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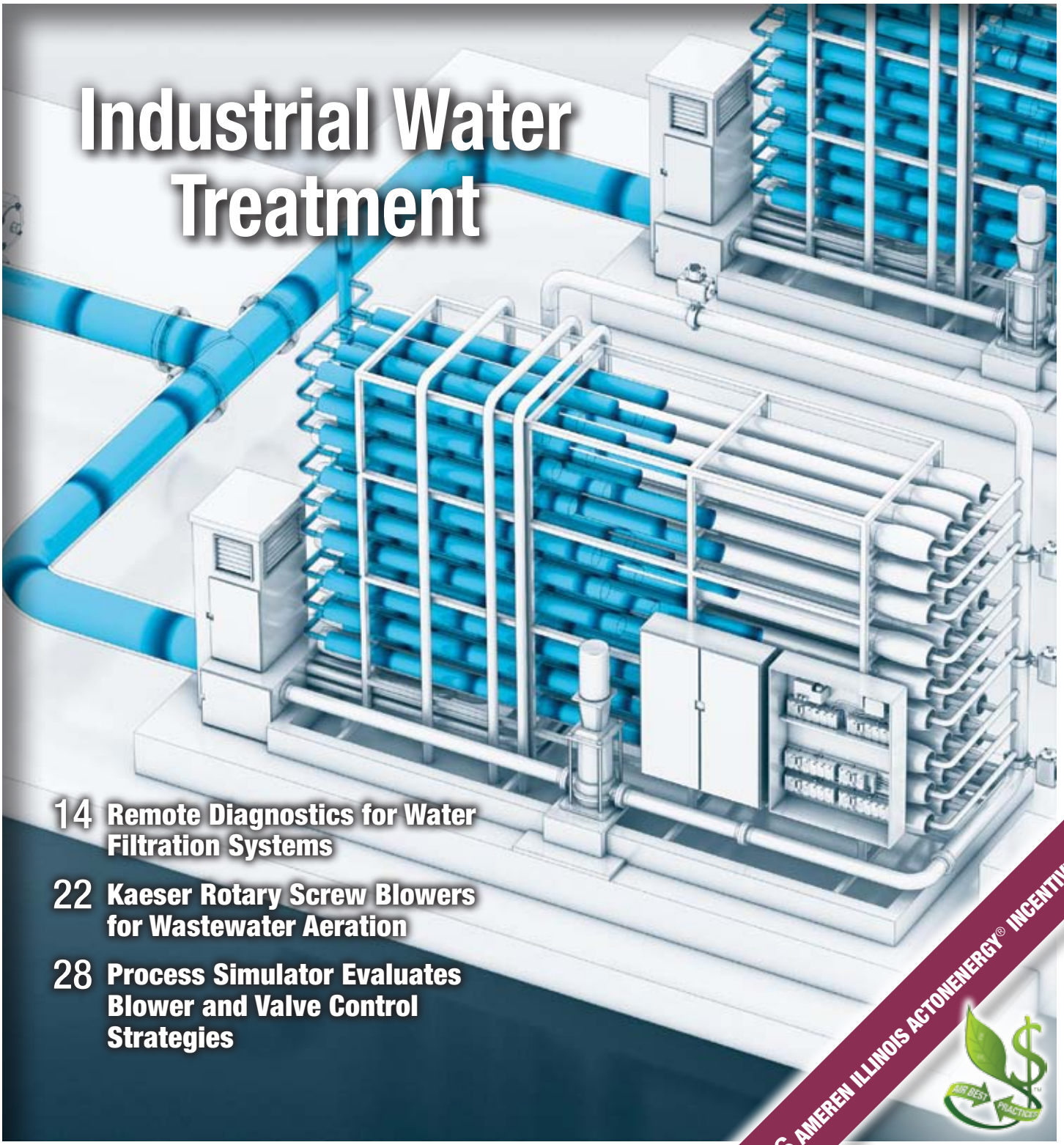
September 2014



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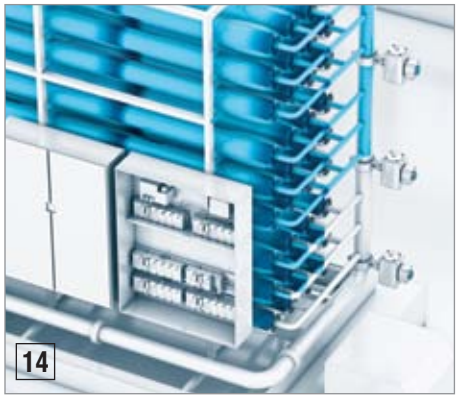

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FROM THE EDITOR | Industrial Water Treatment

Ever ask operations executives in the food & beverage industry, what their biggest worry is looking forward? The scarcity of water is affecting industry and agriculture significantly. Ever the optimist, I believe engineers will find solutions once demand attracts sufficient capital. The blower industry is already very busy optimizing industrial and municipal wastewater treatment systems.

By selecting the proper equipment and instrumentation in the first place, the OEM, machine builder, or system integrator, can set the packaged water or wastewater treatment module up for implementation of remote diagnostics. Festo's Craig Correia, dives deep into this topic with his article titled, "Remote Diagnostics for Water Filtration Systems."

Kaeser Compressors has launched their new line of EBS and FBS series rotary screw blowers. The wastewater treatment market has become an important market for their technologies and "system splitting" philosophy. We had the opportunity to speak with Kaeser Compressors President Frank Mueller and Blower Product Manager Stephen Horne about this recent launch offering up to thirty-five percent efficiency improvements over conventional rotary lobe blower designs.

With almost all applications, the real trick to energy savings is figuring out present and future demand. It's not easy. According to Steve Kestel, Tilo Stahl (BioChem Technology) and Matthew Gray's article in this issue (Keystone Engineering Group), with proper influent and operational data, process engineers can use a commercially available process simulator with activated sludge and aeration models to calculate temporal and spatial oxygen requirements. The calculated oxygen requirements can then be used to design the diffuser layout and calculate airflow requirements. The sizing of the air distribution piping, air control valves and blower are then based on the calculated airflows and a selected single point design pressure.

Utility incentives do make a big difference in industry's willingness to invest in energy conservation. Please read our article titled, "Establishing the Energy Incentive Benchmark-the Ameren Illinois ActOnEnergy® Program", to see how an extremely effective program is structured to optimize compressed air systems. From compressed air retro commissioning (my favorite) to custom incentives, Ameren Illinois compressed air related Trade Allies have jumped on this excellent program to the great benefit of industry in central and southern Illinois.

Thank you for investing in ***Compressed Air Best Practices®***.

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

The September 2014 magazine cover image was provided courtesy of Festo Corporation.

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INDUSTRY NEWS &

Kaeser Expands International Headquarters in Coburg, Germany

Kaeser Kompressoren SE, the international headquarters of Kaeser Compressors, Inc., has broken ground on a major expansion at its main location in Coburg, Germany.

The newly planned facilities will primarily serve to manufacture the company's industry-leading rotary screw compressors and feature the latest in energy saving and sustainable design practices. Construction is scheduled to be completed in June 2016. When complete, the new facilities will add over 200,000 square-feet of manufacturing space.

"With this expansion, our goal is to continue to build superior quality products that represent the best in engineering and innovation," explained company CEO Thomas Kaeser.

This news follows the recent announcement that Kaeser Compressors, Inc. made regarding the additional 50,000 square-feet they plan to add to their facility located in Fredericksburg, Virginia.

To learn more about Kaeser's new expansion, visit www.kaesernews.com/grow. To be connected to your local Kaeser representative, call (877) 417-3527.

About Kaeser

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

SUSTAINABILITY REPORTS

Atlas Copco Appoints Nico Delvaux As President of the Compressor Technique Business Area

Atlas Copco has appointed Nico Delvaux to be President of the Compressor Technique business area, effective August 1, 2014. He is currently President of the Construction Technique Business Area.

"Nico has proven strategic capabilities, a strong commitment in execution and an in-depth knowledge of the global compressor business," said Ronnie Leten, President and CEO of the Atlas Copco Group. *"This will be very valuable in his new mission to further accelerate the growth in the Compressor Technique business area."*

Nico Delvaux joined Atlas Copco in 1991. He has held management positions in several markets including Benelux, Italy, Canada and the United States. Nico Delvaux was President of the Service division within Compressor Technique before he became Business Area President for Construction Technique in 2011, based in China. He will continue to have China as his base until June 30, 2015 and as from July 1, 2015 he will be based in Antwerp, Belgium. Nico Delvaux will remain member of Group Management and Senior Executive Vice President of Atlas Copco AB.

Nico Delvaux is a Belgian citizen, born in 1966, with a degree in Electromechanics from the University of Brussels and a MBA from the Handelshogeschool in Antwerp, Belgium.

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 (BEUR 9.7) and more than 40,000 employees.

Learn more at www.atlascopco.com

INDUSTRY NEWS & SUSTAINABILITY REPORTS

Quincy Compressor to Consolidate U.S. Operations

Quincy Compressor LLC will consolidate the company's two U.S. based manufacturing units into one single location in Bay Minette, Alabama. As a consequence, 152 positions will be affected at Quincy's operations in Illinois, and a number of new positions will be created at the Alabama location. It is estimated that the transition will be concluded in the coming 12 months. Quincy Compressor employs approximately 550 people throughout the United States in a variety of roles.

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 built its reputation on quality and rugged reliability, building tough air compressors for the most demanding applications.

Learn more at www.quincycompressor.com

Vaisala Seeks Profitable Growth through Regional Expansion

Vaisala is looking for profitable growth over the next five-year strategy period. The focus growth areas include the company's industrial businesses; targeted industrial applications and life science. To accelerate the growth of these businesses, Vaisala will invest in regional expansion by contracting new distributors in countries with high industrial potential. These include Russia, Turkey, Italy, Spain, Poland, India, Indonesia, South Korea, South Africa, Argentina, United Arab Emirates and Saudi Arabia. Vaisala's offering is available to current and new customers through the company's own sales channels, local distributors as well as the online store which is currently available in close to 100 countries around the world.

"Our customer base is fragmented and represents numerous industries from high-voltage to food processing. We want to make sure that potential customers know our products and have an easy access to buy. This is why we want to offer them different sales channels to choose from. Our expanded distributor network will be able to offer instruments, systems and services to their chosen customer groups based on their expertise. I am confident that the regional expansion with new distributor partners will serve our global customer base the best possible way." states Sampsa Lahtinen, EVP of Controlled Environment business area.

New Distributors in Russia and Indonesia

Vaisala has signed the first new distributor contracts to expand the company's sales network for industrial instruments.

The first contract was signed with Wexon Oy, a Finland-based company whose daughter company Wexon OOO in St. Petersburg will serve Vaisala's targeted industrial customers throughout Russia. Wexon has 40 years' expertise in selling high-end products and components for process industry, industrial automation and measurement.

PT. Citra Wahana Sekar Buana is Vaisala's new distributor in Indonesia. Vaisala will fit well as part of their offering which includes the

leading brands of technical, mechanical and electrical equipment to various industries.

"Vaisala products are essential in improving operational quality, safeguarding of industrial assets and achieving cost reduction through energy savings. Our products are used globally, the distribution partners can, in turn, provide us with local knowledge and market access. Wexon distributes instruments and components to Russian industrial customers, especially in petrochemicals, steel, automotive and power. PT. Citra Wahana Sekar Buana has grown rapidly to become one of Indonesia's leading suppliers of industrial equipment to power, fertilizer, cement, petrochemical, pulp & paper and other industries. Similar partners in other chosen markets are being evaluated and more sales channels will be opened later this year", comments Raine Pulkkinen, Distributor Sales Manager of Controlled Environment business area.

Vaisala is a global leader in environmental and industrial measurement. Building on 78 years of experience, Vaisala contributes to a better quality of life by providing a comprehensive range of innovative observation and measurement products and services for chosen weather-related and industrial markets. Headquartered in Finland, Vaisala employs approximately 1500 professionals worldwide and is listed on the NASDAQ OMX Helsinki stock exchange.

