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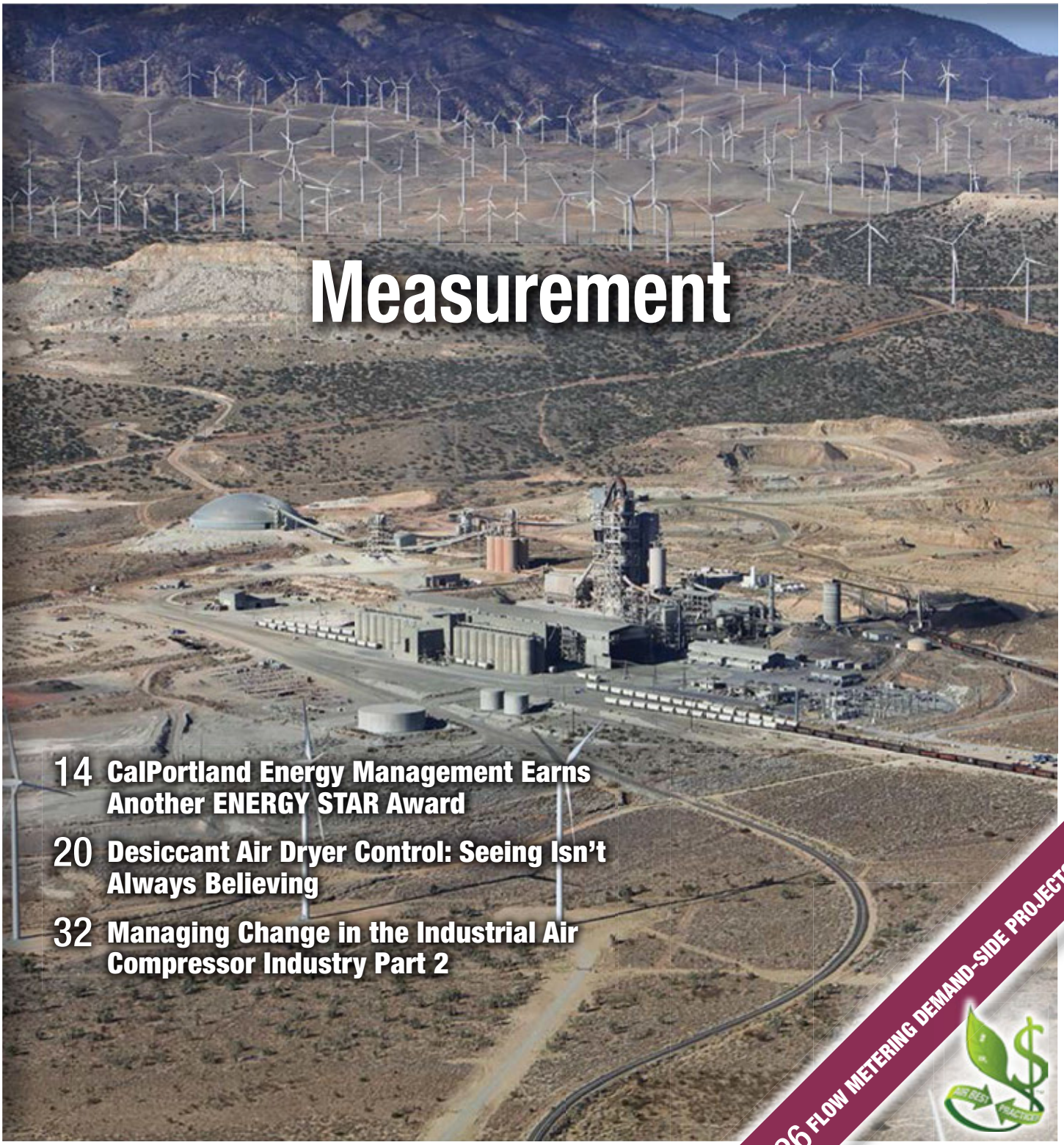

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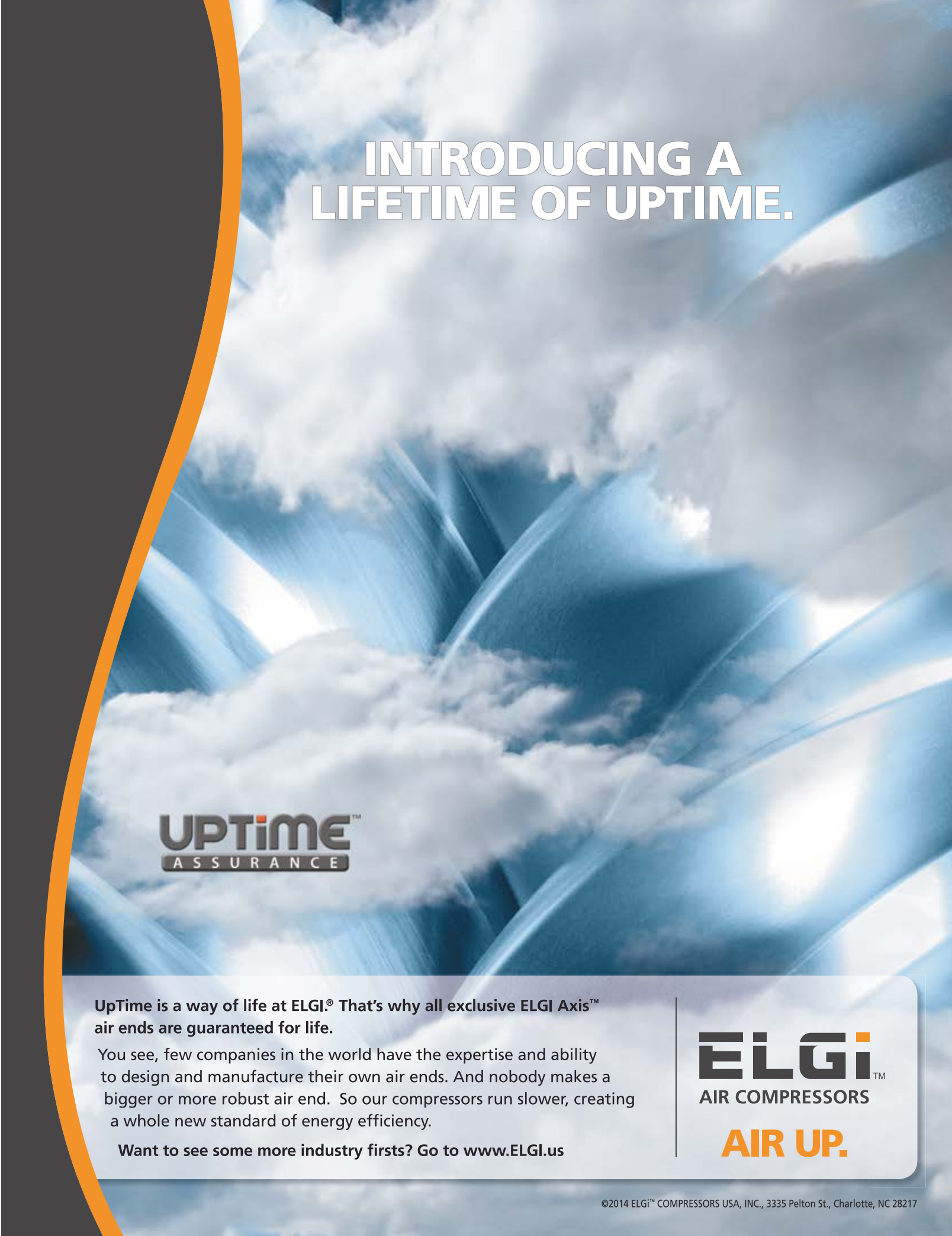

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FROM THE EDITOR | Measurement

When asked recently what I thought the biggest change in compressed air systems will be ten years from now, I quickly replied "measurement." How many compressed air systems have real-time, year-round measurement systems in place? I don't know the percentage but I know it's low. This is why we now dedicate an issue every year to the topic.

CalPortland has earned another ENERGY STAR Award. Our own Clinton Shaffer was able to interview CalPortland's Chief Energy Engineer, William Jerald, to learn why. Jerald described the energy management program at CalPortland and how they manage compressed air. Managing energy for 75 to 80 energy-intensive locations, Mr. Jerald is exactly the type of high-impact individual we design this publication for.

The difference between what happens in a perfect world and what happens in reality, inside of factories, is very interesting. The proper maintenance of equipment is often the biggest factor driving energy efficiency. Ron Marshall, on behalf of the Compressed Air Challenge®, provides an excellent illustration in his article this month, "Desiccant Air Dryer Control: Seeing Isn't Always Believing."

Chris Downs is the new Sales Manager for Compressed Air Best Practices® Magazine and comes to us with 25+ years experience in the compressed air industry. This month he provides us with a very practical article titled, "The Relationship Between Pressure and Flow in a Compressed Air System." I couldn't agree with Chris more that this issue continues to confound many end users of compressed air systems.

Ron Nordby provides us with the second installment of his article on "Managing Change in the Industrial Air Compressor Industry." His experience-based insights into how distribution management can embrace change and take control of their future are very interesting. One of his top recommendations is for distributors to make the necessary commitments for profitability improvement.

Flow metering is a favorite topic of this publication. Veteran auditor Tim Dugan provides a technically strong article on this under-utilized measurement technique titled, "Flow Metering Demand-Side Projects in Large Compressed Air Systems."

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

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INDUSTRY NEWS

DirectAIR® Reduces Energy Costs by 52.6% for Ohio Chemical Plant

An Ohio chemical plant saved 52.6 percent in energy costs and eliminated high compressed air maintenance and repair costs — all with help from Air Technologies® DirectAIR® solution.

The plant was maintaining a fleet of five centrifugal air compressors, two oil-free rotary air compressors and a number of desiccant air dryers to support its 5500 cfm plant air demand. The age of their compressor fleet and dryers varied between 5 years and over 20 years. Because the compressor system was running multiple compressors under part load to provide adequate plant air pressure, electrical costs were excessive. In addition, the company was experiencing a number of costly maintenance issues with its compressed air system.

The DirectAIR® installation, including three oil-free rotary screw air compressors

"Since the installation, DirectAIR® is delivering a 52.6 percent energy cost reduction, which is saving the plant over $300,000 in annual energy costs."

To make matters worse, during the winter months, the system's air lines would freeze up on occasion. Consequently, the company would have to scramble in efforts to defrost the air piping and/or to rent air compressors/dryers for several months. In addition, their air dryers were not running optimally due to air leaks from all of the open valves (trying purge the excess water from the system).

Air Technologies had serviced the plant's two rotary air compressors as well as multiple desiccant air dryers for many years. In 2013, the chemical company looked to Air Technologies' DirectAIR® utility service for a better cost-savings solution. After a detailed analysis was performed jointly between the company and Air Technologies, the financial justification was clearly a positive for a DirectAIR® Compressed Air Utility Service Solution.

Once a decision was made by the chemical company to partner with DirectAIR® for their compressed air needs, Air Technologies installed a state-of-the-art DirectAIR® compressed air facility at the company's site. The total system consists of six oil-free rotary screw compressors, each with MD zero purge air dryers installed into six pre-engineered modules. Air Technologies now owns, operates and maintains the plant's compressed air system to provide a continuous quality, dry air supply — and zero downtime. The DirectAIR® solution has proven to increase the company's system efficiencies and dramatically reduce energy costs by supplying compressed air on-demand as a utility.

