follow local regulations for waste disposal of condensate from compressors, after coolers, dryers and air receivers.

PIPING AND VENTILATION GUIDELINES FOR PROPER AIR COMPRESSOR INSTALLATIONS

Outdoor installations

Depending on the climate or location of the installation, it may be possible to install the compressed air system outside. The equipment should be installed under a lean-to or roof to prevent rain from leaking into its electrical cabinet. Compressors can also draw in water due to its high quantity of air intake. Therefore, the inlet side of the compressor should not be too close to the edge of the roof. If improperly placed, the compressor will ingest water and sustain serious damage. A minimum of NEMA 3R enclosures, protecting the equipment from falling water and dirt, should be specified. Higher ratings such as NEMA 4 are required if the customer intends to pressure wash the compressors.

Figure 2: Ducting heat from a pair of compressors

Air Compressor Room Ventilation

Overheating vs. freezing temperatures

One of the leading causes of compressor shutdowns is due to overheating from inadequate compressor room ventilation, particularly with air-cooled compressors. An ambient temperature of 40 – 100 ˚F should be maintained at all times to keep compressors running properly. Compressor after coolers are typically designed to cool compressed air to a temperature of "ambient +15 ˚F." The higher the temperature rises, the more likely it is for the compressor to fault out with a high temperature alarm and for dryer performance to suffer. The compressed air supply will then contain more moisture, negatively affecting industrial processes.

Conversely, if compressor room temperatures drop below freezing, condensate lines can freeze and cause ice to form in the in the after cooler, discharge line or dryer. As ice forms, it will expand and potentially damage any of these components. Cold temperatures will also increase coolant viscosity, requiring the motor to use more power to turn the airend. In turn, it will drive up energy and maintenance costs due to the malfunctioning of the motor and bearings.

> "One of the most common reasons for compressor shutdowns is due to high temperatures, typically occurring when there is insufficient ventilation. A good rule of thumb – if the room is too hot for employees to work then it's too hot for compressors as well."
>
> — Steve Bruno, Atlas Copco Compressors

Compressor room temperature management

Air compressors generate a tremendous amount of heat. This heat must be properly managed to avoid shutdowns and equipment damage. For example, a rotary screw compressor will produce approximately 3000 BTU/hr of heat energy per horsepower. Ideally, the installation will use this heat energy as an extra heat source in cold weather months or to heat water for an application. If the heat is unable to be reused then proper ventilation is critical.

Ventilation air should be drawn from the exterior of the compressor room at the lowest and coolest possible point on one of the room's walls. On the opposite wall, temperature-controlled ventilation fans should be installed at the highest point of this wall.

Cool air needs to flow across all of the equipment in the room. This is why it is critical to have intake and exhaust ducts on opposite walls. One of the most common reasons for compressor shutdowns is due to high temperatures, typically occurring when there is insufficient ventilation. A good rule of thumb – if the room is too hot for employees to work then it's too hot for compressors as well.

Ducting

If the design of the compressor room makes it too difficult for cooling air to flow across the compressor then ducting is the best alternative. You have the option of ducting both the inlet and outlet air, or just one, depending on your current setup. Make sure to review the manufacturer's specifications on airflow and how to size your ventilation ducting in order to keep backpressure at a minimum. Most cooling fans are not designed to work effectively with more than 1/10 psi of backpressure.

Intake air

For trouble-free, efficient operation, compressor intake air must be free of all solid and gaseous contamination. Dirt, dust and corrosive

PIPING AND VENTILATION GUIDELINES FOR PROPER AIR COMPRESSOR INSTALLATIONS

gases cause premature wear. They can also negatively react with the compressor coolant, causing damage to the oil system and airend. Areas with high dust content should utilize a pre-filter in the installation.

Remember, any gas or fumes ingested by the compressor will eventually end up in the process air at much higher concentrations, contaminating everything from breathing air to your facility's end products.

Piping Design

Pipe sizing

Properly piping compressors to the header is extremely important especially because improperly piped air compressors can cause leaks, pressure drops or machine failure. If the piping is too small than the velocity of the air will increase. Increased velocity causes increased turbulence in valves and tees making it harder to accurately perform pressure readings.

We'll walk through an example to demonstrate the serious effects – pressure drop and efficiency – the diameter and length of piping can have on the compressor system.

Say we have a 25 hp compressor producing 100 cfm at 100 psi. Moving up from a 1" pipe to a 1.5" inch pipe will significantly reduce the pressure drop and save the customer between 1 to 1.5 percent on their energy bill. In addition to proper pipe sizing, minimizing elbows, tees and quick disconnect fittings all help to reduce pressure drop and potential leak points, saving users time and money.

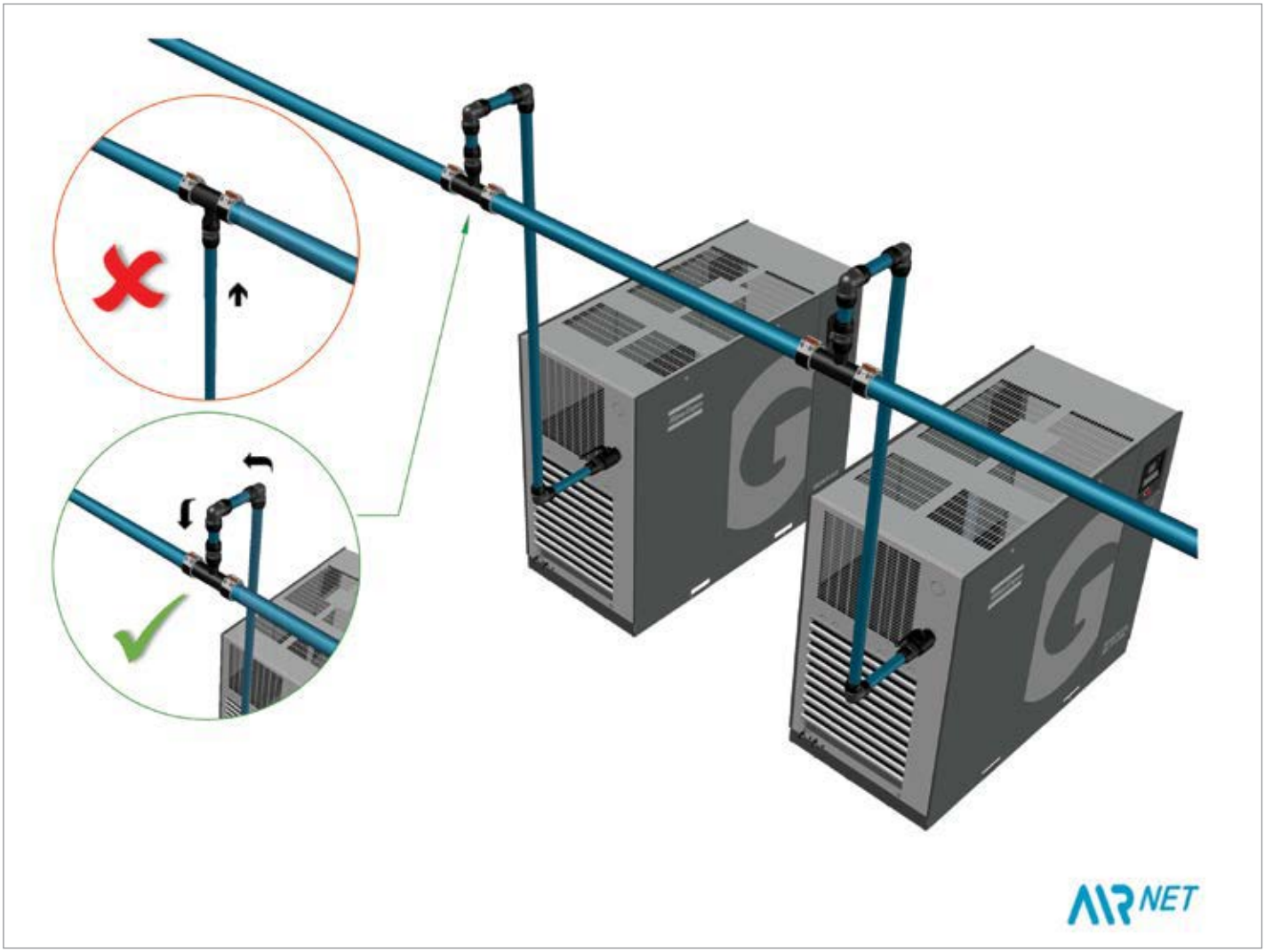

Figure 3: Proper connection to piping header

Piping layout

Piping layout is just as important as the pipe's diameter in optimizing airflow and reducing potential problems. In any system design with multiple drops, equalizing pressure throughout the entire plant is critical for stable use and measurement. Using a single piping run along with multiple airdrops will cause users at the end of the line to receive a significant reduction in airflow. In addition, pressure transducers installed in the system may improperly read varying pressures depending on where they are located. To combat these issues, users should create a layout of their piping in a ring, forcing evenly distributed airflow throughout the entire plant.

Compressor plumbing

Finally, the compressed air may contain small amounts of water having condensed in the piping. To eliminate the possibility for this water to drain back down into the compressor, the supply line should always be plumbed into the top of the header. This will prevent water or contaminants from draining down into another currently stopped compressor.

In an ideal world, we would all have plenty of space, time and money to create the perfect compressed air system. Unfortunately, this is rarely the case. In practice, we have to balance our ideals versus what we can actually accomplish. Compressed air systems take considerable forethought and planning to achieve a perfect install; however, we can use some key takeaways from this article even if we are ever faced a less than ideal installation. Remember to keep the compressors cool, minimize piping pressure drop and to allow sufficient room around the equipment for service. BP

Steve Bruno is the 30-90kw Rotary Screw Product Marketing Manager at Atlas Copco. For more information, visit www.atlascopco.com/en-us.

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

Correctly Solving Low Air PRESSURE PROBLEMS

By Paul Edwards, President, Compressed Air Consultants, Inc.

➤ "For every complex problem there is a solution that is simple, neat and wrong."

HL Mencken uttered those words over a century ago and they're still just as true today as they were then. One of the most common problems in plants is low air pressure. One of the most common solutions is to purchase new air compressors. Often this advice leads to a poor return on investment with the company's hard-earned money. Often the issues are related to demand, distribution, or both. Solving the wrong problem can be expensive from a capital and operating cost perspective. Determining root cause analysis may cost more up front, but will save tens if not hundreds of thousands of dollars long term.

When Compressed Air Distribution is the Main Culprit

Pressure problems were the reason our very first customer ever called us. This cement plant had an issue where lower air pressure intermittently affected the operation causing a rework issue on an irregular basis. When low air pressure occurred in the silos, where trucks were loading, one of the valves responsible for feeding the cement into the truck did not have enough pressure behind it to close. When this happened, the operator had to run up a flight of stairs and manually close the valve. In the meantime, the contents in the silo would continue to spill out on top of the truck.

A local air compressor company performed an analysis determining there was insufficient capacity. It was decided additional compressors and dryers were required to solve the problem. The solution was in excess of $100,000.

> "Determining root cause analysis may cost more up front, but will save tens if not hundreds of thousands of dollars long term."
>
> — Paul Edwards, President, Compressed Air Consultants, Inc.

Figure 1 (p. 22) shows the pressure in the air compressor room and in the silos. The black line represents pressure in the compressor room while the red line represents the pressure in the area of the plant where the valve failures were occurring.

If the issue had been a supply problem, the red and black lines would have run parallel to each other in the graph. If there was insufficient air in the compressor room, pressure would have fallen in all areas of the facility. The increase in differential pressure between the two areas indicates there was a problem on the distribution side and not one of capacity.

The piping distribution to this area of the plant then mapped out the individual areas examined. When root cause analysis was performed, the distribution problem became obvious. The picture below shows the distribution system feeding the area where trucks loaded.

Proper Piping Equals Proper Pressure

Instead of there being one problem, there were multiple issues contributing to the intermittent pressure problem.

