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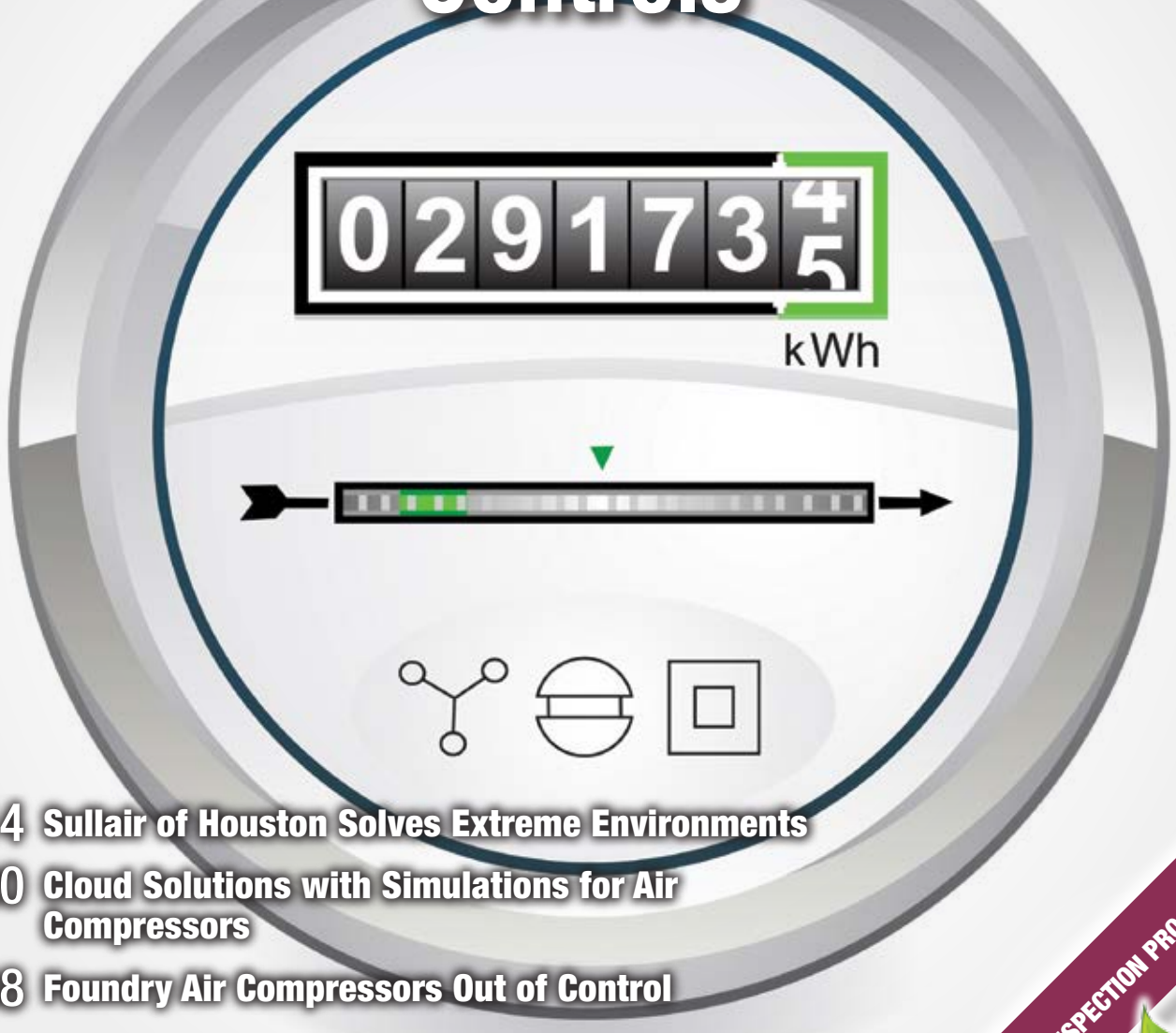

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FROM THE EDITOR | Air Compressor Controls

Our readers will see in our first article that Sullair of Houston loves a challenge. The company designs customized air compressor packages that fit the rough and rugged world outside the walls of an industrial plant. They build air compressor solutions that operate efficiently in extreme, harsh environments around the globe. This includes offshore or marine environments, high or low ambient conditions — any environment where a standard air compressor will not operate safely or efficiently. "We have been in business for more than 40 years and have solved quite a few compressed air challenges for our customers," says Loran Circle, director of engineering and sales.

How can we make air auditing easier and more affordable for smaller plants? Bob Wilson, from PEMCO Services, discusses using cloud computing solutions to achieve this. "A number of compressed air specialists are offering services via remote networking over the internet. The specialist pre-configures the instrumentation and sends it to the client to collect the on-site data. The instruments are then returned to the specialist for analysis and interpretation of the data."

Ron Nordby recently retired from a long and distinguished career at John Henry Foster in Minnesota. I had the pleasure of getting to know him over many years and was always struck at how close his company is to their customers. Their unique product offerings assisted with this but it was clearly not limited to that reason. This month, Ron writes about one such strategy in his article, "The Value of Service Inspection Programs."

We continue to try and highlight new technology and service offerings in the compressed air industry. This month, Contributing Editor Scott Williams highlights the iPM interior permanent magnet motor and drive train of the new Atlas Copco GA 7-37 VSD+ air compressors. Also reviewed in this article is their new SMARTLink program leveraging their decision to be the first major manufacturer to ship a separate data logger as a standard feature with most of their rotary screw air compressors.

A "foundry-out-of-control" is the topic of our last article. Written by Ron Marshall on behalf of the Compressed Air Challenge®, this piece will provoke smiles and nodding heads from any compressed air industry veteran. Ours is not a glamorous business and compressed air systems, quite normally, are buried in grime and are the last financial priority of a company. As compressed air treatment guru Al Oberdeck used to say to me and countless others he trained, I hope you enjoy reading about this foundry who eventually did decide to "get around 2IT".

*A mentor of many, Al Oberdeck handed out coins encouraging people to "get around to it!"

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

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New Food & Beverage Best Practices Guideline from BCAS

New best practice guideline BPG 102 for food and beverage processors on the safe and efficient use of compressed air has been unveiled by the British Compressed Air Society (BCAS).

Following this best practice guideline in association with the food/beverage industry requirements to apply the pre-requisite programme and where applicable HACCP process will ensure that the compressed air system will not only meet current industry best practice but also contribute to customer confidence in food supplied to market.

The guideline expands and clarifies the compressed air requirements identified in existing food/beverage safety standards, guidelines and in some areas legislation.

The best practice guideline is intended to provide an encouragement to the food and beverage industry to improve their compressed air provision rather than demand immediate and possibly costly expense.

Scope

This best practice guideline identifies the requirements for compressed air systems, operating at a pressure greater than 0.5 bar, as pre-requisites in the production and processing including packaging and transportation for safe food and beverage production. It also identifies the air purity requirements for compressed air for both direct and indirect product contact.

- Installation practices are provided as guidance for both existing installations and new installations.
- Measurement and testing procedures are identified to verify the purity of the compressed air.
- Maintenance activities are identified to retain continued performance of the compressed air system.

Importantly all food/beverage sites will be subject to auditing processes. The guideline

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provides specific advice to auditors on what should be reviewed and verified to ensure that the compressed air system complies with the set standards.

The guideline has been produced to be applicable anywhere that a food and beverage plant is located. Copies of the best practice guideline are available as hardcopy or pdf from the BCAS.

Visit www.bcas.org.uk

Atlas Copco Included in United Nations Compact 100 Stock Index

The Atlas Copco Group (Atlas Copco AB) has been included in the United Nations Global Compact 100 Stock Index. The index recognizes companies that demonstrate sustainable business practices and strong financial performance.

"We are excited to be included again in the UN Global Compact 100 for our commitment to sustainable and responsible business practices," said Jim Levitt, president, Atlas Copco North America LLC. "Not only does it make good business sense to align our operations with sustainable practices, but it also positively impacts the environment, our customers and the industry."

The UN Global Compact is a strategic policy initiative for businesses committed to aligning their strategies and operations with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption. Atlas Copco has been a member of the UN Global Compact since 2008, and the company's Business Code of Practice is built on the compact's ten principles.

The Global Compact 100 companies were selected based on their adherence to these principles and for evidence of executive leadership commitment and consistent baseline profitability. The "GC 100" index showed a total investment return of 21.8 percent by the end of its first year, outperforming the general global stock market, according to the UN Global Compact Office.

Earlier this month, Atlas Copco was included in the FTS4Good Stock Index, which measures globally recognized corporate responsibility standards in environmental, social and governance practices. Atlas Copco was also included in the prestigious Dow Jones Sustainability Index, ranked number seven globally in the Newsweek Green Rankings, and recognized in the Top 100 Global Sustainable Companies, presented at the World Economic Forum in Davos, Switzerland.

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 service 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 2013, Atlas Copco had revenues of BSEK 84 (BUSD 12.8) and more than 40,000 employees. Learn more at www.atlascopco.com.

Atlas Copco operates 116 locations and employs more than 4,800 people in the United States. Globally, Atlas Copco had revenues of approximately $12.8B in 2013. The United States represents the largest single-market for Atlas Copco globally. Learn more at www.atlascopco.us.

End-user Industry Focus Likely to Shift in Stationary Air Compressor Market in China, according to GCiS Study

GCiS China Strategic Research estimates that the domestic market of stationary air compressors in China is valued at over RMB 22 Bn as of the year end of 2013. The study is a revisit of the same report published in 2009. Over the last five years, screw SACs have replaced piston SAC in most of applications as domestic end-users shifted towards more efficient products with advanced design and technology.

The report features in-depth analysis of the three stationary air compressor products, screw, piston and centrifugal SAC and finds that besides a stable demand from manufacturing industry, future driving force for the market will come from expansion of Chinese petroleum and chemical industries. Light industry such as food and beverage production led by a growing wealthier consumer base will also compromise for the falling demand from traditional heavy industry such as steel and mining.

In a growing market base, domestic suppliers have gained market shares in the screw SAC segment as customers gradually adopt the replacement of piston SAC. Multinational suppliers would need to focus on products with oil-free, variable speed and other advanced features, which are critical to reinforcing their competitive position in the chemical and light industries. This is especially important given domestic suppliers are facing excess capacity in their mid and lower end products, which will lead towards a focus on price competition.

This GCiS market study draws on a three month in-depth primary survey of 78 of the market's suppliers, channel players and experts. It is essential reading for any professional needing accurate and detailed strategic information of this market. Major areas covered include: market size and shares, five-year projections, market structure, pricing trends, distribution, an assessment of key suppliers and more.