Since the installation, DirectAIR® is delivering a 52.6 percent energy cost reduction, which is saving the plant over $300,000 in annual energy costs. The energy savings alone pay for a vast majority of the total cost of the DirectAIR® service. In addition, DirectAIR® eliminated the high maintenance and repair costs that the company had experienced in years past. There are no production interruptions due to wet air and frozen pipes, and the company no longer has to rent air compressors during the winter months.

For more information visit www.directair.com.

INDUSTRY NEWS

Volvo Group Achieves Energy Efficiency

Volvo Group North America achieved its goal of reduced energy consumption in the U.S. Department of Energy (DOE) Better Buildings, Better Plants Challenge five years earlier than anticipated. Volvo Group's goal had been a 25 percent reduction in energy consumption at its eight U.S. manufacturing plants between 2009 and 2020. By the end of 2014, Volvo Group, one of only 11 companies to meet its goal early, had reduced energy consumption by 26.8 percent compared with its 2009 baseline.

"One of the Volvo Group's core values is environmental care, so we are pleased to be among a select few companies to achieve our goal under the Better Buildings, Better Plants Challenge early," said Rick Robinson, director of health, safety and environment for the Volvo Group North America. "Reaching this milestone required the diligence and dedication of all our employees, and we will continue to strive for improved energy efficiency."

Volvo Group North America's record in energy efficiency reflects efforts to reduce consumption at eight manufacturing facilities in the United States:

- Volvo Trucks, Dublin, Virginia
- Volvo Group Powertrain, Hagerstown, Maryland
- Mack Trucks, Macungie, Pennsylvania
- Volvo Construction Equipment, Shippensburg, Pennsylvania
- Volvo Penta, Lexington, Tennessee
- Volvo Bus, Plattsburgh, New York
- Volvo Group Remanufacturing, Charlotte, North Carolina
- Volvo Group Remanufacturing, Middletown, Pennsylvania

"As the Better Buildings Initiative enters its fourth year, leaders continue to showcase how saving energy saves money, creates jobs, and most importantly, accelerates the nation's competitiveness in the clean energy economy while preserving our environment for generations to come," said Energy Secretary Ernest Moniz.

Volvo Group North America's leadership in energy efficiency has been recognized in other ways. The company announced late last year that, at the time, three of its manufacturing sites — Macungie, New River Valley and Hagerstown — held the top three positions in DOE's Superior Energy Performance program, recording the highest energy performance improvements among Platinum level partners.

Since DOE launched the Better Buildings Challenge in 2011, more than 250 partners have saved $840 million and saved 94 TBTUs of energy, which represents six million tons of greenhouse gas emissions.

For more on the Better Buildings Challenge, visit www.eere.energy.gov/challenge/home.

About The Volvo Group

The Volvo Group is one of the world's leading manufacturers of trucks, buses, construction equipment and marine and industrial engines. The Volvo Group, which employs about 100,000 people, has production facilities in 19 countries and sells its products in more than 190 markets. In 2014, the Volvo Group's sales amounted to about $38.2 billion. The Volvo Group is a publicly held company headquartered in Gothenburg, Sweden.

Atlas Copco Rental to Supply Massive Petrochemical Complex in Latin America

Atlas Copco Rental North America recently won over a bid for renting oil-free air equipment and accessories to the Etileno XXI Project in Mexico.

In January of 2010, the Etileno XXI project was born as a result of the alliance between Braskem, a Brazilian company leading in the petrochemical industry, and Group Idesa, one of the top Mexican companies in the petrochemical sector. Together they invested over 4.5 billion USD in the construction of a 500-acre complex in Coatzacoalcos, Veracruz, Mexico.

At a glance, the Etileno XXI Project includes:

- 24,000 tons of steel structure
- 132,000 tons of concrete
- 38,000 tons of equipment
- 24,000 tons of piping
- 4,000 tons of electrical cable
- 150,000 MW capacity installed with cogeneration capabilities up to 80%
- 14,000 permanent jobs created

This complex will feature a cracker plant to turn ethane gas into ethylene. Within the production possibilities, it is estimated to produce one million tons of ethylene and polyethylene each year. In total, it requires 22,000 cfm of 100 percent oil-free compressed air.

INDUSTRY NEWS

Construction of this complex was implemented by powerful companies in the industry, including ODEBRECHT, a Brazilian construction company, TECHNIP Italy, a world leader in management, project design, engineering, procurement, construction and maintenance of industrial complexes, and ICA Flour, a Mexican company that specializes in commissioning and construction of industrial and petrochemical plants.

"The bid process began in September 2014. Roberto Romero, our Area Sales Manager in the southeast of Mexico, began visiting and presenting our products and services. He informed them of all our products and specifics about the Atlas Copco 100 percent oil-free air compressors," said Enrico Salvatori, Vice President Operations for Mexico. "After several meetings with the engineers, operators and users from all three companies at the plant, Roberto entered the public bid and finally the decision was published in December for Atlas Copco Rental to supply 100 percent of the equipment needed for the project. This included the rental of 13 x PTS 916, 4 x PNS 1250, 2 x ZT 90 and 10 dryers."

In both the pre-commissioning and commissioning phase, it is mandatory to run different tests on equipment and pipelines. Tests include blowing air, drying, testing pneumatic, inerting, chemical cleaning, chemical testing and load testing catalysts. These tests are to ensure safety and reliability within the processes. All of these tests need both standard and high pressure 100 percent oil-free air. On the drying stage, air needs to be somewhere between -30 and -40°F dew point.

Atlas Copco rental equipment onsite at the Etileno XXI Project complex

The job started in March and will be running until late September.

For more information, visit www.atlascopco.com/rentalus.

New Hydrogen Generation Technology From Air Products Now Onstream at Global Tungsten & Powders

Air Products continues to meet the growing hydrogen demand of Global Tungsten & Powders Corp. (GTP) with the first installation of its new PRISM® PHG830 hydrogen generator. The new technology is now onstream at GTP's manufacturing facility in Towanda, PA, where the two companies recently held a ribbon-cutting ceremony to celebrate the successful completion of the project. The newly expanded range of Air Products' PRISM® technology demonstrates the flexibility of this highly efficient and economical supply option for the onsite generation of hydrogen requirements up to 5000 nm^3/hr.

"We value the trust and confidence GTP has placed in us to continue meeting their increasing hydrogen requirements in the most reliable and economical way," said John Robinson, general manager, Industrial Gases-North, at Air Products. "The new PRISM PHG830 hydrogen generator combines Air Products' proprietary reformer technology with our hydrogen pressure swing adsorption capabilities to bring GTP the lowest cost hydrogen available in this production range."

"Air Products has been supplying hydrogen to GTP for more than 30 years, and this is an important material to facilitate our tungsten reduction processes here," said James Morse, director of manufacturing services at GTP.

"It is reassuring to work with a gas supplier who understands our business and has the technical innovation and supply flexibility to meet our increasing product demands in the lowest-cost way possible."

Air Products has installed more than 35 PRISM hydrogen generation units globally. The company's PRISM hydrogen generators for onsite gas production are an important part of Air Products' portfolio of supply options, which includes traditional bulk liquid and gas delivery, large onsite HyCO plants, and pipeline supply. As a leading hydrogen supplier, Air Products has the technologies and experience to help customers improve process efficiency, optimize gas usage, and improve safety.

For more information, visit www.airproducts.com/H2generators.

Air Products' PRISM® PHG830 hydrogen generator

CalPortland Energy Management Earns Another ENERGY STAR AWARD

By Clinton Shaffer, Editorial Associate, Compressed Air Best Practices® Magazine

CalPortland's cement plant in Rillito, AZ

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Making cement is an energy-intensive process. In a cement plant, the electrical energy load can reach up to 25 MW, consuming 185 million kilowatt hours of electricity annually. In addition, the plant consumes a large amount of coal and natural gas. CalPortland is an enormous producer of cement, concrete, aggregates and asphalt. With 80 facilities spanning five states across the western U.S., one might logically assume that CalPortland consumes *a lot* of energy.

While that may be true, that does not mean the cement-making giant is ignorant of its energy consumption. Quite the contrary in fact, as CalPortland was recognized in April by the Environmental Protection Agency (EPA) with an eleventh consecutive ENERGY STAR® Partner of the Year — Sustained Excellence Award. Of the many key accomplishments recognized by the EPA, CalPortland saved 29 billion British thermal units over 2013, and reduced its energy intensity by 16 percent since 2003.

To date, those energy savings have accumulated to $73.1 million.

In contrast to CalPortland's pyroprocessing, the company's compressed air energy demand may seem diminutive — reaching 1 to 2 MW yearly in a given facility. Why then is compressed air a top 5 focus for the energy team at CalPortland?

According to William Jerald, CEM, the Chief Energy Engineer at CalPortland, it's because cognizance is key.

"We've done literally hundreds of compressed air modifications, changes, upgrades, audits," Jerald explained to us in a recent interview. "Compressed air is a huge part across the company. Once you understand that it's energy-intense, it's kind of easy to work on because you can do quick and easy upgrades and save energy right away."

By generating awareness of the costs of compressed air, Jerald and his energy team have successfully driven those costs down. Fortunately, Jerald was kind enough to speak with the team at Compressed Air Best Practices® Magazine about the energy program at CalPortland. During our conversation, he discussed the history of the company's energy program, how compressed air fits into their energy plans, and how partnering with ENERGY STAR has been a boon for the company's energy initiatives.

The History of CalPortland's Energy Program

CalPortland's energy program got its official start in 2003. At the time, the company's primary product was cement, and it had three cement plants along with a few ready-mix concrete plants in southern California. Having a small number of energy-intensive locations made it easier for CalPortland to "take the next step" with its energy program. A nudge from ENERGY STAR also helped.

"Really, it got its big kick-start from ENERGY STAR," Jerald said. "They reached out to us — got in touch with the director of engineering, Steve Coppinger. It became a one-man wolf pack kind of party where Steve was pushing and directing it from the engineering department. It was not his full-time job, but he spent a lot of time on it. He got the executives to buy into it."

In 2007, Jerald was working as the electrical supervisor at CalPortland's cement plant in Arizona. That's when he was asked to become the Energy Manager for the entire company.

CalPortland currently operates in Washington, Oregon, Nevada, California and Arizona. The company's facilities include cement plants, cement terminals, ready-mix plants, asphalt plants, and aggregate mines. It is no easy feat to remain aware of — let alone manage — the energy use of such an expansive and diverse array of facilities. Nevertheless, Jerald is responsible for just that.

"We're probably in about 75 to 80 locations," Jerald told us. "It's hard for me to narrow down, because we've been broadening our territory quite a bit. It seems like every couple of weeks a new plant pops up on my grid that I never even knew about, and we have to start looking at their energy footprint."

Active Corporate Participation

Jerald is not alone in his endeavor, as the energy management program at CalPortland has strong corporate backing. Where initially the energy team was a "one-man wolf pack" led from within the engineering department, it now has a steering committee comprising Steve Coppinger, who is now the VP of engineering services at CalPortland, along with several other VPs, engineers, and divisional managers who are assigned as the energy manager for their respective division.

CALPORTLAND ENERGY MANAGEMENT EARNS ANOTHER ENERGY STAR AWARD

The divisional managers have similar duties to that of Coppinger's when the energy program just started. They have a role as an energy team member in addition to their primary duties.