- The 2" pipe coming from the main plant was undersized
- The two separators were clogged up with trash and debris
- The check valve was unnecessary
- The gate valve failed catastrophically and the actual gate detached from the handle. This meant it basically was flapping in the wind
- There was a filter and dryer suffering from roughly 5 psi pressure drop, yet, the dryer was unplugged
- The tank had over 300 gallons of water in it as the drain trap it was connected to had failed. Air came in the bottom of the tank and exited the top. This meant it had to overcome the head pressure of the water

Instead of purchasing a new air compressor, the client only needed to fix the distribution problems. This would save over $100,000 in capital avoidance. The original configuration offered by the compressor company would have actually increased the operating cost of the system. Fixing the distribution problem had no net effect on overall operational cost making it a win-win solution from an operating cost capital and capital avoidance perspective.

Cement Import Terminal Productivity Problems

A cement import terminal had all the usual productivity problems one develops with moisture in the air such as sticky valves, small boulder formation in the silos, blinding in the baghouses, etc.

Their sister cement plant had recently hired Compressed Air Consultants (CAC) to audit their system and were pleased with the results. The terminal called CAC to talk about their problems. In the ensuing discussions, it was discovered the plant used to run solely on a 75

CORRECTLY SOLVING LOW AIR PRESSURE PROBLEMS

hp and the 125 hp was only used when the plant was blending cement for the bagging operations.

The plant had three basic modes of operation: Standard operation (ship unloading and truck loading), bagging operations, and shut down. The plant had two primary problems. The first was an air pressure problem at the top of the load-out silo while moisture was a problem throughout the facility.

The plant originally ran on a 75 hp air compressor by itself with a 125 hp machine operating only during the bagging operation to feed the blenders and dense phase transporters. This only occurred less than 5% of the week. Over time, the plant found it couldn't run on just the 75 hp and had to run both compressors, yet there weren't any new applications in the plant.

The local compressor company performed a supply side audit and recommended an additional compressor and clean up equipment plus adding additional piping to the top of the silo. The total cost for this retrofit was $40,000 to $60,000 with an increase in operating costs of over $15,000 per year

The client wasn't convinced the problem would be solved so they elected to have a full system audit performed by an independent auditor to look even deeper. It was money well spent.

CAC worked out two different scopes of work. One was to focus exclusively on the moisture issue. The second one was solving the moisture issue while figuring out if it was possible to turn off one of those two compressors for significant periods of time.

Given their operating costs were estimated between $60,000 and $80,000 per year, performing a massive audit didn't make any sense due to cost issues. However, when there are only two compressors running a system and the goal is to turn off a compressor, it was highly likely some demand side work had to be done. A specific scope of work was developed to accommodate the plant's unique situation.

The terminal elected to go with the more detailed look at their system and the results were surprising indeed.

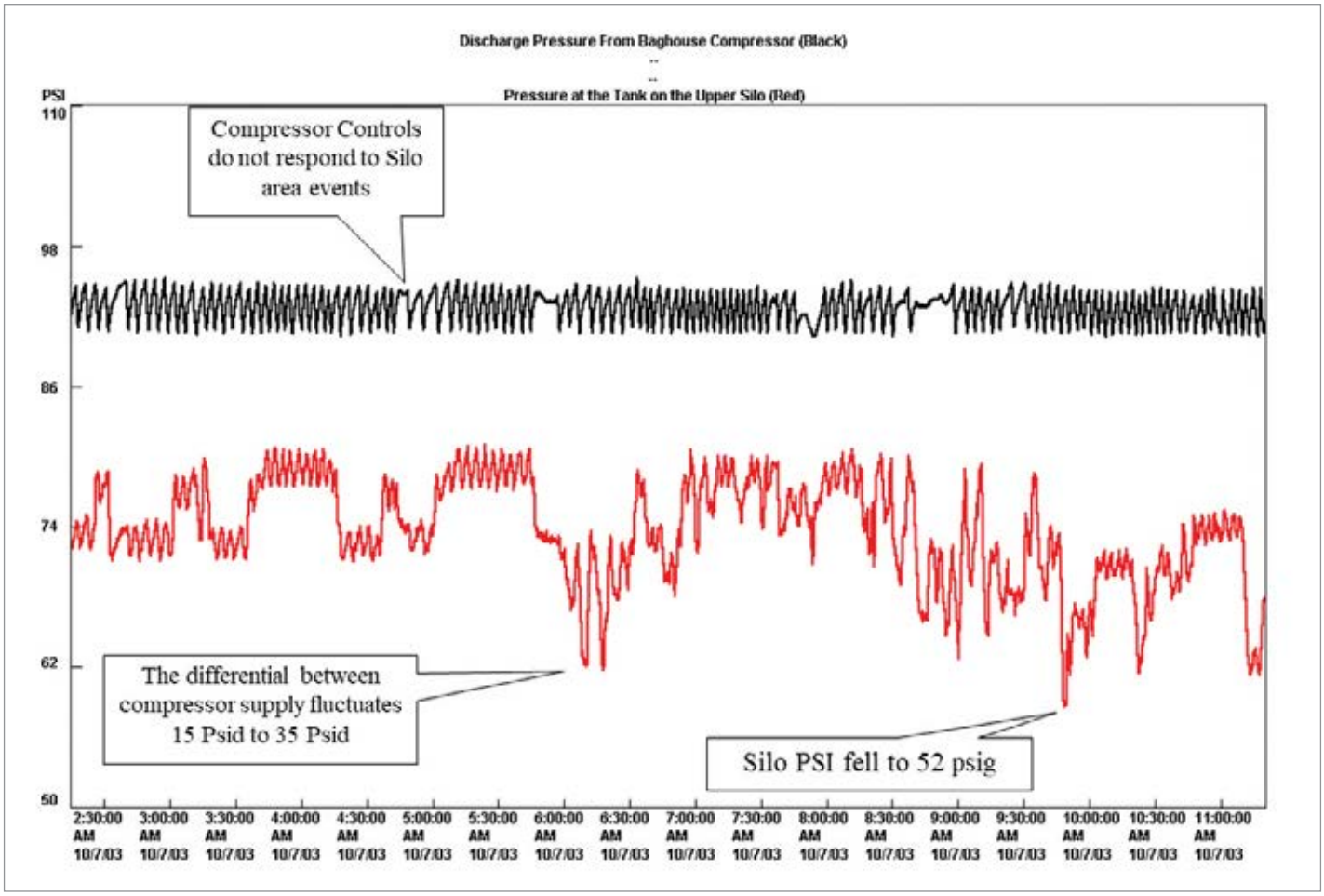

Figure 1

Moisture in Compressed Air Causes Dust Collector to Consume Excess Air

As it turned out, a dust collector consuming excessive amounts of compressed air caused the pressure problem at the top of the silo. In fact, its current setting had it consuming roughly 125 scfm more than it was designed for.

How the system got to this condition was less than obvious. At some point in the past, the 75 hp had failed. While it was down, someone made an emergency connection to the 125 hp system. As described already, the connection was made upstream of the dryer - providing wet air to the entire plant.

The dust collector operator didn't know why the air was wet but he knew his bags were blinding

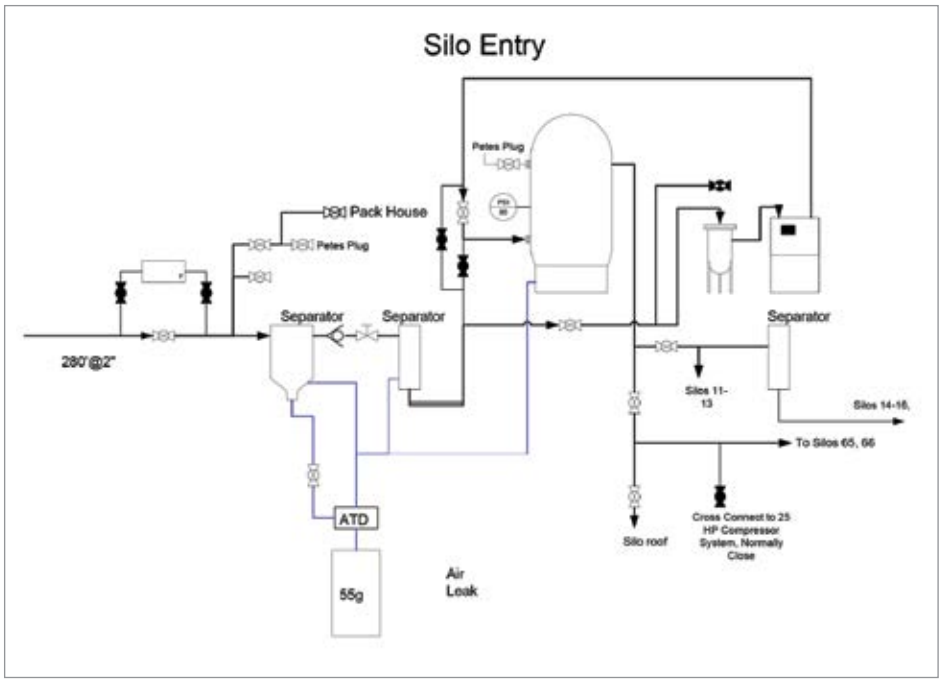

Figure 2

CORRECTLY SOLVING LOW AIR PRESSURE PROBLEMS

due to the water. The only way to keep the bags dry enough to work was to change the settings to the point where the dust collector was pulsing too long and too often. This increased the demand to the previously mentioned 125 scfm.

The increase in flow to the top of the silos increased the pressure drop to the same dust collector - further exacerbating the problem.

When the 75 hp was repaired, it was turned back on and the 125 hp shut off. As you have already figured out, pressure dropped throughout the facility because no one changed the dust collector settings. This new load overloaded the 75 hp. So what did the plant do? Turn on the 125 hp to supplement. Since the control settings on the 125 hp were higher than the 75 hp, it attempted to carry the load in the plant resulting in wet air continuing to be fed to the dust collector.

One of the internal processes on the main system during standard operation was way out of tolerance. Instead of consuming 25-40 cfm as it should have been, it was consuming 150 cfm. The incorrect operation of this equipment was enough to force the plant to turn on the other compressor when intermittent events pushed the system to the limit and this application fired off.

Moisture was also caused by the installation of the 125 hp, as the room temperature of the 125 hp was excessive. This system was placed in a silo just like the 75 hp system. The difference was the 75 hp was in a far bigger silo with a greater transfer of air in it allowing the 75 hp and its dryer to operate at lower temperatures. The 125 hp therefore fed even wetter and hotter air to the main system since its after cooler wouldn't be as effective. It also meant the air being fed to its own system (blender and dryers) was so hot

