The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

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July 2020

12 Compressed Air Industry Rises Above the COVID-19 Crisis

20 How Centrifugal Air Compressor Specifications Impact Costs

38 How Your Air Receiver Tank Improves System Efficiency

32 GUIDELINES FOR VARYING PRODUCTION LEVELS

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FEATURES

QUALITY, SAFETY & RELIABILITY FEATURES

12 **Compressed Air Manufacturers and Distributors Rise Above the COVID-19 Crisis**
By Mike Grennier, Compressed Air Best Practices® Magazine

20 **How Centrifugal Air Compressor Specifications Impact Costs**
By the Compressed Air & Gas Institute

PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION FEATURES

26 **How to Detect and Eliminate Varnish in Oil-Injected Rotary Screw Air Compressors**
By Michael Caruso, AMSOIL INC.

32 **Compressed Air Guidelines for Varying Production Levels**
By Katie Falcon, Atlas Copco Compressors

38 **How Your Air Receiver Tank Improves System Efficiency, Part 1**
By Derrick Taylor, PneuTech USA

COLUMNS

4 **From the Editor**

6 **Compressed Air System Industry News**

44 **Compressed Air System Technology News**

47 **Advertiser Index**

50 **The Marketplace** | Jobs and Technology

FROM THE EDITOR

Quality, Safety and Reliability

The COVID-19 crisis has been handled proactively and courageously by the compressed air industry. Companies are focusing on taking care of their employees and helping factories to keep producing critical products needed by society. Our own Mike Grennier discovered many examples of this when interviewing both air compressor manufacturers and distributors to see how they are weathering this crisis.

Compressed air specifications can have an enormous impact upon the resulting costs. The Compressed Air & Gas Institute has sent us an excellent article titled, "How Centrifugal Air Compressor Specifications Impact Costs."

Productivity, Sustainability & Energy Conservation

Uptime is critical to every plant and an area of no-compromise. Michael Caruso, from AMSOIL, has sent us an excellent article about how to detect and eliminate varnish, which he says is a leading cause of airend failure in lubricated rotary screw air compressors.

Most plants have varying production levels. This fact is often overlooked by specifications, which normally focus on maximum flow and pressure requirements. Atlas Copco has sent us an interesting article on the topic titled, "Compressed Air Guidelines for Varying Production Levels."

As Derrick Taylor, from PneuTech USA writes in his article, "Air receiver tanks don't always get a lot of attention, but they are an essential component of a compressed air system." His article (Part 1 of 2) is a useful one to share with each plant in your organization.

Best Practices EXPO & Conference Announcements

Please consider reserving portions of September 22-23, 2020 for the Best Practices 2020 ONLINE EVENT! Free for all to register at www.cabpexpo.com, this is a great opportunity for maintenance teams, specifying engineers and sales engineers to receive training (and PDH hours)! We will offer LIVE Online Forums and Keynotes, plus hours of pre-recorded sessions.

We have announced the postponement of the Best Practices 2020 Expo & Conference to November 2-4, 2021. It will be held at the same venue – the Schaumburg Convention Center located in Chicago's convenient outskirts near O'Hare International Airport.

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

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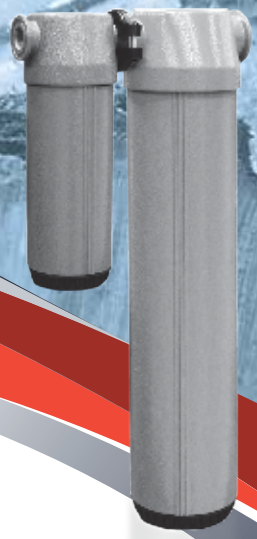

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COMPRESSED AIR SYSTEM INDUSTRY NEWS

ELGi North America Expands into the Portable Compressed Air Market

ELGi North America, a subsidiary of ELGi Equipments Limited, a global supplier of compressed air solutions, will, as part of its continued expansion in the compressed air industry, distribute the Rotair range of portable air compressors throughout North America.

ELGi acquired the Rotair brand of portable air compressors in 2012. Based in Caraglio, Italy, since 1946, Rotair SPA manufactures portable air compressors from 75 CFM through 900 CFM. Portable air compressors support various construction, industrial, and infrastructure applications. Powered by diesel and gasoline engines, Rotair's range of portable air compressors are designed to be durable, fuel-efficient, quiet, and reliable. For convenience and mobility, units are available in trailer or skid mount versions.