Visit www.vaisala.com and www.twitter.com/VaisalaGroup

Atlas Copco Announces Next Phase of Houston Service Industries Acquisition

HSi operations to relocate to Atlas Copco competence center

Atlas Copco has announced plans to fully integrate the Houston Service Industries (HSi) operations and brand into Atlas Copco by early 2015. As part of the integration process, in December of this year HSi operations will relocate from the facility at 7901 Hansen Road, Houston, to the Atlas Copco facility at 15045 Lee Road, Houston.

"We remain fully committed to the products and industries served by HSi and the relocation and brand changes are the next steps in the integration plan with Atlas Copco," said Sebastien Bidault, General

INDUSTRY NEWS & SUSTAINABILITY REPORTS

Manager, Houston Service Industries. "This will allow us to further expand our production capacity, safeguard quality and grow our testing and research and development capabilities. Bringing this all together under one roof will benefit both our customers and our employees"

Both the HSi and Atlas Copco brands have been used since the acquisition of HSi in 2012. Many HSi products have been converted to the Atlas Copco brand already and all HSi product service is conducted by Atlas Copco. Beginning in early 2015, all HSi products will be delivered with Atlas Copco branding. The brand transition has been communicated to customers and displayed publicly at WEFTEC — the Water Environment Federation's Annual Technical Exhibition and Conference. Throughout the transition all customer contacts and phone numbers will remain unchanged.

The Atlas Copco facility on Lee Road is a 96,000 square-foot competency center for engineered products. This custom-built competency center opened in 2012 and it features state-of-the-art production and testing facilities. The assembly of all HSi products will be incorporated into this facility and new custom build assembly and test bays will be installed to ensure the highest quality standards.

The Lee Road and Hansen Road locations are approximately 25 miles apart. A majority of the 75 employees that work at the Hansen Road site will transition directly to the Lee Road facility. Due to synergies created as a result of the move, a small percentage of employees will be offered an opportunity to apply for other positions within the Atlas Copco Group. Atlas Copco owns the Hansen Road site and plans are ongoing for how to utilize this space in the future.

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.

Atlas Copco operates 116 locations and employs more than 4,800 people in the United States. The United States represents the largest single-market for Atlas Copco globally. Visit www.atlascopco.com

Ingersoll Rand Acquires Assets of Energy Equipment and Supply Inc.

Ingersoll Rand, a global leader in compressed air systems and services, power tools and fluid and material handling equipment, today announced it has acquired the assets

of Energy Equipment and Supply Inc., an Ingersoll Rand Master Distributor based in Casper, Wyo. Energy Equipment and Supply Inc. sells compressed air and gas equipment, parts and services in Wyoming, Montana and the western regions of North Dakota and South Dakota.

In addition to being an Ingersoll Rand Compressed Air Equipment and Accessories Master Distributor since 1983, the company is also known for its custom engineered solutions, specialty high pressure rotary air and gas compressors, and skid-mounted compressed air and gas systems.

"The Energy Equipment and Supply Inc. acquisition enhances Ingersoll Rand's ability to offer specialized high pressure rotary air and gas compressors for unique applications such as engine starting and drill rigs for the oil and gas industry and other niche markets," said Jeff Jensen, general manager for the Ingersoll Rand Denver Customer Center. "Keeping with Ingersoll Rand's reputation for reliable and efficient compressor systems and services, we will also now offer skid-mounted compressed air and gas systems that are convenient for customers and help them keep overall project costs down."

Expanding its technology leadership, Ingersoll Rand can now offer these specialized solutions to all of its customers. Ingersoll Rand will build engineered high pressure rotary air and gas compressors with single-stage and two-stage airends capable of pressures up to 450 psig with flows up to 1,000 cfm.

Employees will join the Ingersoll Rand team and continue to provide sales, service, parts and engineering support for compressed air systems from offices in Casper, Wyo. and Billings, Mont. Jensen will lead the business and integration with the Ingersoll Rand Denver Customer Center.

About Ingersoll Rand

Ingersoll Rand (NYSE:IR) advances the quality of life by creating comfortable, sustainable and efficient environments. Our people and our family of brands — including Club Car®, Ingersoll Rand®, Thermo King® and Trane® — work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. Ingersoll Rand products range from complete compressed air systems, tools and pumps to material and fluid handling systems. The diverse and innovative products, services and solutions enhance our customers' energy efficiency, productivity and operations. We are a global business committed to a world of sustainable progress and enduring results. For more information, visit www.ingersollrand.com or www.ingersollrandproducts.com.

To read more ***Industry News*** articles, visit www.airbestpractices.com

REMOTE DIAGNOSTICS FOR WATER FILTRATION SYSTEMS

By Craig Correia, Process Automation Industry Manager, Festo Corporation

Productivity is more reliable when equipment can be monitored to detect incipient failures and take corrective action before the plant goes down. But many devices, such as analog control valves, pneumatic valve terminals and field sensors, often do not offer diagnostic feedback, or it is not being used. This white paper describes how this problem is being addressed, and includes an example of pneumatic valve terminals that can monitor, among other things, open load or coil currents at the specific valve and pressure inside the valve terminal.

Craig Correia, Process Automation Industry Manager, Festo Corporation

Historically, water treatment systems, whether municipal or industrial, have had minimal instrumentation and little in the way of automatic diagnostics. This is partly because treatment methods have changed slowly over time. In fact, the basic sand filter is essentially the same as when Sir Francis Bacon described one in the 1580s!

Now, however, automated control systems are the norm in water and wastewater treatment plants. Manual monitoring, run to failure, and downtime, are expensive, and can be dangerous. It is simply too expensive to have operators walking around the plant, or driving from station to station all day long, inspecting systems and looking for problems.

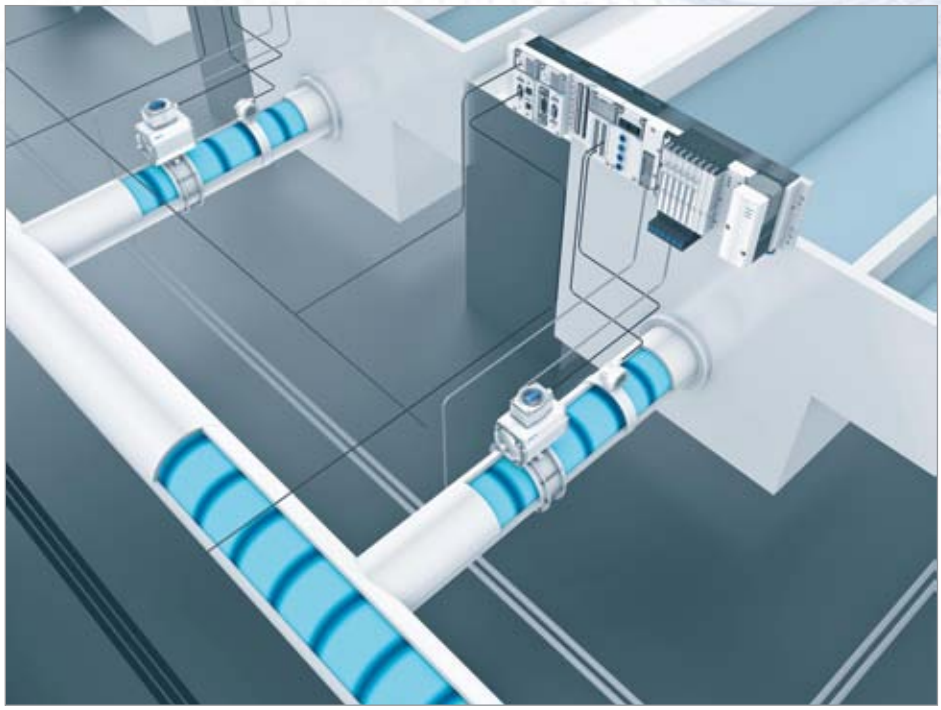
In recent years, OEM builders and control system integrators have begun supplying fabricated, skid mounted treatment modules to water and wastewater treatment facilities, particularly in industrial plants. These plants include everything from power plants (boilers and cooling towers, drinking water and wastewater) to hospitals, golf courses,

industrial plants (boilers, water treatment, process water supply, and discharge systems) to large buildings. Even smaller municipalities have returned to purchasing "packaged" treatment plants from an OEM rather than having a consulting engineer design and engineer-constructor build custom plants on their sites. Pulling a skid mounted treatment plant off a lowboy trailer and sitting it down on a concrete pad is much easier and less costly than a "stick built" plant could be.

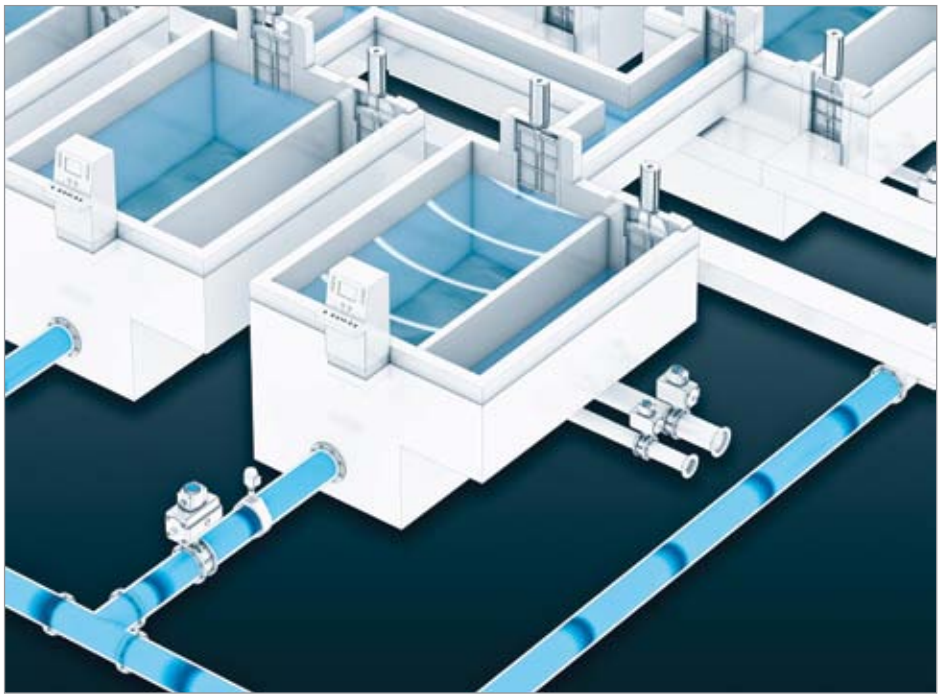
The OEMs who build and install these systems have a responsibility to help their customers maintain and repair their machinery. Sometimes they do this under warranty, and sometimes they do it as a fee-for-service operation. In either case unplanned service calls can be extremely expensive and time consuming. This expense and time consumption can be costly for both the OEM or system integrator and the end user of the packaged treatment module. For example, a failure of an OEM reverse osmosis system may take down an entire pharmaceuticals plant because there is no water supply of the required purity. Similar examples can be found for most applications in nearly every industry vertical that uses water.

Here is where point diagnostics on the I/O and on the pneumatic valves (all of it available over Ethernet) can provide both OEMs and end users a large cost savings.

By implementing the diagnostic capabilities that already exist within the components that comprise the plant, two benefits can be realized. First, remote troubleshooting is possible if the control system is connected to the Internet, allowing fast, easy troubleshooting assistance from a remote engineer. Second, detailed, instant, information about errors and error related trends could be presented to local operating



REMOTE DIAGNOSTICS FOR WATER FILTRATION SYSTEMS



and maintenance staff, if the diagnostics systems are implemented correctly.

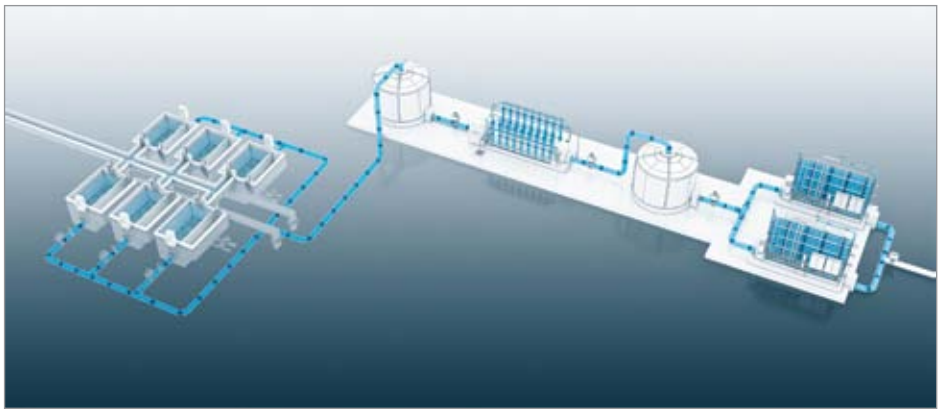
If the correct components are specified during design, these benefits can be realized with little, or no, additional cost to the project.