"For each department or division in the company, we have a variety of managers who are assigned the role as the energy manager for their division," Jerald explained. "It's not their primary job, but it's one of their side duties. Their positions within the company are various, but they are assigned the task of being an energy manager for that area. And then they work with me, and I work with them."

A vital part of the energy program is the active involvement of CalPortland's CEO, Allen Hamblen, who regularly attends Jerald's quarterly energy management meetings.

"This program keeps staying alive because I can call my CEO on a first-name basis," Jerald said. "It's like having a rock star come to your show. People will attend just because they want to hear what the CEO's got to say. There's not a lot of opportunity to get that on a day-to-day basis, so it helps my program get attendance just because they know he's going to be there."

The corporate backing is in no small part due to the monetary gains accrued through the energy management program. CalPortland's annual energy spend is $81 million — the highest operating cost of the company. That metric certainly helps get executive attention. If Jerald saves 1 percent in energy costs, that is $800,000 that goes straight to the company's bottom line.

"The number one reason is money," Jerald said. "It's about saving money and helping the health of our company."

Energy Management Goes Viral

According to Jerald, the quarterly information-sharing meeting is "one of the big assets of the energy management program." Using a videoconference system, all of the energy managers, engineers and corporate team members are able to attend. After an update from Hamblen, other executives discuss the importance of the energy

program from their perspectives. Jerald follows these talks with an educational segment where he may share a recent project that yielded energy savings.

"When you're doing that educational process, you're sharing," Jerald explained. "And when you share it across the energy managers, almost every time you see a guy or two taking a note. It's like the YouTube viral process, where you share it, and then they go back and share it amongst their group. That sharing across the plants helps us out a lot."

Obviously there is a lot more to energy management than simply sharing information, and Jerald makes it a priority to make himself available to all of the members of the energy team, along with the operations personnel that he works with regularly.

"I try to make myself very available so that they can call me," Jerald said. "We look at rebates all the time. I get emails all the time saying, 'Hey these are the three compressors, which one should I use?' So it just grows like a viral process, and we make more and more changes."

For Jerald, earning his co-workers' trust is especially important for when he visits in person. There may be crews at a particular plant that have been working there for thirty years, and the only thing they know is what works.

"When you're there to train them, some of them will say, 'I have to have 155 psi — that's the only way my plant runs,'" Jerald explained. "They've had plenty of engineers or someone from corporate come in and force something down their throat. So I walk in, explain my experience. (Jerald was an electrician in the Navy and worked in a cement plant for 15 years.) Once they're comfortable that I'm not just a behind-the-desk guy, then they open up, and we start really pointing things out.

And over time, we've dropped plants from 155 psi to less than 110."

Compressed Air at CalPortland

As previously mentioned, compressed air is not a large consumer of energy in comparison to CalPortland's other applications, but it remains a major focus. Jerald helped to elucidate the compressed air consumption at CalPortland:

"It's hard to quantify. With the cement plants, we're talking about a 25 MW load. Compressed air at a cement plant is probably 1 or 2 MW — if that. But in the smaller facilities, it becomes a bigger component, a bigger load of the overall electrical. It's definitely a top 5 focus — not necessarily a top 5 energy consumer."

CALPORTLAND ENERGY MANAGEMENT EARNS ANOTHER ENERGY STAR AWARD

CalPortland's cement plant in Mojave, CA

CalPortland uses compressed air in various ways throughout its network of operations. At just about every facility — from the ready-mix plants to the aggregate and mining facilities — cylinder operation for controlling gates and ramps is a key user of compressed air. In ready-mix plants and cement terminals, for instance, the cylindrically controlled gates and ramps fill trucks with sand, gravel and cement powder.

One of the largest compressed air consumers at CalPortland is an environmental application that takes place at the cement plants. Since there are limitations to the temperature of gases leaving an exhaust stack, the gases from the kiln must be cooled. To cool the exhaust effectively, water is sprayed into the air stream as it leaves the kiln. Compressed air is used to atomize the water, thereby maximizing the heat transfer and cooling the exhaust more efficiently. CalPortland has two 1000-hp compressors dedicated to this process at each of its cement plants.

Dust collection is another a major compressed air application at many of CalPortland's facilities. In addition, there are also smaller applications like vibrators and automotive shop compressors that consume compressed air.

Cognizance is Key

Treasure hunts, or events that engage employees to help identify energy-saving opportunities, have been one of the most effective methods for Jerald and his energy management team — especially in regards to compressed air. The treasure hunts help promote awareness among plant personnel of the costs associated with compressed air.

"Compressed air is a utility to them," Jerald told us. "You got some galvanized pipe, thread it together, and boom — I have a cylinder working. To put that energy knowledge in their brain, then the light goes off and they get it.

They understand why I focus on it. Then it becomes easy."

Jerald shared a great example of how simply being aware of the compressed air system can help save money — even though this particular example was more about fuel savings than electrical. One of CalPortland's facilities had been leasing a diesel compressor for five years. Facility personnel constantly filled it up with fuel, unaware that there were better options. After Jerald and the plant's staff identified the issue, bought a new compressor, and installed it, the payback was less than 6 months.

ENERGY STAR Support

While support from corporate certainly helps Jerald with his daunting task, he acknowledged that ENERGY STAR is another indispensable ally in his efforts to cut energy costs.

"ENERGY STAR really helps me out with their method of sharing practices," Jerald explained. "All the stuff I get to use in my day-to-day work is fantastic for me, but the marketing, the ENERGY STAR logo, that label is so important because people recognize it as a good thing."

With their latest award, CalPortland is now tied with 3M — a huge, multinational company — in ENERGY STAR awards, which is very significant for CalPortland. The positive marketing that comes along with the ENERGY STAR brand sheds a positive light on any company affiliated with it.

"I'm pretty passionate about the energy job. It's very exciting for me, and the ENERGY STAR award is a tool that we use," Jerald said. "It just gets attention. Even inside of our property, this logo is everywhere. It's on doors, on walls, on signs, and people know about it."

"I have two daughters, and they think I work for ENERGY STAR," Jerald continued. "When they see an ENERGY STAR refrigerator, they say 'hey dad, there's your company.' It's just such a big part of my job that I'm always excited to talk about it."

At the end of the day, if you are an energy manager and your children think that you work for ENERGY STAR, you are doing something right. BP

For more information about CalPortland, visit www.calportland.com.

To learn more about ENERGY STAR, visit www.energystar.org.

For more articles about ***Energy Management,*** please visit www.airbestpractices.com/energy-manager.

"I'm pretty passionate about the energy job. It's very exciting for me, and the ENERGY STAR award is a tool that we use."

— William Jerald, Chief Energy Engineer, CalPortland

DESICCANT AIR DRYER CONTROL

SEEING ISN'T ALWAYS BELIEVING

By Ron Marshall for the Compressed Air Challenge®

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➤ Many thousands of dollars of annual electrical savings are being achieved worldwide using special purge reduction controls on desiccant air dryers. These controls reduce the expensive purge air that must flow through the dryer to regenerate the desiccant beds. But, unexpected problems with these controls can cause hidden problems that can reduce or eliminate the savings.

Desiccant air dryers produce very dry, high-quality air for instrumentation and process requirements typically in the -40˚C dew point range. The twin tower heatless variety uses about 15 to 20 percent of the rating of the dryer as purge air to drive off the moisture that has been adsorbed by the desiccant beads, which are typically activated alumina. The simplest dryer controls use a fixed timer to switch sides, using one tower to dry the air while the other regenerates. The purge air is drawn off from the outlet side of the air dryer; therefore, the dryer becomes its own compressed air consumer. It is important to realize that for a basic heatless air dryer, the purge flow is related to the *rating of the air dryer,* and is not the percentage of the air flowing through it. For a 1000 cfm heatless air dryer, the 15 to 20 percent purge air loss would be between 150 and 200 cfm. At 10 cents per kWh, this purge would cost between $26,000 and $35,000 per year in annual electrical costs.

Some heated desiccant dryers reduce the amount of required purge air by using electric elements to heat the air before it comes in contract with the desiccant. This increases the effectiveness of the purge and reduces the amount of already compressed air that needs to be used to about half. The heaters — and blowers in the case of heated blower dryers — consume electric power, which negates some of the savings from reduced purge flow requirements. Because hot desiccant does not adsorb moisture, most heated dryers also require some sort of compressed air cooling flow to reduce the desiccant temperatures back down to ambient conditions.

Energy Turn Down from Controls

Just like air compressors, most air dryers see average compressed air demands and moisture loads that are less than the nameplate rating; therefore, the internal desiccant does not get fully saturated during each cycle. If controls are installed to detect when the desiccant is fully saturated, the purge cycles can be delayed or reduced — if rated conditions are not being experienced. This control can be called dew point dependent switching (DDS), automatic control, or a variety of other names. In all of these control schemes, there will be some sort of dew point measuring probe that will provide indication of the condition of the output air, and in most cases provide a signal to the dryer control.

If a dew point control was used on a heatless dryer that has an average compressed air loading of 40 percent, the controlled dryer will reduce the purge air requirements by about 45 to 50 percent (remember the dryer has to supply its own air). For the example

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

1000 cfm dryer, this would reduce operating costs by about $14,000 per year — more than paying for the typical $4,000 initial cost of purchasing the control option.

Remember: Probes are Sensitive

Various measurement methods are used to measure the dew point, but in all cases these probes are quite sensitive to shock and contamination. When these probes become contaminated or damaged due to water or lubricant accidentally getting into the unit, the output signal can be permanently altered significantly, reducing the effectiveness of the control mode or causing it to fail altogether. Probes that are reading too high cause the control to never save energy. Errors showing too low may cause the purge to fail altogether, allowing wet air to enter sensitive areas of the plant. It is very important to ensure the accuracy of the sensors by testing them against a standard or regularly changing them out with recalibrated units. Some recent experiences with dew point probes are as follows.

Building Products Manufacturer Experiences Costly Calibration Drift

A manufacturer of wallboard required desiccant-style compressed air because pipes and machines were located outdoors in unheated areas that could fall as low as -40°C. The compressed air system was upgraded, and an energy-efficient externally heated dryer was purchased with the dew point control option. The dryer was sized at 1500 cfm to service two 150-hp compressors. However, except in emergency situations, only one compressor ran most of the time at an average output of 370 cfm, or about 25 percent of rated flow.

When the dryer was new, the heater circuit only operated 20 percent of the time due to the action of the efficient controls. But, as time went on, the analysis of the energy input to the dryer revealed that the purge was operating 100 percent of the time. A thorough maintenance check was done on the unit and various check valves were changed on warranty, but none of these actions fixed the problem. As a last resort, a consultant was

DESICCANT AIR DRYER CONTROL: SEEING ISN'T ALWAYS BELIEVING

Figure 1: A check against a portable meter (top center) shows a 22˚F difference from the onboard probe.

called in to measure the dew point with a calibrated portable meter. The meter showed that, while the on board control showed a -37˚C dew point — not enough to trigger the purge reduction — the actual output was at -59˚C (Figure 1). Due to calibration drift, the sensor was far enough off to disable the control. This failure was costing $6,500 per year in electrical costs plus the cost of the additional maintenance activities to troubleshoot the dryer.