"Since 2012, ELGi North America has established reliable distribution and brand recognition with its industrial range of air compressors and accessories. The entry into the portable compressor market space will strengthen our presence in the compressed air industry," said David Puck, President, ELGi North America.

ELGi North America will distribute the Rotair range of portable air compressors.

Eight years ago, FTG Equipment Solutions, an industrial distributor based in New Castle, DE, started the representation of the Rotair brand in North America, driving growth and market share in the portables industry. ELGi North America will take over the master distribution for Rotair going forward, allowing FTG to focus its efforts on the distribution and growth of generators, LED light towers, pumps, and fuel solutions.

"We are grateful to the FTG team for establishing strong brand awareness for the Rotair product line. We look forward to serving the customers they cultivated over the last eight years. Our focus is to build the business and distribution base by offering best in class products supported by responsive service in North America," said Zeke Hendrix, Vice-President Portable Compressors, ELGi North America.

In addition to the headquarters and main warehouse in Charlotte, NC, Rotair's range of portable air compressors will be immediately distributed across strategic locations on the West Coast and the Northeastern US. ELGi is also planning other distribution sites to be added as part of the expansion project for the division.

About ELGi

Elgi Equipments Limited is a global air compressor manufacturer with a broad line of innovative and technologically superior compressed air systems. ELGi has consistently worked towards ensuring that companies achieve their productivity goals whilst keeping the cost of ownership low. ELGi offers a complete range of compressed air solutions from oil lubricated and oil-free rotary screw compressors, oil-lubricated and oil-free reciprocating compressors, and centrifugal compressors, to dryers, filters, and downstream accessories.

The company's portfolio of over 400 products has found wide application across industries. For further information on the organization and its products, please visit www.elgi.com.

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COMPRESSED AIR SYSTEM INDUSTRY NEWS

BEKO Meets Demand for DRYPOINT M During COVID-19

The ongoing COVID-19 pandemic has certainly taught us many things and exposed weaknesses in infrastructures around the world. From shortages in qualified medical and nursing personnel to the complete absence of necessary medical devices, protective equipment and raw materials required to help quell this pandemic.

With those on the frontline risking their life every day in situations like this, there are also those in the background helping to ensure that this battle can be fought – and won. Manufacturers across the globe are increasing their output at an unprecedented rate, and have banded together to help deepen the arsenal of not only critical intratracheal ventilation devices, but products and supplies that are essential to food processing, pharmaceutical production and laboratory and hospital diagnostic testing that help meet service needs for public health, safety and global well-being during this critical time.

Mobile respiration systems often have an independent compressed air supply and most applications in the sectors mentioned above are sensitive applications requiring the highest purity of air. Many of these devices utilize an internal compressed air membrane dryer for that exact reason. The compressed air supplied to these ventilators and other devices is dried by the membrane dryer to a certain percentage of relative humidity, as required by the application.

BEKO Technologies has been manufacturing the DRYPOINT M membrane dryer in the USA for more than 20 years and has been supplying these membrane air dryers to manufacturers of ventilation and respiration equipment as a component approved for medical technology for more than 15 years worldwide.

Supported by government projects and the massive uptick in global demand, a veritable flood of orders set in at BEKO Technologies. The demand received for the next three months is roughly equal to the demand of two years under normal circumstances. While the causation of this order intake is something BEKO Technologies would never wish for, the company is proud to stand behind those at the vanguard working to suppress this pandemic and to help overcome the challenges faced by global society.

The BEKO DRYPOINT M family of products.

At BEKO Technologies, a sounding out of the situation was immediately convened at management level, including the manufacturing facility in Atlanta, Georgia. The worldwide requirements and the prioritization of its manufacturing facility in the USA were subsequently coordinated at short notice. Special task forces work together across two continents to coordinate production, control the allocation of delivery quantities to individual customers and the global use of resources within the company.

The Atlanta manufacturing facility was identified as being an essential business operation and allowed to continue production despite the various lock-down and shelter-in-place orders that have been issued since the surge of COVID-19. Amidst the increase in demand, the company has remained flexible in terms of organization to meet the worldwide need for ventilation systems, but without losing sight of the capacity required for long-standing, loyal customers.