About GCiS China Strategic Research

GCiS (www.GCiS.com.cn) is a China-based market research and advisory firm focused on business to business markets. Since 1997, GCiS has been working with leading multinationals

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such as ABB, Emerson and GE in sectors ranging from technology to industrial markets, medical, chemicals, resources, and others.

For additional information about the report, please contact research@gcis.com.cn or visit: http://www.gcis.com.cn/Research/Stationary%20Air%20Compressors%202014.htm

EU on Track to Meet 2020 Energy and Climate Targets

European Union (EU) greenhouse gas emissions fell almost 2 % between 2012 and 2013, putting the EU very close to its 2020 reduction target, according to new analysis from the European Environment Agency (EEA). The EU is also on track to meet two other targets to boost renewable energy and energy efficiency by 2020.

According to EEA analysis of Member States' own projections, the EU is likely to cut greenhouse gas emissions by at least 21 % of 1990 levels by 2020, surpassing its 20 % target. With 14 % of final energy consumption generated by renewable sources in 2012, the EU is also ahead of the planned trajectory to hit 20 % renewable energy by 2020. Likewise, the EU's energy consumption is also falling faster than would be necessary to meet the 2020 energy efficiency target.

"Our analysis shows that Europe is on track towards its 2020 targets," Hans Bruyninckx, EEA Executive Director, said. "Even against the backdrop of economic recession in recent years, we can see that policies and measures are working and have played a key role in reaching this interim result. But there is no room for complacency. The analyses we are publishing today also highlight countries and sectors where progress has been slower than planned."

The picture at Member State level is more mixed compared to that at EU level. Nine countries were making good progress in pursuing the three linked policy objectives — greenhouse gas emissions reduction, renewable energy and energy efficiency — while no Member State was underperforming in all areas.

However, three Member States are at risk of missing their individual targets for 2013 under the Effort Sharing Decision and projected greenhouse gas emissions for six Member States indicate that they will not achieve their 2020 targets through domestic policies and measures.

"European heads of state and government agreed new headline targets for 2030, reducing greenhouse gases emissions by at least 40 % from 1990 levels."

Furthermore, projections from Member States show little or no emissions cuts in the transport and agriculture sectors.

Beyond 2020

Last week, European heads of state and government agreed new headline targets for 2030, reducing greenhouse gases emissions by at least 40 % from 1990 levels, increasing renewable energy to make up at least 27 % of final energy consumption and a minimum 27 % reduction in energy consumption compared to business-as-usual.

The current projections for 2030 indicate that further efforts are required at national and EU level to keep the EU on track towards its new 2030 targets, as well as its longer term objectives to decarbonise the European energy system and cut EU's greenhouse gas emissions by 80 to 95 % by 2050.

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Sullair of Houston Provides Air Compressor Solutions for EXTREME ENVIRONMENTS

By Neal Lorenzi

High-pressure stainless steel enclosures are produced by Sullair of Houston.

Sullair of Houston, one of the largest North American distributors of Sullair industrial and portable diesel compressors, loves a challenge. The company designs customized air compressor packages that fit the rough and rugged world outside the walls of an industrial plant. It builds air compressor solutions that operate efficiently in extreme, harsh environments around the globe. This includes offshore or marine environments, high or low ambient conditions — any environment where a standard air compressor will not operate safely or efficiently.

"We have been in business for more than 40 years and have solved quite a few compressed air challenges for our customers," says Loran Circle, director of engineering and sales. "We design everything from a custom single machine to multi-unit skid packages that meet complex requirements of air compressors that operate under severe environmental conditions."

Sullair of Houston opened at its current location on Jan. 3, 1970. Today it distributes Sullair compressors rated up to 600 hp, portable compressors up to 1,600 cfm, oil-free compressors, air drying equipment up to 30,000

cfm and related ancillary equipment. The company provides customers with air compressor solutions from start to finish — from the time of purchase to preventative maintenance to air system audits.

Because Houston is an engineering hub for the world, Sullair of Houston has been called on many times to assist in designing custom air compressor packages. The company has 250 combined years of compressed air application experience on its staff, which includes three U.S. Department of Energy AirMaster specialists.

Along with standard industrial and portable lines, Sullair of Houston offers in-depth capabilities in the customized and packaging fields. According to Owner Brad Fish, the company has built customized compressors and packages for applications on all the world's continents except for Antarctica. In fact, Sullair of Houston provided equipment that assisted in extinguishing the Kuwait fires during the Persian Gulf War.

What percentage of its air compressors are sold from inventory, as opposed to custom designed? Loran Circle says that depends on whether you are talking total dollars or number of units. "We have an extensive inventory of new machines for immediate delivery and these generally are for the standard industrial market. We also use this inventory for reasonably quick delivery of some of our packages." The company has a rental fleet of 250 units that are available for customers that experience unexpected events and require quick turnaround.

Building Custom Packages

Many steps are involved when it comes to building custom-designed air compressor packages. "We start with a set of specifications from an engineering firm and study details of the site and application for each project," Circle explains. "We try to meet as many of the specifications as possible. However, many times we must deal with boilerplate specifications written many years ago. In our meetings with clients, we work with them to provide the proper equipment for the application and site using the best technology."

For example, Sullair of Houston often receives requests for oil-free compressors. This can lead to greater project costs because of the high maintenance required for oil-free machines. "This is due to

SULLAIR OF HOUSTON PROVIDES AIR COMPRESSOR SOLUTIONS FOR EXTREME ENVIRONMENTS

the fact that years ago compressors used petroleum-based fossil fuels for their cooling, lubrication and sealing processes. Nowadays, we use polypropylene glycol coolants and filtration that can provide oil-free air with coolant flooded-compressors, which meet ISO 8573.1 standards that exceed 1.1.1 (oil free)," he says.

In order to build customized packages that will operate in harsh environments, the Sullair of Houston team strives to answer the following questions: What is the air being used for? What is the demand profile? Is the unit running 24/7 or is it on standby for emergency? Does the application require 100 percent backup redundancy on the compressor and the air dryer? Loads and air quality standards all are factored into the design of the package.

"Current manufacturing of compressors follows the 80/20 rule," Circle explains. "Manufacturers build for 80 percent of the market — for general industrial applications where the compressor is situated inside a manufacturing plant and is not subject to extreme environments.

"To properly engineer a package, one needs to look at the application and site conditions. For example, what will the air be used for and where will the compressor be placed? If the unit is situated in a plant with 65- to 90-degree temperatures and is running general production equipment, a standard 100- to 115-degree ambient machine with a refrigerated dryer usually is practical for this application."

Many Variables to Consider

Many other variables come into play. If the air compressor will be placed on a land drilling rig where it will be moved over the ground, it needs a specially built frame. If the unit will be moved frequently over its lifetime, it requires a different frame. If the unit will be used in an underground mine, it needs to incorporate fire suppression capabilities and an overhead grating, so that debris falling on the unit will not damage the package parts.

If the air compressor will be operating in climates above 115 degrees, the design needs to incorporate provisions for motor and coolers on the package to survive in that heat. If the unit will be operating in a classified area up to and including a Class 1, Div. 1 hazardous environment and must be NEMA 7-explosion-proof, it needs specially built panels, which involves placing the machine's controllers in an enclosure to facilitate access. "Some of the electronics used in today's compressors do not operate well in harsh environments, so we build the packages with standard gauges and electromechanical controls for the environment," Circle notes.

If the air compressor will be placed in a severe cold environment, a cold weather package needs to be installed. Site-specific conditions such as salt air, corrosive chemicals, gas or possible combustible environments require specifically designed packages. Sullair of Houston also builds stainless steel enclosures for these environments.

Sullair of Houston also builds specialty packages for the nitrogen generation market. Nitrogen packages need high-quality air and pressures from 130 psig to 350 psig. The compressed air package is built and shipped so the customer merely has to hook up the electrical and discharge piping from the skid to the nitrogen generator before use.

Becoming the Standard

Sullair of Houston has designed several air compressor packages that are now used as standard in instrument air requirements for pipeline packages, chemical plants and refineries. "Our packages are now the basis for what many companies come to us and

The big tank is an air start package for large diesel engines.

specify," Circle explains. "For example, our instrument air package specifications are used as standard for many companies that want to control instrumentation in field conditions; they want a package that has a minimal footprint, is ready to go with only electrical and piping hook-up needed from the skid.

"Petrochemical plants use our packages with Class 1, Div. 2, Group C and D electrical and controls for hazardous areas with site-specific conditions. These units are already designed for these applications. We've done the design and application work for them; they just need to let us know the flows and pressures required for their application."

Sullair of Houston conducts compressed air system audits to help reduce energy costs for its customers. The company offers AirMetrix solutions that analyze, manage and control total compressed air systems, which encompasses energy-efficient products, compressed air system controls, monitoring and management systems, and air distribution products.

Various steps are involved in the auditing process as well. The Sullair of Houston team conducts a walkthrough and interviews the customer to determine how the plant is currently operating. It then places data loggers on the compressors to measure kW power and pressure.

"Our audits are only a determination of where the plant is today," Circle explains. "It is a starting point of the planning process to create a long-term plan of action. Too often, we've seen audits that come complete with recommendations for fixing everything, from replacing all compressors to fixing leaks. If the compressed air system is not energy-efficient to begin with, reducing leaks will not bring the expected results.

This instrument package is designed for hazardous locations.

SULLAIR OF HOUSTON PROVIDES AIR COMPRESSOR SOLUTIONS FOR EXTREME ENVIRONMENTS

"We look at the current demand, the issues, foreseeable growth and (the most important part) what compressors they work with now. From this, we can determine a path to correct the issues and get the plant moving in the right direction. We like to work proactively with the people there, so that any change in the compressed air system is a change in the right direction."

AirMasters On Board

Sullair of Houston has three AirMaster specialists on staff, the most of any air compressor distributor in Texas. AirMaster specialists are certified by the U.S. Department of Energy and the Compressed Air Challenge. In order to become a specialist, one must complete classroom and practical training, pass a rigorous exam and demonstrate the ability to use AirMaster software.