Problems with a Probe at a Paper Mill

A paper mill used a heated blower dryer to feed their instrument air system that needed -40˚C compressed air. The dryer was equipped with automatic dew point controls that delayed the start of the regeneration cycle until the desiccant was saturated. The dryer had a large visual display on it that was part of the normal maintenance checks of the plant operators. System personnel were to record key system parameters and place them on an hourly log to ensure proper operation. All appeared well for a number of months because the dew point stayed at a rock solid -70˚C (Figure 2), however, maintenance personnel were concerned because they were getting numerous calls about water in the instrument air.

An auditor checked the dryer and opened up the after filter drain, discovering it was full of water. Still the dew point meter read -70˚C. The auditor removed the probe and waved it around the steamy environment — still -70˚C. The probe had failed, and, in failure mode, the meter stayed at a very low level (Figure 3). None of the operators had thought to check things out further, as the meter was reading an acceptable value. The contamination caused significant damage to controls connected to the instrument system, and likely loss in product quality.

Damaged Probe Causes Inefficiencies at a Lime Products Processor

A lime products processor purchased a heatless dryer with dew point control as part of a compressed air system upgrade project. The 400-cfm dryer was sized so that it could handle 360 cfm of air-cooled compressor capacity. Purge flow was rated at 60 cfm. Unfortunately, the equipment was installed beside an unloading area, and the lime dust covered everything in the compressor room, including the compressor coolers and dryers (Figure 4, pg. 25). The lack of cooling caused overheated compressed air and free water to enter the dryer, and some of the water ended up contaminating the dew point probe. A compressed air audit was done and showed the actual average flow through the dryer was only 100 cfm plus dryer purge, yet the purge control never activated — even after a desiccant change.

Figure 2: Dew point on this dryer was always a rock solid -70˚C.

Figure 3: A check on the dryer after filter showed the -70˚C reading was in error.

In this case, the dryer purge totaled 38 percent of the total compressed air demand, by far the largest individual compressed air user. Testing against a handheld device showed that while the dryer was producing excellent dew point, the damaged probe was reading too high, disabling the control. The extra purge air flow kept a small 30-hp screw compressor running at only 10 percent duty, yet running unloaded full time for the remaining 90 percent (at 10 hp), further increasing the energy waste. A new probe was ordered, and the second compressor is now only required when the dryer purges. Leakage reduction will eliminate the operation altogether.

Faulty Probe at a Large Fertilizer Plant

A large fertilizer plant purchased a 4000 cfm heated blower style dryer to condition the air for the instrument air system. The dryer was oversized for future requirements; the actual capacity connected to the unit was 2000 cfm. The future requirements never materialized, but the dryer remained. This dryer was sold as a "purgeless" unit, using heated ambient air fed from a blower to regenerate the desiccant. Little did the purchaser know that the dryer used a cooling flow (not actually called "purge") rated at 2 percent of the dryer capacity. This is 2 percent over the 4-hour cycle, which is actually 8 percent flow in the 1-hour cooling cycle of the dryer. On a 4000 cfm dryer, this flow consumes 320 cfm, enough to keep a 75-hp compressor running.

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DESICCANT AIR DRYER CONTROL: SEEING ISN'T ALWAYS BELIEVING

Figure 4: When maintenance and general housekeeping is lacking, the controls can easily fail.

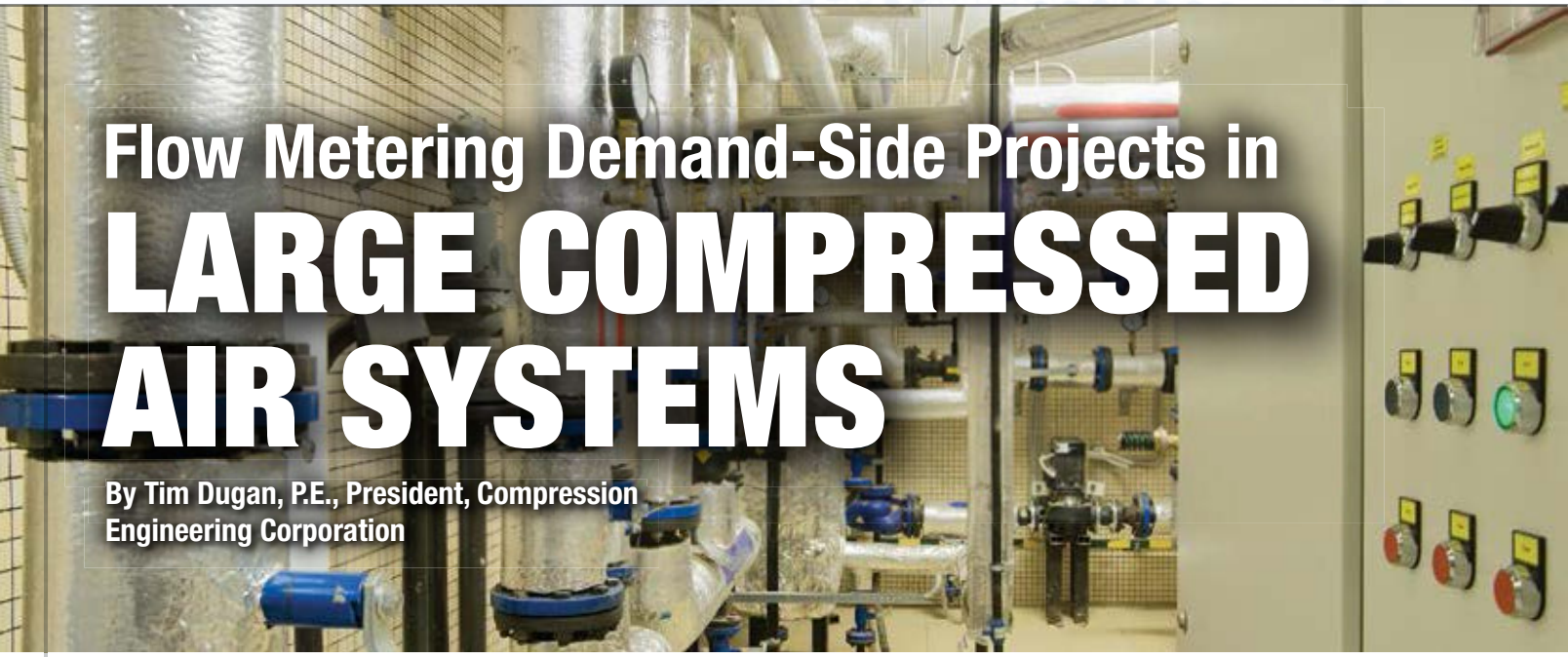
The compressed air system at this plant was at the edge of its maximum capacity; therefore, whenever the cooling purge came on, the system pressure dropped. This caused an additional 100-hp compressor — the only remaining unit — to run constantly just to be available to feed the cooling purge so low pressure could be avoided. The dew point controls on this dryer were turned off, causing maximum cooling purge flow, likely due to problems caused by a faulty probe.

Conclusions

Dew point controls can save significant energy costs if they are kept working correctly. It is foolish to rely absolutely on the accuracy of the installed meter; it must be tested and calibrated on a regular basis. An accurate handheld dew point probe is a good troubleshooting tool. Staff should also be trained to look for obvious signs that the dryer may not be working correctly. Not only can failure of the probe negatively affect dryer efficiency, but it can also cause extra compressed air equipment to operate. Probe failure can also lead to the failure of sensitive compressed air powered machinery and/or result in the final finished product being contaminated. BP

For more information about the Compressed Air Challenge, please visit www.compressedairchallenge.org.

To read more about ***Compressed Air Measurement,*** please visit www.airbestpractices.com/technology/instrumentation.



Flow Metering Demand-Side Projects in LARGE COMPRESSED AIR SYSTEMS

By Tim Dugan, P.E., President, Compression Engineering Corporation

As a reader of this journal, you are well aware that large compressed air systems often have significant wasted air — often from leaks — that represent tens of thousands of dollars of waste per year. However, it is our experience that the so-called "low-cost" measures identified often go un-repaired, while other more costly capital projects get funded. Why? With an ROI of a half year or less, they seem like IQ tests to many compressed air auditors.

The answer is that the low-cost items are really not low cost. They take the most expensive resource in the plant — key staff's time. Even if staff is aligned, it can be poorly utilized. Staff might have no idea where to start, start in an area that has little opportunity, run out of time and drop the project, and have no idea what their results are.

Some audits (not ours) do not point out a prioritized implementation plan, just a brief description of the measures. They are made to seem "easy" when they really are not. Oversimplifying will not work, but neither will making it too complicated. As Oliver Wendell Holmes, Jr. wisely said:

"I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity."

How can a demand-side project be started and ended in a reasonable manner, while many other maintenance activities are happening? How can you get concrete feedback as to the results of that project? And how does management know if scarce resources (time) were spent on the right opportunities? How can you avoid having the project literally evaporate into thin air?

This article will show how flow metering, done properly and aligned with a practical project methodology, can help you focus on the right project, achieve results, and document savings. It will help you find the *"simplicity on the other side of complexity."*

Definitions

Before I launch into the article, let me define several key terms:

Supply Side: The equipment and controls in all running compressor rooms.

Demand Side: The distribution system and usages in a compressed air system.

Key Performance Indicator: Abbreviated KPI, this is a calculated value, based on real-time monitoring, that indicates the energy (or other) performance of a system.

Dead Load: This KPI is the uncontrolled airflow required to keep the plant systems pressurized during a non-production period. It includes leaks, but also includes 24/7 demands like dust-collector pulsing or boiler gas valve control air.

Live Load: This KPI is the airflow required to produce product. It can be cylinders, aerators, blow-offs, etc. It is controlled by automatic valves and varies with production.

System Efficiency Slope: This KPI is the ratio of power to flow in a compressed air system. In other words, how much compressor and dryer power drops as flow in the system drops. A "flat-lined" system (like one with a compressor in blow-off) has no power savings associated with demand-side projects.

Hot Tap: Installation of a coupling, ball valve and drilled hole in a pressurized line. This requires a specialized drill and contractor who is experienced in operating it. Most mechanical contractors can do this.

Recommended Project Methodology

In a nutshell, I recommend a "top-down" and "zone-based" process instead of a "bottom-up" one, with the right kind of metering. The recommended steps are as follows:

1. Install metering and perform technical work.
2. Plan first zone project.
3. Implement first zone project.
4. Measure project results and learn.
5. Repeat in other zones.

1. Install Metering and Perform Technical Work

This is the part of the project that we recommend an outside specialist for, one who has significant auditing and metering experience. Since the purpose of this article is to show how flow metering facilitates the project, we will highlight the flow meter sections:

- **Meter Supply Side First**
  This can be done temporarily at first, with the ability of integrating into the plant's SCADA system as the projects develop and budgets are justified. In some systems, this metering is already installed:
  - Current (or power) transmitters on all compressors and dryers.
  - Flow meter at the outlet of each compressor room. We currently recommend thermal mass flow meters like the VP FlowScope from VP Instruments (Figure 1, www.vpinstruments.com) and Prime by Sage (Figure 2, www.sagemetering.com). They are relatively inexpensive, can be hot-tapped, and can work in any line size from 2 inches and up. Meter after the dryer, since they are only for dry air.
  - A smart logging system that can be programmed to collect data and calculate KPIs. IT support is usually not available for exploratory projects, so a canned logging system is recommended. The logging interval needs to be set fast enough to capture system

FLOW METERING DEMAND-SIDE PROJECTS IN LARGE COMPRESSED AIR SYSTEMS

dynamics. We currently recommend VP Instruments VP Vision or Logic Beach IL80.