Increased personal hygiene for all employees, intensified sanitization protocols and social distancing is being practiced and have been in place since late-February. Front office personnel were mobilized to work remotely early on, automated machines are now working 24/7 and required production personnel has been increased and working in a two-shift operation not only to increase output, but also to ensure that all personnel maintain a safe distance from one another. The purchasing and logistics teams throughout the organization have remained agile to successfully maintain their global supply chain given the uncertainty of conditions throughout the world. BEKO Technologies is pleased to say, this additional workload is something all personnel are highly motivated to cope with. Thanks to quick reactions, a high degree of flexibility and a determination to help, BEKO Technologies has proven to be a reliable partner in times of extreme crisis.

About BEKO Technologies

BEKO Technologies develops, manufactures, and distributes components and systems for the treatment and management of compressed air and compressed gas. The independent family-owned company with headquarters in Neuss, Germany was founded in 1982 and is now internationally positioned with over 500 employees and 14 sales offices and production facilities in the USA, India, and China. BEKO Technologies advises manufacturing companies in all industries to find the optimum solution for their compressed air treatment and to ensure that the required quality and energy efficiency in the process are maintained. For more information, visit www.beko-technologies.us.

COMPRESSED AIR SYSTEM INDUSTRY NEWS

UCA to Supply Compressed Air to Ford Motor Company

Universal Compressed Air (UCA) announced multiple contracts with Ford Motor Company to install Compressed Air Systems at three locations in Michigan and Ontario. This establishes a total of five Ford plants supplied by UCA, including the Compressed Air Systems at the Livonia Transmission Plant and Kentucky Truck Plant. The three new locations will have an installed air compressor capacity of over 20,000 horsepower. Using Ford's performance contracting process, UCA will install, operate, and maintain the facilities to provide long-term savings to Ford. UCA is delighted to deliver its Pipeline Air™ to one of the leaders in the automotive industry.

UCA's scope includes the design, construction and commissioning of the highly modularized facilities, plus long-term operations, and maintenance services with comprehensive power guarantees. The Pipeline Air concept combines UCA's application and installation expertise with 16 of Atlas Copco's highly efficient ZH centrifugal compressors.

"Working with Ford has been a great opportunity" said Bob Hutchison, UCA General Manager. "Early in our launch of Pipeline Air, Ford Motor Company embraced the concept and provided UCA the opportunity to develop a compressed air system retrofit for their Kentucky Truck Plant. Following the successful completion of KTP, Ford awarded us the Livonia contract. Unlike KTP, this was a greenfield onsite project. Through these positive experiences, UCA continues to develop creative ways to improve our Pipeline Air offerings. We are enthusiastic about the upcoming projects."

Customers like Ford are finding UCA and Pipeline Air to be a great way to address their compressed air needs so that they can focus on their core business.

The Pipeline Air installation can be located in a separate location away from the main facility.

About UCA

As a spin-off of Universal Industrial Gases' parent company, Universal Air Gases, think of UCA as an industrial gas company specializing in producing and distributing compressed air to sites that require utility-like air for around-the-clock operations. Large volume users of compressed air increasingly find that outsourcing the ownership and operation of compressed air systems is a preferred strategy. UCA designs, builds, operates, and maintains complete compressed air supply and distribution systems including compressors, dryers, cooling towers, advanced control systems, substations, power control systems and pipelines. UCA works in cooperation with key suppliers and contractors to execute projects and achieve ultra-high system reliability. For more information regarding UCA and Pipeline Air, please visit www.universalcompressedair.com.

SPX FLOW Completes Sale of Its Power and Energy Business

SPX FLOW, Inc., leading provider of premier process solutions, announced today that it completed the sale of its Power and Energy segment to funds managed by affiliates of Apollo Global Management, Inc. with net proceeds totaling approximately $400 million after adjustments, fees and taxes.

By completing the sale of its Power and Energy business, the company's exposure to oil and power generation is de minimis. SPX FLOW's remaining revenue profile is comprised of approximately 50% sales into sanitary markets (such as food and beverage, pharmaceuticals, water and personal care) and approximately

50% sales into industrial markets (such as specialty chemical processing, air treatment and mining).