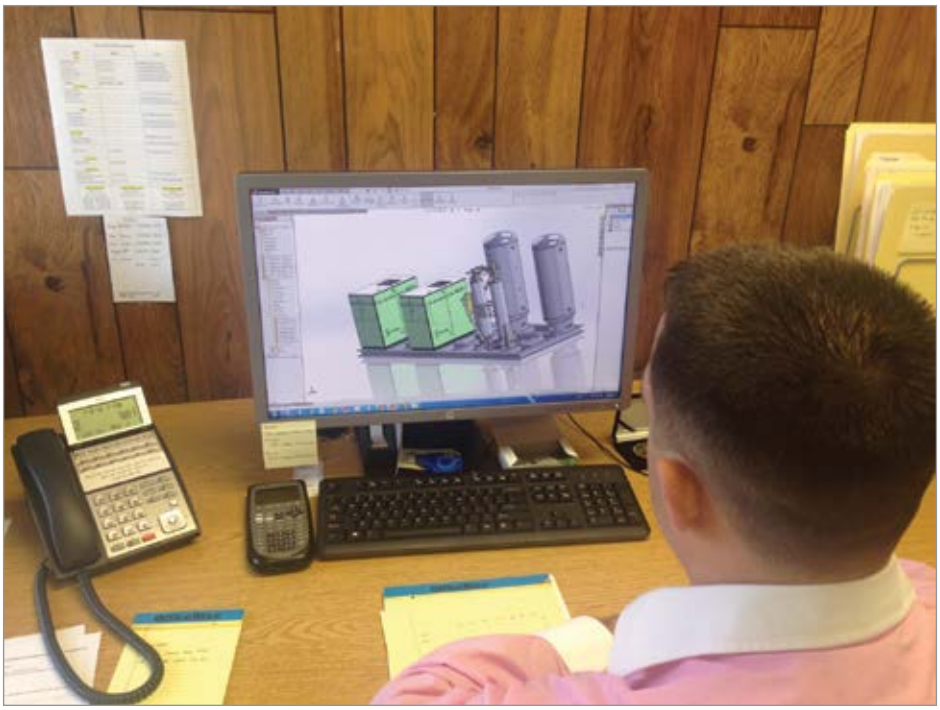
The company's three AirMaster specialists are Loran Circle, Brad Bonnecaze and Robert Gregory. Because of their expertise, these individuals can help customers determine the best practices and most efficient way to design their air systems.

"Too often, we see instances where sizes and numbers are generated from many sources of expertise, then additional air is added to cover all possibilities; that number is then sent out for quotes," Circle says. "Our AirMaster specialists have many years of hands-on experience, coupled with training that can help our customers design energy-efficient air systems. We don't guess at the system, we design it based on all the information and criteria needed."

Experience Reigns Supreme

"I have been blessed with incredible talent here at Sullair of Houston," says Owner Brad Fish. "Our employees, for the most part, have been with the company from 10 to 40 year. That type of longevity is just not found in business nowadays." Fish offers the following examples.

- Brad Bonnecaze, chief operating officer, has been with the company for 12 years. His knowledge has helped in the design of piping packages for the pipeline construction industries.
- Tom Hocking, vice president for the past 35 years, is retiring. Loran Circle, his replacement, has 35 years of experience with



Sullair of Houston has in-house 3D capabilities for drawing customized packages.

Sullair of Houston and 42 years of total compressed air design experience.

- David Hall, service manager, started with the company in 1972 and is retiring at the end of this year. He has been replaced by George Saez, formerly lead service and training instructor at Sullair corporate headquarters in Michigan City, Ind. Saez is setting up a training facility in Houston to develop and qualify service technician standards to the highest levels.
- Steve Metcalf, parts manager, began working for Sullair of Houston in 1983. He can recall parts for compressors dating back to the 1970s.

Looking Ahead

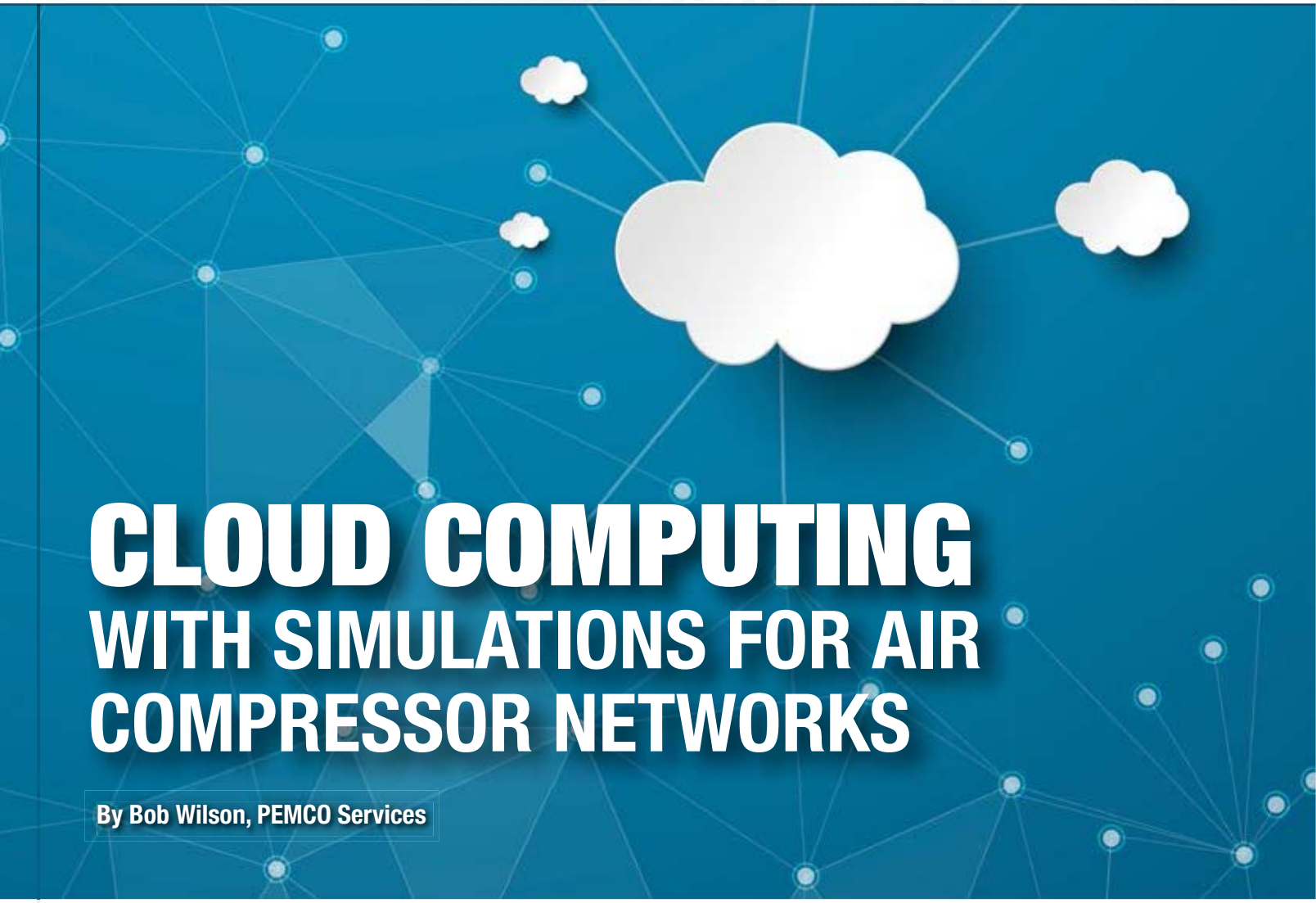
While the compressed air industry has made rapid advances over the last 15 years, Sullair of Houston has positioned itself as a leader in building engineered packages that utilize state of the art compressors, controls and air treatment. By using best practices for environmental- and application-specific systems, the company will continue providing these specialty packages well into the future. BP

For more information please contact Sullair of Houston, www.sullairhouston.com

AUTHOR BIO

Neal Lorenzi is a Contributing Editor to Compressed Air Best Practices® Magazine. He has covered a wide range of industries during his 25 years as a writer and editor.

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



CLOUD COMPUTING WITH SIMULATIONS FOR AIR COMPRESSOR NETWORKS

By Bob Wilson, PEMCO Services

Production complains about frequent work stoppages due to air supply related problems. It wants a more reliable consistent source of compressed air. Maintenance says it will need to replace an older compressor with a new one to improve the reliability and stability of the system. Maybe purchase a bigger one than currently needed in anticipation of future increases in air demands. Management wants assurances a good return on the investment will be realized from the expenditure before making a financial commitment. For comparing and evaluating alternatives, a benchmark must be established to determine the cost to run the current system. An assessment must be performed to identify the saving's opportunities and assign dollar values. Questions about the cost of the assessment and what is to be expected in return need to be answered.

Outsourcing assessment services to a compressed air system expert is expensive. Companies with large plant air systems operating 24/7 can afford contracting with an outside resource because the potential dollar savings from a comprehensive assessment will be substantial. But small and midsized companies also need to address reliability and operating cost issues for their respective compressed air systems. These smaller companies compose 90% of the manufacturing establishments in the US and are a very important stakeholder in the compressed air market. The statistical data compiled in a *Compressed Air Market Assessment — The Supply Side of the Market* commissioned by the U.S. Department of Energy shows 72% of all facilities have 4 or less compressors. The majority of these operate less than 24/7. The potential return for these companies may not economically justify hiring an outside consultant. Alternative resources to assist in performing a comprehensive assessment need to be explored. These might include:

- Power Authorities
- Compressor distributors
- Compressed air equipment manufacturers
- Independent auditors
- Energy Management Companies
- Government Agencies

> "A number of compressed air specialists are offering services via remote networking over the Internet. The specialist pre-configures the instrumentation and sends it to the client to collect the on-site data."
>
> — Bob Wilson, PEMCO Services

A good first step would be to get the air compressor network under control and operating efficiently. Options to look at include:

- Rearranging the cascading pressure schedule of the compressor network
- Installing automated compressor sequencing
- Rotating compressors in accordance with an energy algorithm
- Adding a more efficient VSD compressor to the network, perhaps oversized to create a source of reserve energy from its excess motor capacity
- Increasing air storage
- Applying Pressure-Flow Control

Start the evaluation process with a supply side assessment in the compressor room. The energy consumed by the compressors represents about 80% of the compressed air generating cost. Improving the compressor performance offers a significant cost savings opportunity. Also, a benchmark must be established for evaluating the available energy efficiency improvement measures. A business plan with specific goals needs to be developed for upgrading and improving the plant air system. Knowing the cost to operate the compressors is essential to the development and successful implementation of an overall plan.

For the companies with smaller systems, management may want to consider doing the work with their in-house personnel. In fact, the previously referenced *Compressed Air Market Assessment* shows 45% of the user respondents believe their internal staff has the capability to perform the study services. If they had the instrumentation and software tools to record the data, the assessment could be performed in-house. Assistance with the analytics, however, will probably require working with a compressed air specialist.