Water and wastewater plants are being automated at a fast pace

The shortage of trained and qualified operations personnel has impacted the water and wastewater treatment sectors just as much as it has the rest of the process manufacturing industries. Salaries have risen, headcounts have come down, and automation is increasingly being used to substitute for monitoring and control directly by operators. This shortage includes trained maintenance technicians, and requires not only automation of complete systems but as much diagnostic information as can be obtained from the system.

Systems are being designed from the ground up to be highly automated, with diagnostic information from nearly every component in the system, from valves and actuators to digital, pneumatic, and electrical I/O modules, to control cabinets and HMI stations and controllers.

With increasingly limited resources, both small municipal and industrial water and waste treatment projects are being designed and constructed by OEM skid builders who provide turnkey systems from inlet to outlet. Generally, these OEMs provide warranty and after-warranty service for the systems they construct. To do this economically, this has led to the growth of regionally based OEMs who can be relatively local to their installed plant base. Economies of scale, however, are producing higher volume OEMs who are located sometimes quite far from their customers.



Field service is expensive and time consuming for the OEM

As regional OEM skid builders become larger and cover bigger sales territories, providing field service becomes increasingly problematic. When an industrial water treatment module goes down due to equipment failure, the end-user or asset owner may be faced with a plant shutdown. A municipality may be faced with the lack of sufficient water to handle mandated fire flow capabilities. The OEM must get the plant operating in as short a time as possible.

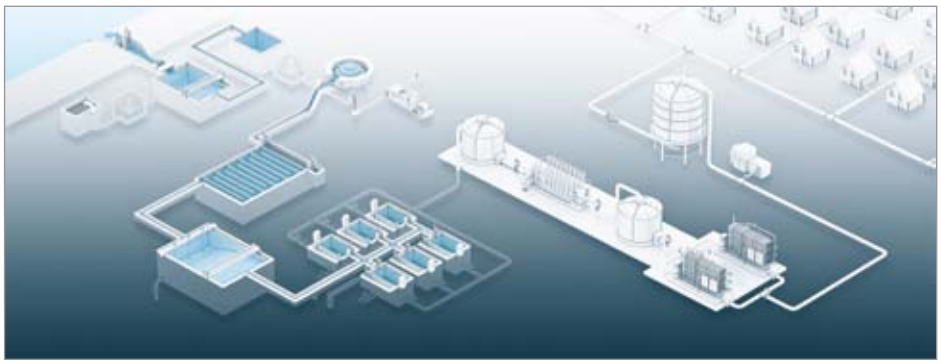
This is difficult, and often quite costly, if the OEM technician must travel several hours to reach the plant site before beginning to troubleshoot and repair the system. The technician may find that the required parts and systems aren't what are on hand, and there may be additional delay while those parts are sourced and brought to the plant site. All the while, the plant is down, the process or municipality is without adequate water, and the asset owner is becoming increasingly angry.

Traditional field service modes simply do not work in today's marketplace.

Troubleshooting modern industrial control systems can be time consuming, even for highly qualified personnel

Plant control systems are increasingly complex. Water filtration systems can no longer be operated by semi-manual means. Unattended operation capability for long periods of time is a required design parameter. This entails the use of more analog instrumentation such as flow, level, and pressure sensors. Unattended operation requires more complex controllers with sophisticated software and increased connectivity to the Internet. Unattended operation requires more automatic pneumatic actuation for control valves rather than depending on manual operation of valves.

All of this means that as the number of components increases, the failure modes also increase. Each component is a potential point



REMOTE DIAGNOSTICS FOR WATER FILTRATION SYSTEMS

of failure. When troubleshooting a system, each component must be checked and cleared to determine what the actual cause of the failure is. This can use up a lot of expensive technician time, even when the technician is highly trained and experienced.

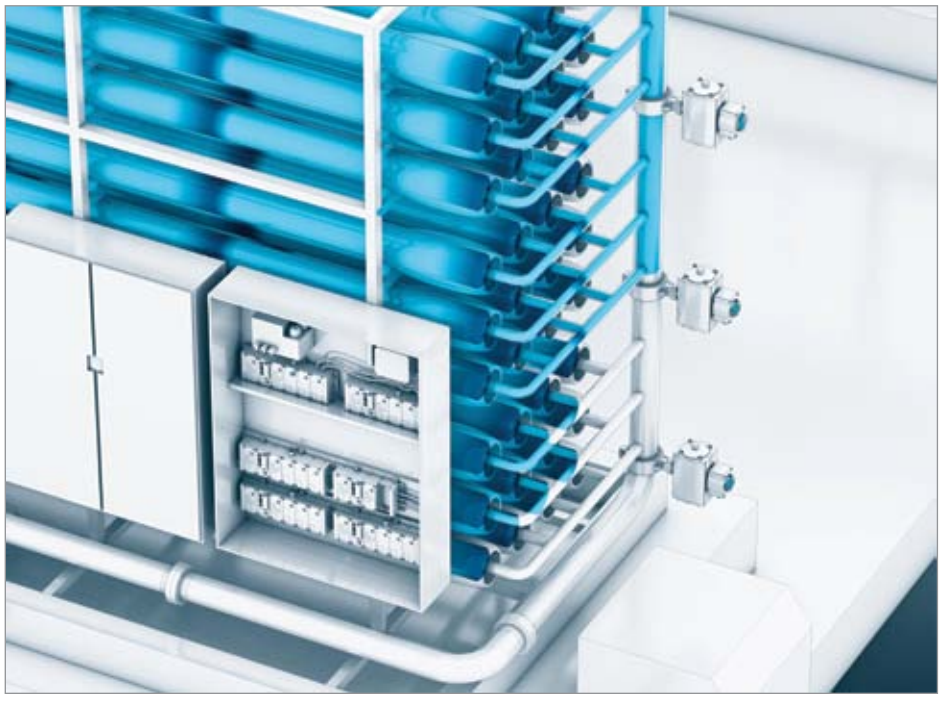
The solution must be to provide components that can report issues for themselves, so that the technician can easily determine and correct faults. More important, the level of connectivity from the component level must be sufficient that an OEM can perform remote diagnostic checks and diagnose component failure from their offices before they arrive on site to repair the system. This way, the technician arrives with replacement parts and subsystems already in hand, shortening the time necessary to troubleshoot and get the system back on line.

Well-designed industrial control components can offer data to the user that can shorten this process

For most of the past two decades, designers of industrial control components have been concentrating on standardizing the interfaces to them, and making the components themselves smarter. It is substantially easier to troubleshoot a component, be it IO or a controller, or a valve actuator, if it can report what is wrong with it. Every fieldbus since Modbus has as its most important feature the ability to carry not only the Process Variable (PV) but also other computed variables and a complete set of diagnostics.

For the OEM, the fact that the components used in the skid mounted water treatment module can report when they are not working properly, and in some cases, report why they aren't working properly, saves money, technician time, and can produce repeat business based on the efficiency of maintenance and repair of the system.

It is difficult to imagine that a designer at an OEM of water or wastewater treatment systems would deliberately select components that do not have onboard diagnostics over components that do, especially since equipment that offers these features often costs the same as similar equipment that doesn't.



In order for this benefit to be fully realized, the equipment designer must select equipment that offers these features

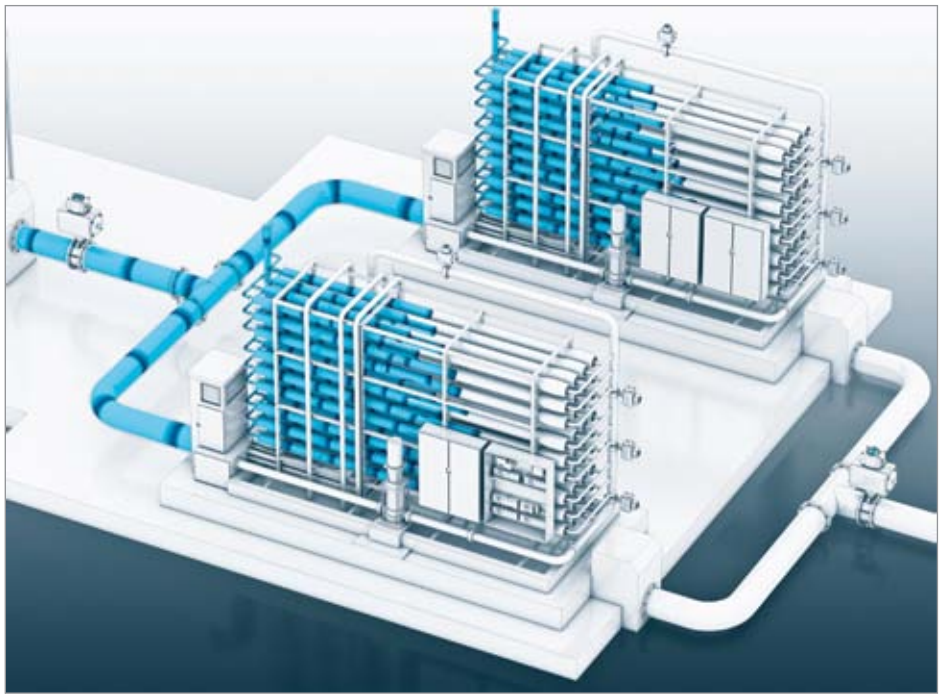
There are two best practices that OEM equipment designers should use to make sure that their packaged treatment modules have the most capable diagnostic features available.

Minimize Risk with Short Lists and Sole Source Supply

First, designers should minimize exposure to risk by using only a very short list of suppliers for components. Another fairly commonly used best practice is to select a company like Festo that can provide most of the components necessary for automation of a water or wastewater treatment package plant. In some cases, companies like Festo will be willing to act as a Main Automation Contractor, providing control panels, wiring enclosures and IO cabinets as well as the individual automation components. Selecting a company that can provide most of the components means that incompatibility in diagnostic packages does not occur, makes FAT and SAT easy to accomplish, and permits easier maintenance than trying to select components one at a time. Selecting a company that can act as a complete single source for all the automation on the packaged treatment plant minimizes risk and maximizes the ability of the OEM and the end user to keep maintenance and troubleshooting costs to a minimum.

Buy Components and Systems with Strong Diagnostic Packages

Second, designers should make sure that the components they select have the most diagnostic features they can buy. Most of these components, such as controllers, IO modules, actuators and the like, are priced competitively with components that do not provide diagnostics or only provide a minimal set.



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REMOTE DIAGNOSTICS FOR WATER FILTRATION SYSTEMS

These detailed diagnostics are needed to make remote troubleshooting easier for the OEM and easier for the end user. As an example, Festo's design features "on the spot diagnostics." This includes color-coding valves and LEDs, which the simplify troubleshooting, and in the case of water treatment for pharmaceutical plants, makes validation easier as well.

Festo's on the spot diagnostics include under-voltage monitoring, fieldbus status, controller and I/P transducer status, module specific diagnostics, and valve specific diagnostics and solenoid coil status. Short circuit detection for transducers, outputs and valves is supported and open load detection finds missing solenoid coils.

Festo's CPX terminal has on-board history, which can store up to 40 error events with timestamps for start and end of event.

Diagnostics aren't worth much if you have to be present physically to read and interpret them. Companies like Festo provide a variety of remote diagnostic applications ranging from handhelds to laptop software to fieldbus and integrated Ethernet interfaces so that the diagnostics can be read out remotely and historicized and used to direct maintenance remotely via the control system or Web-based asset management applications.

When applied correctly, this diagnostic data can even be used to predict failures before they occur

Diagnostics like the ones included in Festo products can be imported into the most common Asset Management software packages.