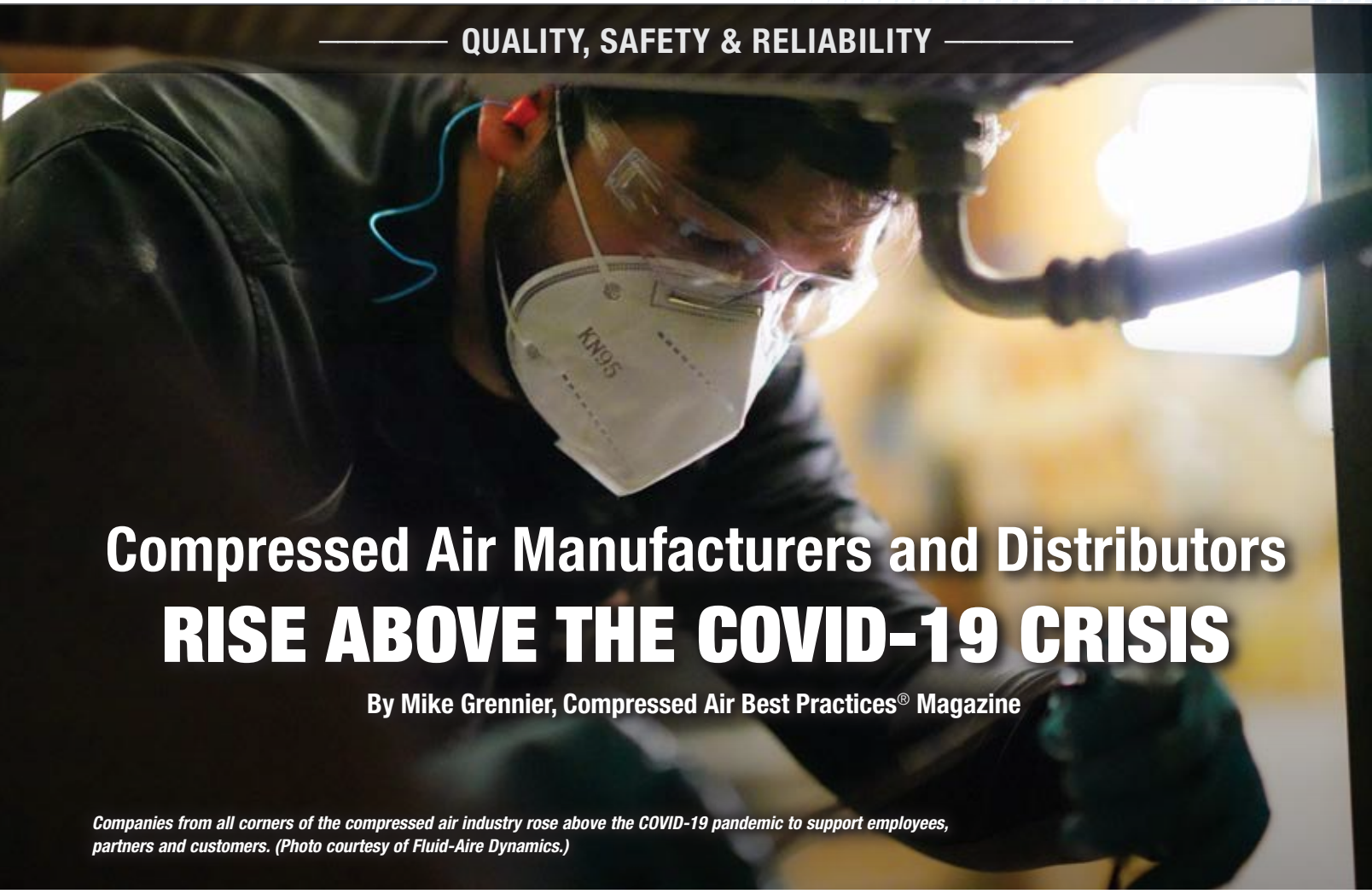
The net proceeds from the sale further strengthen the company's financial position. Net debt and interest coverage ratios are well below the company's debt covenants and liquidity is more than $1.1 billion (including more than $600 million of cash on hand and a $500 million undrawn, global revolver). This provides ample flexibility to maintain a conservative balance sheet while prudently investing in the business and opportunistically returning capital to shareholders.

In line with management's commitment to prioritize the use of divestiture proceeds on debt reduction and a return to shareholders, the company also announced today its intention to reduce total debt by $300 million, or more than 40%, to approximately $400 million in 2020. Additionally, management intends to return cash to shareholders through share repurchases over time. The company will continue to assess market and business conditions in connection with its capital allocation plans.