A number of compressed air specialists are offering services via remote networking over the Internet. The specialist pre-configures the instrumentation and sends it to the client to collect the on-site data. The instruments are then returned to the specialist for analysis and interpretation of the data. A Report is issued containing all the pertinent information

CLOUD COMPUTING WITH SIMULATIONS FOR AIR COMPRESSOR NETWORKS

Air compressor nick name	Air compressor brand ID	Air compressor model ID	Productive energy kWh	Non-productive energy kWh	Total energy kWh	Total cost $	Annual energy kWh	Annual cost $
ZT90 VSD	Sample Audit	A	24898.7	343.8	25242.5	12621.27	435284.1	217642.37
ZT160 FF	Sample Audit	A	51206.8	1680.9	52887.7	26443.86	912000.5	456000.42
ZT30 FF	Sample Audit	A	1448.8	287.3	1736.1	868.05	29937.5	14968.74
ZR4/51	Sample Audit	A	12612.6	3094.3	15706.9	7853.43	270851.3	135425.29
System			90166.9	5406.3	95573.2	47786.60	1648073.4	824036.69

Figure 1. Tabular Chart Illustration

Figure 2. Graph over 20 day period

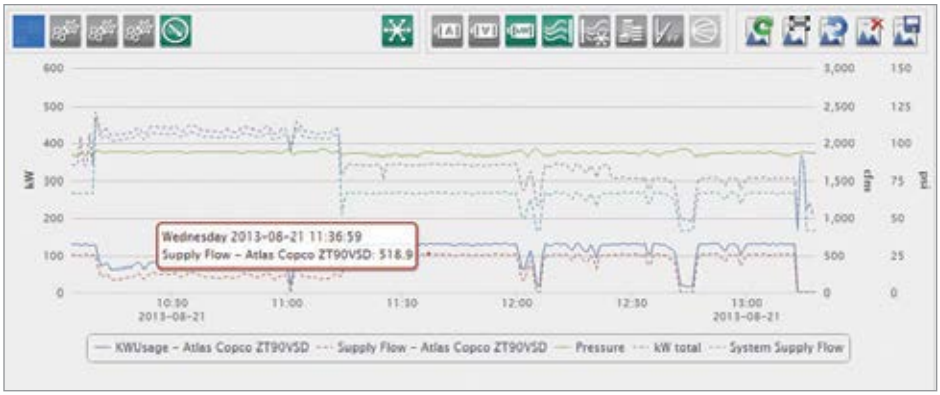


Figure 3. Graph at 30 minute intervals

presented in a format management can use in making business decisions about the air system.

One such program, called SCADAR™, offers a simple, low cost method of assessing the air system using advanced hardware, the latest software, and cloud computing solutions that enable the compressed air supply side to be quickly and easily audited. It is a compressed air analytical tool that lets small-midsize plants to perform the required data gathering using local or in-house personnel. A contracted compressed air specialist ships the preconfigured data loggers to the client and coordinates the project with on-site personnel via phone and the Internet. When the units are returned, the specialist performs the analytics using the SCADAR™ cloud computing software. The results are posted on the cloud for authorized personnel access and view. By eliminating the cost burden of a specialist's on-site time and the associated travel expenses, the assessment service becomes much more affordable. Taking advantage of the cloud computing solutions is a quick easy way to perform the analysis and develop the visual presentation for management. Upgrades to improve the operating efficiency of the network can be quantified through simulations. Also, once the costs and savings opportunities in the compressor room are defined, a cost effective comprehensive compressed air system study plan can be devised for performing an expanded assessment of the total site specific facility.

The SCADAR™ Audit

Simplified analytic solutions streamline the compressed air system audit process. Single channel, battery operated definite purpose data loggers preconfigured by the compressed air specialist are packaged and shipped in protective transit cases to the jobsite.

Local service providers or in-house personnel install the loggers. At a minimum, the power consumed by the air compressors and the pressure profile in the compressor room are logged. Data loggers are also available, at additional cost, for recording other parameters to include demand side pressures, temperature, dew point, and flow. Data is recorded over a representative production period. The loggers are then disconnected, repackaged in the shipping cases, and returned to the specialist for uploading the data to the cloud computing platform. The specialist performs the advanced charting, graphing, simulations, and reporting of the logged data. The final report is posted on the cloud for viewing by the client.

The Analytics

To initiate the audit, the client must first provide information about the project. At a minimum, the specialist needs to know its location, the contact person, and compressor models and their rated performance. To facilitate compiling the compressor specifications CAGI Data Sheets are available and can be accessed via the compressor manufacturer's website using quick links.

The performance parameters needed for the eventual analysis are entered into SCADAR™. The cloud computing software organizes the information for transfer to the assigned loggers. The compressed air specialist structures the audit in accordance with the defined goals of the study. The loggers are now ready to begin their assigned functions.

The client receives the pre-programmed loggers and arranges for them to be installed on the appropriate compressor or instrument port. Loggers are manually started to record the data. After returning the loggers, the specialist uploads the data to the cloud and begins the analytical functions.

Charting Program

SCADAR™ populates a series of pre-defined tabular charts. The specialist can choose from a library of tables that display the compressor room profile. The sample illustration below shows the **Compressor Power and Cost** for both the 20 day audit period and the extrapolated annual totals.

Tabular charts are available for the specialist to display:

- Compressor operating hours and % loading
- Compressor power and flow
- Compressor hourly operating profiles
- System power analysis
- Key Performance Indicators (KPI)
- System flow analysis
- System pressure profile analysis

The specialist reviews the analytics and selects the appropriate charts, consistent with the scope of the audit, for inclusion in the final report.

CLOUD COMPUTING WITH SIMULATIONS FOR AIR COMPRESSOR NETWORKS

Graphing Program

Data selected by the specialist is also plotted for visualization in the form of graphs. Pre-defined formats are used to depict selected data. The **Flow, Power, and Pressure** sample audit data is graphed in **Figure 2.** It is plotted in one hour intervals over the full 20 day audit period. **Figure 3** shows the same compressor with additional data plotted at 30 minute intervals. The logger's sampling rate allows a graph resolution as low as 1 second intervals. Graphs can be combined as desired to enhance the presentation.

Data available for graphical depiction include:

- Compressor load profiles
- Basic power, current, voltage, and true kw
- Calculated or measured flow
- Power factor
- CO_2 emissions
- Costs

Totalized system data can also be graphed.

Simulations

System control scenarios can be simulated to identify the predicted energy, cost, and CO_2 benefits. The simulations demonstrate the potential savings from various actions applied to the benchmark profile. The results are shown in a tabular chart. Simulations compare the benchmark with a new profile from modifying the compressor configuration by:

- Adjusting the cascade pressure settings
- Removing or replacing an existing compressor
- Adding a compressor to the existing network

This is where maintenance can evaluate replacing the older, less reliable compressor with a new one. The impact on the operating profile of oversizing the new compressor can be determined. The benefits of a higher efficiency VSD compressor can be simulated. Comparing the benchmark operating costs with the reconfigured network operating scenarios lets management see the financial consequences after adjusting for the capital expenditures.

The application of a System Master Network Control to automatically sequence the compressors is simulated in **Figure 4.** The red graph shows the existing performance. The blue graph shows the predicted performance after the installation of the System Master Control.

Figure 4. The impact of installing System Master Network Control

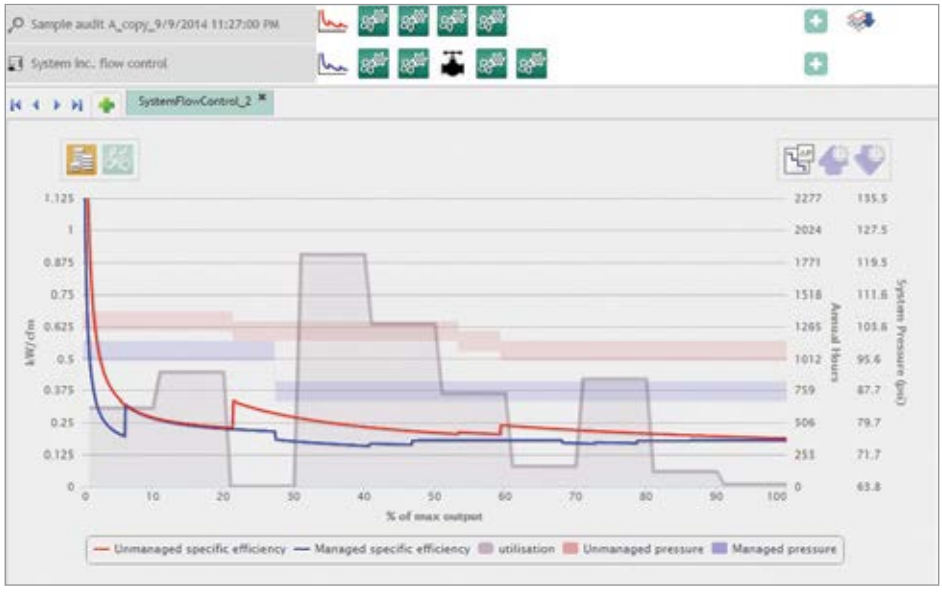


Figure 5. Applying Pressure-Flow Control

The predicted savings comes to $36,042 per year, which offers an excellent return on investment opportunity even after factoring in the expenses associated with the installation of the equipment.

The application of Pressure-Flow Control can also be simulated and the potential savings evaluated at different inlet and target outlet pressures. **Figure 5** simulates adding a Pressure-Flow Control Valve to the original compressor network.

The estimated savings from adding the Flow Control Valve upstream of the two largest fixed speed compressors and downstream of the small fixed speed and VSD compressor comes to $52,396 per year. Even after adjusting for the additional capital expense of installing a large receiver, the upgrade offers a good the return on investment.

The cloud computing Simulation program is valuable tool for management to use when making business decisions about the plant air system.

Publish Report

Relevant charts, graphs, and simulations are arranged by the specialist into a written Report for posting on the cloud. The specialist will upload images, add and edit text, and organize the content into useable information for the client.

SCADAR™ offers a simple, low cost method of assessing the true power cost to run the compressors. A benchmark is established for management to use in comparing and evaluating available cost saving measures. The cloud computing platform allows a qualified compressed air specialist to perform the analytics. The Simulation program allows various scenarios to be analyzed to determine the benefits of reconfiguring the existing compressor network. The impact of applying a System Master Network Control or Pressure-Flow Control can be evaluated. A Report is issued for the client and colleagues to use in future planning.