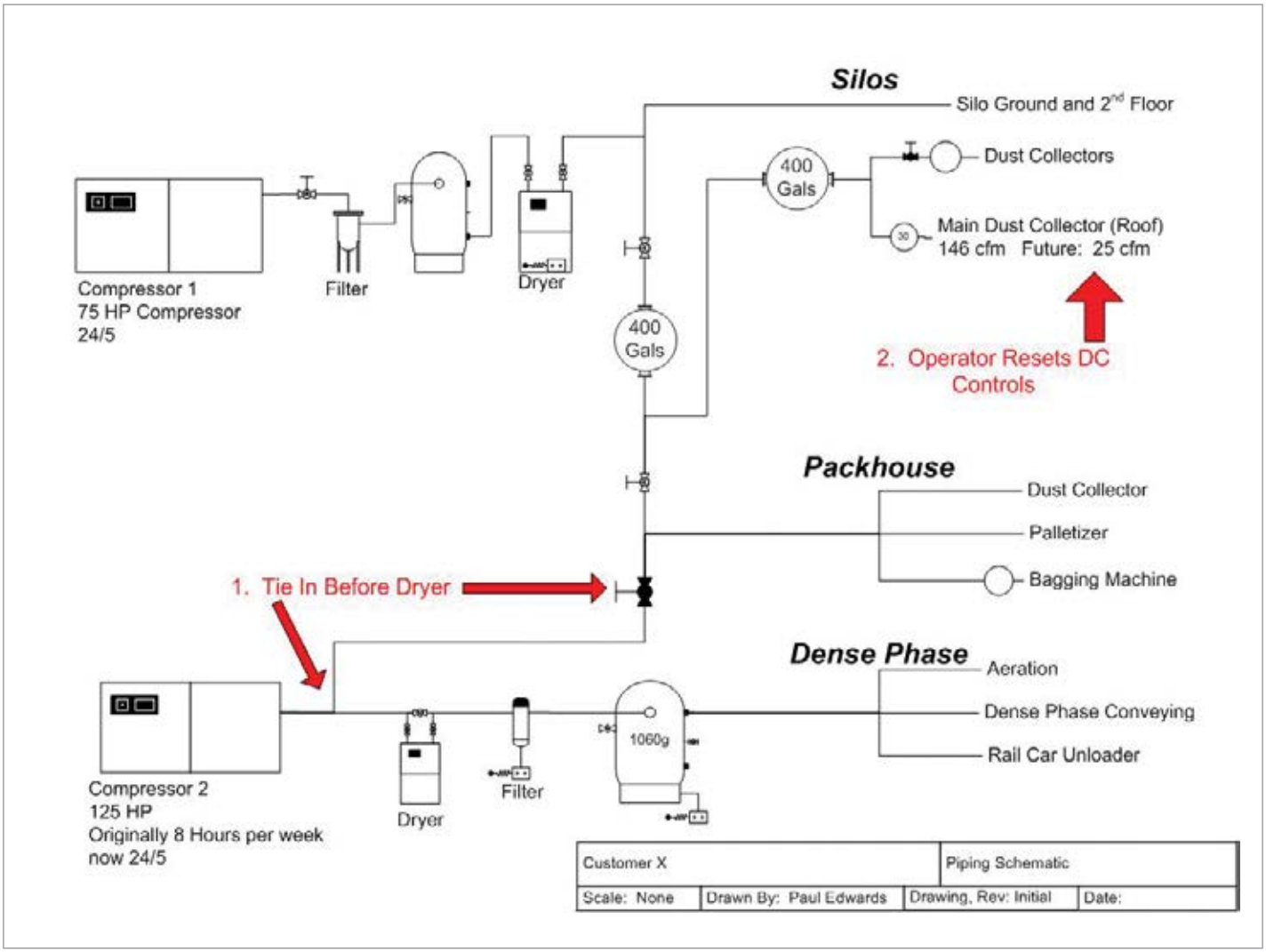

Figure 3

the refrigerated air dryer couldn't do its job providing less than adequate air quality to the system.

Reducing the demand on this application combined with some other infrastructure improvements (piping, controls, storage) alone was critical to turning the compressor off. If the auditor had stayed in the compressor room only, they would have never realized the potential operating cost improvements.

The audit determined there was a ROI project that solved the moisture problem. This is due because the improvements in supply, distribution and demand would allow the plant to run on one compressor during standard operation. This not only reduced operating costs but also would increase the longevity of the compressors and allow scheduled maintenance to occur during normal working hours.

In the end, attempting to solve the pressure problem in the compressor room would have resulted in a $50,000 project. This would have increased operating costs for a negative ROI. By looking at the demand side to solve the pressure problem, it was discovered $500-$1000 of piping could reduce operating costs by over $20,000 per year. Since the project return was as high as it was, it allowed the plant to create a project where the air pressure and moisture problems were solved while increasing the reliability of the system, equipment longevity and maintenance cost of the projection machinery. The final estimated savings was $32,000 per year (46%) with a 22-month payback.

Conclusion

Far too often, compressed air pressure issues are assumed to be supply side related. While adding new compressors may solve the problem, it can often mask the root cause driving operating costs up while spending unnecessary capital. In some cases, the capital expenditure doesn't solve the problem leaving the plant back at square one. If you have low air pressure issues, make sure you examine supply, distribution and demand to determine the root cause. BP

For more information, contact Paul Edwards, tel: (704) 376-2600, email: paul.edwards@loweraircost.com, or visit www.lowercostair.com/web.

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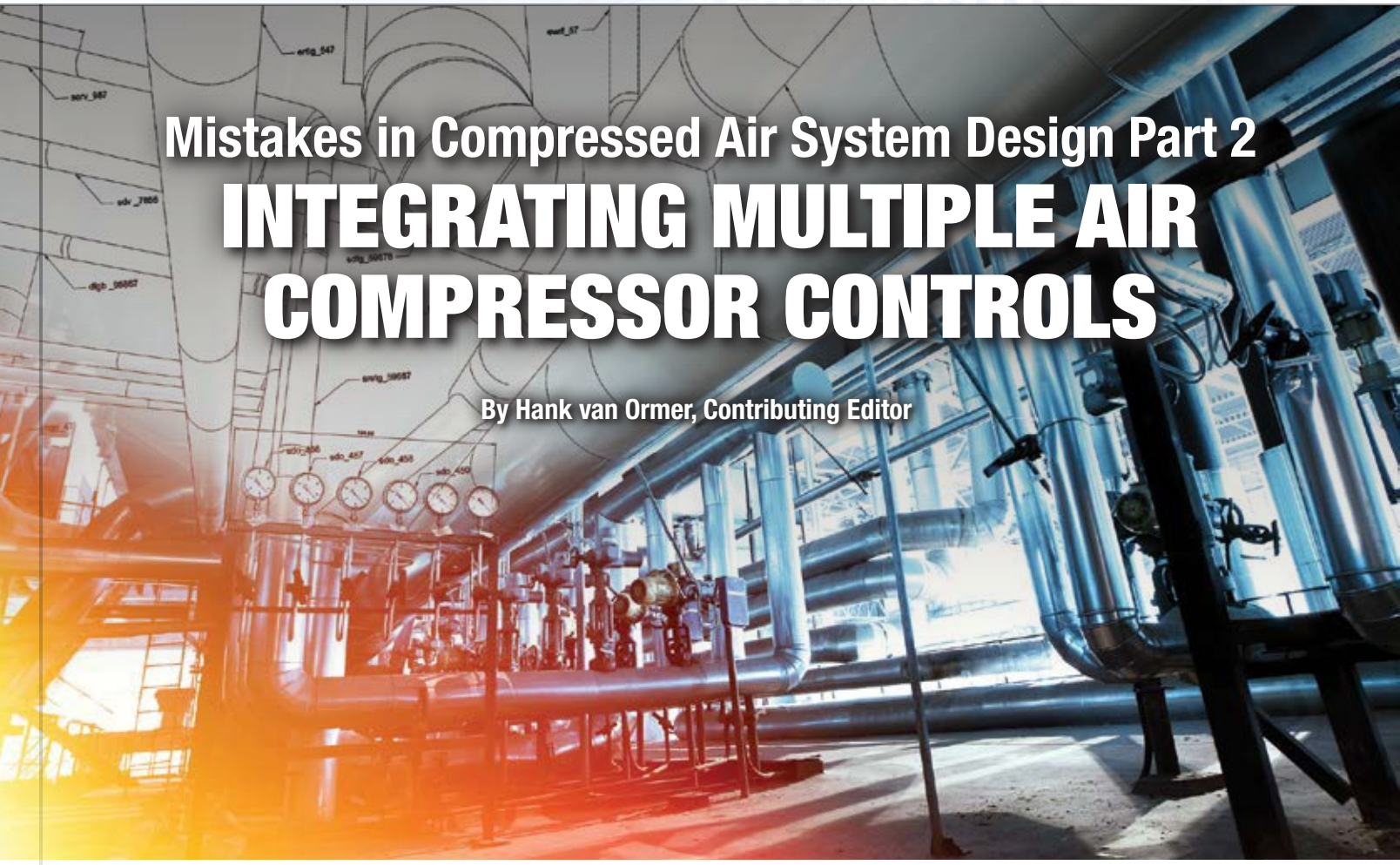

Mistakes in Compressed Air System Design Part 2

INTEGRATING MULTIPLE AIR COMPRESSOR CONTROLS

By Hank van Ormer, Contributing Editor

➤ In the initial article of this continuing series, we looked at the most common problem preventing multiple unit air compressor installation (2+), to do their job of matching supply to demand in an optimum manner. This article focused on piping design errors creating signals to the air compressor controls unrelated to anything happening on the production floor.

This article is going to identify two air compressor control situations that will preclude translating air use reduction in the production area into lower input energy into the air compressor.

The missing ingredient is often caused by a lack of understanding of the basic operating dynamics of each type of capacity control and air compressor.

Positive Displacement Air Compressors

Positive displacement air compressors are units where the inlet ambient air is swept into the compression chamber – sealed – and the compression chamber reduced creating the air compression to the desired discharge pressure. The most common types are reciprocal, rotary screw, rotary vane, rotary lobe and scroll.

> "The missing ingredient is often caused by a lack of understanding of the basic operating dynamics of each type of capacity control and air compressor."
>
> — Hank van Ormer, Contributing Editor

All positive displacement air compressors, basically, react to an increase in discharge pressure with the volume (cfm) staying about the same and the input energy also increasing. Just the opposite happens when the pressure falls, similar volume (cfm), and lower input energy. This is an important dynamic to remember.

Capacity Controls for positive displacement air compressors can be placed into two categories:

Step Controls – Often two-step, also called full load/no load or cut in/cut out. The dynamics are (two-step) the compressor goes from idle or no load at the cut in pressure and runs at full capacity from that pressure until it senses the cut out or unload pressure (nominal 10 psid) where no air flows to the system until the system pressure falls to the cut in or load set point.

Flow Varying Controls – These have set points to hold and react almost instantly to any sensed change in discharge pressure. The most common types are Inlet Throttling, Variable Displacement and Variable Speed – all of which take action to adjust flow.

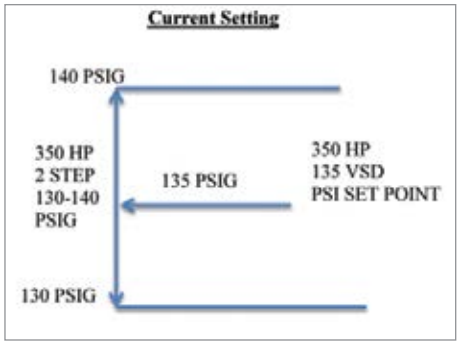

Figure 1

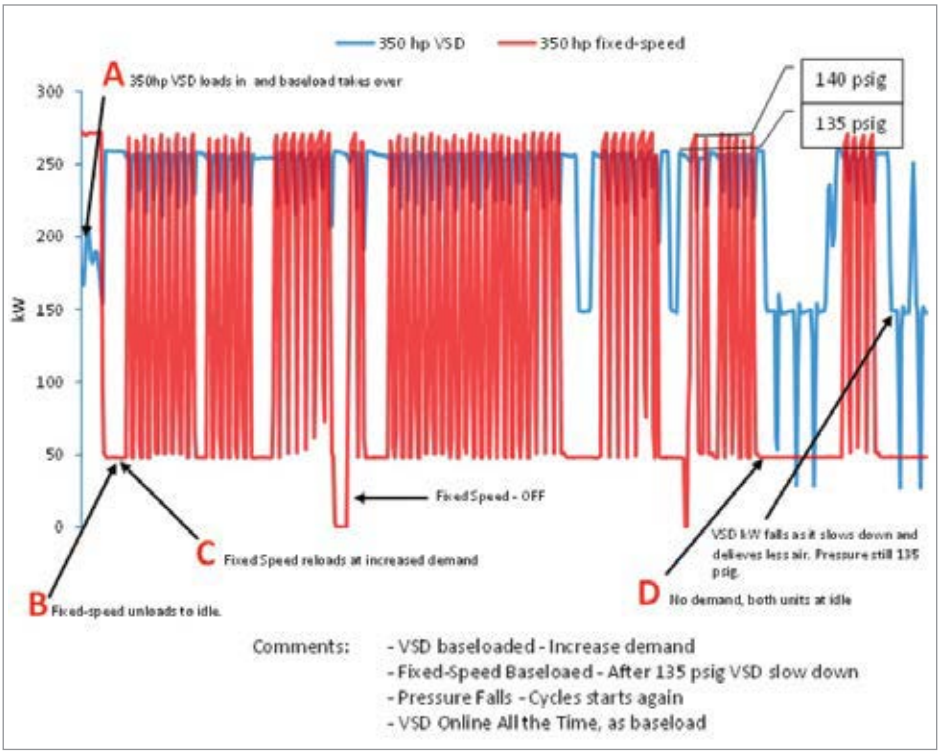

Figure 2

MISTAKES IN COMPRESSED AIR SYSTEM DESIGN PART 2

The operating dynamic is when they sense a rise in pressure above the set point they immediately start to deliver less air and when they sense a fall in pressure they immediately adjust to deliver more air.