About SPX FLOW, Inc.

Based in Charlotte, North Carolina, SPX FLOW, Inc. innovates with customers to help feed and enhance the world by designing, delivering, and servicing high value solutions at the heart of growing and sustaining our diverse communities. The company's product offering is concentrated in rotating, actuating and hydraulic technologies, as well as automated process systems, into food and beverage and industrial markets. SPX FLOW has approximately $1.5 billion in annual revenues with operations in more than 30 countries and sales in more than 100 countries. To learn more about SPX FLOW, please visit www.spxflow.com.

QUALITY, SAFETY & RELIABILITY



Compressed Air Manufacturers and Distributors RISE ABOVE THE COVID-19 CRISIS

By Mike Grennier, Compressed Air Best Practices® Magazine

Companies from all corners of the compressed air industry rose above the COVID-19 pandemic to support employees, partners and customers. (Photo courtesy of Fluid-Aire Dynamics.)

No one knows when the Corona virus pandemic will officially end, yet one thing for certain is the high level of professionalism demonstrated time and again by manufacturers and distributors across the compressed air industry during one of the worst global crises in modern times.

Those in the industry reacted swiftly to protect employees and support their families. They did what it took to safely keep essential businesses up and running. They found efficient ways to conduct business and get things done. And they thought of others and how they can help.

In summary, the industry not only rallied through an immensely difficult time; it rose above it.

Employee and Customer Safety Comes First

In late January, the World Health Organization declared coronavirus (later called COVID-19) a public health emergency of international concern. Later, the president of the United States declared a national emergency to fight COVID-19.

As the crisis unfolded, manufacturers and distributors of compressed air and vacuum systems took the necessary steps and precautions using guidance from the Centers for Disease Control and other agencies to minimize the spread of the virus, while continuing to support customers. At all times the top priority was the safety and wellbeing

"The biggest thing is really, just providing care. It's about people in leadership roles stepping up and helping to keep morale up."

— Jeff Carlson, Vice President/General Manager, Zorn Compressor & Equipment

of employees and their families, as well as partners and customers.

At Kaeser Compressors, the goal early on was to help employees throughout the company's global operations feel safe and confident during a time of uncertainty.

"A fear among employees and customers was the existential fear of losing your job and everything you've worked hard for. We had to take that fear away," said Frank Mueller, President of Kaeser Compressors, Inc., in describing a key message shared by Kaeser Kompressoren Chairman Thomas Kaeser and other company leaders in the early stage of the COVID-19 crisis. "We let people know we will come out of this whole and together and that we're in a strong position to do it. Whether it takes place over weeks or months we wanted them to know they will continue to have a livelihood. We also asked them to be brave and take the appropriate precautions."

Sullair, LLC, is another example of a company that made employees the top priority. That message came through loud and clear early on from Sullair's parent company Hitachi Group, said David Andrews, Senior Director, Marketing and Communications, Sullair.

"The very first words from Hitachi President and CEO Toshiaki Higashihara were, 'I want to make sure you and your family are safe,'" said Andrews. "Hearing that made me proud to work for Sullair and to be a part of Hitachi."

Manufacturers and distributors alike took unprecedented steps to ensure employee safety. Those who could work remotely were asked to do so. Video conferencing took the place of face-to-face meetings. Most gave employees the option to remain home, especially if they or family members were at high risk. Those who needed to be onsite took precautions, ranging from social distancing to hand washing to wearing protective masks and more.

All the while, production and service and repair operations looked very different than usual in the effort to protect employees. Sullair's manufacturing plant in Michigan City, Indiana, for example, normally operates a single shift. However, the company switched to a double shift during the early days of the crisis to create space between employees at the plant.

"It's not an easy thing to do with such a large workforce, but our employees responded quickly and we were able to transition smoothly to a two-shift operation," said Jessica Bailey, Senior Director of Human Resources,

Service technicians took extra steps to ensure the safety of customers when servicing compressed air systems during the COVID-19 crisis. (Photo courtesy of Fluid-Aire Dynamics.)

COMPRESSED AIR MANUFACTURERS AND DISTRIBUTORS RISE ABOVE THE COVID-19 CRISIS

How to Restart a Dormant Air Compressor

"How do I start up my compressed air system after prolonged stoppage?"