- Develop a total flow, total power and system efficiency metric. See Figure 3 for an example.
- The above instrumentation can be purchased and installed for about $8,000 to $15,000 for typical compressed air systems (200 to 800 hp). That is less than 10 percent of one year's electric cost to operate the system — well worth it.

Program Logger with KPIs

- Either in the logger or a spreadsheet, develop a supply-side profile with several key performance indicators, particularly dead load, live load and system efficiency slope. KPIs should be visible to all. In the early phase of a project, this might have to be done via individual reports.
  - NOTE: If the system slope is too "flat" (less than 14 kW per 100 scfm reduced), then the supply side needs to be addressed in a project before the demand side. That is outside the scope of this article.
- Determine realistic magnitude of overall savings opportunity. Demand-side projects improve two KPIs:
  - Reduction in the dead load and associated kW (see Definitions).
  - Reduction of the live load and associated kW.

Figure 1: The VP FlowScope from VP Instruments

Figure 2: The Prime thermal mass flow meter by Sage

Find and Meter Zones of Potential Opportunity in Demand Side

- Determine potential zones of opportunity via a walk-through.
- Hot tap and temporarily flow meter the perimeter of all zones with potential opportunity. We recommend a thermal mass flow meter with built-in data logging. These don't have to be done at the same time, so you only need a few flow meters. Ideally, log the flow for a couple days to see highs and lows, including a no-production period if possible (See Figure 4, pg. 30).
- Hot taps cost about $500 each when several are done at the same time. The cost for a portable flow metering system ranges from $3,000 to $7,000, which is less than 5 percent of one year's electric cost of the system — well worth it.
- Calculate the net consumption of each zone. Flow might be coming and going, so it is important to have the meters in the right direction. We know of only one bi-directional thermal mass flow meter on the market.
- Prioritize zones by wasted air.
- Identify "classes" of measures that are in each zone. For instance, leaky hoses or stuck open solenoid valves.

2. Plan First Zone Project

Once the flow metering has identified the areas with the most opportunity, we recommend starting with one zone as the first project. This might or might not be the zone with the most opportunity. Sometimes that one is the most complex. We have recommended that approach at one huge plant, and they installed more than 50 flow meters. The complexity of the projects that resulted were beyond their experience to implement, so they have delayed the start of the project. It might be best to start with a more modest project.

Establish Flow Reduction and Average kW Goal

This can be tricky. You might need to bring your technical resource back in for this. Just because the zone metering identified a large constant demand during a non-production period, and several large leaks are found, the dead load might be from something besides leaks. It might take some additional testing on a non-production period to determine what the source of dead load is. A recommended methodology is as follows:

- During a non-production period, with flow meter(s) installed and logging, shut off sub-zones. The area that made the most difference is where to look first. It might be a leaky area, or it might be

an air lance that is needed during production that was left on during non-production.

- Determine flow change and hours per year opportunity. For the "non-interlocked" air bar, it might be a high flow for a small number of hours. For leaks, it might be a small flow for a large number of hours.
- Estimate the total opportunity for the zone. Usually some percentage goal is used for leaks (usually around 50 percent of all leak load, or maybe all of found leaks), plus some goal for interlocked air demands.
- Calculate average kW opportunity and $/yr:
  - Savings = sum of each flow reduction x kW/scfm slope x hours x energy rate
  - For instance, for 100 scfm leak reduction, 300 scfm off for 2 days per week, a 20 kW/100 scfm slope, and $0.08/kWh rate:
    - » Average kW savings goal = [(100 / 20) + (300 / 20) x 2/7] Average kW = 9.3 kW
    - » Cost savings goal = 9.3 x 8760 x $0.08 = $6,507 / year

Establish One Project Manager/ Planner for the Project

This person collects data and manages the project.

Identify a "Finder" and a "Fixer"

In some systems and plant organizational cultures, these two steps need to be done by separate departments. Aligning them closely will improve project efficiency and organizational learning. The

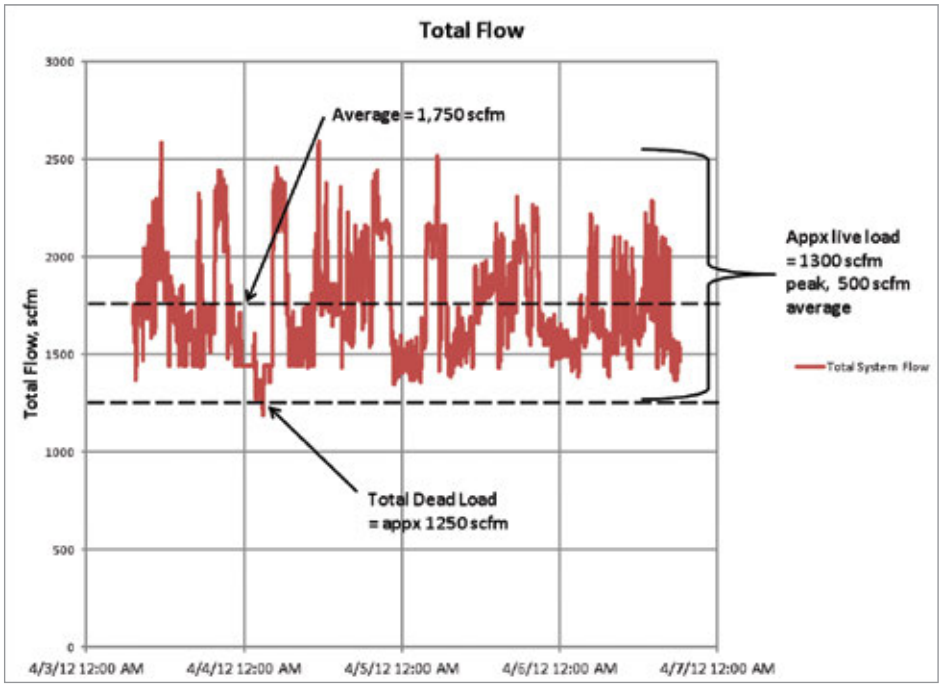


Figure 3: Typical Total Flow Profile

FLOW METERING DEMAND-SIDE PROJECTS IN LARGE COMPRESSED AIR SYSTEMS

perfect "Superman" would do everything from assessment to verification. In the real world, a plant needs to align available staff as well as possible. The project planning recommended above will integrate efforts done by separate parties. In some cases, these functions need to be a contracted out. The "finder" can be an air auditor, and the "fixer" can be a mechanical contractor.

- **Train "Finder" and "Fixer"**
  The Compressed Air Challenge has a great Fundamentals class. There are other resources. They also need to be trained on data collection and cost documentation.

- **Create One Work Order for the Zone**
  Without cost documentation, you won't be able to justify the next project, so measure costs at the same time as energy reduction. The logistics need to be determined. Some areas can be only be shut down at specific times. Most demand-side projects require a shutdown period for detailed assessment and repair. Lock-out/tag-out, hot work, confined space, etc. plans are developed at this time.

3. Implement First Zone Project

If planning is done well and metrics are in place, this part can focus on the details, and the measurement will happen on its own.

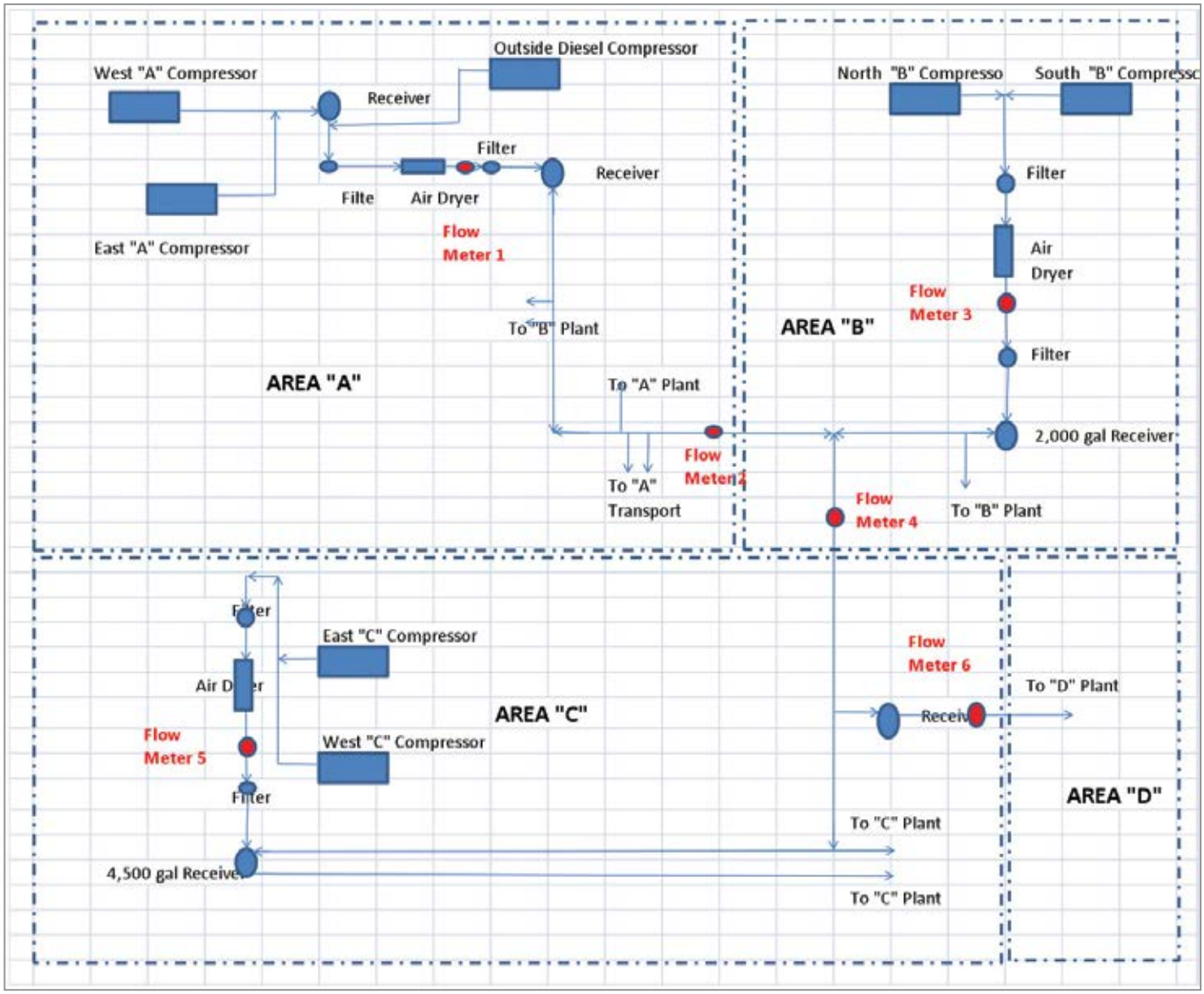


Figure 4: Typical 3-Zone System Diagram

- **Start with One "Class" of Measure**
  - For instance, leaky hoses or stuck open solenoid valves. The finder/fixer would go through as many of those as possible to gain experience, refine methods, and see results. Then move on to the next class, like air bars.
- **If Finder and Fixer are Separate, Develop Detailed Action Items**
  - This is where the "leak audit" can come in handy.
- **Combine Compressed Air Project with Other Projects in Same Area if Possible**
  - It is hard to justify resources solely for reducing compressed air usage, and shutdown times are obviously used for mission-critical maintenance. So, combining air reduction efforts for the same time as other work might be needed. However, we recommend that you manage the compressed air part of the project separately.
- **Monitor Project Status and Conclude Project When Done**
  - The project can be ended either when enough results have been obtained or when efforts are not resulting in progress.
- **Keep Work Order Open Until the "Zone" Project is Complete**

4. Measure Project Results and Learn

The project metrics are simple — energy saved and costs incurred. The zone-based flow metering is the key item that shows what you really accomplished. The method above will make it easy to report results. Lessons learned from this first zone project need to be used in the next, and passed on if different staff are implementing it.