Plant Audit with Two-Step and VSD Air Compressors

The plant has two oil free 350 HP rotary screw air compressors. One is a two-step or load/no load and the other is a VSD drive. The two units combined full load capacity is 2,617 cfm (VSD 1,329 scfm; fixed speed two-step 1,288 scfm) to supply a full production demand of 2,200 to 2,400 scfm and lower production levels of about 1,100 scfm. Accordingly, the two units were set up for the fixed speed (two-step) to run base load and the VSD unit in auto start trim. Both units enter an appropriately sized single compressed air storage tank from where the control signal is taken. Sounds like a good plan! The base load fixed-speed two-step control unit pressure settings are 130 psig to 140 psig and the VSD set point is 135 psig.

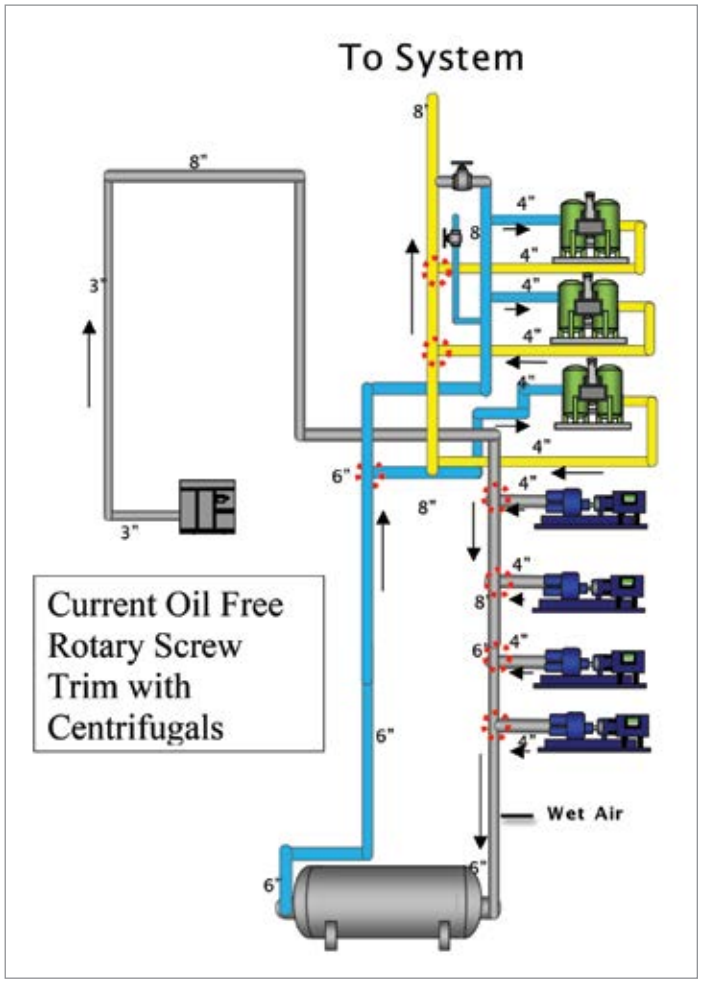

Figure 3

Figure 1 shows these settings and Figure 2 indicates how they are running together.

What Happens?

The fixed speed air compressor is "short cycling" two to three times per minute. The VSD is running loaded but backing down constantly when it runs base and the fixed speed loads in.

A. The VSD set point is 135 psig and the fixed speed reaches 140 psig and unloads, the VSD is now in the base load.

B. The fixed speed is at idle and the VSD is carrying the load demand (at 1,329 or less scfm).

C. When the pressure falls 130 psig, the fixed speed loads in at full load. As the supply increases it stays fully loaded up to 140 psig. When the pressure exceeds 135 psig, the VSD backs off and the fixed speed continues at full load up to 140 psig, where it unloads and immediately reduces the delivered air by 1,288 scfm. Then the pressure falls rapidly until the cycle starts over again.

D. The continued short cycling of the fixed speed goes on and on reducing its maximum flow capacity from 1,288 scfm to 50% or 644 scfm.

Net Result

Since the two units cannot run together at full load rating (2,617 scfm) to deliver the required 2,200 – 2,400 scfm needed for production, the plant had to rent another air compressor. The maximum possible air volume would be less than 1,329 scfm from the VSD and only 644 scfm from the fixed speed, for a total of 1,973 scfm or less.

The Correction

Reset the VSD air compressor's set point from midway between the operating band of the two-step control (130 – 140 psig). Reset the VSD target to 125 psig. When the pressure settings were adjusted on the fixed speed air compressor to 130 – 140 psig and a VSD set point of 125 psig, the fixed speed stayed at base load and the VSD became a very effective trim unit. The rental air compressor was returned.

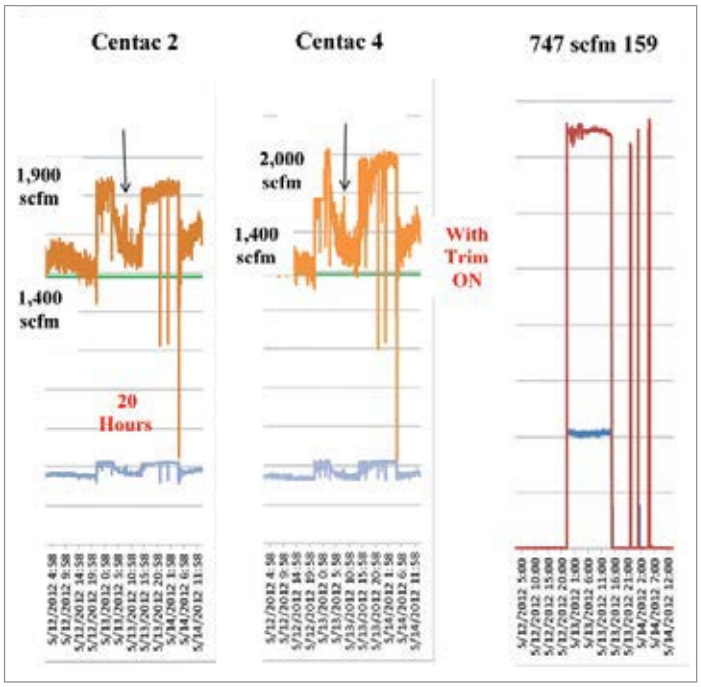

Figure 4

Second Case Study – Operating Dynamics of Two Different Types of Air Compressors

Earlier we described the positive displacement operating dynamics with regards to sensed discharge pressure with a relatively stable volume and the input energy varying directly proportionate to the discharge pressure.

Now we put a positive displacement two-step rotary screw air compressor to run as a trim unit into a system with dynamic-type centrifugal air compressors. Centrifugal air compressors are also called mass flow units – with operating dynamics significantly different with regards to discharge pressure.

With dynamic air compressors, rising pressure also reduces flow at about the same percentage as the discharge pressure change but is inversely proportionate at about the same input power. Falling pressure usually increases flow at about the same input power. The important point here is each type (positive displacement or dynamic) reacts differently when the sensed discharge pressure changes even when at "full load." This has to be taken into account in any air system management program, particularly when centrifugal compressors are involved.

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MISTAKES IN COMPRESSED AIR SYSTEM DESIGN PART 2

What Actually Occurred

As soon as the variable speed drive trim air compressor (positive displacement) loaded into the system, pressure rose and the two 500 HP centrifugal (dynamic) units backed off in flow and the trim unit continued to stay on fully loaded for 20 hours (as shown in figure 4) until it was manually shut off. The trim unit added 747 scfm to the system while one centrifugal backed off from 1,900 scfm to 1,400 scfm and the other from 2,000 scfm to 1400 scfm. A total reduction of 1,100 scfm occurred. The total flow was reduced from 3,900 scfm to 2,800 scfm. Unfortunately, the centrifugal input KW stayed almost the same, while the trim unit added 159 KW. At the lower air supply the additional unneeded energy cost (.08 kW/h /8000hr/yr) was $ 101,760 per year to serve the same demand.

Corrective Actions

- Added directional angle entry from each centrifugal air compressor to the 8" header to minimize the turbulent backpressure.
- Installed an appropriately sized storage receiver (2,500 gal) for the after-cooled discharge air coming from the oil free screw trim unit. The set points are 95 psig to 105 psig.
- Installed a properly sized regulator to deliver the trim air at no greater than 98 psig. The regulator was selected to operate with less than 2 psig pressure drop. 95 psig was deemed an acceptable minimum system pressure.
- The regulated flow pressure of 98 psig operates below the full load set point of the centrifugal and will not push them back.

Conclusion

Whenever a positive displacement air compressor is entering the same header as a dynamic air compressor (in this case a centrifugal), the positive displacement air compressor load points have to be below the centrifugal compressor full load set point. This can be accomplished with proper set points or with a pressure regulator as shown.

Since this is an ongoing column, we encourage feedback on the discussions. In the next article, we will review products and technologies offering plants significant compressed air reduction opportunities – at low capital costs and usually with a rapid simple payback. BP

We hope you've found this interesting and look forward to your comments! Contact Hank van Ormer, email: hankvanormer@aol.com

To read similar ***Air Compressor Control System Assessment*** articles visit www.airbestpractices.com/system-assessments/compressor-controls.

PLASTICS PLANT SAVES 55% IN ENERGY with VSD Air Compressor and Sequencer

By Ron Marshall, Marshall Compressed Air Consulting

A Canadian plastics product plant has upgraded their system of older modulating air compressors to a newer system using a variable speed compressor and a compressor-sequencing controller. This article discusses their challenging experience.

Molded and Blow Molded Plastics Application

The plant produces both molded and blow molded plastic parts on a 5 day per week, three shift schedule. Production and maintenance sometimes occurs on weekends, occasionally requiring the air compressors to run on a 24 x 7 basis so the practice was to leave the compressed air system always pressurized. The system consisted of three

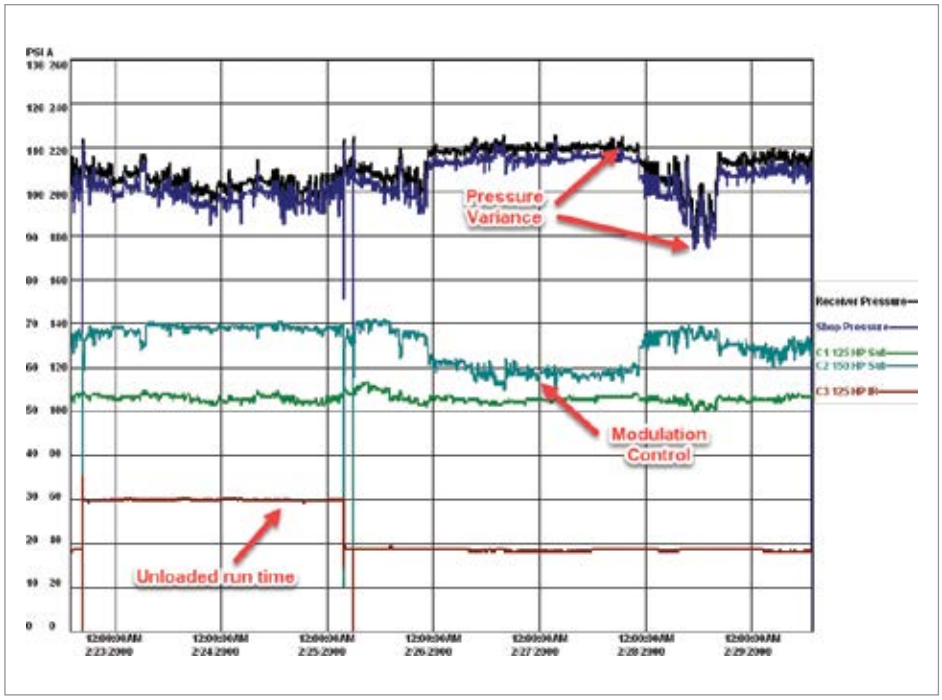

Figure 1: Original pressure/amp profile.

modulating lubricated screw compressors one sized at 150 hp and the others 125 hp (3 units), each controlled with their local compressor controllers. The system also had non-cycling refrigerated air dryers dedicated to each compressor. The flow profile had a fairly constant base component, but with occasional high variability depending on what production machinery was running.