That was a popular question among users of compressed air throughout the COVID-19 crisis. Here's advice from two compressed air service providers on the topic:

"The definition of prolonged stoppage in the air compressor world is really dependent on the geographical location of the installation," said Carlson of Zorn Compressor & Equipment. "A damp, humid climate could mean as soon as two to three weeks, whereas a relatively dry climate could be three months or more."

Carlson said a necessary precaution when an air compressor is down for a long period is to turn over the airend and motor by hand during the downtime to avoid potential for rust on the airend and/or motor bearings.

When starting the machine after a prolonged period, Carlson recommends checking all electrical connections, air connections and fluid levels. He also recommends draining water from tanks/drip legs/filters and cleaning components that need to be cleaned.

Another tip is to power-on the equipment and run under a load to make sure the operation and safety controls are functioning as they should. Then check the unit for proper temperature and see if any leaks have developed. Sometimes hoses and connections can dry out or crack if not in use.

Carlson said it's important to perform these procedures and checks, before production starts, to prevent compressed air problems from causing potential downtime.

Like Carlson, Crowl at CompressAir said it's important to quantify the length of stoppage and to know more about an end-user's routine maintenance practices.

"The first question we ask customers, who want to start-up a compressed air system after it has prolonged stoppage, is when was the last time it had preventive maintenance," Crowl said, noting the answer will help determine the proper procedures.

"It's important to ask about preventive maintenance because the filters, controls and oil could be dirty and corroded if it has been a long time or if the machine has sat a while," he said. "These are parts of the machine that provide clean air and have a major impact on the dependability of the machine."

Crowl suggests changing the oil, air filter, oil filter, and separator, and greasing and cleaning the controls on the air compressor. On the dryer, he recommends changing the pre- and after filters. Then, he said, it's important to ensure the machine's controls all set correctly for what is needed in production.

Sullair. "We knew it would be disruptive to our employees' lives, but it was an important measure to keep our employees safe."

Like manufacturers, employees needs were everything to distributors. An example is J.P.L. Compressor Service, Inc., Westminster, California. When a customer needed immediate assistance with their compressed air system early in the crisis, J.P.L. Compressor Service Co-owner and Senior Mechanical Engineer Joe Lester asked for volunteers to travel overnight to tackle the project. One service technician quickly volunteered but expressed concern about his family's needs while he was out of town. Lester told the employee he'd see to it.

"His family was running low on essentials like everyone else," Lester said. "I told him that I'd take care of it. So, I drove to the store, stood in line, and drove back to deliver the items to his wife. I just didn't want him to have to worry about it, you know?"

Service and Support Remains Steadfast

Choose any point in time during the crisis and distributors and manufacturers said the need for services remained at a high level. All made sure their customers understood they were there for them when needed.

"We noticed how important compressed air is to the general infrastructure since we saw very little drop in the level of service calls," said Mueller at Kaeser. "It hammered home the point that compressed air is the fourth utility. Nothing happens without compressed air."

Derrick Taylor, Director of Fluid-Aire Dynamics, Schaumburg, Illinois, said some customers initially wanted to fully limit access to their facility, but soon changed their minds.

Sullair air compressors helped essential businesses maintain production throughout the pandemic, such as this food and beverage operation in the state of Washington. (Photo courtesy of Sullair.)

"It wasn't long before they recognized that if they don't maintain their compressed air systems, they're going to be shutting their doors for a different reason," Taylor said.

To ensure an uninterrupted flow of products and services, manufacturers and distributors ensured their shelves were fully stocked with supplies and spare parts. They wasted no time in communicating the need for their suppliers to support them as essential businesses. None left anything to chance.

"Our distributors' customers were most interested in aftermarket parts and services and ensuring we could deliver what they needed to keep them up and running," said Sullair's Andrews. "When it came to our aftermarket operations, we not only had a backup plan to our normal backup plan, but we had another backup plan."

Robert Eshelman, President, Atlas Copco Compressors USA, said advanced preparation for any unknown crisis played a key role in Atlas Copco's ability to provide support throughout the pandemic.

"We can't honestly say we planned for this eventuality, but our business continuity planning, which we put such high-priority on, really kicked in and we were able to become a fully functioning virtual organization almost overnight," Eshelman said. "And thanks to our people we're proud to have been able to provide support in terms of getting some really critical applications up and running in a really short space of time."