Summary

The energy required to maintain a stable reliable source of compressed air to production is the largest controllable expense in most manufacturing operations. That makes it one of the biggest saving's opportunities. Since about 80% of the cost to run the air compressors is energy, it makes good business sense to address improving the performance of the compressor network as a first step in developing a more comprehensive overall plan. Large companies can afford to contract with outside sources to do the study work. Smaller companies may need to offset some of the study cost by using local or in-house personnel to perform the on-site work and outsourcing support services only as needed. In the end, the proper implementation of the assessment recommendations will result in a production getting a stable reliable compressed air supply, the new compressor maintenance wants, and the return on the investment management is looking for. It becomes a win-win situation for everyone. BP

For more information contact Bob Wilson, PEMCO Services , email: rwilson@pemcoservices.com, tel: 727-866-8118, or visit www.pemcoservices.com

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THE VALUE OF SERVICE INSPECTION PROGRAMS

DISTRIBUTION'S ROLE IN MAINTAINING THE PERFORMANCE OF COMPRESSED AIR SYSTEMS

By Ron Nordby

During my forty years of involvement with distribution (companies that sell and service compressed air system products) as a Vice President of Sales and Marketing and Account Manager, I have witnessed a tremendous amount of change in the compressed air industry. As much as we like to reminisce about the good old days, it is quite apparent that the resources, capabilities and knowledge of distribution today are significantly better than ever before. This has been most apparent from distribution's involvement in the design, application and operation of compressed air systems. Their grasp of the latest technology has made it possible to analyze, monitor and control virtually every aspect of the compressed air system. This has give distributors the ability to not only maximize efficiency but more importantly help improve the reliability and performance of compressed air systems to unprecedented levels.

Despite these achievements, distributors have not utilized resources effectively to motivate their customers to maintain and improve their compressed air systems. Just like all mechanical systems, the gradual deterioration of compressed air systems in reliability and performance over time is inevitable and will usually continue until the point of system failure. Due to reasons inherent in distribution's approach to sales and service, most distributors neglect to maintain a direct involvement in the ongoing operational status of their customer's compressed air systems. They willingly assume a reactive, rather than proactive role in providing support to their customers in maintaining and optimizing the performance of their compressed air systems.

Service Contract Programs

For distributors who have been successful in building this awareness with customers it has been through the utilization of service related programs. They have structured these programs, in order to optimize efficiency, by integrating the promotional capabilities of sales with the operational expertise of the service department. This has been proven, over the years, by distributors who have successfully marketed and implemented well-structured Service Contract Programs.

Service Contract Programs have been popular for many years, especially among larger and

THE VALUE OF SERVICE INSPECTION PROGRAMS

more progressive distributors. However, due to the significant investment in personnel and financial resources required to effectively implement these programs, they have not been a viable option for most distributors. In order to optimize service related program participation, by both distribution and their customer base, a program must minimize the resources required while being cost effective. When considering the critical aspects required for a successful program, the most beneficial business solution for most distributors is a Service Inspection Program.

Service Inspection Programs

Implementing a Service Inspection Program allows distributors to utilize their resources and maximize their ability to help sustain their customer's system performance on a continual basis. A Service Inspection Program, whether contractual or non-contractual, is unique in that it gives distribution an opportunity to participate in the advantages offered by service related programs, regardless of size or resources available. The program limits and strictly defines the extent to which a distributor is exposed, allowing the distributor to minimize and accurately determine his operational costs. This greatly enhances the distributor's opportunity to expand their company's integration into a larger segment of their customer base.

A Service Inspection Program requires three basic requirements:

1. **Establish regularly scheduled service appointments.** These are usually based on hours of operation and are most commonly performed annually or semi-annually.
2. **Provide a comprehensive inspection of the compressed air system.** The scope of the inspection should be agreed upon with the customer but should at a minimum cover all equipment on the supply side of the compressed air system.
3. **Generate an inspection report.** This should outline the status of all equipment included in the system, the condition of the system itself and any issues that need to be addressed.

In the event that service work or maintenance parts are required, the approval of the customer would be required. Any service work or parts supplied would be scheduled and billed outside of the Service Inspection Program as a separate work order.

Benefits of the program for the distributor:

- Regularly scheduled access to the customer's compressed air system
- Ability to provide customers with more reliable system performance
- Acquire comprehensive and accurate information on customer's system
- Enhance distributor/ customer relationship
- Increase opportunity to promote ancillary equipment
- Increase parts sales
- Become the primary system supplier to customers
- Maintain and grow service business

Benefits of the program for the customer:

- Increased system reliability
- More consistent performance of the compressed air system
- Longer equipment life
- Reduction in operational costs
- Reduce product waste and rework
- Minimize production downtime
- Ongoing training for maintenance personnel

For distributors who have already implemented a Service Contract Program, the addition of a Service Inspection Program would be very beneficial. A Service Inspection Program

"The Service Inspection Program is truly one of the rare programs providing a win/win situation for both distribution and their customers."

— Ron Nordby

will open up a large new segment of the distributor's customer base unreachable by Service Contract Programs alone. Many distributors that currently offer a Service Contract Programs find that only about 10-15% of their customer base are willing to participate despite devoting a great deal of internal resources, such as service schedulers and procurement personnel to facilitating the program. A well-structured and promoted Service Inspection Program has the ability to increase customer participation level up to 30-40%.

If you do not currently offer any service related programs, I encourage you to give a Service Inspection Program serious consideration. Service Inspection Programs, whether on their own or in conjunction with another program, give distribution the opportunity to increase revenue and profitability as well as provide additional value to the distributor/customer relationship. This simple, yet effectively designed service program allows all sizes and levels of distribution to participate with minimal up front and on-going financial investment and resources. The Service Inspection Program is truly one of the rare programs providing a win/win situation for both distribution and their customers. BP

For more information contact Ron Nordby, tel: 651.308.2740, email: ronknordby@gmail.com

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

INNOVATION PROFILE

Atlas Copco's iPM Interior Permanent Magnet Motor and SMARTLink Service

By Scott Williams, Contributing Editor

The Department of Energy estimates that compressed air systems in the U.S. consume about 30 trillion Watt-hours of energy per year. Of all the energy used in manufacturing, compressed air systems have the greatest potential return for implementing energy efficiency practices, according to the DOE.

One approach to access some of that return is to eliminate waste by producing compressed air efficiently and only in the amount demanded. Another approach is to leverage compressed air system data to assess the impact of any system changes on energy consumption and productivity.

Atlas Copco Compressors offers new solutions that employ both of these approaches. This article examines the new GA 7-37 VSD+ air compressors and SMARTLink data monitoring system, and includes application insights from two independent distributors of Atlas Copco compressors.

The GA 7-37 VSD+ air compressors feature an innovative and patent pending interior permanent magnet motor designed by Atlas Copco

GA 7-37 VSD+ Air Compressors

Atlas Copco recently announce their new line of GA 7-37 VSD+ air compressors offer reduced noise levels of 62 to 64 dB(A) depending on model, 20% lower Specific Energy Requirements (SER), a 12% increase in Free Air Delivery (FAD), and up to 55% reduction in footprint compared to previous GA models. This new line of air compressors comes in sizes from 10 to 50 horsepower, each equipped with the Elektronikon Mk5 controller and SMARTLink data logging system. The line is offered in variable speed drive only.

How were these improvements achieved? An air compressor has many subsystems- but one of the main subsystems is the motor and how it's connected to the air end that compresses air. Virtually all air compressor manufacturers purchase motors from the major international suppliers. Atlas Copco has taken an important step and designed in-house their own interior permanent magnet (iPM) motor, which significantly exceeds the minimum IE4 standard for Premium Efficiency, the highest standard for motor efficiency in the U.S. The iPM motor is directly coupled to their airend (they call it an element). Both of these components were designed in-house by Atlas Copco specifically for the new GA VSD+ compressor and both have patents pending.

The direct drive iPM motor is oil-cooled and pressure-tight, with no gears or belts and no shaft seal. Oil cooling the motor warms the lubricating oil before it reaches the compressor element, helping prevent condensation under low load conditions.

Freeing up floor space is beneficial in practically any industrial setting, and the vertical orientation of the GA VSD+ cabinet requires less than half the floor space of like-sized compressors. The vertical configuration allows the compressors to be installed close to a wall or in corners with all maintenance parts easy accessible. These compressors are also available as "full feature" units including the latest generation refrigerant dryer built in. Full feature units increase the footprint slightly.

The canopy is designed with two internal compartments to separate components that generate heat from those that require cooling. Cooling is facilitated by a new fan design. This quiet fan cycles automatically depending on heat load and is turned by a new, high efficiency, ERP2015-compliant fan motor that achieves additional SER savings of up to 7% of compressor power. This contributes to the low dba sound attenuation ratings.

Innovator Profile:

Kurt Lang
President of Air Technologies
Columbus, OH
www.aircompressors.com

This is our 34th year with Atlas Copco as a primary distributor and it's their 141st year in business. Lots of compressor companies focus on very large compressors, but Atlas Copco is also committed to energy efficiency at the smaller end of its product line. They are committed to sustainable productivity by their actions.

Two things stand out about the GA VSD+ compressors: they are providing energy savings, up to 50% for the user, and they are extremely reliable. I see the claims Atlas Copco is making in the marketplace being realized by our customers. It could be a small industrial manufacturing company, a food or beverage processor, plastic tool and die shop, or a paint and body shop. These folks need to manage a better and more profitable business to stay competitive. One way we're helping them do that is with a much more efficient air compressor. We're helping small to medium size factories save major dollars and capture very large rebate checks from their power utility.

One of Air Technologies' customers, a leading plastics packaging converter, was expanding to a second location. It was an open space warehouse where a 50 horsepower skid-mounted air compressor was already in place. The unit was more than twice as large as required for current or future needs and produced excessive noise. Our experts determined that Atlas Copco's 15 horsepower GA 11 VSD+ compressor would address the customer's requirements for low noise level, small footprint and zero idling time. The interior permanent magnet motor and variable speed drive are providing energy savings that will pay for the new compressor in less than 18 months.

Another customer, a small food manufacturer, was using a reciprocating air compressor that was so noisy they kept it inside a shed behind the production building. They wanted to bring the unit indoors during the winter to keep it from freezing, but space was limited and it would be too loud to work around. Our solution was a GA 7 VSD+ with a 62 dB(A) noise level. It's so quiet that workers can conduct a normal conversation while standing next to the unit. With a rebate on top of energy savings, it was an easy decision for the customer.

We have several customers connected with SMARTLink, too. It's only the first year or so but we're finding that it helps them understand compressor maintenance and warns them before there is a shutdown. It helps us to manage a customer site more effectively.

INNOVATION PROFILE | Atlas Copco's iPM Interior Permanent Magnet Motor and SMARTLink Service

The new vertically-oriented drive train. The iPM Interior Permanent Magnet Motor and Compression Element

Excellent turndown capacity, as low as 18%, is enabled by VSD+ technology. This eliminates wasted idling and blow-off losses during operation, and minimizes system leakage by means of lower system pressure. The compressor can start or stop under full system pressure without the need to unload, which helps eliminates peak current penalties during start-up.