Initial Assessment of Compressed Air System

The local power utility was called in to do a scoping study of the system. Data loggers were placed on the 100 psi system, showing the compressed air system was running inefficiently due to modulating compressor control. In modulating control, the inlet valve of the compressors chokes off the compressor inlet air, reducing the compressor output in response to the system pressure change. As can be seen in Figure 1 when this modulation happens there is a reduction in compressor amps as the pressure rises. The other smaller 125 hp compressor amps rises at times of increasing pressure, and falls at times when the pressure reduces. This is not modulation but shows the compressor is in drawdown, at maximum capacity, inlet valve wide open.

Around the center of the chart, corresponding to a weekend, the amps of the 125 hp start to go down as the pressure rises. This is a sign the inlet valve is closing under light loading, creating a worst-case scenario, two modulating compressors sharing the load. Figure 2 shows a photograph of the inlet valve of this type of compressor in fully closed position.

In addition, you can see a third compressor with much lower amps. This compressor is running unloaded through the first third of the profile and was manually turned off part way in. You can see the unit continues to draw amps even though the motor is not running. This is due to installed power factor correction capacitors consuming amps (not power) when they are energized.

A profile like this presented a problem in estimating the flow based on amps (no flow meter was installed at the time) because a reduction in amps can mean two different things, either full load in draw down or a compressor in modulation at part load. Care had to be taken in simulating a flow profile in this case so estimated savings could be calculated accurately.

The system auditor found the energy consumption was 2,740,000 kWh per year, costing an equivalent to $267,000 annually

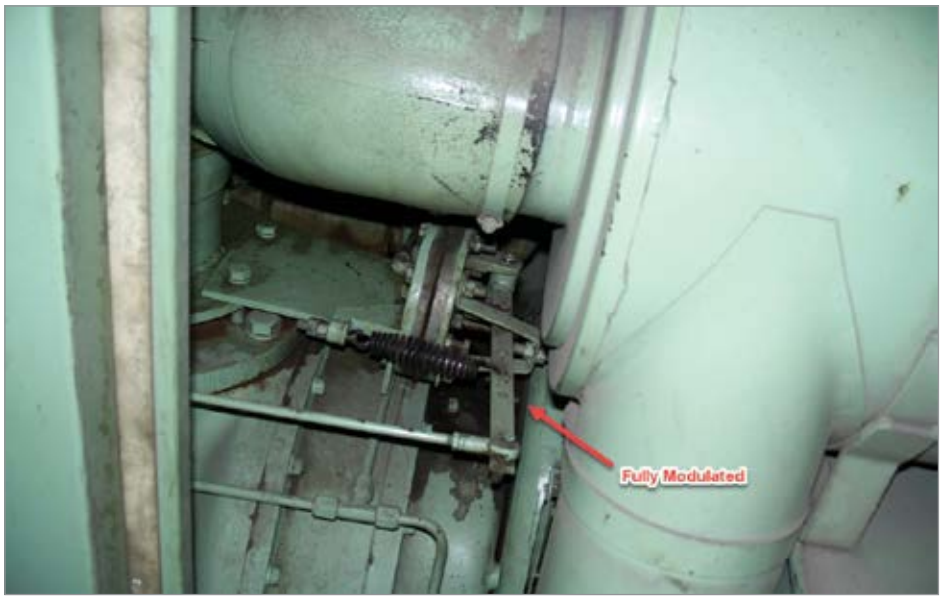

Figure 2: Compressor inlet Fully modulated at poor efficiency.

Figure 3: This controller keeps pressure constant while choosing the most efficient compressor.

PLASTICS PLANT SAVES 55% IN ENERGY WITH VSD AIR COMPRESSOR AND SEQUENCER

Figure 4: Cycling dryer shows savings to date.

at 10 cents per kWh while producing about 1,390 cfm. This energy consumption represented about 10% of the total facility electrical load. The system specific power calculated to about 22.5 kW per 100 cfm, equating to a fair amount for a compressed air system of this size.

The utility calculated a possible 35% savings could be gained by applying various energy conservation measures to the plant and a substantial energy rebate could be granted to pay for the changes.

Integration of VSD and Air Compressor Sequencer

The first recommendation by the utility was to get the compressors under control. Modulation is one of the worst ways to operate compressors at part load. The improvements consisted of three conservation measures. The first was to upgrade one of the older compressors to a more efficient two-stage variable speed unit. This had the potential to renew the compressed air production system, provide better efficiency, and provide excellent part load turn down to match the variable loads. A compressor sequencer was recommended

Figure 5: Airless drains save wasted air.

Figure 6: Flow controller reduces artificial demand.

to provide good control of the remaining base compressors, comprised up of the remaining 150 hp and 125 hp. A large storage receiver was added, sized to 2,000 gallons, to make it easier to control the compressors.

The controller selected has an energy efficiency mode capable of selecting the appropriate size compressor to operate based on the system loading. This occurs all the while maintaining the VSD compressor as the trim unit, taking the partial load. The controller senses the pressure downstream of the air dryer and controls the typical sag caused by the dryer and filter pressure differential. The controller is interfaced to the base compressors in such a way as to force the units to full load when they run. Conversely, if the compressor is not required, the unit will unload and turn off using its local automatic start controls. Verification loading showed this control strategy worked very well, with the base compressors only having 1% unloaded run time through the full final profile.

Combating Artificial Demand from Compressed Air Dryers and Filters

The power utility recommended other changes to the system. The air dryers were non-cycling units consuming a total of about 8 kW at all times. This is almost full rated power, even when the associated air compressor turned off. Purchase of a single new thermal mass dryer sized for all the compressors was recommended to reduce power in proportion to the moisture load of the compressed air production. Figure 4 shows its control tracking energy savings. The overall savings were 78% compared to a similar sized non-cycling unit.

Filter pressure loss, typically 3 to 5 psi, was addressed by installing a mist eliminator style main filter with average pressure drop of about 0.5 psi. Airless drains were installed on the filters, dryers, and compressors to reduce compressed air loss (Figure 5).

The production load was found to be pressure sensitive. Therefore, the higher the plant pressure the more air the machines demanded (called

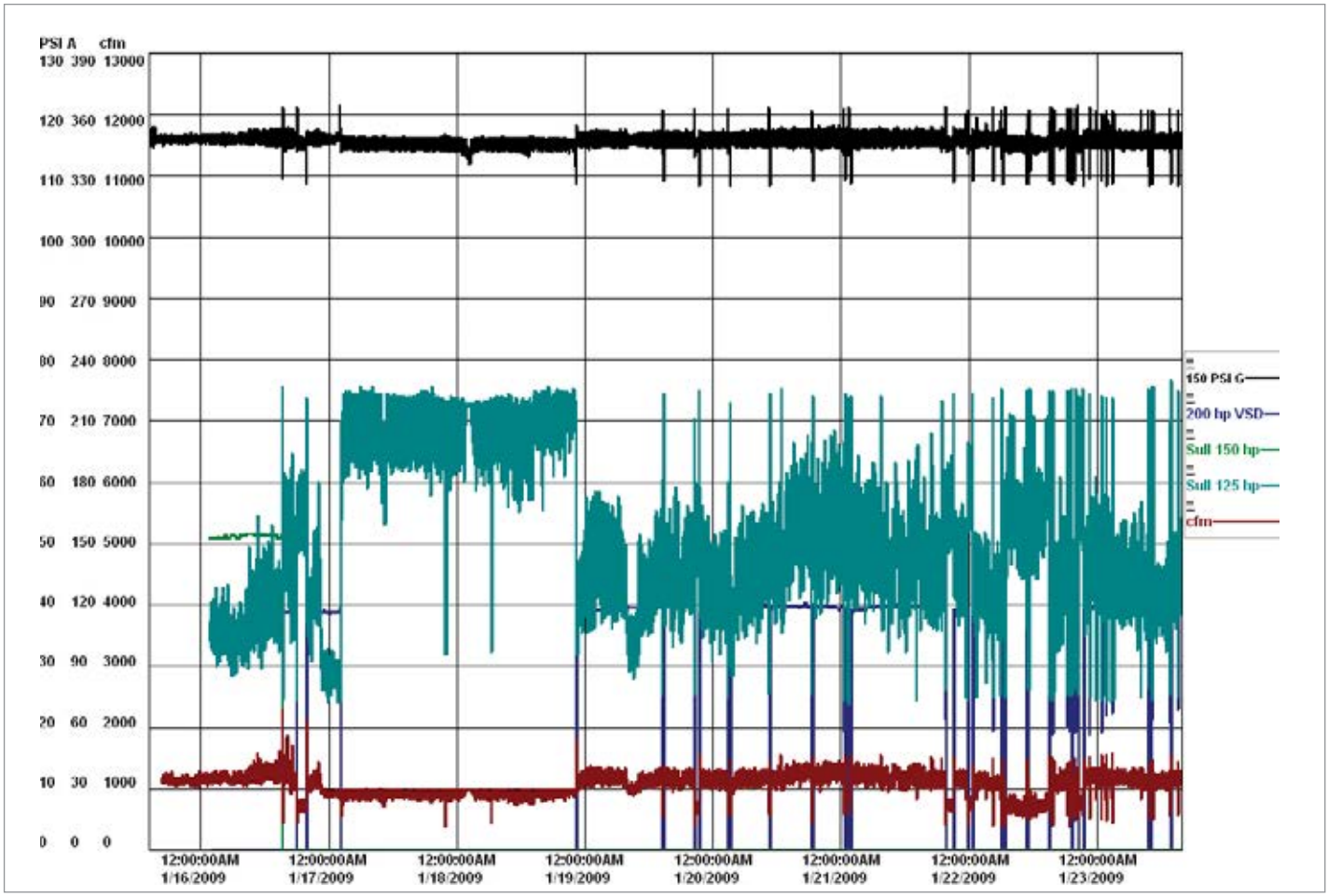

Figure 7: Final profile (plant pressure not shown).