Service technicians across the country took numerous precautions to ensure safety when serving compressed air systems. Typically, only one technician was sent to a job site; not two even when required. Rather than entering the facility through the front door, service technicians went directly to the compressor room after clearing it with the customer by cell phone. They also conducted system maintenance during the weekends at times, rather than weekdays.

COMPRESSED AIR MANUFACTURERS AND DISTRIBUTORS RISE ABOVE THE COVID-19 CRISIS

End-users also took precautionary steps to maintain production. Many didn't hesitate to contact compressed air distributors to communicate their need for support.

"We heard from a lot of companies that declared Zorn Compressor an essential business because we are an important part of their supply chain. They basically said, 'We're counting on you to keep the doors open,'" said Jeff Carlson, Vice President/General Manager of Zorn Compressor & Equipment, Pewaukee, Wisconsin.

The message CompressAir, LaPorte, Indiana, communicated to customers was straight forward. It also echoed the sentiments of most throughout the industry.

"We wanted customers to know we're staying safe and healthy so we can be there for them. Throughout this pandemic we wanted them to know we're going to stay open and fully operational," said Andy Crowl, Owner of CompressAir.

Manufacturers and distributors also encouraged users of compressed air to continue to care for their compressed air systems during the crisis. As an example, PneuTech USA held a popular webinar during the crisis about things companies can do to improve a compressed air system at little to no cost and achieve tremendous savings. Examples include preventive maintenance and leak repair.

"We wanted to provide more value to customers in any way we could during the crisis," Derrick Taylor said. "These are things they could do at that time to reduce their overhead and improve the system efficiency. That hopefully will put them in a better position when the pandemic is over with."

Uptime the Only Option for Many

From the beginning of the COVID-19 crisis, company after company didn't just talk the talk of providing service and support; they walked the walk knowing downtime wasn't an option.

Compressed air professionals did what needed to be done throughout the pandemic to keep their customers up and running. (Photo courtesy of Fluid-Aire Dynamics.)

"We work with a division of the CDC that certifies breathing air ventilators," said Eric Solverson, Vice President of Total Equipment Company (TEC), Coraopolis, Pennsylvania. "They were having issues over the weekend with an older air compressor. We had multiple technicians there within two hours late on a Saturday night. Luckily, they lost no production time."

In Minnesota, an internationally recognized hospital saw the need for additional medical air for ventilator patients early in the crisis. The institution wanted to prepare for a potential influx of patients, said Brian Antony, Senior Vice President, JHFoster, Eagan, Minnesota.

"Mid-morning on a Friday we calculated the additional air capacity needed," Antony said. "By the following Wednesday we assisted in the installation of a 20-horsepower (hp) air compressor. The hospital was relieved and excited. They sent an email saying they couldn't believe how quickly we responded."

At JHFoster, nine of the company's 20 service technicians are credentialed to the American Society of Sanitary Engineering (ASSE) requirements of "ASSE 6040, Professional Qualification Standard for Medical Gas Maintenance Personnel." The certification, which is required by NFPA 99 – Healthcare Facilities Code, signifies a technician is proficient and experienced in the maintenance of medical gas and vacuum systems.

In the Chicago area, healthcare decision-makers also took no chances with a potential increase in ventilator patients. But they needed help after re-opening a dormant hospital and put a call into CompressAir.

"We had a new installation that was to start up that day, but we needed to adjust our service technician's schedule because of the importance of this situation," Crowl said. "We went ahead and sent two technicians to the facility to make sure everything was running properly."

A near crisis at an air separation plant took precedence for J.P.L. Compressor Service in California. The plant provides liquified oxygen to local hospitals and other healthcare facilities for use with ventilators. When a motor failed on an 800-hp centrifugal air compressor feeding the plant, J.P.L. Compressor Service immediately dispatched two technicians to the plant at 3 a.m. to drive 16 hours to the jobsite in separate trucks.

"Without that feed unit, they make zero oxygen. That means they would've had to ramp up another plant to make up for it and truck the oxygen that much farther to where it's needed," said Lester, noting the plant was back up and running within two days. "It makes me proud to have employees who were willing to make sure other people had oxygen at this difficult time."

During the crisis, many industries in addition to the medical field required attention from compressed air companies.