These asset management packages typically include software for calculating preventive maintenance schedules, predictive maintenance strategies, and determine replacement times to keep plant shutdowns to a minimum. In the ideal case, the diagnostic alarm on the component should automatically generate a work order to repair or replace the component before complete failure occurs.

The OEM can then use the diagnostic data remotely to improve on-site maintenance and response time, reduce trips to the plant, and save money for both the OEM and the end user.

Doing It Correctly from the Beginning Pays Off

By selecting the proper equipment and instrumentation in the first place, the OEM, machine builder, or system integrator, can set the packaged water or wastewater treatment module up for implementation of remote diagnostics. This will make remote service and troubleshooting less costly and less time-consuming, and provide better service to the end user. BP

For more information contact Craig Correia, Process Automation Industry Manager, Festo Corporation, tel: 631-404-3407, email: craig.correia@us.festo.com

For general information on Festo, call 800-993-3786, visit http://www.festo.com/us, or write us at customer.service@us.festo.com. For information on process automation, visit www.festo.com/us/processautomation

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.

To read more articles on ***Wastewater Treatment,*** visit www.airbestpractices.com/industries/wastewater

KAESER ROTARY SCREW BLOWERS for Wastewater Aeration

By Rod Smith, Compressed Air Best Practices® Magazine

Kaeser screw blowers are fully integrated turn-key packages complete with high efficiency motors, silencers, inlet filters, starters/drive and a sound proofed steel enclosure.

Compressed Air Best Practices® Magazine interviewed Frank Mueller (President) and Stephen Horne (Blower Product Manager) from Kaeser Compressors.

➤ Good morning. Can you elaborate on the recent growth announcements coming from Kaeser?

Good morning. Yes, Kaeser Compressors continues to grow both in the U.S. and internationally. We currently employ approximately 4800 people globally. In order to support the demand and maintain our superior quality and quality service levels, we continue to invest in people, facilities and technology.

At our U.S. headquarters here in Fredericksburg, Virginia, we are adding 50,000 square feet to the warehouse area to help us handle the volumes created by some new market segments we are investing in. We had just previously expanded the shipping and receiving areas.

Kaeser's long-standing commitment to the environment and energy management is reflected by our being an Allied Partner with the Department of Energy and an ISO 14001 Environmental certified company. The design of our headquarters expansion includes the aforementioned energy-saving elements, and our employees actively participate in energy and waste reduction programs in place for batteries, cellular phones, computer equipment, electricity and more. Reflecting this company commitment to the environment and energy management, we were pleased to recently announce our partnership with the Environmental Protection Agency's ENERGY STAR program.

Our international headquarters, located in Coburg, Germany, has started the construction of two production halls adding over 200,000 square feet of manufacturing space. The company purchased land next to the existing manufacturing campus to make this possible. One production hall will be dedicated to large equipment assembly — 150 horsepower air

compressors and the other will be dedicated to intermediate size air compressors.

This follows the opening, not long ago, of the Sonnenfield, Germany facility. This plant is dedicated to the complete manufacture of the enclosures for our air compressor, dryer and blower product lines. Moving these processes out of our central manufacturing hub in Coburg opened up needed product manufacturing space and allowed us to further optimize this sheet metal process.

Finally, our Gera, Germany campus specializes in manufacturing our compressed air dryers and blower product lines. This facility recently completed a new research and development center dedicated exclusively to blower technology.

The blower R&D laboratory has obviously been busy. Please describe the launch process of your new rotary screw blowers.

Kaeser has been engaged with blower market segments since 1994. We felt, over this time, we had optimized the potential of the rotary lobe blower packages we offered. At the same time, we became a leader in packaging blowers. In the past OEM's did this work — taking open frame, loud blowers and creating their own packages. Our approach was to build the complete package-for the OEM's application. This would include controls, sound-attenuated enclosures, motors, cooling systems and so on. We could customize OEM packages for different industries such as furniture manufacturing or wastewater treatment plants. So over time we enhanced the performance of this type of rotary lobe blower, while recognizing some of the inherent limitations of this technology with regards to energy efficiency.

As you know, Kaeser is one of the largest manufacturers in the world of rotary screw airends. We recognized, many years ago, the wastewater treatment market as an ideal market for our unique and proprietary Sigma Profile rotary screw airend technology and began our technology development process. This market matches because they look for energy efficiency, longevity, complete packaging and communication/integration capabilities with SCADA and other plant operating systems.

We tend not to be the "first-to-market" with technologies because we are obsessive about

KAESER ROTARY SCREW BLOWERS FOR WASTEWATER AERATION

testing and quality. We take a very measured approach to product introductions and don't rush to market just so we are first. We test-market technology in the field for periods measured in years — not months. This allows us to acquire detailed application and production knowledge and refinements one only acquires through experience. This gives us an opportunity to listen to customer feedback and meet the needs of individual markets.

Kaeser's global subsidiaries benefit from this philosophy — as we only launch products with several years production and application experience already under their belt. Our company has always prided itself in excelling on the details – Kaeser Quality is about a customer being delighted when they take the time to examine our product closely and "look under the hood."

Please describe the benefits of rotary screw versus lobe blowers.

Rotary screw blowers have better specific performance (more air per kW) than lobe blowers due to their compression process. Lobe blowers utilize external compression — air is not compressed within the block itself. Lobe blowers have two impellers and the inlet is directly opposite the discharge port. As one impeller begins to seal off the air inlet, air is trapped between the blower case and the impeller. Meanwhile, the other rotor begins to open at the outlet. The impeller sweeps the trapped air to the discharge port where it passes on to the discharge piping — pressure builds in the piping in relation to the length and diameter of the piping and the depth of the wastewater pond. Lobe blowers all have some degree of "slip" which allows air to flow from the high-pressure side to the low-pressure side. This is a source of inefficiency.

With rotary screw blowers, compression occurs within the block. The helical twist of the twin rotors compresses air as it moves to the discharge. Unlike lobe blowers, the compression ratio is fixed by geometry rather than by the system dynamics. Screw blower efficiency is higher in large part because they rotate much faster than lobe blowers and operate with much higher isentropic efficiency.

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KAESER ROTARY SCREW BLOWERS FOR WASTEWATER AERATION

Kaeser asserts that their new line of rotary screw blowers are up to 35% more efficient than conventional blower designs.

Additionally, rotary screw blowers have a much flatter specific performance curve, across a wider range of operation, compared to lobe blowers. Lobe and other types of blowers are typically much less efficient at one or both extremes of their operating range.

With internal compression, however, it's important the internal pressure is as close to the pressure required as possible. When the pressure required is lower than the internal compression, over-compression happens — resulting in wasted energy. To combat over-compression, we offer two pressure versions of our rotary screw blowers, one for pressures up to 9 psig, and the other for pressures up to 16 psig.

What are the specific gains in energy efficiency and specifications for the new rotary screw product line?

The new EBS and FBS Series of rotary screw blowers are up to thirty five percent more efficient than conventional rotary lobe blower designs and are also significantly more efficient than other comparable rotary screw blower packages. The models run from 25 to 150 horsepower for flows between 530 and 2366 cfm. As mentioned before, we offer two pressure versions; one for pressures up to 9 psig, and the other for pressures up to 16 psig.

Over the past five to ten years, the blower market for wastewater treatment plants has been affected by the introduction of high-speed turbo and rotary screw blowers. There are now all sorts of different blower types on the market. Each technology has its positives and negatives. At Kaeser, we get a solid basis of what the benefits/drawbacks of a certain technology are and then optimize.

The wastewater treatment market is a strong market for us now and our screw blower is an exciting step forward for our customers. Not only does the screw blower enhance energy efficiency at the plant, it continues to provide the advanced packaging we've always provided.

Please provide some details about the total blower package.

Rotary screw blowers run at high speeds creating a lot of agitation. Our package design features a proprietary internal sealing system on the rotary screw blower block, which eliminates the problem of escaping oil mist. The customer benefit is that our package does not require external devices like an oil-cooler or a de-foaming pump creating negative pressure in the oil sump — devices often found in other positive displacement packages.

TEFC premium efficiency motors are standard. Enclosures feature heavy gauge powder coated steel frames and sound attenuated panels. Vibration isolation, in our chassis design, eliminates vibrations to keep piping leak-free and all wiring secure.

The rotary screw blowers are available with variable speed control managed by our Sigma Control 2™ system. This advanced controller comes standard with multiple pre-programmed control profiles so wastewater treatment plants can select the one best fitting their application. The control system monitors more than twenty critical operating parameters on each unit.

Many if not all aeration blower applications require a total system controller. Kaeser's Sigma Air Manager (SAM) can control up to 16 blowers and only turn them on as needed. The SAM system allows the blowers to be controlled based on dissolved oxygen levels or other WWTP performance targets. While the desired levels of DO, NH4 and NO3 remain the same, the amount of air required to maintain those levels varies based on a wide range of factors such as ambient temperature and humidity. The SAM system automates and optimizes the blower's wire-to-air efficiency while delivering the required oxygen.

Can you share some blower wire-to-air efficiency recommendations?

Every wastewater plant is unique. Municipal plants are different than industrial applications. There are some common system design philosophies we can share. The first point is to focus on the system and not on individual blowers. Conventional aeration system designs include multiple oversized variable speed blowers with an identically sized back-up unit. Simple control systems are set to share the demand and the blowers operate at the same speed. This is very costly, since not only do variable frequency drive units cost more to purchase, their drive losses must be factored into the unit's efficiency. In addition, the blowers are oversized and do not operate at their most efficient design point, spending as much as ninety percent of their operating time wasting costly energy.

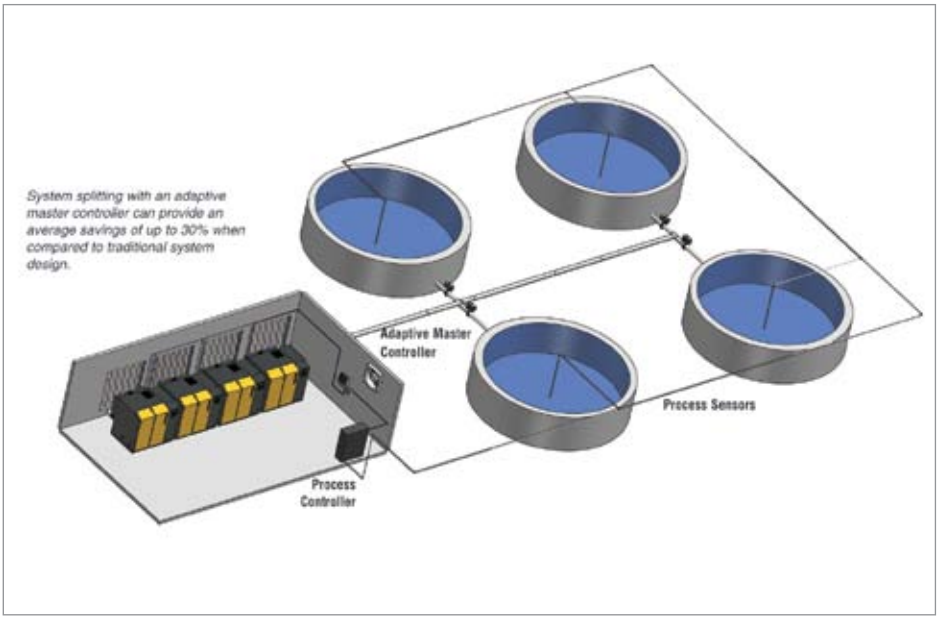
Our preferred approach is to split the maximum load amongst several fixed-speed blowers. You cycle these fixed-speed blowers, to share run-time hours, on auto-dual control allowing them to run idle for a defined period of time before shutting down. This allows the master controller enough time to observe the system's response and signal the units to reload if needed.

Much smaller (than the conventional system designs) variable frequency drive units are also deployed to handle the trim loads. The VFD is sized no larger than required, reducing the initial investment cost while covering the supply gaps that occur when the fixed speed machines are idle.