PLASTICS PLANT SAVES 55% IN ENERGY WITH VSD AIR COMPRESSOR AND SEQUENCER

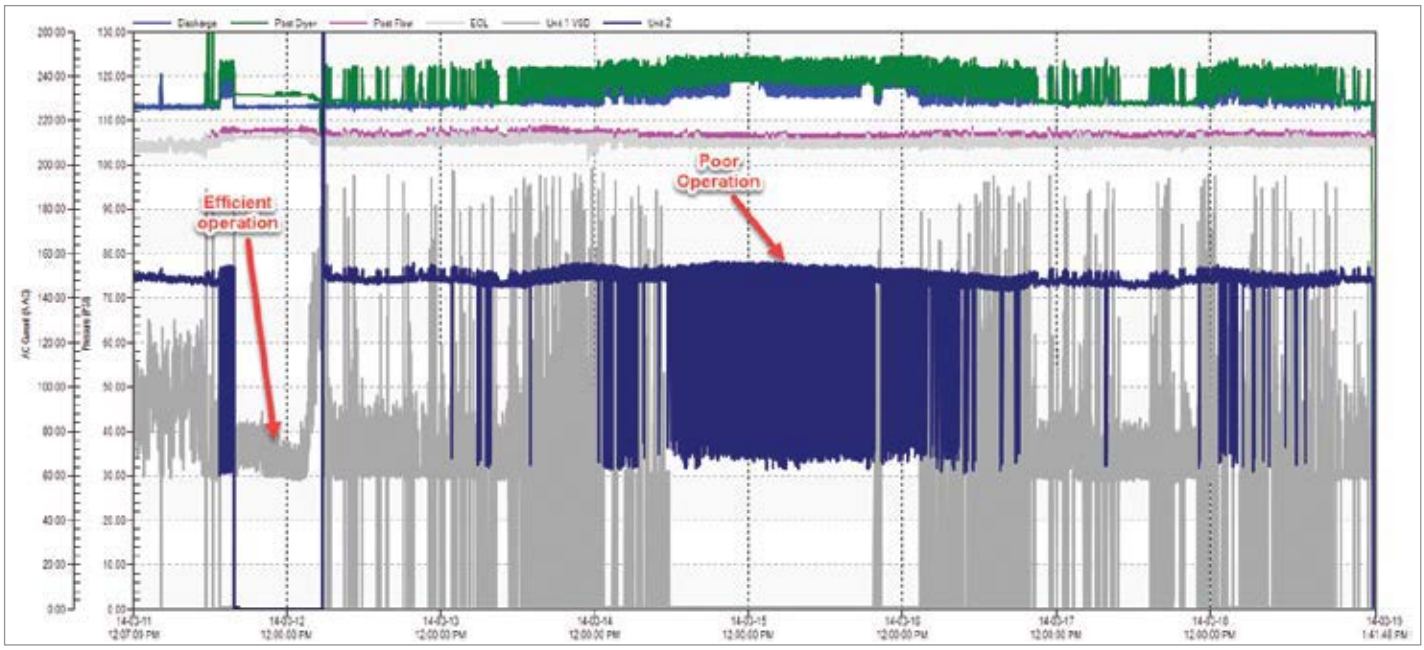

Figure 8: Second logging years later showed problems.

artificial demand). The utility recommended the installation of a flow controller (Figure 6) to regulate plant pressure to a lower level while keeping the compressor pressure a bit higher. This allowed for good control of the compressors without disturbing the plant level.

Energy Audit Savings Results

After installation the power utility returned and performed verification logging. This showed the system consuming about 1,242,200 kWh while producing about 1,050 cfm of compressed air. This calculates to a savings in energy of 55%. This was considerably different than the predicted values. The big change was the plant started turning their system off on weekends to save energy. The specific power of the system, when running, was now 18.5-kW/100 cfm meaning a savings of about 18% on compressed air production efficiency. The remainder of the savings was due to reduced compressed air flow and lower operating hours. The utility incentive was over $100,000 in this case and helped reduce the simple payback of the new equipment to an agreeable level of under 3 years.

Subsequent Compressed Air Data Logging Finds Problem

A number of years later the power utility approved another data logging by the compressed air supplier to check if the savings in the original verification were sustained. The assessment found most of the compressed air production equipment was operating adequately, but unfortunately, the compressor controller had malfunctioned, unknown to the plant operators. This caused one of the compressors to continue to run over the weekend in load/unload mode, even though there was an efficient two-stage compressor available. The plant had no way of monitoring the efficiency of the compressed air system, so energy efficiency had inadvertently slipped. The plant realized this after discussion with the utility and corrected the situation.

Conclusion

This project shows the kind of savings that can be gained by not only replacing compressors, but also correcting the control through use of an intelligent sequencer and added storage capacity. Additional measures like efficient air dryers and flow control made for extra savings on top of what the efficient production equipment could deliver. Of course, a substantial savings was gained by simply turning off the compressors during non-production hours. Despite good control being in place, the extra logging showed if the system efficiency is not monitored, the operation of the system could become less efficient as time goes on.

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

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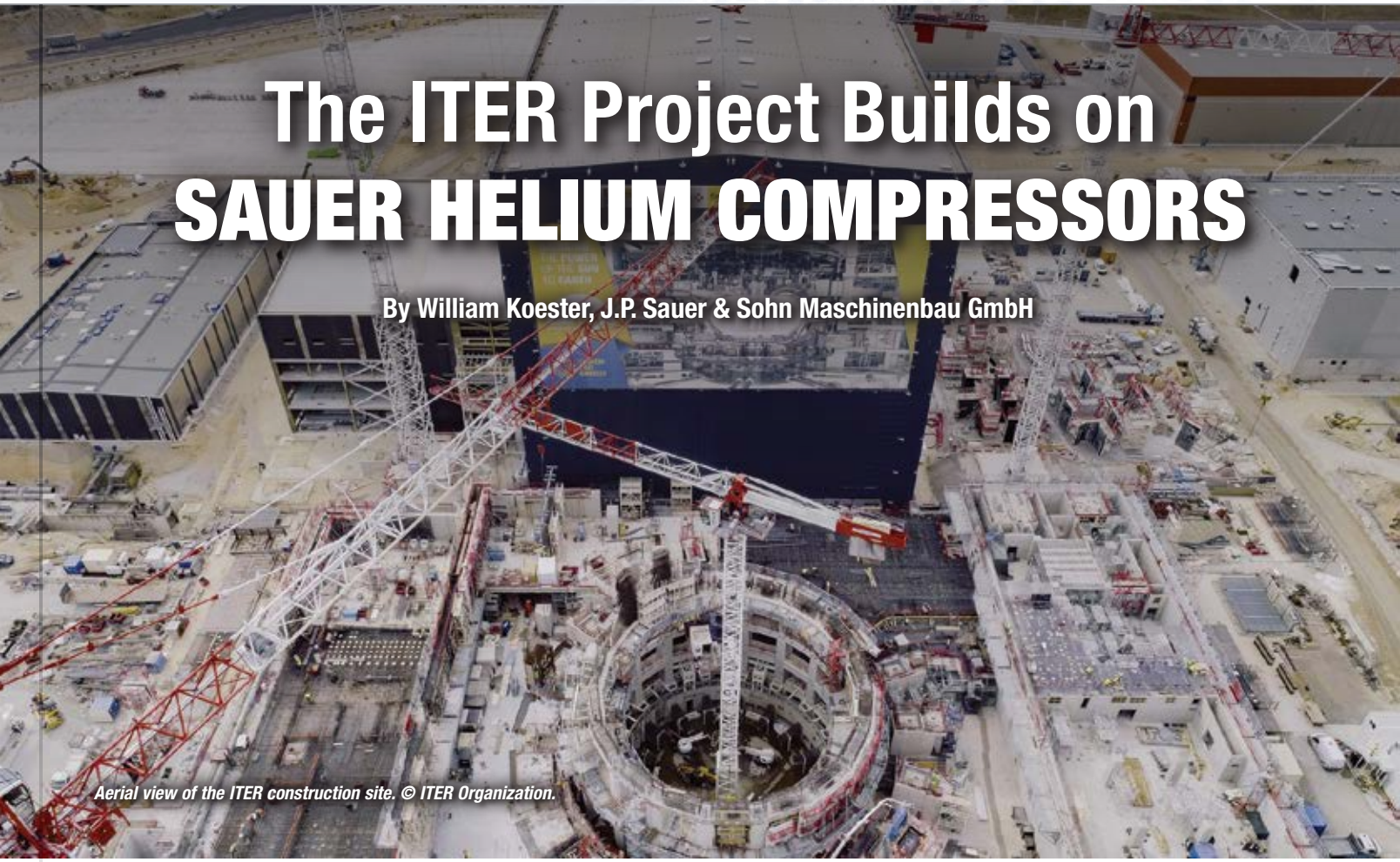
The ITER Project Builds on SAUER HELIUM COMPRESSORS

By William Koester, J.P. Sauer & Sohn Maschinenbau GmbH



Aerial view of the ITER construction site. © ITER Organization.

A spectacular vision is gradually becoming reality in Cadarache in the south of France. Modeled on the sun, the ITER (International Thermonuclear Experimental Reactor) fusion system uses nuclear fusion to generate energy in order to secure humanity's supply of electricity. One of the biggest challenges is the high temperature inside the reactor. Technology by Sauer Compressors is a key factor in cooling the reactor. The manufacturer has supplied the world's largest system for helium recovery.

The ITER fusion reactor is an international consortium project involving the European Union, the United States, Russia, China, Japan, South Korea and India. The reactor is scheduled to be put into operation in 2020, with the aim of harnessing nuclear fusion – the sun's source of energy – under terrestrial conditions as well. The hydrogen isotopes deuterium and lithium melt and form plasma when exposed to immense heat. This process releases large quantities of energy. Researchers

"The ITER fusion reactor is an international consortium project involving the European Union, the United States, Russia, China, Japan, South Korea and India. The reactor is scheduled to be put into operation in 2020, with the aim of harnessing nuclear fusion."

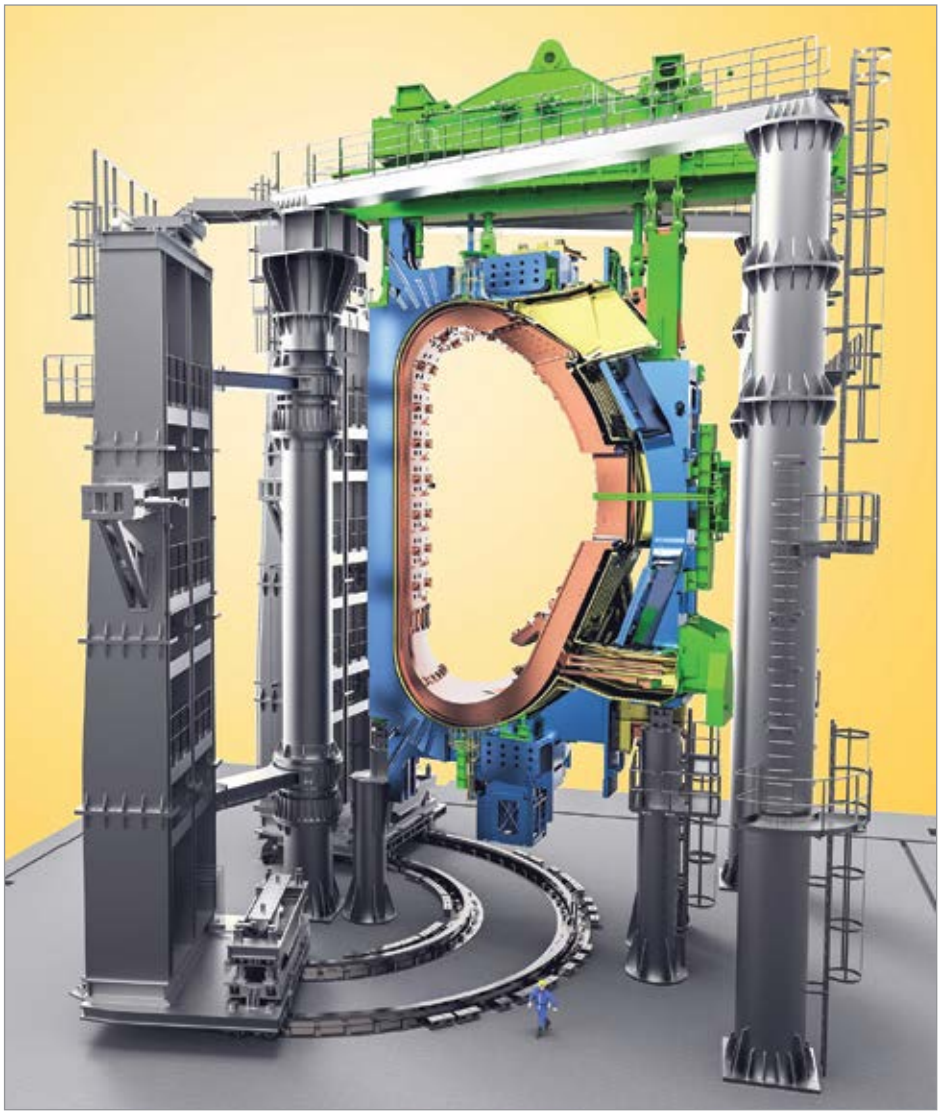
— William Koester, J.P. Sauer & Sohn Maschinenbau GmbH

hope this will provide an infinite source of energy, one that is entirely emission-free and safe. Proof of concept has been demonstrated. However, up until now heating the plasma to the ignition temperature of around 100 million °C has required a greater input of energy than could be recovered from subsequent fusion.