GA VSD+ TECHNICAL SPECIFICATIONS

Capacity FAD	14.4 - 246.4 cfm; 24.5 - 418.9 m³/h; 6.8 - 116.4 l/s
Working pressure	58 - 188 psig; 4 - 13 bar(e)
Installed motor power	10 - 50 HP; 7 - 37 kW

SMARTLink Data Logging and Monitoring

In most production settings, servicing a compressor is largely reactive: an unforeseen event triggers an immediate need for a service technician. Even when compressors run reliably, they rarely run at the same level around the clock, so it can be difficult to know exactly when any given compressor is due for maintenance that can prevent such reactive measures. If maintenance activities go overdue — and production demands have a way of taking priority over downtime for system maintenance — both energy consumption and risk of breakdown increase.

Even though compressed air auditing activity has become commonplace, the majority of air compressors have still not been "audited" and demand profiles and energy use is not available to the owners of most units. Even systems that have been audited were data-logged for a one or two-week period only — and one thing we know for sure about compressed air systems is that demand profiles and component performance are always changing.

Atlas Copco created the SMARTLink service program to remove these unknowns by making the decision to ship data loggers standard with most of their rotary screw air compressors. The idea is to make it easy for factories to monitor compressors automatically 24/7 — all year. Launched two years ago at the *Hannover Messe* (Hanover Trade Fair) in Germany, we wanted to see how this innovative service offering

"Atlas Copco is also committed to energy efficiency at the smaller end of its product line."

— Kurt Lang, President, Air Technologies

was going. SMARTLink is Atlas Copco's data logging, monitoring and communication system that enables compressed air users to see how much air they are producing, how much energy they are using, how their compressor is performing and when it's due for service.

There are three levels of SMARTLink functionality offered. As with many of today's technology services, the base level of service is provided to customers at no charge and higher services levels can be accessed for a fee. A free trial period is provided so customers can evaluate the higher level SMARTLink services under operational conditions with no cost or risk. Atlas Copco personnel said that, "forty percent of our clients have signed up for the free trial period to test the service." The information on how many of these clients continued to use the technology was not available.

Reliable operation can be enhanced as this system analyzes air compressor operating data continually, and automatically sends alerts in advance so customers can plan their service interventions. By tracking and analyzing usage and maintenance information, the program gives customers both a quick snapshot and a complete in-depth analysis of

Innovator Profile:

Walter Deeken
Manager for Field Technical Services
HTE Technologies
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www.htetech.com

We became an Atlas Copco distributor in February 2014 and the quality improvement has been night and day. You can tell by the precision, in how well things fit together. The new GA VSD+ is a great example. The motor is sealed and completely dust proof. There's no shaft seal to leak and no worry about a coupling element to wear or crack or get misaligned with vibration. We were so impressed with the GA VSD+ that we have a 25 horsepower model that runs light manufacturing for our sister division in St. Louis. It's designed to run 8,000 hours without changing filters, it stops and starts at pressure, and it almost sounds like a blow dryer it's so quiet.

The GA VSD+ can turn down to 18% of flow, which is lower that most VSDs which turn down from 28% to 40%. The interior permanent magnet motor can spin slower and still maintain enough oil flow to lubricate the bearings. That's a big advantage over other units. Where a traditional compressor has a blow down valve and check down valves, the GA VSD+ doesn't have to blow off air when it shuts down. And if you're out of real estate, as a lot of older plants are, the small footprint of the GA VSD+ helps, too.

Since June we submitted four rebates through Energy Impact Illinois for $12,000, $17,000, $6,100 and $9,300, each where we replaced a traditional compressor with a GA VSD+ unit. Payback on all of these upgrades was just over a one year.

We're seeing customers have good success with SMARTLink, too. People set up monitoring and an alert system just by signing up through a website. If a compressor has an issue, in about 30 to 45 seconds the customer gets an email or a text alert. They don't need SCADA or a plant wide system either. You can still plug into an Ethernet if you want to dedicate a line to it, but the GA VSD+ is a smaller platform so they usually go in smaller businesses that may not have the resources or engineering talent on staff to connect it to the network. Now they do it via a website and it's all automated. SMARTLink is hassle free and already built into the unit.

As a technology, compressed air has been around a long time and there's only so many ways you can do things, but Atlas Copco has a history of innovation with the rotary screw and variable speed drive, and now the GA VSD+ and SMARTLink. They've definitely changed things for the better.

INNOVATION PROFILE | Atlas Copco's iPM Interior Permanent Magnet Motor and SMARTLink Service

SMARTLINK OPTIONS			
FEATURES	SMARTLINK SERVICE	SMARTLINK UPTIME	SMARTLINK ENERGY
SMARTLINK Hardware	✓	✓	✓
Monthly Service E-mail	✓	✓	✓
Machine Status Overviews	✓	✓	✓
Quote Request	✓	✓	✓
Service Performance Dashboard	✓	✓	✓
Service Log	✓	✓	✓
SMS/E-mail Warning		✓	✓
Event List		✓	✓
Actual Machine Status		✓	✓
Performance Indicators in Energy Related Dashboards			✓
Performance Indicators in Energy Related Graphs			✓
Reporting Function for Events, Energy, and Flow, Pressure & Dewpoint (PDF, Word, Excel)			✓
24/7 Remote Monitoring by Atlas Copco			✓

SMARTLink ships standard with most Atlas Copco rotary screw air compressors.

their air supply, helping them learn from their activities. The customizable system tracks a wide range of information about compressors in operation to predict potential problems, shows how and where the production can be optimized, and identifies ways that energy can be saved. Real-time compressor performance data can be transmitted to any mobile phone number, email address or computer desktop, so secure access can come from across the plant or across the globe.

The system gathers and transmits compressed air system data collected by Atlas Copco MkIV and Mk5 controllers. Data is collected outside of a customer's firewall and protected by Atlas Copco hardware so no LAN connections are required. The system provides GSM communication (cellular only). Hardware is comprised of the SMARTLink device, antenna and power supply. New Atlas Copco compressors are SMARTLink enabled from the factory and many Atlas Copco compressors can be retrofitted in the field.

To get started, users create an account via the SMARTLink website, enter their SMS/email information, and subscribe to the free monthly service email. Users add machines to their account by name and serial number and the SMARTLink provides a convenient place to record service data to an exportable log. Service data can even be recorded for machines that aren't connected. BP

To learn more about these technologies, visit www.atlascopco.us/usus/products

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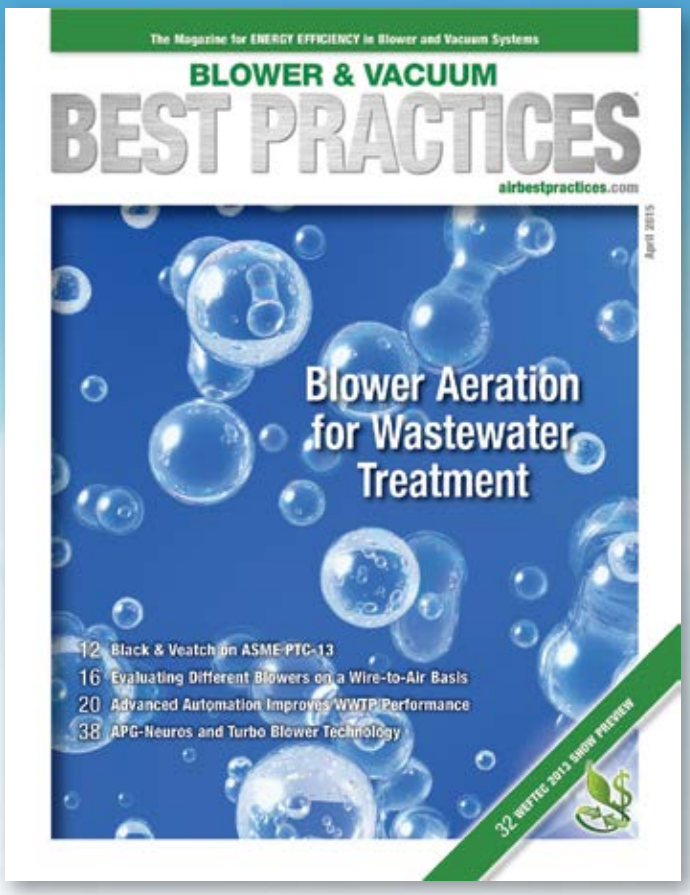

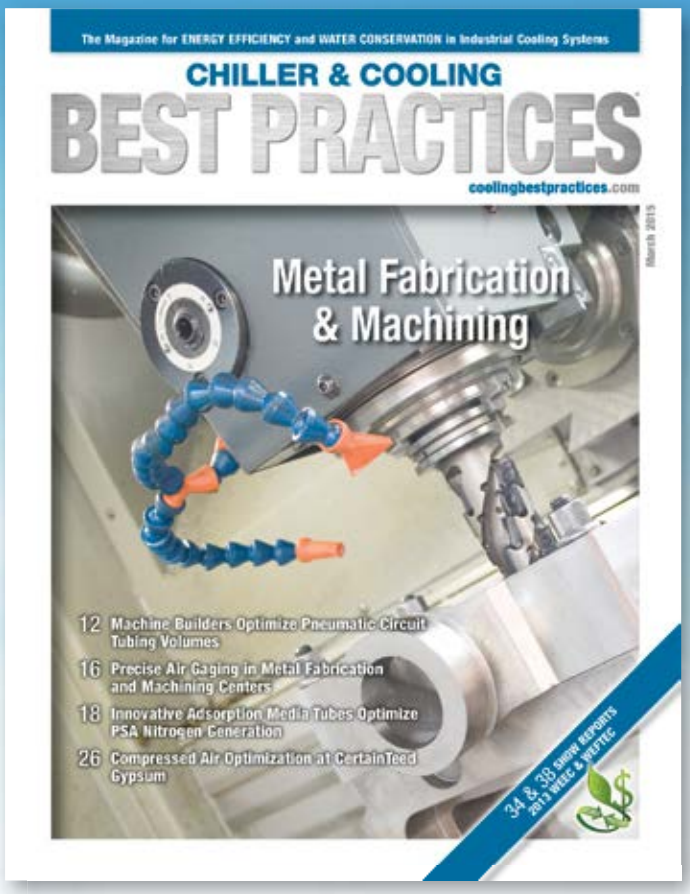

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FOUNDRY AIR COMPRESSORS OUT OF CONTROL

By Ron Marshall for the Compressed Air Challenge®

KNOW PRESSURE COMPRESSED AIR CHALLENGE

▶ Quite a number of worst-case compressed air scenarios have been encountered over the years but none may compare to the conditions that existed in a metal foundry somewhere in North America. For reasons you are about to discover, we will not reveal the name of this factory or its location, in order to protect the innocent from embarrassment.