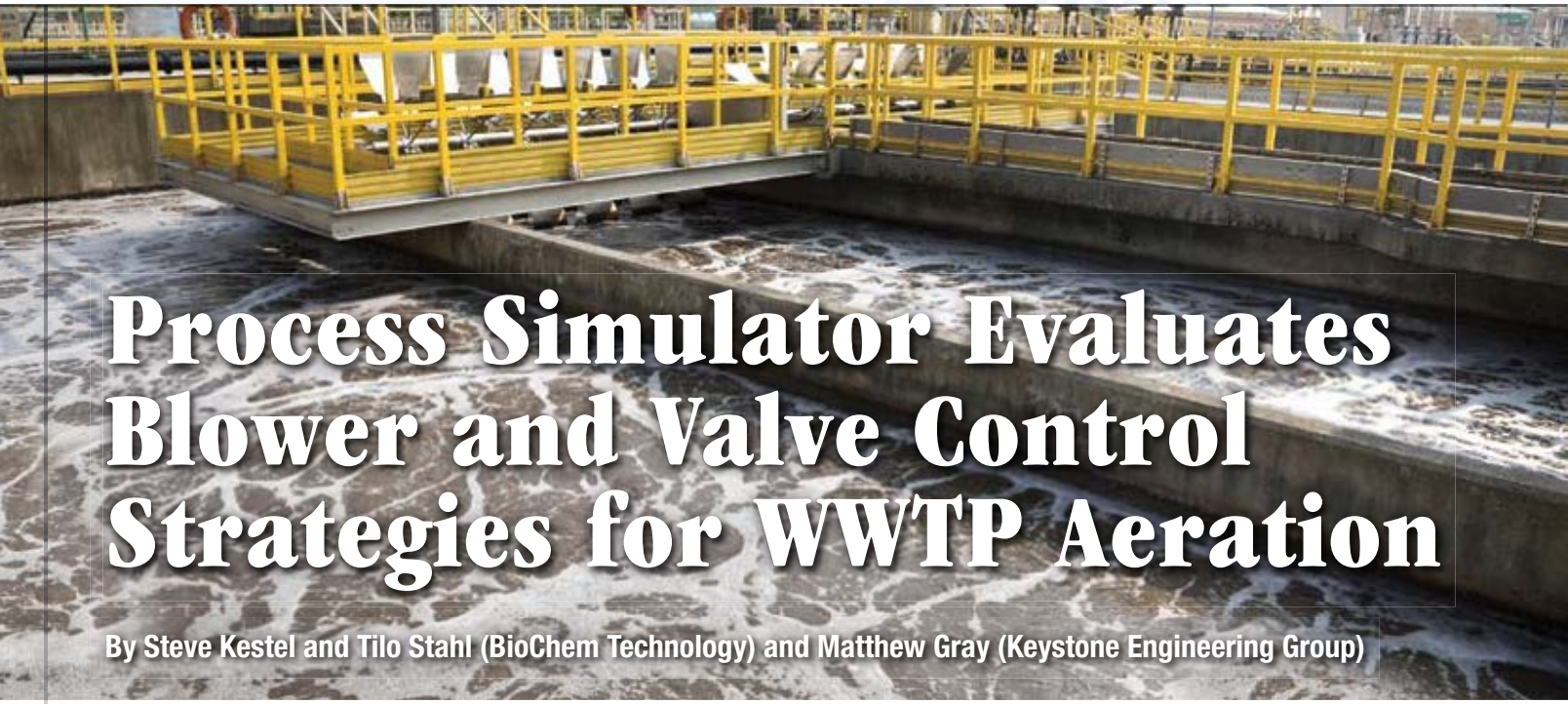
Thank you for your insights and congratulations on the new product launch. BP

For more information please contact Stephen Horne, Blower Product Manager, Kaeser Compressors, tel: 540-898-5500, email: Stephen.horne@kaeser.com, www.kaeser.com/cabp

To read more ***Blower Technology*** articles, visit www.airbestpractices.com/technology/blowers



System splitting with an adaptive master controller can provide an average savings of up to 30% when compared to traditional system design.



Process Simulator Evaluates Blower and Valve Control Strategies for WWTP Aeration

By Steve Kestel and Tilo Stahl (BioChem Technology) and Matthew Gray (Keystone Engineering Group)

➤ Introduction

With the continuing increases in energy costs and the requirements of Biological Nutrient Removal (BNR), the design of the aeration system has become one of the most important aspects of the design of the activated sludge process.

With proper influent and operational data, process engineers can use a commercially available process simulator with activated sludge and aeration models to calculate temporal and spatial oxygen requirements. The calculated oxygen requirements can then be used to design the diffuser layout and calculate airflow requirements. The sizing of the air distribution piping, air control valves and blower are then based on the calculated airflows and a selected single point design pressure.

The single point design pressure is based on a single condition, but in reality, the actual pressure is dynamic, based on airflow and valve positioning. The large number of valve positions and influent conditions normally limits the engineer to only design for a single pressure, but the use of a single design pressure can lead to improperly sized equipment, which will promote operational difficulties and energy inefficiency.

Incorporating pressure losses and valve positioning calculations into the activated sludge model simulation allows the engineer to see the pressure and valve position changes as the influent process conditions change diurnally and seasonally so equipment can be sized accordingly.

This paper will introduce the process of calculating and incorporating pressure losses, blower speed and valve positioning into the activated sludge model simulation, quantify the control response for conventional and innovative control strategies, and demonstrate the benefits of flow-based blower control schemes versus pressure-based blower control.

Model Configuration

The basis of the model was an actual biological nutrient removal (BNR) wastewater treatment plant (WWTP) with a hydraulic capacity of about 19,000 m^3/d (5 million gallons a day). The results of the simulation runs are based on this plant but have broad validity.

The commercially available software GPS-X by Hydromantis ESS, Inc. was used to perform the process simulation and pressure loss calculations. The aeration system model calculations were programmed into the GPS-X User File using Advanced Continuous Simulation Language (ACSL) statements; further information about GPS-X User Files and ACSL can be found in GPS-X and ACSL Reference manuals.

The aeration tank was modeled as a plug flow reactor; this model allows the reactor to be divided into numerous continuously stirred tank reactors (CSTR) in series. This, in turn, allows a great deal of operational flexibility in the model so that various conditions can be simulated. The reactor for this model was divided into eight (8) CSTRs in series. The dynamic inputs for the simulation were from actual sampling of influent flow, diurnal peaking factor, cBOD, TKN, and TSS data. The influent fractions were considered to be constant. The analysis was run for 259 days at a 15 minute time interval.

Aeration Model System Description

The aeration system model is a combination of valve, blower and pressure models that are all linked by the aeration system pressure (Psys). The models are solved iteratively until the actual airflow for each aeration zone is within the determined tolerance of the airflow set point, and the pressure model is balanced.

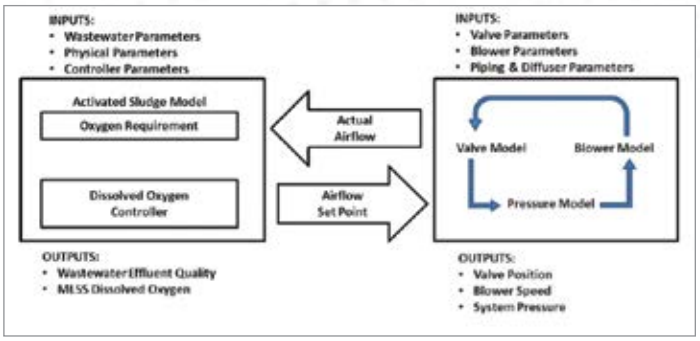


Figure 1: Activated sludge system and aeration system interaction

Valve Model

Within the aeration system the control valves are used to balance the airflow into the aeration zones. The most common control valves used for aeration control are butterfly valves. Control valves can be modeled by using flow coefficient (Cv) characterization curves. The Cv curve provides the relationship between the valve position and Cv. The curves are based on empirical data derived from laboratory testing done by the valve manufacturers. Figure 2 is an example of a Cv curve, and Equation 1 is used to describe the CV curve.

Equal Percentage Valve: 0000,00_00(00_1)

(Equation 1)

Vp :Valve Percent Open VR : Valve Factor Cv,max: Cv at Open Position

The definition of Cv is the amount of flow per unit pressure loss in units of gpm/psi. In regards to airflow, Equation 2 calculates Cv based upon the airflow and pressure on either side of the valve. Equation 2 can be rearranged to calculate the pressure loss across the valve (Pi – Po) at a specified airflow and valve position. The equation requires that the pressure loss across the valves is less than 10% of the inlet pressure (Pi) (Crane, 1991).

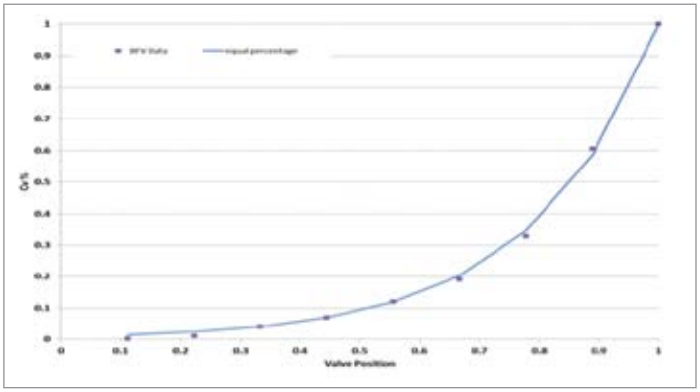


Figure 2: Butterfly Valve Cv Curve

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Flow Coefficient for Gases: 00_096200(0+460)002_002
(Equation 2)

Q :Airflow, scfm Sg: Specific Gravity T: Temperature, F
Pi: Inlet Pressure, psia Po: Outlet Pressure psia

Blower Model

Blowers generate the airflow for the aeration system. Depending upon the type of blower, the airflow output is dependent upon the system pressure (Psys), blower speed, or inlet valve position and discharge vanes positions. For this paper only the positive displacement type blower was modeled, so only blower speed is needed to model the blower. Equation 3 was used to calculate the blower output based on percent of maximum speed (N). Depending on the control method of the blowers, the blower speed is modified until the control variable, airflow or system pressure, is within the control system dead band.

Positive Displacement Blower: 000
(Equation 3)

Q :Airflow, scfm Qmax: Capacity of blower, scfm N: Blower Speed %

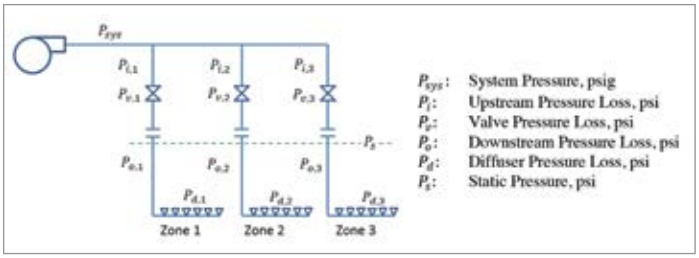

Figure 3: Aeration system minor pressure losses

Pressure Model

To model the system pressure within the aeration system, pressure loss calculations are required for aeration piping, diffusers, and control valves. In regards to the control valves, the Cv Equation 1 is used to calculate pressure loss across the valve. The diffuser pressure losses are highly dependent upon the diffuser flux (scfm/ft2). Diffuser manufacturers can provide pressure loss versus flux curves. Data fitting analysis is used to generate a simple model equation. Calculating the pressure loss for the aeration piping can be fairly complex, because

of multiple individual minor and pipe length losses required for the standard Darcy-Weisbach formula, but can be simplified by calculating pressure loss for one flow condition, then calculating a pressure loss coefficient that can be used for other flow conditions (WEF 2010).

The sum of the minor pressure losses plus the static pressure becomes the system pressure (Psys) as shown in Equation 4. The sum of the minor pressure losses for each aeration zone must all be equal for the system to be considered balanced. Figure 3 is a depiction of all the minor pressure losses within a three zone aeration system.

System Pressure Calculation: 00-00,0+00,0+00,0+00-0000
Equation (4) when the system is balanced

Aeration Control Concepts

The goal of aeration control is to provide the required airflow to meet the current oxygen demand in each aeration zone while keeping the system pressure as low as possible. For this to happen, the blower control and the distribution control need to work together efficiently.

There are two methods for the distribution control to communicate to the blower control that a change in total airflow is required:

1. The blowers are controlled to maintain a pressure set point requirement, which can be
   - **a.** constant, independent of plant operating conditions, or
   - **b.** dynamically calculated based on valve positions.
2. Airflow control, where the actual total airflow requirement is sent as a set point to the blower control.