5. Repeat in Other Zones

Once the team has worked through one zone, it will be pretty clear what to do next. The numbers will be your guide, and the staff will take the logical next step, going after the next priority area. It will start to get simple. You will be on the *simplicity side of complexity!* BP

For more information, contact Tim Dugan, P.E., President, Compression Engineering Corporation, tel: (503) 520-0700, email: Tim.Dugan@compression-engineering.com, or visit www.comp-eng.com.

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Managing Change in the Industrial Air Compressor Industry Part 2: TAKING CONTROL OF YOUR FUTURE

By Ron Nordby, Contributing Editor, Nordby Consulting

As the 21st century progresses, the environment is becoming very unsettling for distribution in the industrial air compressor industry. The forces of change discussed in Part 1 of this two-part series created a situation very unfamiliar to distribution. The stability experienced by the industry from 1960 to 1990 was displaced by the volatility of the last 25 years. Consolidation of manufacturers and distributors, loss of channel power, evolution of hybrid channels to market, and intense pressure on profitability are just a few of the major forces distribution has had to deal with. Distribution's tentative reaction to these forces has resulted in both distributors and manufacturers questioning the long-term viability and relevance of distribution in the industrial air compressor industry.

While a pessimistic attitude about the future of distribution has some validity, there are also reasons to be optimistic. We can all agree that many distributors continue to struggle with adapting to the new business environment, but we must also acknowledge that there are distributors that are not only surviving but flourishing. What makes these distributors different? What can we learn from them, and how can we apply it in our own businesses? This is the focus of Part 2 — "Taking Control of your Future."

When analyzing these high-performing distributors, it comes as no surprise that they have integrated strategies that allow them to adapt and succeed. While there are strategies unique to certain distributors, there are also strategies that are commonly found in successful distributors. Four of these strategies are:

- Creating a visionary culture
- Developing a culture of profitability
- Creating customer loyalty
- Establishing a balance of power in the manufacturer/distributor relationship

"The future belongs to those who see possibilities before they become obvious."

— John Sculley, former CEO of Pepsi-Cola and Apple

Even though high-performing distributors may not demonstrate total assimilation to all of these strategies, they have embraced them at some level. There is no question that a definite relationship exists between these strategies and the success of distribution. Careful analysis shows the greater the integration of these strategies, the greater the success.

Creating a Visionary Culture

John Sculley, the former CEO of Pepsi-Cola and Apple Computer, once said: "The future belongs to those who see possibilities before they become obvious."

One of the critical characteristics common among high-performing distributors is their ability to create a visionary culture within their organizations. They embrace the visionary culture because they recognize that their long-term growth and viability can only be sustained by implementing a process of continuous improvement through innovation and change. These companies readily accept change because they are always looking to make the future better than the past.

Distributors that are able to develop a visionary culture create a major competitive advantage for their organizations. The business environment confronting distribution now and in the future will be difficult and uncertain. Distributors will be faced with decisions involving every aspect of their businesses, many of which will have a major impact on the future success and viability of their organizations.

Distributors that anticipate the direction and magnitude of change and have processes in place to proactively respond strategically will be prepared to take advantage of and manage opportunities. They will be in a better position to efficiently leverage their resources, maximizing their ability to secure long-term growth and profitability. Distributors that are reactive in their response to change will consistently underperform and place their long-term growth and viability in jeopardy.

Embracing a visionary culture is important for all distributors, but it is vital for small- and medium-sized distributors. It is vital because the effects of change in the future will have a disproportionate impact on the small- and medium-sized distributors. With the level of resources required to compete in the future increasing, making the right decisions and minimizing mistakes is crucial for this segment of distribution.

A successful shift to a visionary culture gives distributors the ability to anticipate and react proactively instead of reactively to changes in their business environment. Distributors that create a visionary culture execute strategies that provide a platform for successful implementation. These strategies include:

1. **Networking within the industry**
   Networking will deliver a greater ROI than any other activity you can perform. It has the capability to provide insights into the future direction of the industry that would not ordinarily be readily available. Networking also plays a role in providing information and expertise on when and how to take advantage of the opportunities that the future will provide.

2. **Empowering the organization**
   Developing a visionary culture cannot be the responsibility of one individual. In order to be successful, it must have the involvement and full support of the entire organization. Many times the best insight into managing and adapting

MANAGING CHANGE IN THE INDUSTRIAL AIR COMPRESSOR INDUSTRY PART 2:

originate from individuals who are closest to the ground level of the organization.

3. **Strategic planning development**
While having a visionary culture is essential, the advantages are marginalized without the development of a strategic plan. The primary purpose of the strategic plan should be to provide not only clarity of direction, but also a flexible framework for implementation capable of responding to changes in an uncertain business environment.

Developing a Culture of Profitability

Paul Marsden, a British writer and business psychologist, noted: "Business is all about solving people's problems — at a profit."

The success of any business is primarily dependent on its ability to consistently earn a profit. Profit is necessary for growth, and growth is the main driver of success. In order to achieve consistent long-term growth and viability, profitability must be the first priority of a business.

Studies consistently show that profitability ranks as a high priority for distribution. Yet despite large investments in technological and operational improvements, the overall level of profitability of distribution has not kept pace. This is a major cause of concern for distribution. They realize that they are facing a business environment that will not only require continued and increasing reinvestment, but will also present challenges that tend to erode distribution profitability.

Surprisingly, despite understanding the importance of profitability, many distributors have not made the commitments necessary for profitability improvement. They continue to place their focus on revenue (sales) at the expense of profit, instilling this attitude into their businesses in the process. These distributors fail to realize that there are a number of variables that influence profitability, including profit margin and expense management, which are the most important and have the largest impact.

They also neglect to recognize that profitability improvement requires a total organizational commitment, reflecting the understanding that every employee has a role in the process and can impact the result either positively or negatively.

While opportunities to improve profitability are numerous, two major business strategies required include:

1. **Establishing total commitment of upper management**
Any initiative to improve profitability has to start with a total commitment from upper management. Lack of commitment will make it impossible to gain organizational participation in the process, and will hinder the ability to instill a culture of profitability throughout the organization.

2. **Instituting profitability awareness to all employees**
In order to effectively manage profit margins and operational expenses, distribution management needs to extend the involvement to all employees. This is critical because employees in all departments of a distributorship have a significant impact on margins and expenses. As long as management neglects to educate and hold employees responsible for their role in controlling profitability and expenses, their efforts to maximize profitability will continue to be marginalized.

Creating Customer Loyalty

How can a distributor take a mediocre product line and turn it into a market share leader in their area? Why is distribution still the dominant channel to market in the industrial air compressor industry? The answer can be attributed to the position distribution holds in the channel that allows them to exert influence on the customer at a far greater level than manufacturers have been able to achieve. This positioning has established them as the main driver in the creation of customer loyalty, and — by extension — brand loyalty, awareness and market penetration. The creation of customer loyalty is one of the main values

"Despite large investments in technological and operational improvements, the overall level of profitability of distribution has not kept pace. This is a major cause of concern for distribution."

— Ron Nordby, Contributing Editor, Nordby Consulting

TAKING CONTROL OF YOUR FUTURE

distribution can provide to the channel and is crucial if distribution is to maintain its relevance in the industry.

It is also critical since both manufacturers and distributors are dealing with a mature industry, with highly saturated and limited markets, and where attaining sustainable growth and profitability is increasingly difficult. Studies have shown that customer loyalty is directly linked to increased sales, profitability and market share. These results are achieved because loyal customers exhibit certain characteristics. They are more receptive to cross selling, up selling, and are more inclined to pay a premium price. They are also less likely to pursue competitors and will support the product lines of their preferred suppliers. It is important to remember that while customers may prefer brands, they reserve loyalty for people.

So what does creating customer loyalty involve? It involves providing superior products, programs and services that customers value and perceive as superior to other competitors. This may sound simplistic, but it is far more difficult than most believe. Customers have become increasingly sophisticated and more demanding, requiring their distributors to be more than just competent. They are looking for distributors that consistently deliver more than they promise, provide solutions, and differentiate themselves in supporting their needs in product and services.

Some of the strategies that distribution needs to adopt in order to maximize customer loyalty include:

1. **Develop a value-added philosophy**
   Developing a value-added philosophy is a customer focus — not a competitor focus. It means measuring your success on making a difference to your customer instead of making a sale, where the programs and services you offer add value, not cost. Ultimately, developing a value-added philosophy means consistently providing great customer service.

2. **Enhancing the capabilities of employees**
   The future demands of customers and manufacturers will require distribution to upgrade the capabilities of its employees. This would involve providing resources to establish ongoing training

MANAGING CHANGE IN THE INDUSTRIAL AIR COMPRESSOR INDUSTRY PART 2:

for all employees, as well as increasingly sophisticated support equipment.

3. **Provide specialized technical capabilities**
   The demands of customers have become more sophisticated and will necessitate specialized skill sets, such as engineering (both mechanical and electrical) and advanced computer and information technology (IT) expertise.

Establishing a Balance of Power in the Manufacturer-Distributor Relationship

One of the consequences of the last 20 years has been a gradual shift in the balance of power within the manufacturer-distributor relationship. This shift in power to manufacturers at the expense of distribution has occurred for a number of reasons, including:

- The desire of manufacturers to control their channels to market
- The inability of distribution as a whole to maximize its value in the channel
- The tendency of distributors to underestimate and effectively communicate the value they bring to the channel

High-performing distributors recognize the importance of establishing and maintaining a balance of power in the manufacturer-distributor relationship. They understand that it is crucial for the long-term success and viability of their companies. Realizing that short-term imbalance can be tolerated, long-term imbalance results in conflict, distrust and eventually the dissolution of the relationship.

The realization that in order to maximize long-term potential of the relationship, there must be a balance of power seems like an easy concept to understand. However, history shows there is always a natural tendency to increase power in order to control the relationship. These efforts are usually masked in terms like partnership and loyalty. While these are noble concepts, they give the impression of mutual benefit for both partners while the reality of the advantage is usually much more one-sided.

Balancing the power in the relationship is not always an easy proposition for distributors. Many distributors, especially small to medium size, find themselves at a disadvantage in the manufacturer-distributor relationship. Unlike large distributors, small- and medium-sized distributors do not have the advantage of critical size and purchasing power that gives large distributors increased influence in the relationship.

Business strategies in achieving a balance of power in the manufacturer-distributor relationship include:

1. **Maximize value in the channel**
   Distributors must consistently maximize their value to both manufacturers and customers. If distributors are unable to provide value to the channel, manufacturers will look for other ways to provide it through alternative sales channels.

2. **Proactively drive communication**
   Distributors must adopt a philosophy of communicating the value they bring to the relationship. This can only be achieved through open communication between distributors and manufacturers that defines the role and responsibility each is to bring to the channel.