The ITER test system has a tokamak-type fusion reactor. At 840 cubic meters its capacity is far greater than other systems of its kind. The reactor is designed to generate ten times the energy needed to ignite the plasma. These immense temperatures prevent the enclosure of fusion plasma in physical vessels. Instead, the system uses gigantic magnetic fields to confine the suspended fuel in thermal insulation and to keep it away from the boundary walls.

Minimizing Helium Consumption

A large volume of highly pressurized helium and an input temperature of 4.5 K are used to cool the superconductive magnetic coils that



Cross-section of the ITER fusion reactor. The tokamak has a capacity of 840 m³. © ITER Organization.

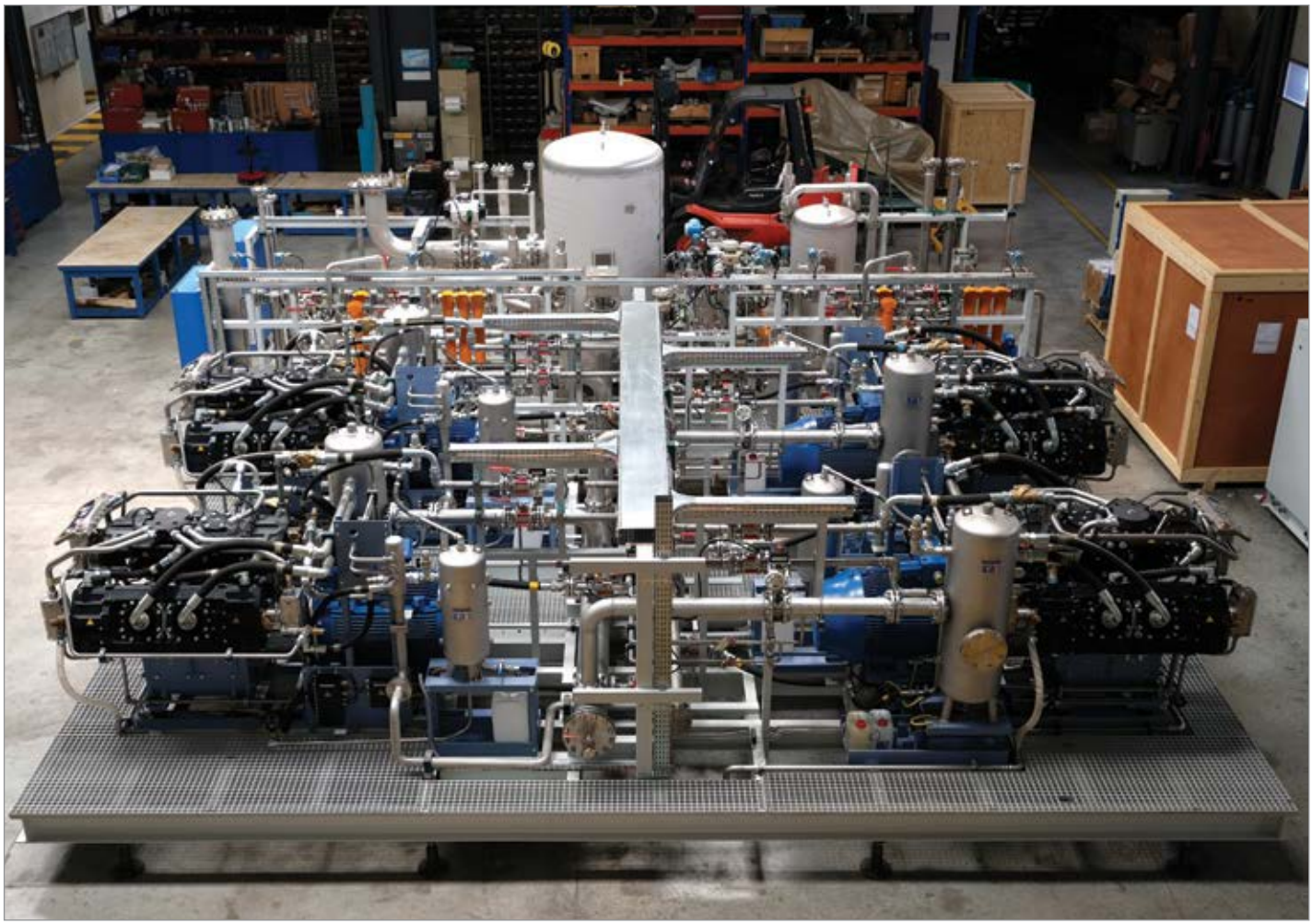
THE ITER PROJECT BUILDS ON SAUER HELIUM COMPRESSORS

generate the required magnetic field. However, due to its particular diffusibility the inert gas is a demanding coolant. Helium possesses a very small atomic radius and can pass through even the tiniest openings and pores in metals and screw connections. Since the inert gas is very expensive, loss due to evaporation or leakage must be kept as low as possible. The planners behind the ITER fusion reactor have requested a system to recover the gas that evaporated during the cooling process. An additional system for compressing leakages in the helium loop was to be installed as well.

Sauer Compressors was the world's only provider with the ability to meet the project's demanding requirements. Both systems were manufactured and tested by the Sauer experts in Kiel, Germany. The merging of the two happened at the assembly hall of French company Girodin-Sauer SAS: There, both systems were combined and assembled to form a single unit, consisting of five helium compressors on a four-part base frame measuring 8 x 8 meters – the largest assembly of its kind. The entirely gas-tight recovery system with stainless steel tubing was then dispatched to the customer Air Liquide. Installation on the ITER fusion reactor began in summer 2017.

Special Compressors For Helium Recovery

Once the helium has been used as a coolant, the recovery system collects the gas in 10 storage balloons, each with a capacity of 100 m³. Then four Sauer WP6305 BasSealHe-B helium compressors recompress it. Sauer Compressors developed these compact, two-stage six-cylinder piston compressors as a bespoke solution specifically for this application. They produce a final pressure of 22 bar.g and a volume flow of 535 m³/h with minimal noise and vibration emissions. An integrated water-cooling system enables direct cooling of the cylinders and cylinder



The fully assembled helium recovery system at the Girodin-Sauer SAS plant. © Sauer Compressors.

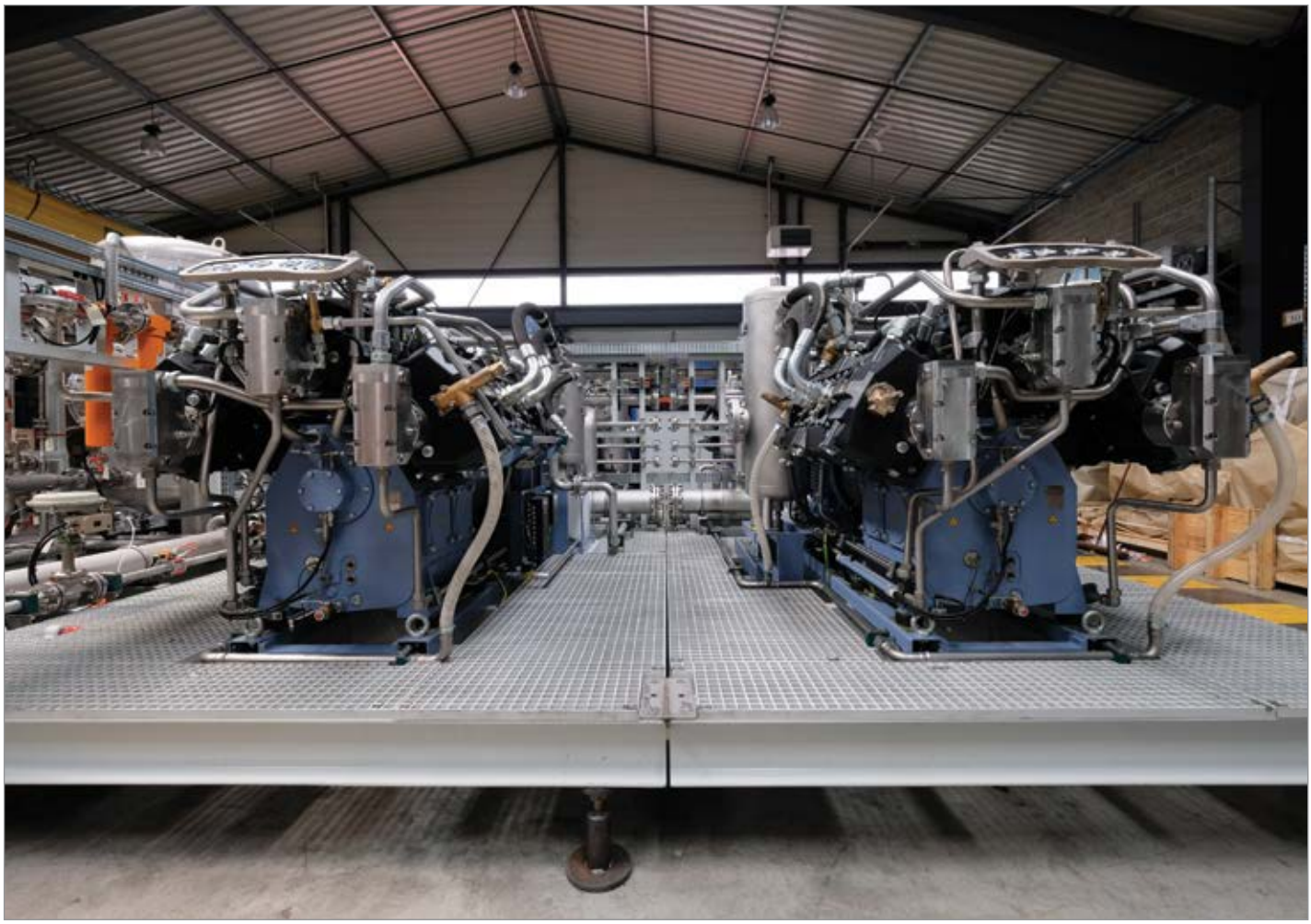
valves (single cylinder cooling as well as cooling between the stages). Other features include the unique double shaft seals, the gas-tight safety valves and gas recirculation from the separators.

The recovery module will operate in the ITER fusion reactor for around four hours per day and in normal operation will deliver a recompression rate of one gram of helium per second. But the system is designed to compress up to 100 grams of helium per second. This ensures that the complete quantity of helium present in the system can be recovered in case of a blackout of the fusion reactor. This is why the recovery system is the only component that is equipped with an independent emergency power supply.

The compressors have a static leakage rate of less than 0.1 mbar x l/s. Losses are reduced by a factor of 8 compared to optimized air compressors used for the compression of helium. Sauer Compressors determined and validated the machinery's static and dynamic leakage rates on a special helium test rig under real conditions. All components of the recompression system, including the buffer tanks and the filtration system, were produced by Sauer Compressors.

Compressing Leakage In The Helium Loop

An additional system by Sauer Compressors is used to compress leakages in the helium loop. A special PASSAT WP156L BasSealHe-B-type helium compressor is designed to recompress leakage occurring at mechanical seals in the loop. The three-stage air-cooled piston compressor is built for continuous operation. It achieves a final pressure of 20.5 bar.g and a volume flow of 96 m³/h. With a leakage rate of less than 0.1 mbar x l/s this compressor features an unrivalled gas-tightness.



Sauer Compressors built the WP6305 BasSealHe-B-type helium compressor as a bespoke solution for the ITER application. © Sauer Compressors.

THE ITER PROJECT BUILDS ON SAUER HELIUM COMPRESSORS

A PASSAT WP156L BasSealHe-B-type compressor is used to compress leaked gas. © Sauer Compressors.

The installation of the entire helium recovery system will be completed in 2018. The ITER fusion reactor is able to cool the superconductive magnetic coils at minimum helium consumption and therefore keep operating costs permanently low.