1.a. Constant Pressure Blower Control

At regular intervals, the aeration control system positions the air control valves to distribute the air to each aeration zone based upon the calculated airflow set point (typically using proportional-integral feedback control based on a dissolved oxygen error signal) for each zone. At the same time the blower control adjusts the output of the blowers to keep the system pressure within the specified dead band of the pressure set point. As the control valves open as airflow demand increases, the system pressure will drop and the blower control will

PROCESS SIMULATOR EVALUATES BLOWER AND VALVE CONTROL STRATEGIES FOR WWTP AERATION

then increase airflow to maintain the system pressure at the set point. The same control applies with the valves closing as airflow demand decreases, just in the opposite direction.

1.b. Dynamic Pressure Blower Control

Dynamic pressure control is intended to promote lower system pressure by having the position of the most open valve (MOV) determine the system pressure set point. The MOV is controlled between two predetermined valve position set points (Jenkins, 2013). If the MOV is opened higher than the high set point, the system pressure set point is increased, increasing the airflow and forcing the valve to close to within the prescribed limits. If the MOV is closed below the low set point, the system pressure set point is decreased.

2. Flow Based Blower Control

At regular intervals, the aeration control system sends a total airflow set-point to the blower control, and then positions the air control valves to distribute the air to each aeration zone based upon the calculated airflow set point for each zone.

The valve control includes dynamic most open valve logic to promote low system pressure by having one of the control valves become the most open valve (MOV) at 90% open and allows the other control valves to seek their position to meet the airflow requirements. When a control valve that is not the MOV is calculated to be at greater percent open than the MOV, then that valve becomes MOV, and the previous MOV will be able to close.

Results

The model demonstrates a correct and verifiable response to steady state input conditions, and a stable, repeatable response to variable loading conditions, so it is suitable for evaluating and comparing aeration system designs and aeration control schemes.

Changes in blower, valve and pipe sizing were all tested to determine their effects on system performance and operating efficiency. Only the results for testing the aeration control concepts are shown in this paper.

Control system comparisons

A simulation was run for each of the three aeration control logic concepts described above; all simulations used the same airflow piping, valve sizes and airflow rates. The control responses were tuned in the model to provide best possible performance. The simulations were run for seven days with a 15 minute control step interval.

1.a. Constant Pressure Control

The constant pressure simulation had a system pressure set point of 7.6 psig, with a 0.05 psig dead band on the blower control.

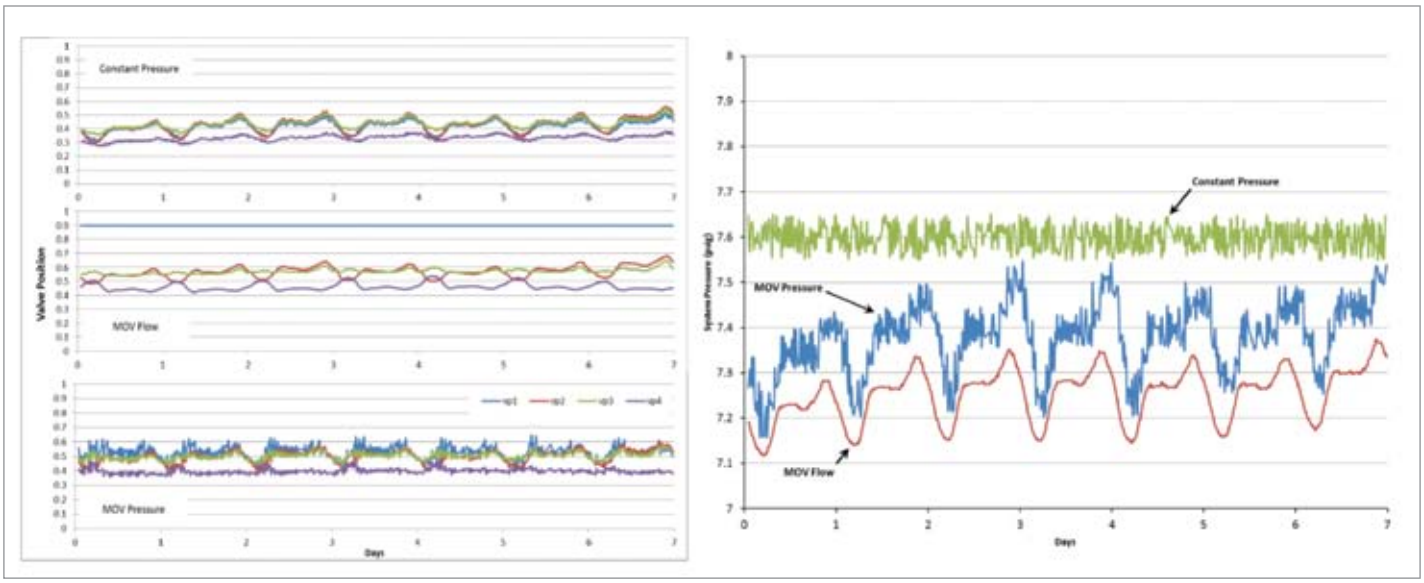

Figure 4: Valve positions and system pressure for different aeration control methods

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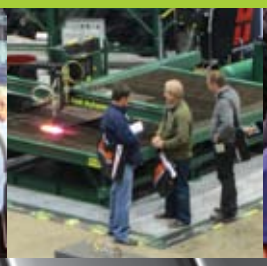

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"Compared to constant pressure control, dynamic pressure saved 3% in aeration power, while flow based control saved 5% and provided more stable valve responses."

1.b. Dynamic Pressure Control

The dynamic pressure simulation had the MOV set points at 60% and 45% open with a system pressure set point change of 0.05 psi with a 0.05 psi dead band on the blower control. Simulations were run at various MOV position set points to try to optimize system pressure for the dynamic pressure control. At first the MOV set points were increased to drop the system pressure but control became unstable, with the MOV bouncing between the set points due to the sensitivity of the valves to pressure changes at high open ranges. Then the MOV set points were spread apart, but that resulted in performance similar to a constant system pressure set point.

2. Flow Based Control

The flow based simulation had the MOV set at 90% and the blower control had a 30 scfm or about 1% of the blower capacity dead band. Figure 7 shows the valve positions and system pressure of the simulations.

The flow based control valve positions were the most open, showing aeration zone 1 as the MOV at 90%, while the other three control valves were between 40 to 70% open. Next, the dynamic pressure control showed valve positions between 30 and 60% open. Last, the constant pressure valve positions were between 30 and 50%. The system pressure is dependent upon the valve positions, which is seen in the system pressure comparison figure. The constant pressure control is the highest at 7.6, moving within the dead band of the set point, while the flow based control is lowest between 7.1 and 7.4 psig without the operational noise of the system pressure dead band. Using the extended time period simulation data, the system pressure and airflow results were used to calculate blower power requirements. Compared to constant pressure control, dynamic pressure saved 3% in aeration power, while flow based control saved 5% and provided more stable valve responses.

Conclusions

The design of the aeration system has become one of the most important aspects of the design of the activated sludge process, but process engineers only have commercially available process simulators with activated sludge and aeration models to calculate dynamic process requirements, not the actual equipment requirements for an aeration system.

It was demonstrated that the process of calculating and incorporating pressure losses, blower speed and valve positioning into the activated sludge model allows the engineer to see them change as the influent process conditions change diurnally and seasonally, so equipment can be sized accordingly.

Using the combined models for control valve sizing, estimating the pressure requirement for the blower, and comparing the dynamics of three different types of aeration control methods was also demonstrated.

At this point, the aeration system model could not be compared to actual operational data. A comparison would be valuable, and should be done to determine the overall accuracy of the model. However, the valve, blower and pressure models were developed using methods already used in design, which gives confidence that the models as used in the paper would provide an accurate design tool. BP

For more information contact Tilo Stahl, BioChem Technology, tel: 610-768-9360, email: tstahl@biochemtech.com, www.biochemtech.com

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Establishing the Energy Incentive Benchmark

The Ameren Illinois ActOnEnergy® Program

By Rod Smith, Compressed Air Best Practices® Magazine

Compressed Air Best Practices® Magazine interviewed Keith Martin (Director Energy Efficiency) and Cheryl Miller (Energy Efficiency Advisor) from Ameren Illinois and Robert Baumgartner (Business Program Manager) from Leidos Engineering.

➤ Good afternoon. According to my sources, your program is one of the most effective in the U.S. at incenting industry to make their compressed air systems more efficient. Congratulations! In broad strokes, please describe the Ameren Illinois ActOnEnergy® Program.

Good afternoon and thank you! Seven years ago, a team of three of us at Ameren Illinois made the commitment to create and deliver a program that would make a difference. Today, the Ameren Illinois ActOnEnergy program is an award-winning energy efficiency program covering southern and central Illinois. After six program years, we are thrilled to report our business customers are saving over $132 million in annual energy costs due to energy efficiency measures they implemented with financial incentive assistance from ActOnEnergy.

The funds come from the Ameren Illinois rate payers (residential and business), based on the amount of electric energy they use. All eligible customers are paying into the Energy Efficiency Program with a Rider EDR charge on the monthly electric bills.

The purpose is to provide cash incentives to help businesses with the up-front costs of installing energy-efficient electric and gas equipment. It can also be used to perform tune-ups on existing equipment.

The ActOnEnergy program year starts on June 1st and ends on May 31st. Program Year (PY) 7 started on June 1, 2014. For customers requesting pre-approval, the completion date of their project determines which program year the project will be associated with and the incentives for which the project is eligible.

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With Custom Incentives making our scope almost limitless, we organize our equipment-specific incentives and programs into twelve areas. Compressed air incentives fall under three of them; Retro Commissioning, Leak Survey and Repair, and Custom Incentives.

What's new for Program Year Seven?

There are a number of changes from Program Year Six (PY6) summarized below:

- Project completion dates for PY7 must be on or after June 1, 2014 and before June 1, 2015.
- The incentive caps have changed. Previously, all Standard, Custom, and Retro-commissioning projects were capped at $600,000 per project for electric incentives and $400,000 per project for natural gas incentives. In PY7, standard and custom projects may receive up to $500,000 in electric incentives per project, and an additional $250,000 in gas incentives per project. The Competitive Large Incentive Project, Staffing Grant, Retro-Commissioning, Feasibility Study, Leak Survey and Repair, Metering & Monitoring, and New Construction programs are the exception to this limit.
- In PY7, all Standard and New Construction Lighting projects will be capped at 75% of the project cost (project cost includes cost of materials and external labor; internal labor is not considered in the project cost).

Please describe the Compressed Air Retro Commissioning (RCx) incentive.

Through the ActOnEnergy Retro Commissioning Programs (RCx), a pre-approved Retro Commissioning Service Provider (RSP) will evaluate a business' existing compressed air systems to identify no-cost and low-cost energy efficiency measures to optimize their systems. This RCx program is designed to help manufacturing and industrial customers optimize the operation of their compressed air systems.

The RCx incentive can defray 80 percent of the discovery phase cost for tune-up projects that have a simple payback period of up to one year. No-cost and low-cost compressed air energy efficiency measures that qualify for this program may include:

- Leak loss reduction
- Adjustment of an existing flow controller or air compressor sequencer to match plant operations

Ameren Illinois ActOnEnergy RCx Incentive Registered Service Providers

Airometrix	www.airometrix.com
Delta Industries	www.deltaind.net
HTE Technologies	www.htetechnologies.com
Jim McAuley, LLC	www.jimmcauley.com
John Henry Foster	www.jhf.com
Ingersoll Rand Chicago	www.ingersollrand.com
Ingersoll Rand Indianapolis	www.ingersollrand.com
Kaeser Compressors	www.kaeser.com
Power Supply Industries	www.psiind.com

- Correction of inappropriate uses of compressed air such as open blowing

A typical plant in the Ameren Illinois service territory can expect to see energy efficiency savings of more than 15 percent as a result of compressed air leak repairs alone!

Pre-approval from Ameren Illinois is required before the RCx survey is initiated and a purchase order is generated.

Is there an incentive to implement the recommendations of the RCx survey?