This manufacturer historically had a great deal of difficulty keeping their air compressors and air dryers running. Typically, after a number of compressed air system shutdowns were experienced the compressed air service provider would get the blame and be fired only to be replaced with a new firm. This had continued over the years, with each local vendor trying numerous solutions to attempt to keep the system running. Each competing vendor rarely communicated any maintenance history to the other.

After attending a Compressed Air Challenge® seminar the maintenance staff at this foundry decided to hire a compressed air auditor to look into their system and suggest solutions. The audit discovered poor compressor control, poor operating conditions and high system waste were costing this manufacturer thousands of dollars per year in wasted energy and maintenance. What follows is a general description of what was found and what was done to improve the system.

Ambient Conditions

The ambient conditions in this factory were terrible for air compressors. A layer of soot and metal dust deposits was on anything stationary, quickly turning the cleanest of new equipment to shades of black. Since large electric arc furnaces are used to melt steel for the product, the heat expelled raises the building temperature in some areas to very high levels, even on cold winter days.

"The ambient conditions in this factory were terrible for air compressors. A layer of soot and metal dust deposits was on anything stationary."

— Ron Marshall

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FOUNDRY AIR COMPRESSORS OUT OF CONTROL

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If you have additional questions about our web-based training or other in-person CAC training opportunities, please contact the CAC at info@compressedairchallenge.org

Since the dust was everywhere, formed by the vapors rising from the molten metal being poured into molds, and generated by the grinding operations, any air cooled equipment cooling surfaces would be quickly clogged. Because of this, the air compressors and dryers were liquid cooled. Unfortunately, the cooling water used for this equipment was also used to cool other processes and was full of contaminants.

System Configuration and Baseline

This manufacturer had a system of four 150 hp water-cooled lubricated rotary screw compressors grouped in two separate compressor areas, which were separated by about 600 feet. These compressors were operating in modulation control mode, partly due to the poor condition of the units, and partly because it was difficult to coordinate any other type of control across the plant and the significant pressure differential across the filters and dryers. This system used water-cooled non-cycling refrigerated dryers experiencing shutdowns due to water contamination and high inlet temperatures.

The system was consuming slightly over 4 million kWh while producing about 2,000 average cfm flow. The system specific power was about 26 kW per 100 cfm. Plant flows on weekends, with no production running, consumed enough air where two compressors were required to run to maintain pressure. The operating costs for the system were estimated at $202,000 per year when all the compressors were running. Unfortunately, as the system compressors started failing, a bank of diesel rentals had to be brought in to assist, greatly increasing the costs due to rental and fuel consumption.

Air Compressor Control

The air compressors were running in an inefficient modulating mode allowing the compressors to be adjusted so they shared the load. When the units all ran at partial loading, less heat was generated by the compressors. Since the compressor cooling water was poor the internal tubes of the heat exchangers were partially blocked by debris. Less heat meant less chance of tripping the compressor off on over-temperature.

Over the years various control schemes were attempted to try to coordinate the operation of the compressors and improve pressure control, including moving the pressure sensing downstream of the dryers and filters, and installing special pilot actuators which reduced the compressor operating pressure band from the standard 10 psi to a narrower 3 psi. This scheme failed, resulting in motor losses and confusion because as service providers were hired and fired, each new set of technicians did not know what the other had done previously. Finally one ill advised method was installing drain valves on the pneumatic circuit feeding the modulation valve actuator, a diaphragm operated device that

This poorly maintained air dryer operated for many years even though it had no load.

mechanically opens or closes the compressor inlet valve. Plant personnel would manually operate these valves to dump air out of the pneumatic circuit causing the inlet valve to open more or less. They used this manual method to try to balance the compressor loading. Unfortunately this change swamped the inlet control circuit and caused the compressors to operate blind, when the plant load dropped, pressure levels would rise to dangerous levels. One compressed air parts supplier tells a story of the plant production personnel coming to them asking for mufflers to attempt to quiet the receiver tank safety blow-off valves because they were too loud and distracting!

Due to poor maintenance practices, and extreme ambient conditions, various items on the compressors started to fail as they aged. Two items that cause a reduction in capacity that tipped the scales for this customer were blow-down valves that failed in the open position, robbing the plant of the compressor's full capacity, and an improperly installed inlet valve. After one compressor had been replaced, it was discovered that someone had installed the inlet valve improperly after a rebuild, preventing it from opening fully and thereby blocking this compressor from adding much capacity into the system, even with the manual control. These items made it impossible to maintain normal plant pressure without diesel backup capacity. After struggling with the system for over a year, permission was finally granted by head office to start making improvements to the system.

Compressed Air Leaks and End Uses

The economic situation for this customer wasn't the brightest at the time of decision and management looked for ways to get some kind of external assistance to help pay for the equipment purchases. Fortunately they had a power utility granting incentives for power savings. Simply replacing the compressors didn't generate enough incentive to allow the project to proceed, so other items needed to be addressed to increase the energy savings. A compressed air audit identified a number of items that could be improved on the demand side of the system. The primary one was plant compressed air leakage. The plant had a flow of over 1000 cfm even when there was no production. A focused leak management effort was able to achieve a significant impact on this flow. During leak reduction activities a large unnoticed leak on a bag house manifold up in the roof area of the plant was found. This reduced the flow by an estimated 550 cfm.

Other items such as compressed air powered cabinet coolers were used extensively in the plant as well as ring jets to promote the flow of vapors up exhaust ducts. These items were converted to more efficient methods and/

Uncontrolled cabinet coolers were used extensively

or controlled so they did not run during times where they were not required. One heatless desiccant dryer was found purging continuously. This type of dryer was required to protect bag houses that were located outdoors to prevent freezing in extremely low temperatures. This is acceptable, but the bag house the dryer was installed to protect had been removed 5 years earlier, the dryer had never been decommissioned.

The reduction of end uses and leakage was enough to generate the level of funding necessary to initiate the project, which involved almost completely gutting the compressed air system.

Solutions

Three of the four compressors were replaced with new water-cooled, two-stage lubricated air compressors. The units were purchased with extra large coolers to reduce the effect of dirty cooling water. One compressor

"One compressed air parts supplier tells a story of the plant production personnel coming to them asking for mufflers to attempt to quiet the receiver tank safety blow-off valves because they were too loud and distracting!"

— Ron Marshall

FOUNDRY AIR COMPRESSORS OUT OF CONTROL

Best Practices for Compressed Air Systems Second Edition

This 325 page manual begins with the considerations for analyzing existing systems or designing new ones, and continues through the compressor supply to the auxiliary equipment and distribution system to the end uses. Learn more about air quality, air dryers and the maintenance aspects of compressed air systems. Learn how to use measurements to audit your own system, calculate the cost of compressed air and even how to interpret utility electric bills. Best practice recommendations for selection, installation, maintenance and operation of all the equipment and components within the compressed air system are in bold font and are easily selected from each section.

Drains were installed on compressor controls that rendered the sensing circuit blind causing dangerously high pressures at low loads.

purchased was a VSD controlled unit designed for partial load. This was installed in an area of the plant less susceptible to dust contamination and high temperatures. The compressors were connected to a new master compressor control system that orchestrates the operation of the compressors within a single narrow pressure band. Pressure is sensed at each end of the plant and compressors are turned on and off to maintain the average pressure between the two ends. This controller is also outfitted with a remote monitoring system allowing plant management to monitor the efficiency of the system and the status of the compressors from any plant computer.

Water-cooled compressed air dryers were purchased using cycling style control and the filters were arranged resulting in low pressure differential. End use reduction and leakage repair reduced the average flow substantially.

Verified energy savings were measured at 1.8 million kWh for a 42% reduction resulting in an operating cost saving of $85,000 per year. System specific power fell to 17 kW/100 cfm due to excellent compressor control. With the utility incentive the project simple payback worked to 2.9 years based on electricity savings alone. If rental air compressor costs were included, the payback was substantially lower.

Benefits of System Analysis

The plant was obviously having problems than needed attention, but it took a compressed air system audit to come up with a list of issues to improve. Because an audit was done, plant management received documentation of their baseline energy consumption, and a list of potential improvements that could be used to apply for external energy efficiency funding. As a result, the project was implemented and the system greatly improved, not only increasing the reliability and pressure stability, but also reducing the cost of operation. BP

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

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Sustainable Energy Savings with Compressed Air Best Practices®

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.**

"Compressed air is very important to our manufacturing process and managing its reliability and energy-efficiency is critical."

– Patrick Jackson, Director of Global Energy Management, Corning Inc. (feature article in June 2014 Issue)

"Compressed air is the #1 kW user across our 35 factories."

– Doug Barndt, Manager Demand-Side Energy & Sustainability, Ball Corporation

"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, measurement and control, pneumatic, blower and vacuum technology.**

Industrial energy managers, utility incentive program managers, and technology/system assessment providers are the three stakeholders in creating energy efficiency projects. Representatives of these readership groups guide our editorial content.

"Each of our 10 production plants has an Energy Coordinator who is part of the corporate energy team."

– Michael Jones, Corporate Energy Team Leader, Intertape Polymer Group (feature article in July 2014 Issue)

To subscribe visit **airbestpractices.com**

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Prevost Introduces Prevo S1 Safety Couplers

Prevost Corporation has introduced the Prevo S1 line of safety couplers for shop air systems. The unique one-hand push-button action of the ergonomic couplers is surer and faster to use, while the internal design eliminates hose-whip by first venting line pressure, and then releasing the plug. The advanced anti-static composite material shell offers longer-lasting service and greater resistance to scratching, impact, abrasion and corrosion. Prevost coupler's precision construction also ensures tighter leak-free service that can reduce shop energy costs.