3. **Establish the needs of both parties**
   Understanding the needs of both parties and the importance of compromise is critical in a manufacturer-distributor relationship. Failure to embrace both concepts makes it virtually impossible to build a mutually beneficial relationship.

"Make no mistake — distribution is all about being responsive to change. Everything involved with distribution is changing, the industry, markets, role in the channel, and relationships with suppliers and customers."

— Ron Nordby, Contributing Editor, Nordby Consulting

TAKING CONTROL OF YOUR FUTURE

4. **Develop the relationship**
   Building a good working and personal relationship between manufacturers and distributors is an important factor in maximizing the potential of the channel. It creates an environment that promotes open communication and enhances cooperation between partners. While it is essential to recognize the importance of developing a good working and personal relationship between manufacturers and distributors, it must be recognized that ultimately it is a business relationship.

Summary

Leon C. Megginson, former Professor of Management and Marketing at Louisiana State University at Baton Rouge, once wrote: "It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change."

Paraphrasing Megginson: It is not the strongest distributor that survives, nor the most intelligent, but the one that is most responsive to change. Make no mistake — distribution is all about being responsive to change. Everything involved with distribution is changing, the industry, markets, role in the channel, and relationships with suppliers and customers. While these changes have been significant, they will not only continue, but they will also accelerate. The future of distribution will be dependent on the willingness and ability of distribution to integrate the four strategies discussed into their organizations. If they are successful, they will position themselves to take advantage of the opportunities, adapt and manage change, and take control of their futures. BP

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

The Relationship Between PRESSURE AND FLOW in a Compressed Air System

By Chris Downs, Sales Manager,
Compressed Air Best Practices® Magazine

After more than 25 years in the compressed air industry, it still amazes me that many plant personnel and even those who sell compressed air products for a living don't fully understand the relationship between flow, or volume (cfm), and pressure (psig). Walk into many body shops or small manufacturing plants, and you will find the compressor operating at an elevated pressure to satisfy the "demand." If a plant has low air pressure on the production floor, what is the first thing that the maintenance professional does? You guessed it: He or she "jacks" up the pressure on the compressor, not realizing that he or she made the problem worse. Furthermore, the majority of production-line personnel do not have a clue that compressed air isn't free. There have been many articles written on this subject over the years, but many of them have been so technical that it was difficult to follow for a person outside of the industry. In this article, I try to address the subject in a way that non-engineering types can understand.

Compressed Air Isn't Free

I remember an experience that occurred many years ago when I worked for a major U.S. compressor distributor. After thoroughly reviewing a compressed air system, I sold a 200-hp rotary screw compressor to a granite mining facility in east Georgia. One way granite is mined is by using a high-temperature torch that melts the rock to enable a slab to be removed. This process is performed many times vertically down several hundred feet beneath the ground. An air compressor is needed in this process to project the flame. As you can imagine, this is a hot environment for the employee who is working the torch.

A couple of weeks after the compressor was installed, I received a call from the owner, who was complaining that the compressor wouldn't hold the desired pressure as the ambient temperature increased throughout the day. Being a degreed engineer, I knew that what he was describing wasn't possible. I also knew that the only way for me to solve this phenomenon was to visit the site to gather data. I arrived early the next morning, and the compressor setting was at 115 psig discharge pressure, just where it was supposed to be. However, as the day got hotter I witnessed just what the owner had said — the discharge pressure began to fall. I knew that this had to be a "system" problem and not a "compressor" problem, so I began to walk around the quarry to see what I could find. After several minutes of investigation I found the culprit, a quarry worker had opened two 1/8-inch ball valves to direct some of the compressed air on his face in an effort to cool himself in this sweltering environment. I instructed the owner to have those two

"The majority of production-line personnel do not have a clue that compressed air isn't free."

— Chris Downs, Sales Manager, Compressed Air Best Practices® Magazine

valves closed. When we arrived back at the compressor, the machine was at full pressure.

The moral to the story is that the quarry worker didn't know that by opening two 1/8-inch valves under 100 psig discharge pressure the system would lose approximately 100 cfm, which equates to a 25-hp rotary screw air compressor (rule of thumb is that a rotary screw compressor delivers 4 to 5 cfm per 1 hp). Therefore, out of these two relatively small leaks, the 200-hp compressor was losing essentially one tenth of its overall capacity. A handy rule of thumb to remember is that a 1/4-inch opening/orifice will leak approximately 100 cfm at 100 psig. Remember, compressed air is "stupid" (i.e. it will follow the path of least resistance). A comical fact when conducting a full plant air audit (both supply side and demand side) is that in many cases the largest event that spikes the system is a shift change. Why you ask? Because production workers typically blow off their workstations between shift changes. Funny but true!

What is the Relationship Between Flow and Pressure?

Another little known fact about compressed air from an end user's point of view is that discharge pressure has a direct impact on flow. In fact, we know from Boyle's Law that:

$$P1 \times V1 = P2 \times V2$$

Where P1 is the initial pressure, V1 is the initial volume, P2 is the final pressure, and V2 is the final volume.

Let's take a look at an example of how to use Boyle's Law in a real-world scenario:

- A plant has a 25-hp rotary screw compressor rated at 100 acfm at 100 psig.
- However, they can only maintain 80 psig in the production area.
- How much more compressor hp does the plant need to maintain the required 100 psig in the plant header?

Using Boyle's Law:

$$100 \text{ acfm} \times 100 \text{ psig} = (X) \text{ acfm} \times 80 \text{ psig}$$

Using a little Algebra:

$$100 \text{ acfm} \times 100 \text{ psig} / 80 \text{ psig} = 125 \text{ acfm}$$
$$125 - 100 = 25 \text{ acfm}$$
$$25/4.5 = 5.5 \text{ hp (I assumed 4.5 cfm per 1 hp)}$$

In this simple example, I would recommend adding a 7.5-hp compressor to the system to add volume, which will stabilize the discharge pressure to the desired level.

What is the Cost of Over-Pressurizing the System?

An industry term that has been used in recent years to describe supplying more pressure to the system than is necessary is "artificial demand." For example, if the production floor only needs 75 psig to maintain steady production, why maintain the compressed air header at 100 psig? The artificial demand in this case is 25 psig. A rule of thumb to remember is that for every 2-psi increase in discharge pressure, the energy (measured at the compressor) goes up by 1 percent.

To determine the "critical pressure" in a production process, you have to leave the comforts of the compressor room and venture out onto the production floor. It's common to see pressure regulators installed on

THE RELATIONSHIP BETWEEN PRESSURE AND FLOW IN A COMPRESSED AIR SYSTEM

production equipment — sometimes set for pressures well below the system/header pressure. I've personally been in plants where the vast majority of the production equipment only needed 75 psig to function properly, but the plant air header was being maintained at 100 psig. Obviously, there are pressure drops across the clean-up equipment (dryers and filters), which could equate to 10 to 15 psig or more. But if the system was properly sized and maintained, this should be easily factored into what to set the discharge pressure of the compressor. Assuming that the clean-up equipment and piping distribution system were poorly sized and maintained, which equates to a 20-psig pressure drop, you could still cut the pressure on the compressor operating at 125 psig to 100 psig, and still maintain the desired 75 psig on the production floor. Dialing the pressure down by 25 psig, the plant could save 12.5 percent energy on an annual basis. To calculate the energy savings, use the energy equation below:

$$\frac{\text{BHP} \times .746 \times \text{\# hours/year} \times \$/\text{kWh}}{\text{Motor Efficiency}}$$

Note that compressors are rated in hp, not kW. To calculate kW, multiply BHP by the constant (.746). Also note that rotary screw air compressors pull more hp than the motor's nameplate rating. Typically compressor manufacturers utilize a 1.15 service factor motor, meaning that the motor can safely operate 10 to 15 percent beyond its nameplate rating. Therefore, a 200-hp rotary screw air compressor actually pulls on average 220 BHP at full load, depending on the manufacturer. The exact BHP can be derived from the manufacturer's technical datasheet, or by contacting a representative of that brand. Let's go through a quick example:

- 200-hp compressor operating at 125 psig (220 BHP)
- 8,000 hours per year operation
- $0.10 per kWh (the energy cost can be calculated in most cases by obtaining a copy of the end user's power bill. For this exercise we can calculate the "blended" rate by dividing the total dollar amount of the bill by the total kW usage). For this example, I use $0.01/kWh

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- Motor efficiency of 95%
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$$\frac{220 \text{ BHP} \times .746 \times 8000 \text{ hours} \times \$0.1 \text{ kWh}}{.95} = \$138{,}206.00$$

$131,924 x 12.5% = $17,276.00 per year every year in energy savings!

Keep in mind that this example is for a modulating or load/no load controlled compressor, possibly without adequate storage. If the compressed air system was properly audited on the supply and demand side, which resulted in adding the proper amount of storage, pressure flow controller, etc., then these savings could be much larger. A little hint on determining the critical pressure if it isn't readily known — simply turn down the pressure switch on the compressor(s) by 2 psig, then wait to see if anyone complains about inadequate plant air pressure. Keep doing this over a period of time, and you will eventually have someone scream at you. Then turn it up 2 psig, and leave it alone.

Another major benefit to dialing down the system/header pressure is that any leaks in the distribution of the compressed air will be reduced. Another way to reduce leaks is to have a leak audit performed and implemented. However, remember that you can effectively reduce leaks, but you can never completely eliminate them.

Education is Key

Compressed air isn't rocket science, but you do have to know some basics before you can optimize the system. My philosophy to sales has always been to be a consultant and to educate the end user, not to merely be a salesman. If you help an end user solve a problem, that person is much more apt to buy something from you in the future. In addition, an educated customer is a quality customer. BP

For more information, contact Chris Downs, tel: (251) 510-2333, email: chris@airbestpractices.com, or visit www.airbestpractices.com.

To read more about ***System Pressure,*** please visit www.airbestpractices.com/system-assessments/pressure.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Chicago Pneumatic Introduces New Rotary Screw Compressor Ranges

Chicago Pneumatic (CP) is dedicated to improving the design and technology of its product offering. Therefore, CP recently introduced the new CPBg 35- to 50-hp rotary screw models.

The CPBg and CPVSd rotary screw air compressors

The CPBg models are fixed speed with gear drive, and have four pressure variants, including 100, 125, 150 and 175 psig. The CPVSd models are variable speed with direct drive, and have a pressure range from 73 to 188 psig. The CPVSd models also provide speed regulation up to 83 percent.

The premium motors produce lower energy costs, greater protection and reliability. Easy accessibility and installation are provided by both ranges, as well as a low sound enclosure. The large, hinged doors and removable panels make service simple and convenient.

The D variant is available for both fixed and variable speed ranges. It includes an integrated dryer and coalescing filter to offer an all-in-one concept and proper air treatment. Combined with the low noise level, the D variant offers the flexibility of installation near point of use.