Of course, this is key! RCx program incentives include the aforementioned survey incentive and an implementation incentive. The additional implementation incentive applies to all implemented and verified retro-commissioning measures with a payback period of 0-1 years. This incentive is $0.02/kWh saved.

Customers qualify for the retro-commissioning incentive by implementing sufficient 0-1 year payback energy efficiency measures to meet the minimum energy savings requirement outlined in the pre-approval letter.

Our customers may implement their projects using in-house resources, a contractor of their choice or the RSP. The retro commissioning survey may also identify capital improvement projects (1-10 year payback) that might qualify for additional incentives through the ActOnEnergy Custom Program. The recommendations and supporting data from the RCx Survey may be used to provide the basis for a Custom Program application.

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Jim Timmersman, Talbot Pratt, Dan Trachsel, Peter Faust, and Adam French (left to right) from Power Supply Industries.

Erin Roehrs, Naomi Marciante, Jennifer Barkalow, Erik Woehrle and Walter Deeken (left to right) from HTE Technologies.

Mark Olson and Tim Mathews from Kaeser Compressors.

How does the Custom Program encourage rapid implementation of energy efficiency measures with 1-10 year paybacks?

The ActOnEnergy Custom Program provides incentives to support the implementation of energy efficiency measures with a 1-10 year payback. Custom Program incentives are $0.07/kWh for annual savings. In addition, we offer two bonus incentives to incent rapid implementation.

1. Applications submitted for custom compressed air projects within six months of the completion of compressed air retro-commissioning are eligible for a 15% incentive bonus (electric) upon project completion.

2. Applications submitted for custom compressed air projects within one year of the completion of compressed air retro-commissioning are eligible for a 5% incentive bonus (electric) upon project completion.

Factories may receive up to $500,000 in electric incentives, per project. There is no cap on the amount of incentives that can be requested in a program year for a facility. Stockpiles of equipment are not allowed. All incentivized equipment must be installed and operational.

Please describe the Illinois ActOnEnergy Metering & Monitoring Incentive.

Absolutely. This is an exciting incentive for compressed air systems. ActOnEnergy is now offering financial support for enhancements to metering and monitoring of energy. We will pay up to an initial $10,000 (up to 50% of the costs) to install new meters or software to better visualize, manage and reduce energy use at an industrial facility. When enough energy is saved through efficiency actions that result from the use of this enhanced metering, we will pay up to an additional $10,000 (up to 50% of the costs). So it is possible that ActOnEnergy may cover 100% of the cost of the enhanced metering and monitoring.

This incentive provides an answer to the problem facing so many facilities — a lack of measurement. We want to incent the installation of metering and monitoring software/equipment — to provide data for energy savings and other factors required for a customer decision to move forward with an energy savings project. Metering and monitoring software/equipment are intended to identify and implement energy efficient measures through a structured plan.

Subsequent Custom and Standard projects resulting from Metering & Monitoring data should be extensive energy-efficiency projects, equipment optimization or process improvements, and must also meet

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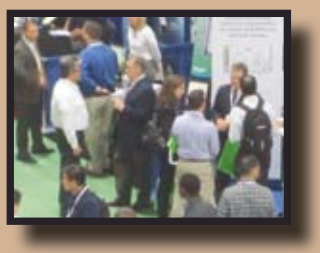

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Frank Coglianese from Brabazon and Zach Switalski from Sullair Compressors.

Brent Christensen and Bryan Crane from John Henry Foster.

Brice Schultz and John Eckley from Quincy Compressor.

ActOnEnergy cost-effectiveness and technical criteria. Compressed air, HVAC energy management and industrial process improvements are typical examples of the kinds of Custom projects that we incentivize. Project pre-approval is required to receive this incentive. Here is further detail:

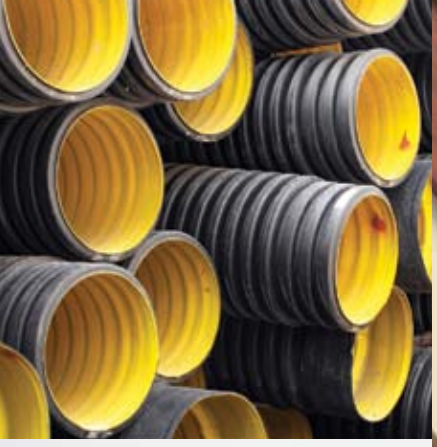
- Base Incentive: The "base" Metering & Monitoring application incentive is calculated as the lesser of 50% of the Metering & Monitoring installed costs or $10,000. This will be paid once the new monitoring equipment or software is installed.
- Performance Incentive: The "performance" Metering & Monitoring application incentive will be paid based upon the annual energy savings generated by Custom or Standard projects identified and implemented via metering and monitoring at the rate of $0.01 per kWh or $0.20 per therm, capped at the lesser of 50% of the Metering & Monitoring installed costs or $10,000. The total maximum for "base" and "performance" incentives is $20,000.

Any success stories you'd like to share related to compressed air?

We could share countless stories but we know you are familiar with the project at Continental Tire in Mt. Vernon, Illinois. This plant manufactures thousands of passenger car and truck tires every day. They operate multiple 900 horsepower air compressors and had annual energy costs related to compressed air totaling $2 million. They turned to Power Supply Industries (PSI), a registered ActOnEnergy Program Ally to survey their system and recommend energy efficiency measures.

Jim Timmersman, from PSI, conducted an in-depth retro-commissioning study with ActOnEnergy covering 80 percent of the survey costs through the RCx incentive. The survey identified significant compressed air leak and piping changes that would allow the air compressors to operate at lower pressures and permit Continental Tire to shut down one 900 horsepower centrifugal air compressor.

In order to help Continental Tire implement the larger-scale (and longer payback) recommendations made by PSI, ActOnEnergy provided more than $236,000 through its Custom Incentive Program. As a result of these energy efficiency measures, Continental Tire is already seeing annual savings of $200,000 per year.



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"In 2008, the Cardinals embarked on their Sustainable Operations journey under the "4 a Greener Game" title. Since then, the Busch Stadium Operations Department has reduced solid waste by 30%, energy use by 20%, and water use by 10%."

Do small and medium-sized plants use your incentives for compressed air?

You bet. One of our favorite case studies is from Original Smith Printing in Bloomington, Illinois. Like all commercial printing facilities, compressed air is used throughout the plant most notably in their presses and in the bindery department. Lane Company is a Program Ally of ActOnEnergy and they conducted a compressed air leak survey using a ultrasonic leak detector throughout the 119,000 square foot facility. The pre-approved leak survey qualified for a $1,920 incentive from ActOnEnergy covering more than 40 percent of the costs for leak identification and subsequent repair.

Lane Company's Justin Penn identified 25 compressed air leaks which when fixed reduced air compressor related electricity use by more than 110,000 per year — a saving of $8,700 per year for Original Smith Printing. The ActOnEnergy incentive not only helped give the company the confidence to do the survey but also reduced the project costs from $4,390 to $2,470. That's a pretty amazing payback!

How do you get the word out-through the Business Symposium?

We have a comprehensive marketing and communications strategy and plan. The Business Symposium is absolutely one of the highlights of our annual plan. As you know (and thank you for speaking!), this year we held them June 3rd and 4th in Collinsville (outside St. Louis) and in East Peoria, Illinois.

The Symposium was once again extremely well attended with over 300 Ameren Illinois business customers attending the workshop sessions and visiting with our Program Allies in the exhibit hall.

We were thrilled that Joe Abernathy, the VP of Stadium Operations for the St. Louis Cardinals, could be our Keynote Speaker. Wasn't he good?! He is responsible for all day-to-day facility operations and game-day event management activities at Busch Stadium. He manages a staff of 25 full-time and 800 part-time employees and contractors.

Joe has been in charge of Stadium Operations for the Cardinals for 18 seasons with the last 8 being at Busch Stadium III. This 42,500 seat stadium, located in downtown St. Louis, opened in April of 2006. Joe, a Mechanical Engineer by education, has always had a keen interest in operational efficiency and continuous improvement. In 2008, the Cardinals embarked on their Sustainable Operations journey under the "4 a Greener Game" title. Since then, the Busch Stadium Operations Department has reduced solid waste by 30%, energy use by 20%, and water use by 10%.

We also received good feedback on the breakout sessions covering our ActOnEnergy incentives, energy benchmarking, project ideas, variable frequency drives, compressed air solutions, and LED lighting technology. Over-all, we were very pleased with the results.

Thank you for inviting me to Illinois and I think your business customers are thanking you for helping them save energy. We hope more incentive programs follow your lead. BP

For more information please contact Robert Baumgartner, Business Program Manager, Leidos Engineering, an Ameren Illinois ActOnEnergy Partner, tel: 309-349-2417, email: Robert.Baumgartner@Leidos.com, www.ActOnEnergy.com

To read more ***Energy Incentive*** articles, visit
www.airbestpractices.com/energy-incentives

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Kaeser Launches New Rotary Screw Blower Packages

Kaeser Compressors, Inc. has brought the energy efficiency savings of their world-renowned Sigma Profile™ to the low pressure world with the launch of their new line of rotary screw blower packages. The EBS and FBS series are up to 35% more efficient than conventional blower designs and are also significantly more efficient than comparable rotary screw blower packages.

With flows from 530 to 2366 cfm, the EBS and FBS series include the same design features as Kaeser's comprehensive Com-paK™ blower packages, such as high efficiency motors, silencers, inlet filters, starters/drive, a full enclosure, an onboard controller, and a full complement of sensors. These units are designed, built, and tested to meet international and domestic performance and safety standards, and are available in both STC (wye-delta start) and SFC (Variable Frequency Drive) versions.

Models also come standard with Sigma Control 2™. In addition to monitoring all onboard sensors, Sigma Control 2 features expanded communication features. With an Ethernet port and built-in Web-server, Sigma Control 2 enables remote monitoring and email notifications for service and alarms. Optional industrial communication interfaces such as ModBus, Profibus, Profinet, and Devicenet are available to provide seamless integration into plant control/monitoring systems such as Kaeser's Sigma Air Manager (SAM).

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 diesel screw compressors. Our national service network provides installation, rentals, maintenance, repair, and system audits. Kaeser is an ENERGY STAR Partner.

To learn more about Kaeser's new line of rotary screw blowers, visit www.kaesernews.com/EBS_FBS. To be connected to your local Kaeser representative, call 877-596-7138.

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TECHNOLOGY PICKS

Atlas Copco Celebrates 5 Years of Pioneering Energy Efficient Blower Technology

The energy efficient ZS screw blower, which is used in many air blowing application, is celebrating its 5th year of production. With the ZS screw blower, Atlas Copco has a comprehensive offering for pressures between 300 mbar up to 1200 mbar and for flows from 100m³/hr to 9100 m³/hr. Over the last five years, many customers across different applications have benefitted from this energy efficient technology.

Atlas Copco was so convinced on the performance of the ZS screw blower that shortly after launching it in 2009, they independently tested it against a tri-lobe blower by the Technische Überwachungs-Verein (German Technical Monitoring Association, or TÜV), according to the international standard ISO 1217, edition 4. It was proven that the ZS is 23,8% more energy-efficient than a tri-lobe blower at 0,5 bar(e)/7 psig, and 39,7 percent at 0,9 bar(e)/13 psig. The efficiency of the ZS is mainly attributed to the superior screw technology. Other features that secure increased efficiency and reliability are the integrated gearbox, the oil system and the innovative package design that integrates all individual components into a plug-and-run solution. Industries and applications such as wastewater treatment, pneumatic conveying, power generation, food and beverage, pharmaceuticals, chemicals, pulp & paper, textiles, cement, and general manufacturing have already benefited from energy savings by replacing the conventional lobe with the screw technology.

A huge potential for energy savings

In a typical biological wastewater treatment plant, the aeration blower system accounts for up to 70% of the energy usage. Today the majority of these plants use less efficient lobe technology. By reducing the energy usage of their aeration blower system, these plants will decrease their energy costs while operating in a more environmentally friendly manner. Atlas Copco continuously innovates to ensure sustainable productivity for its customers because they understand their growing needs and changing trends. Also by investing into Houston Service Industries with their range of energy efficient high speed turbo blowers in 2012, Atlas Copco is focused to continuously find solutions for reducing the energy costs for its global customers with low pressure applications. Since the launch of the first ZS blower, Atlas Copco has continued to invest in the technology and now carries the largest range in the market with flows from 100 m³/hr to 9100 m³/hr and has a large installed base globally supported by its aftermarket team.