About Sauer Compressors

Sauer Compressors is a medium-sized German group of companies with twelve international subsidiaries. The company was founded more than 130 years ago, and has over 80 years experience in compressed air technology. Today, it focuses on the development, production and sale of medium- and high-pressure compressors for applications in the naval, shipping, offshore and industrial sectors. Its modern reciprocating compressors for the compression of air and neutral and inert gases reach pressures of 20 to 500 bar. It offers customized solutions for individual customers, OEMs and companies that operate on a global stage. With a global network of agents and representatives, Sauer maintains close proximity to its customers. By enhancing its range of compressors with high-quality accessories, engineering services, installation and service concepts, Sauer can offer end-to-end system solutions and compressed air modules, including complete turnkey installations. For more information, visit www.sauercompressors.com. BP

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Quincy Compressor Introduces VSD Air Compressor for Extreme Environments

Quincy Compressor introduces the industry's first VSD air compressor for extreme conditions. The QGV **BADGERXE** NEMA4 VSD is designed to withstand the harshest environments trouble-free. Now you can save energy anywhere and lower your service cost with a lower oil volume and a longer consumable life.

Quincy Compressor designed the QFD (Quincy Frequency Drive) to provide maximum uptime and productivity for its users. The **BADGERXE** combines high protection and optimized cooling. It utilizes a unique cabinet cooling system to keep temperatures in check. It has passed tests at sites in the field that were chosen specifically for their harsh conditions.

The QFD has a unique thru-the-wall mounted design that separates the drive heat from the enclosure and protects the drive electronics to an IP5X protection degree. The NEMA4 enclosure provides a variation of protection on all fronts. It delivers a degree of protection to personnel against incidental contact with the enclosed equipment; protection against falling dirt, rain, sleet, snow, windblown dust, splashing water and hose-directed water; and against external formation of ice on the enclosure.

Quincy Compressor is a leading designer and manufacturer of reciprocating and rotary screw air compressors, from one-third to 350 horsepower; vacuum pumps and a full line of air treatment components. Quincy employs nearly 450 worldwide and sells through multiple channels, including a network of direct and indirect partners, commercial retailers and online. The Quincy brand is synonymous with quality, delivering "Performance You Demand. Reliability You Trust." To learn more about the company and to locate an authorized air expert near you, visit www.quincycompressor.com.

About Quincy Compressor

Quincy Compressor is a leading designer and manufacturer of reciprocating and rotary screw air compressors, vacuum pumps and a full line of air treatment components. In business since 1920, Quincy has built its reputation on quality and rugged reliability, building tough air compressors for the most demanding applications. The Quincy brand is synonymous with quality, delivering "*Performance You Demand. Reliability You Trust.*" Quincy's dedicated network of authorized partners offers top-notch installation and after-sales services for reliable, efficient air year after year. To learn more and locate an authorized air expert, visit www.quincycompressor.com

The Quincy QGV BADGERXE NEMA4 VSD Air Compressor

Kaeser Improves VFD Efficiency with New Motor Design

Kaeser Compressors' latest series of 30 hp and 40 hp variable frequency drive compressors now features a new synchronous reluctance motor for improved efficiency during part load operation.

This new design underscores Kaeser's continued commitment to sustainability and energy efficient system design. The motors do not use aluminum, copper or expensive rare earth magnets in the rotors. Instead, they are made of electrical steel and feature a special profile. The unique rotor design means these motors can run at higher speeds without additional rotor warming. This increases bearing life and reduces maintenance costs.

The motors were developed in partnership with Siemens, and are designed to work with the Siemens drive technology used in Kaeser's

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Kaeser's latest VFD models feature a SynRM motor for improved part load efficiency.

Sigma Frequency Control (SFC) models. The drive features a specially developed control algorithm for powerful performance delivering maximum energy savings.

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, please visit www.kaeser.com. To be connected with your local authorized Kaeser representative, please call (877) 596-7138.

VPInstruments Now Has Easier and Quicker Flow Meter Services

VPInstruments has professionalized their flow meter services. First of all, they have introduced a simple online return form on their website. This way the service team can make the right preparations ensuring a quick and complete service.

Furthermore, by simplifying services to just two programs, All-in and Exchange service, services are more transparent and fitting our client's needs better. Regardless of the reason for service, either repair or re-calibration, your flow meter will always be inspected, cleaned, repaired (if required), calibrated and updated to the latest firmware. This ensures the high quality of your flow meters and at a fixed low price.

This professionalization has led to a drastically shorter service time, a clearer cost structure and the services costs are maintained as one of the lowest for flow meter services globally. With VPInstruments service programs for flow meters will have guaranteed reliable results.

About VPInstruments

VPInstruments offers industrial customers easy insight in energy flows. We believe that industrial energy monitoring should be easy and effortless, to enable insight, savings and optimization. VPInstruments' flow meters are calibrated at a state of the art calibration facility.

VPInstruments has professionalized their flow meter service by introducing an online return form on their website and simplifying their services to just two programs.

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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, please visit www.vpinstruments.com.

Pneumatic Solution from Aventics Ensures Model PET Bottles

With the latest pneumatic solution from Aventics, a world first, users can now monitor the pre-blow molding process in the production of PET bottles online, in real time, and immediately make any necessary adjustments. This results in reduced material and energy consumption during high-throughput PET bottle production. For the first time, PET bottle formation can now be controlled and adjusted during the blow molding process.

With this new solution based on proportional technology, Aventics is entering uncharted technological territory. In collaboration with a major filling company, the pneumatics specialists performed extensive research on the blow molding process. By combining a proportional valve, control electronics and software, the solution records the actual values occurring during the process and compares them with the set points.

The new solution is intended for applications in the pre-blowing process. The set points for this step can either be stored in the electronics or transmitted via all common real time Ethernet protocols and fieldbuses. During a blowing period of around 200 milliseconds, enough control cycles are available to precisely control bottle formation. This allows process technicians to intervene as needed. For example, reducing material consumption and fine-tune the formation of the bottle wall. Additional energy savings are possible by lowering the pressure level, or reducing the furnace temperature.

With Aventics' newly developed pneumatic solution, PET bottle formation can be controlled and adjusted during the blow molding process.

Process data taken from the analysis can be used to derive continual improvements. At the same time, quality documentation is carried out in order to safeguard and track the process. In addition, trend analyses of the data enable the detection of wear before a failure can occur. Condition monitoring notifies maintenance early-on to be able to carry out the necessary work in planned maintenance breaks.

The electro-pneumatic solution also meets new requirements in bottle production resulting from the trend towards more and more complex PET bottle shapes and smaller batches. As a software-based solution, the bottle formation process can be changed easily, without any mechanical alterations, and specific to each blowing station on the machine. The software can also automatically control process events. For example, reaching the yield point and target bottle volume, according to specifications and keeping them constant, provided no wear limits have been reached. Once saved, parameters for a bottle type or specific material can be opened and activated at any time, significantly reducing waste during the start of production. In close collaboration with product designers, the developers at Aventics validated numerous sample settings during the pilot production phase of new bottles.

An example of the Stretching Cylinder Units used in these applications can be seen online.

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About Aventics

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

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

Sierra Introduces One Complete Industrial Flow Energy Solution

Sierra Instruments announces the launch of its new flow energy solution for managing and optimizing flow measurement for industrial facilities of all sizes. It features Sierra's QuadraTherm 640i/780i thermal flow meters, their InnovaMass 240i/241i vortex flow meters and their new InnovaSonic 207i ultrasonic flow meter. Designed, built and calibrated in the U.S.A. by Sierra, the Big-3 TM share the same revolutionary Raptor firmware and many of the same software apps. They are a complete flow energy solution for flows like compressed air, natural gas, steam and hot and chilled water. Together, they set a new standard in ease-of-purchase, performance, accuracy, reliability and ease of use.

"In larger facilities, there are a wide variety of flow energy applications that require measurement," says Matthew Olin, Sierra's president. "Engineers often must contend with an assortment of companies to obtain the right instrumentation. With the Big-3, we've eliminated many of the overwhelming challenges they face. They now have the option of acquiring all necessary flow meters from one company, saving time and

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

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

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money on installation and maintenance. And one contact point links them to Sierra's global network of flow energy experts for all of their support requirements."

The Big-3 share common firmware and software for easy integration, set up, and serviceability, enabling operators to leverage their knowledge between the different platforms. All patented Big-3 (thermal, vortex, and ultrasonic) sensors provide unparalleled accuracy, extensive flow knowledge through multivariable functionality and benefit from the Raptor operating system to manage sensor inputs.

QuadraTherm iSeries thermal sensors offer a no-drift sensor with a lifetime warranty and accuracy of +/- 0.5% of reading. QuadraTherm's four sensor technology provides the critical inputs for Raptor's living, learning algorithm set and gas database to accurately manage changes in gas and pipe selection, gas temperature, gas pressure, and outside temperature.

InnovaMass vortex sensors, combined with the Raptor OS, offer a patented Mass Balance sensor, improved DSP, and achieve flows below 1 fps. The InnovaMass iSeries measures up to five process variables with one process connection: volumetric flow rate, mass flow, density, pressure and temperature, ideal for highly accurate steam flow measurement.

The InnovaSonic 207i ultrasonic flow meter ensures accuracy of +/-0.5% of reading from 0.16 to 40 ft/s (0.05 to 12 m/s). This is maintained even if liquid density changes as the temperature of a flowing liquid moves up and down over time. Sensors are designed for temperature compensation to ensure correct speed of sound for increased accuracy and ease of installation.

Raptor, the Big-3's shared firmware system, is a fluid, dynamic algorithm set with hyper-fast microprocessors, delivers digital communication protocols, provides field flexibility and enables software apps. For QuadraTherm (thermal), Raptor calculates out unwanted heat transfer to provide precise mass flow rate. QuadraTherm also comes with on board qMix gas mixing software, allowing engineers to create custom gas mixtures in the field to compensate for gas compositional changes without recalibration costs and loss of accuracy. With InnovaMass (vortex), Raptor reduces external vibration with proprietary noise reduction algorithms to enhance the signal-to-noise ratio. Raptor firmware also gives InnovMass iSeries the ability to measure much lower flow velocities (near 0.5 fps) than equivalent vortex meters in the industry. In the InnovaSonic (ultrasonic) flow meter, Raptor, with its temperature input, adjusts fluid density calculation in real-time to maintain accuracy. Most ultrasonic meters assume a fixed temperature and thus lose accuracy.

In addition, the Big-3 has shared software apps with common home screens. With the Big-3 there is no learning curve on three different software platforms. Big-3 software apps gives plant engineers and managers the ability to mine and analyze data quickly to make effective productivity decisions. Software apps include ValidCal Diagnostics for field calibration validation, Datalogging, MeterTuning to automatically cancel external noise to improve accuracy, Dial-A-Pipe to change pipe size in the field and Dial-A-Fluid to change fluid type in the field without loss of accuracy.

The accuracy of the Big-3 is backed up with world-class calibration. Flow meters are only as good as their calibrations, and Sierra has invested millions in its state-of-the-art, fully automated, gas and liquid calibration facilities to assure consistent accuracy and repeatability of its flow meters. Sierra is ISO certified and follows ISO17025 guidelines. All Big-3 flow meters come with a NIST traceable and fully ISO 17025 compliant Cal cert.

All three flow meters making up the Big-3 are designed, built, and calibrated in the U.S.A., a first for any U.S.A. company. Commissioning to set up the Big 3 is also available through Sierra's global network of flow energy experts.

To learn more about the Big-3, visit www.sierrainstruments.com/promo/big-3.html

About Sierra

A global leader in flow measurement and control for over 40 years, Sierra Instruments designs and manufactures fluid flow measurement and control solutions for customers spanning global industries as diverse as scientific research, oil & gas, energy management, semiconductor, clean energy, aerospace, and biotech, to name a few. In everything we do, we challenge the status quo to continually push our technologies and solutions to the next level to do the "never before possible" for customers. With over 150 locations in over 50 countries, Sierra is uniquely positioned to provide innovative products and lifetime support for the leading companies of today and the growth enterprises of tomorrow. For more information, please visit www.sierrainstruments.com.

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