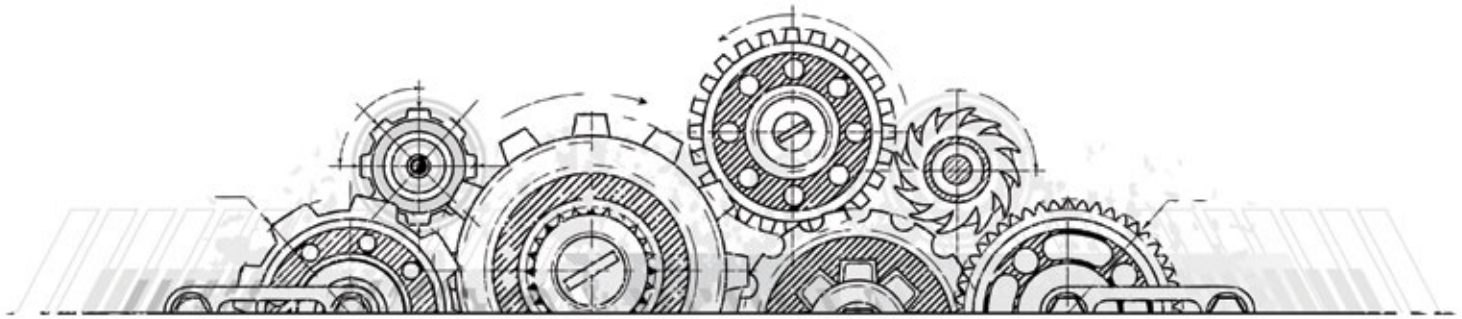
Overall, each range has a wide offering that achieves savings through energy efficiency, reduces operating cost, and fits a variety of compressed air requirements for industrial applications.

For more information, visit www.cp.com.

Atlas Copco Launches New 'Plug-and-Play' On-Site Nitrogen Generators

Atlas Copco has launched a new generation of NGP+ on-site nitrogen generators with pressure swing adsorption (PSA) technology that produces nitrogen with purities of up to 99.999 percent while reducing energy consumption by 50 percent when integrated with an energy-efficient compressed air network. The NGP+ can be plugged directly into an existing compressed air installation and offers an independent, reliable and flexible supply of nitrogen gas.

"When combined with Atlas Copco's innovative and energy-efficient compressors, on-site nitrogen generation can offer significant benefits compared to bulk nitrogen delivery," said Robert Eshelman, vice president, Industrial Air Division, Atlas Copco Compressors. "On-site industrial gas generators offer a more sustainable and cost-efficient solution by eliminating the need for transport, handling and administrative costs while increasing productivity and lowering energy consumption."



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Sustainable Energy Savings with Compressed Air Best Practices®

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

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

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

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

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

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

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

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

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

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RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Available in flows from 200 scfh to 21,860 scfh, Atlas Copco's NGP+ PSA on-site nitrogen generators utilize high-quality carbon molecular sieves to adsorb oxygen molecules from compressed air. When tuned perfectly to the compressed air network, the NGP+ adsorbs more oxygen for the same input of compressed air compared to standard installations. The NGP+ also features sensors to easily adjust the nitrogen purity and pressure, and remote monitoring technology to ensure reliability and optimize energy efficiency.

Atlas Copco's new NGP+ on-site nitrogen generator

The new NGP+ complements Atlas Copco's full range of on-site gas solutions, which includes nitrogen generators — also available with membrane technology — and oxygen generators with PSA technology. For applications such as laser cutting and bottle filling, Atlas Copco will launch a complete package with compressors, air treatment and nitrogen generators that delivers nitrogen at 5075 psi.

For more information, visit www.atlascopco.us.

Sparks Dynamics Launches New Monitoring and Analytics System

Sparks Dynamics, a provider of intelligent solutions for industrial customers, recently launched its latest ReMASTER Monitoring and Analytics system based on Tridium JACE technology.

The Sparks Dynamics ReMASTER system offers industrial customers a way to capture and analyze their compressed air system's data. ReMASTER's core processor is a Tridium (Honeywell) JACE running the Niagara software framework.

ReMASTER with FLIR Thermal Imaging Camera and Insertion Mass Flow Meter

The ReMASTER panel uses standard Modbus communication and can collect data on energy, flow, pressure and temperature as well as control panel data. It also features additional add-ons such as thermal imaging and vibration detection.

All the data collected is streamed to the Sparks Cloud, mitigating firewall issues, and can be viewed online using ViewMaster software. The analysis of this data can be used to determine inefficiencies and areas in need of optimization. Data analytics developed in conjunction with the National Institute of Standards and Technology (NIST) can also send alerts to the user for any system anomalies. The ReMASTER system allows industrial facilities to baseline, optimize, implement and verify energy efficiency projects.

For more information, visit www.sparksdynamics.com.

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EXAIR Unveils New Internal Mix Atomizing Spray Nozzles

EXAIR's new 1/2 NPT internal mix atomizing spray nozzles atomize fluids in a range of spray patterns and liquid volumes for a variety of uses. They combine liquid and compressed air inside of the air cap to produce a fine mist of atomized liquid that can be easily adjusted to meet the needs of your application. These 1/2 NPT spray nozzles provide high liquid flows up to 303 GPH and are available with multiple spray patterns including narrow angle round, wide angle round and flat fan.

EXAIR's new 1/2 NPT internal mix atomizing spray nozzle

With EXAIR's atomizing nozzles, you can coat, cool, treat and paint a variety of products using compressed air and liquids with a viscosity of up to 300 centipoise. Used with water, atomizing nozzles are an efficient way to evenly cool hot items in your automated process. They are also commonly used with light oils, rust inhibitors, chemicals, paints and dyes.

The stainless steel construction of these atomizing nozzles adds to their durability and corrosion resistance. EXAIR atomizing nozzles are available with 1/4 and 1/2 NPT connections and in a variety of sizes and shapes to meet your needs. All models are adjustable, come with our 5-year Built to Last Warranty, and are CE compliant.

For more information, visit www.exair.com/lintmix.htm.

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RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

JORC Releases New Air Treatment Products

JORC, a manufacturer of compressed air condensate management and air leak prevention solutions, recently introduced three new air treatment products. They include the Smart Guard Mini electronic condensate drain, a 7000 psi version of the Smart Guard, and a smaller version of the Mag 11, that will be marketed under the name of Mini Mag in the North American Market.

Smart Guard Mini

The Smart Guard Mini is a capacitive sensing, zero-air-loss drain designed for smaller compressed air applications. The Smart Guard Mini incorporates the reliable JORC direct-acting valve assembly with FPM seals, offering a pressure range of up to 230 psi (16 bar).

The solid and robust aluminum housing design has also been incorporated into this model, following suit with the larger Smart Guard models. With an inlet connection height of only 74 mm (2.91"), this is an incredibly compact solution with unrivaled installation versatility and reliability.

The JORC Smart Guard Mini

The weight of the Smart Guard Mini is only 0.5 kg (approx. one pound). The maximum compressor capacity of this drain is 10 m^3/min (350 cfm), and typical draining applications include refrigerated dryers and filters — mainly due to its incredibly compact size.

Smart Guard 7250

The Smart Guard 7250 is a capacitive sensing, zero-air-loss drain designed for high-pressure applications of up to 500 bar (7250 psi).

JORC's direct-acting valve construction — in combination with the clever level sensing technology —offers high-pressure applications a zero-air-loss solution.

Mini Mag

The Mini Mag removes condensate from compressed air filters. The operation is automatic, and there is no compressed air lost during the condensate discharge cycle. The Mini Mag uses magnetic forces to operate the direct-acting valve assembly, and is ideally suited in applications where power is not available, too expensive, or not reliable. The magnets have been specially selected to ensure that long-lasting magnetism is guaranteed.

For more information, visit www.jorc.com.

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THE MARKETPLACE

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Job location is Sioux City, Iowa. Compensation range $55-95,000 with Company Vehicle. Relocation assistance will be considered based upon experience.

Light Industrial Sales Position

Light Industrial Sales Rep. calling on small industrial manufacturers, food processors, fabrication shops, auto body shops, auto repair facilities, commercial laundries, small labs, pallet manufacturers, and cabinet shops. Responsible for professionally representing Peerless Energy Systems at all times. Self-starter that will gather and retain knowledge and technical expertise necessary to design and sell small horsepower compressed air systems and piping. Current sales goals to be maintained while focusing on growing market share. Successful applicant will be able to make polished presentations, possess high level of social skills, and cold call as well as work from set appointments. A high activity rate is required.

Job location is Omaha, Nebraska. Compensation range $35-60,000 with Company Vehicle.

Requirements and Benefits

Proficiency in Microsoft Office is a must, CRM software is a plus. Possess excellent communication and social skills, clean driving record, college education, engineering skills are helpful, and a strong desire to excel and be number #1.

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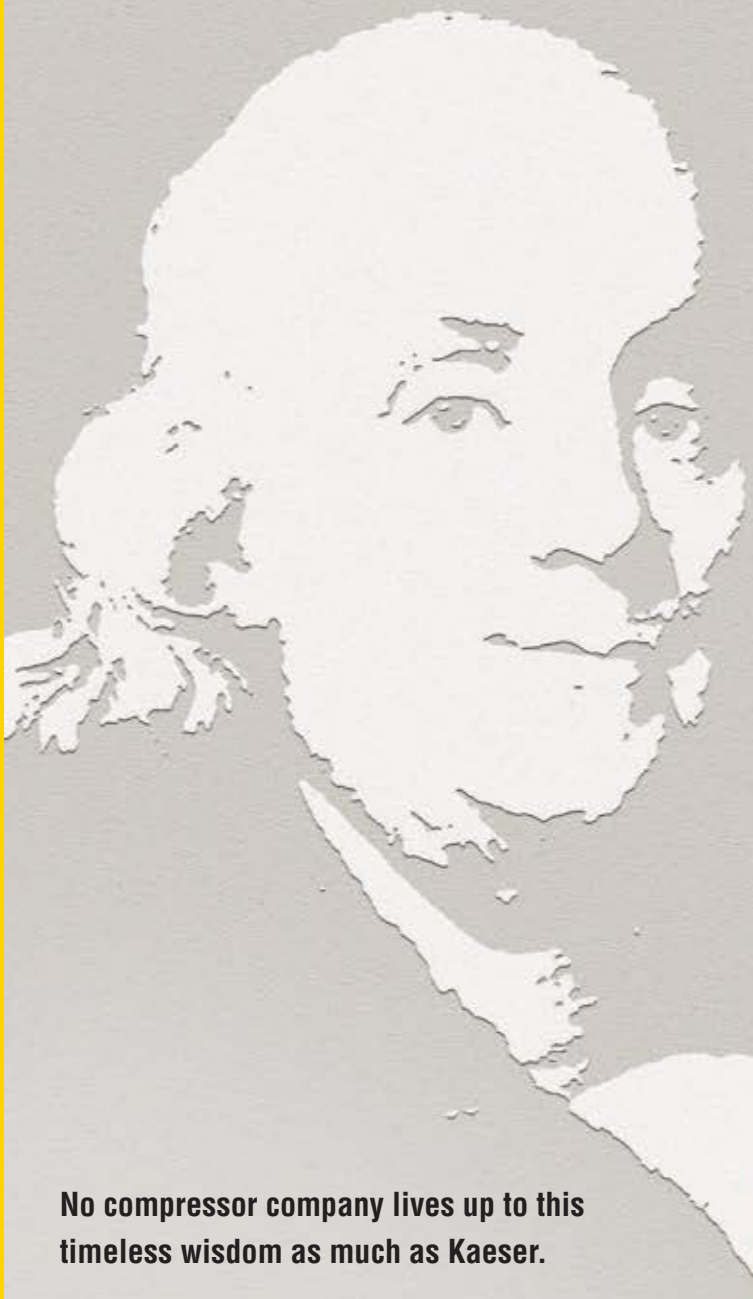

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