Energy-efficient and reliable technology

Conrad Latham, Vice President, Marketing of Atlas Copco's Oil-free Air Division adds: *"At Atlas Copco, we strive to develop products and services with a total life-cycle cost in mind. Seen over the entire life cycle of a product, the energy consumption makes the most significant impact. Therefore, we are focused on reducing the energy consumption of all our products and increasing profitability of our customers. The ZS screw blower is a perfect example of how we are able to use more than 140 years of product and application knowledge to develop a truly pioneering blower technology."*

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 (BEUR 9.7) and more than 40,000 employees.

Oil-free Air is a division within Atlas Copco's Compressor Technique business area. It develops, manufactures, and markets worldwide oil-free and oil-injected air and gas compressors combined with air and gas treatment systems. The division focuses on sustainable solutions for all kind of industries where the gas quality is critical to the production processes. The divisional headquarters is located in Shanghai, China, and the production centers are in Antwerp, Belgium; Wuxi, China; Pune, India and São Paulo, Brazil.

Learn more at www.atlascopco.com

New BOGE Airstatus Remote Diagnostic Tool

The BOGE airstatus remote diagnostic tool ensures maximum reliability. The BOGE airstatus is based on pioneering technology that redefines the communications between man and machine. This remote diagnostics tool by BOGE is a new solution which increases safety and transparency in compressed air production and all associated components. This tool maintains the high-level performance and

TECHNOLOGY PICKS

efficiency of your compressed air station and is ideally suited for monitoring and managing complex systems and plants.

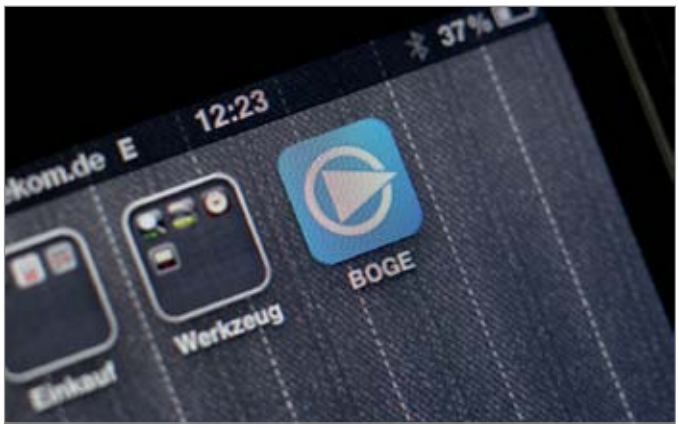
With airstatus, users have the status of up to 32 components firmly under control — from anywhere in the world. Process data such as status, maintenance messages, temperatures and pressures are directly transmitted and displayed, making airstatus a powerful remote diagnostics tool. Users can identify, analyze and react immediately to fault messages on their own computer or smartphone, considerably reducing the time needed to rectify faults. Or you can use the BOGE airstatus for condition monitoring in order to manage proactive measures and to plan and coordinate maintenance work. All of this can be easily managed using the BOGE airstatus app, which works with all mobile iOS and Android devices.

Easy installation, lasting safety

A ModbusScan to detect each of the compressors and components makes it easy to commission the BOGE airstatus monitoring facility. The system data communication is processed in real-time via GSM/GPRS or a LAN connection. Users can view data in the BOGE airstatus web portal or in the BOGE airstatus APP. Alarm management by email or SMS if defined limits are exceeded or undercut provides an additional safety feature.

About BOGE Compressors

BOGE America is the United States of America Daughter Company of BOGE KOMPRESSOREN Otto Boge GmbH & Co. KG based in Bielefeld, Germany. BOGE manufactures a comprehensive range of oil lubricated and oil free screw and piston compressors used by all sectors of industry to supply compressed air for a wide range of manufacturing processes. It also supplies a complementary range of filters, dryers and condensate management equipment. The product is sold and serviced through a dedicated network of over 50 distributors in North and South America.



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Atlas Copco Compressors Introduces Redesigned Energy Recovery Unit with Compact Footprint and New Product Offerings

Atlas Copco Compressors has introduced a redesigned Energy Recovery unit for the GA range of oil-injected rotary screw compressors. The new unit features a compact footprint, reduced by 66 percent compared to the previous generation, and an increased selection of heat exchangers and other complementary products.

"The redesigned Energy Recovery unit for the GA range meets the water purity needs of the food and beverage industry through the increased selection of heat exchangers, while addressing space limitations in the compressor room with a more compact design," said Brian Blum, CTS optimization marketing for Atlas Copco Compressors. "The redesigned unit is also compatible with a Mk5-based energy counter and the SmartLink data monitoring program, which allows the customer and Atlas Copco to monitor energy savings and maintenance needs 24/7."

The vertical design of the heat exchanger reduces the footprint of the Energy Recovery unit by up to 66 percent compared to the previous generation. A new heat exchanger, available in stainless

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"Compressed air is the #1 kW user across our 35 factories."
– Doug Barndt, Manager Demand-Side Energy & Sustainability, Ball Corporation

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.**

"Do your homework, demand excellence, and don't be afraid to say no to the audit. If you want to audit my plant, you should be able to provide some savings incentive beforehand."

– Rodney Dayson, Sustainability & Energy Manager, Archer Daniels Midland BioProducts. Article published in the Jan/Feb 2013 Edition of Compressed Air Best Practices® detailing a compressed air energy-savings audit saving $422,000 annually at ADM.

"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, 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. The Compressed Air Best Practices® Editorial Advisory Board guides our mission to help create more energy saving projects.

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steel, features standard oil change intervals (up to 200 degrees Fahrenheit), eliminates the risk of oil contamination and is corrosion-free, which makes it suitable for food and beverage applications or applications with corrosive water. Additional complementary products include a hose extension kit and an energy counter to monitor energy savings.

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

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ANEST IWATA

Anest Iwata Air Engineering, Inc., a rapidly expanding air compressor and vacuum pump manufacturer, is currently looking for Regional Sales Managers for its East Coast and West Coast territories.

Position responsibilities:

- Manage, train & evaluate new/current distributors in assigned territory
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- Influence distributors and develop OEMs through face-to-face calls
- Knowledge of compressed air marketplace and applications
- Develop business plan for territory

Requirements:

- 3-5 years minimum experience
- BS/BA undergraduate degree
- 50%-60% travel required
- Compressed air background preferred, not required
- Excellent communication skills
- Proficiency in Microsoft Office required

Please forward cover letter and resumes to Erin Polley at erinp@anestiwata.com.

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Requirements

- BS in Engineering or relevant Industry experience
- Five + years of service experience in compressed air Industry
- Service/application knowledge of compressed air system products
- Ability to technically troubleshoot air compressor and refrigeration products
- Service familiarity of competitive brands of air compressors
- Ability to travel 50-70%

Please apply online (Job Number: 26012): https://hitachi.taleo.net/careersection/2/jobsearch.ftl?lang=en

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Midwest Control is looking for an energetic individual to join their Customer Service Team! We are looking for a technical minded individual with strong organizational skills and the ability to multi-task. You must be focused, responsive to deadlines, able to set priorities and work effectively in a team based environment as well as individually.

Responsibilities include communicating with customers via phone and email, processing orders in a fast paced environment, providing knowledgeable answers to questions about product, pricing, availability and order status while making use of problem solving/decision making skills to achieve the highest level of customer satisfaction.

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Midwest Control is a leading national wholesale distributor of pneumatic accessories located in the far NW Suburbs of Chicago.

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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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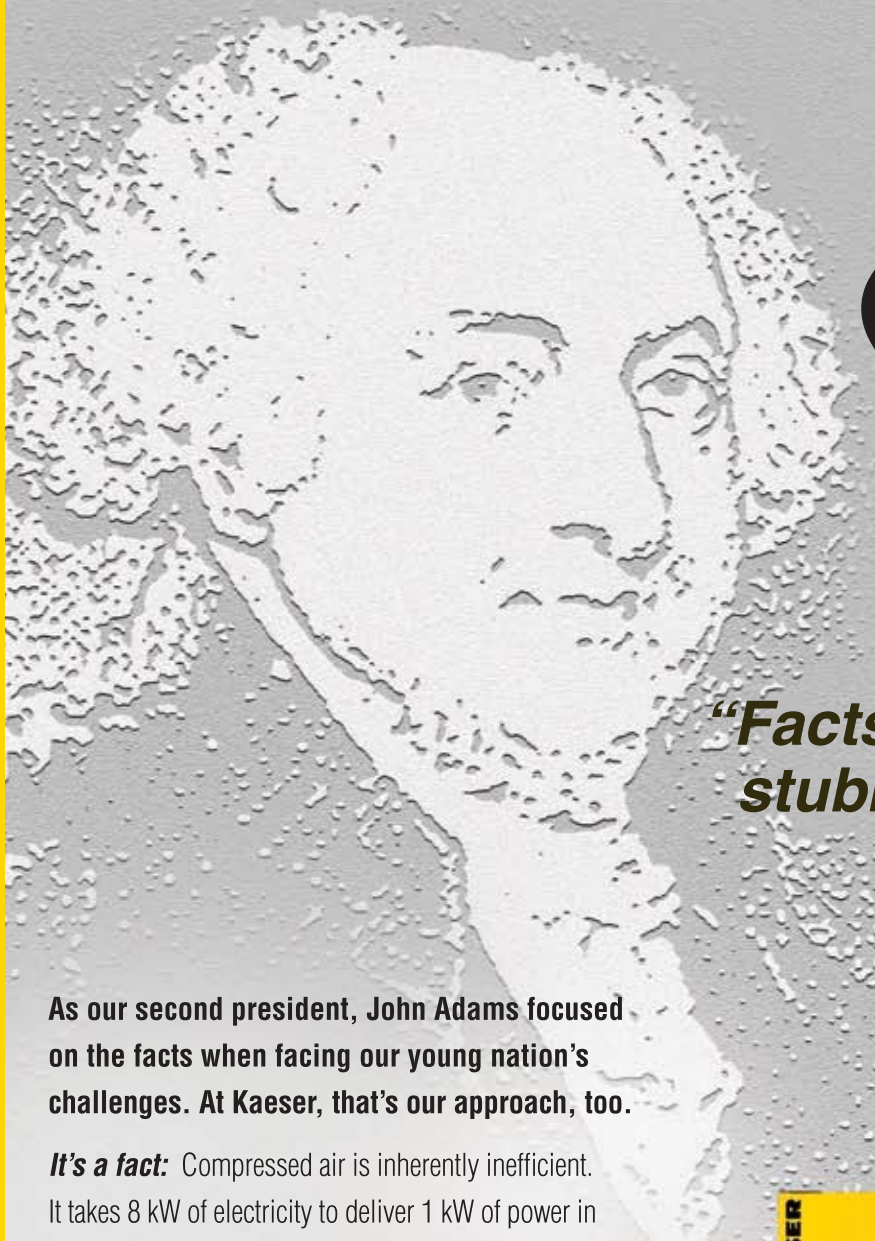
BOGE AIR. THE AIR TO WORK.

BOGE
COMPRESSED AIR SYSTEMS

KAESER COMPRESSORS

Built for a lifetime.™

Visit us at WEFTEC 2014 in Booth #4747



"Facts are stubborn things."

— John Adams

As our second president, John Adams focused on the facts when facing our young nation's challenges. At Kaeser, that's our approach, too.

It's a fact: Compressed air is inherently inefficient. It takes 8 kW of electricity to deliver 1 kW of power in compressed air – and almost all of the remaining 7 kW is lost as heat. At Kaeser, we design efficient compressors with smarter controls and more effective heat recovery, so you can have more efficient plant air.

Here's another fact: If you operate a compressor, you can't afford to do business without it. Downtime is expensive and disruptive. That's why we build our products for maximum reliability and easy serviceability. So when service is needed, it takes less time.

Learn the facts. They point to Kaeser.

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.

Kaeser Compressors, Inc. • 866-516-6888 • kaeser.com/CABP

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