About Prevost

PREVOST CORP (PREVOST) is the North American import, sales, distribution and service offices of Prevost, a global manufacturer and supplier of air tools and systems headquartered in France. Established in 1978, Prevost Corp's product offerings now include: regular and safety quick disconnect couplings, a variety of hose products (hose reels, spiral hose assemblies, bulk hose & fittings), OSHA-compliant & ergonomic blowguns, FRLs, push-in fittings, and energy efficient aluminum piping systems. Prevost also offers other industrial shop-related products and accessories including water couplings, wash guns, and breathing air couplings.

www.prevostusa.com

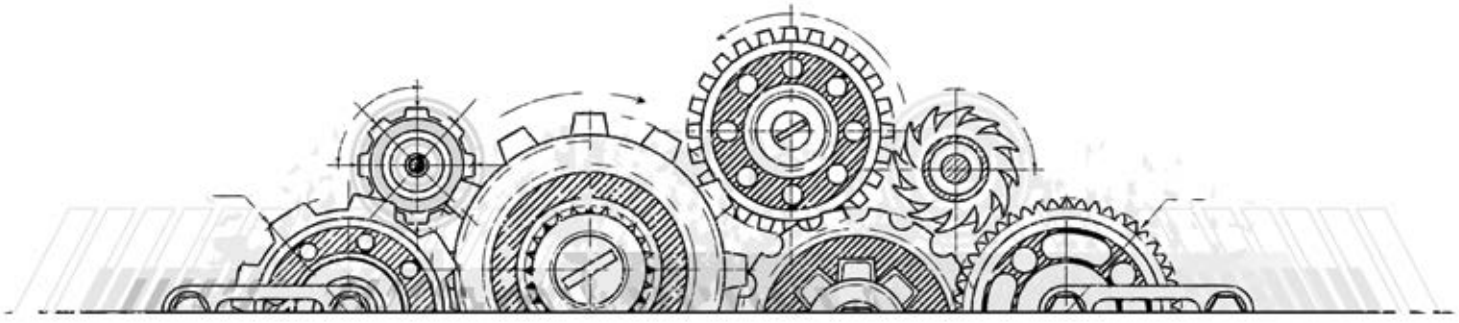
Sullair Announces Expanded ShopTek Air Compressor Line Now Available in Latin America

Expanded ShopTek Line Extends Range up to 100 hp

Sullair, an industry leader in innovative compressed air solutions since 1965, announced today the introduction of the expanded ShopTek line of lubricated rotary screw air compressors to Latin America. The expanded product line features larger compressors ranging from 25 hp to 100 hp, complementing the existing ShopTek line of smaller compressors.

The ShopTek line redefines industry standards for continuous-duty air compressors in the 5 hp to 100 hp range. The compressors are designed with a small footprint and are built to provide exceptional reliability and extremely low maintenance. All ShopTek compressors come standard with the precision rotary screw air end for which Sullair is famous. Additionally, all ShopTek air compressors come factory-filled with Genuine Sullube® — Sullair's proprietary compressor lubricant, which keeps the unit running in peak condition. And all ShopTek models are covered by the Sullair Diamond Warranty, including 10-year protection on the critical air end.

The expanded ShopTek line now includes 14 models with either 50 Hz or 60 Hz motors and features direct coupled gear drives for increased durability and modulation control for improved efficiency.



TECHNOLOGY PICKS

"The expansion of the ShopTek line into Latin America provides new opportunities for customers to experience the benefits of a Sullair air compressor," said Brent Mumford, VP and General Manager, Sullair Stationary Air Compressors. "While we have had smaller horsepower units available for several years, many Latin American countries are experiencing growth in manufacturing. The larger ShopTek units provide more choices for helping our distributors match the right compressor to the right customer. Our global manufacturing capabilities have really made this expanded ShopTek launch possible."

The entire ShopTek line of air compressors is available in most Latin American countries through the Sullair distributor network.

About Sullair

Sullair is globally recognized as a leading manufacturer of portable air compressors, contractors' air tools, stationary air compressors, compressed air treatment equipment and vacuum systems. The company will be celebrating its 50 year anniversary in 2015. Sullair is located at 3700 East Michigan Boulevard, Michigan City, IN 46360. Telephone 219.879.5451. FAX 860.353.5779. Website: www.sullair.com.

New Festo CMSX Closed Loop Position Controller

Festo introduces the CMSX, the first in a new generation of process industry closed loop position controllers for quarter turn actuators. The new CMSX delivers high functionality at a price significantly less than that of typical closed loop position solutions.

The electro-pneumatic CMSX positioner provides proportion closed loop control for liquids, gases, or any application utilizing a quarter turn actuator, in such industries as food and beverage, water/wastewater, paper manufacturing, and pharmaceutical.

The unit is equipped with two digital output signals for alarms and a 4-20mA output signal that provides data on the actual position of the valve for greater overall feedback and closed loop control. For maximum energy savings, once the position of the actuator is reached, the unit goes into rest mode and air consumption drops to zero. Most other positioners continue to bleed air while in a rest state causing a higher demand on the overall pneumatic system. To ensure safety the unit can be predefined to fail in-place or in the open or closed position, therefore the OEM can design with the confidence of predefined fail positions in the event of an electrical system failure or use of the digital input signal for emergency shutdown mode.

The CMSX is self-commissioning for simple set up and commissioning — users simply push a button. The CMSX comes standard with a teach function that makes it easy to delineate the valve's specified range of motion. And, each unit can accommodate 0-10V, 4-20mA, or 0-20mA input, which simplifies ordering — one part number covers all three.

The CMSX is an ideal positioner for the robust and multi-functional Festo DFPB quarter turn actuator. The CMSX meets the IP65 standard for dust and water protection and the ISO 5211 mounting standard. The housing is made from a technical polymer that is ideal for indoor and outdoor applications. Signal and position information is displayed via a back lit LED screen.

"The CMSX closed loop positioner was designed from the ground up to answer the short comings of today's closed loop proportional position controllers for quarter turn actuators, namely in the areas of cost, energy consumption, and safety," said Craig Correia, Process Automation Industry Manager for Festo. "Most positioners for quarter turn actuators cannot match the control, feedback, and simple set up of the CMSX."

Key technical specifications

Input signal 0 ... 20 mA, 4 ... 20 mA, 0 ... 10 V
Feedback signal, standard 4 ... 20 mA
Pressure range 43.5 ... 116 PSI
Operating temperature 23 ... 140 °F
Rotation angle 0 ... 110°
Repetition accuracy ±3%
Air consumption at rest 0 l/min
Flow rate 100 l/min (P = 86 PSI)

For more information on the Festo CMSX closed loop positioner for quarter turn actuators, call Festo at 800-993-3786 and visit http://www.festo.com/us.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

About Festo

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

New No-Drip Internal Mix Atomizing Nozzles

Internal Mix Atomizing Spray Nozzles mix liquid and air inside the nozzle and produce the finest atomization of liquids up to 300 centipoise. The new No Drip Internal Mix Atomizing Spray Nozzles work in the same way our standard atomizing nozzles do, but have the added benefit of positively stopping liquid flow when compressed air is shut off.

When spraying any type of liquid, post-spray liquid flow can cause big problems. Unwanted drips can ruin product function on sealing or mating surfaces. Drips can also ruin the appearance of painted or coated finishes. In addition, excess liquid flow wastes precious resources such as expensive coatings, chemicals or water. EXAIR's No Drip Atomizing Nozzles are ideal where no post-spray drip is permissible. When the compressed air supply is shut off, the no drip nozzle positively seals off the flow of liquid eliminating the possibility of drips.

EXAIR's No Drip Internal Mix Atomizing Nozzles are available in five patterns: narrow angle round pattern, wide angle round pattern, flat fan pattern, deflected flat fan pattern and 360° hollow circular pattern. They are for pressure fed applications that don't require independent air and liquid control.

Applications include painting, coating, rinsing, cooling, quenching, wetting (moistening), humidification and dust control. The compact Atomizing Nozzles are fully adjustable to minimize air and liquid consumption and have interchangeable liquid and air caps. They are CE compliant and conflict mineral free. Price is $328.

For more information contact: EXAIR Corporation, 11510 Goldcoast Dr. Cincinnati, OH 45249-1621 Phone: (800) 903-9247 Fax: (513) 671-3363 E-mail: techelp@exair.com

www.exair.com/ndintmix.htm

Vic-Press™ Series P569 and P589 Ball Valves

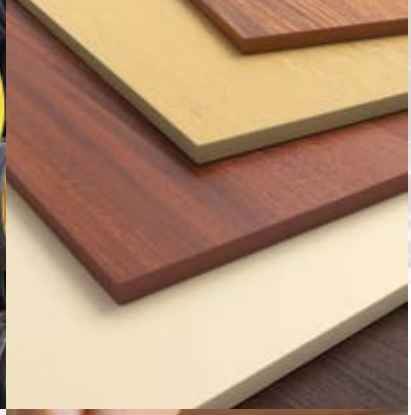
Victaulic Vic-Press™ Series P569 and Series P589 ball valves are designed to be used with the Vic-Press system, a flame-free press-to-connect system that joins pipe, valves and fittings in a matter of seconds.

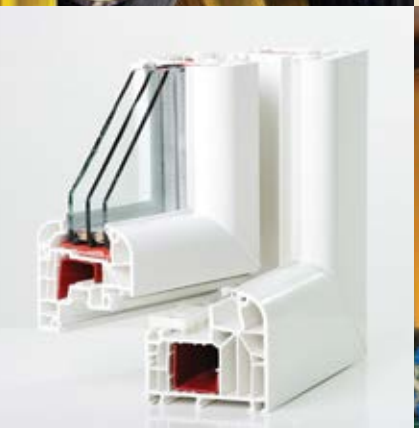
The Victaulic Series P569 ball valve features a full Type 316 stainless steel body and trim with PTFE seats. A blow-out proof stem and self-adjusting floating ball provide uniform sealing. The full-port design minimizes pressure drop for maximum flow efficiency. The three-piece swing-out design permits easy in-line maintenance. These valves are offered with Vic-Press Schedule 10S ends, grooved ends, or press by grooved ends.

The Victaulic Series P589 ball valve features a forged brass valve body. The chrome-plated brass ball is hollow to eliminate unnecessary weight, while maintaining flow and mechanical strength. PTFE seats and washers reduce the friction coefficient, which eases valve operation. The Vic-Press Schedule 10S ends are offered in either ASTM A-312 Type 304 or Type 316 stainless steel.

Victaulic Series P569 and P589 ball valves are rated for service up to 400 psi (2065 kPa), and are available in ½ to 2-inch (15 to 50 millimeter) sizes.

Vic-Press, the industry's first press-to-connect system for ANSI Schedule 10S stainless steel pipe, is an industrial-grade solution for quickly and reliably joining small-diameter piping systems. For more information, please visit www.vic-press.com.





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About Victaulic

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TECHNOLOGY

Best Of German Engineering

BOGE is a leading German air compressor manufacturer with its North American headquarters located in Powder Springs, Georgia. BOGE has earned a strong reputation for building premium quality compressors in support of a large global distribution network located in more than 120 countries. Through our long heritage of being family-owned, since our founding more than a century ago, BOGE continues to focus on meeting customer expectations by offering the very finest in compressed air equipment through design, production and rigorous final testing.

BOGE does business the old fashioned way. We believe in forming strong partnerships with our distributors so both sides succeed. BOGE offers stability in an industry undergoing many changes that may not be in an independent distributors best interests. Come join the BOGE family of distributors and have a partner you can count on for the long term.

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Our 25-125 hp compressors feature **true direct drive** design, a **thermal management** system plus built-in **heat recovery** options for the ultimate in operational efficiency.

** Based on independent U.S. comparative brand perception surveys conducted in 2004, 2008 and 2012.*

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