Such was the case for a Fluid-Aire Dynamics's customer in the vitamin supplement industry. The company didn't encounter a maintenance or service issue. Instead, it needed to keep up

COMPRESSED AIR MANUFACTURERS AND DISTRIBUTORS RISE ABOVE THE COVID-19 CRISIS

Amber Brown and Kelly Molchan of the Sullair Human Resources team sew masks on their personal time for first responders, following critical shortages during the COVID-19 crisis. (Photo courtesy of Sullair.)

with demand. That meant working creatively to install an entire backup compressed air system during the pandemic.

"Their business has increased significantly and we were able to ensure they have what they needed to ensure 100% redundancy in their system, despite the challenges of the virus," said Kevin Taylor, General Manager of Fluid-Aire Dynamics.

The True Meaning of Customer Care

Throughout the pandemic, manufacturers and distributors truly demonstrated the meaning behind customer care.

While service technicians did their part, others worked from home, or in sparsely populated offices, to keep their operations running and to ensure customers' needs were met. Sales teams put site visits on hold, opting for video conferencing and phone calls instead. Many sales reps delivered parts to customers when others couldn't, while naturally taking the necessary safety precautions.

Manufacturers and distributors alike said the key to working through the COVID-19 crisis was to focus on the right thing to do.

"The biggest thing is really, just providing care," said Carlson of Zorn Compressor & Equipment. "It's about people in leadership roles stepping up and helping to keep morale up."

Kevin Taylor at Fluid-Aire Dynamics could not agree more, explaining how one customer was despondent about the state of business. When talking with the customer, Taylor focused on the positive.

"I said, 'Look, there's a light at the end of the tunnel. This is going to pass and the economy will come back.' By the end of the call, the customer said he felt better. What people need now is to remain optimistic and hopeful. That will go a long way in the future."

Many in the industry not only remained hopeful throughout the crisis, but also found ways to be helpful.

At Atlas Copco USA, for example, employees helped meet the increased need for clean drinking water during the crisis by donating water to the Food Bank of the Rockies in Colorado. The initiative is part of Atlas Copco USA's Water-for-All program in partnership with Can'd Aid. Additionally, Atlas Copco Comptec in Voorheesville, New York, supported local first responders by using the facility's 3D printers to create face masks and face shields. Atlas Copco Comptec is a U.S.-based business unit of Atlas Copco's Gas and Process division.

Sullair, meanwhile, found it had extra face masks in stock thanks to operations in Asia moving past the worst of the crisis and sending them to the Michigan City plant. Sullair donated the masks to a local healthcare provider. Some Sullair employees also took time out their personal schedules to sew masks for first responders.

Andrews of Sullair said the COVID-19 crisis is unlike anything most have ever experienced, making it especially important to provide support to all involved.

"Unlike the financial crisis in the early 2000s, no one had a playbook for this crisis," Andrews said. "The first thing our company did was to take care of employees and families. That to me, is a huge thing. I think people you have been loyal to through this crisis will be loyal to you when we come out of this." BP

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BEST PRACTICES

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12:00PM	First Wave of Pre-Recorded Sessions
2:00PM	Live Discussion Forum
3:00PM	Second Wave of Pre-Recorded Sessions

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11:00AM	Live Keynote Presentations
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QUALITY, SAFETY & RELIABILITY

How Centrifugal Air Compressor SPECIFICATIONS IMPACT COSTS

By the Compressed Air & Gas Institute

The budget for the project was $100,000; however, the quote is $1,000,000. How did this happen? Why did it happen? These are questions many engineering contractors and end users ask when the air compressor cost dramatically exceeds the budget. Unfortunately, as the purchaser and the project engineer start to evaluate their potential suppliers from the Project Front-End Engineering Design (FEED) stage and transition to a Firm Request for Quote stage, an all too familiar trend starts to become apparent. The quotes during the FEED stage were all based on a few documents and a simple data sheet detailing what was needed, and quotes came in around the $100,000-range. Now firm bids are coming in around $1,000,000.

How did every manufacturer come in so far off-base during the FEED? Did the project scope balloon between when the FEED and

> "In some cases, the air compressor manufacturer could pay three times or more what the plant owner/operator pays for the instrumentation."
>
> — the Compressed Air & Gas Institute

firm bids were requested? Did those 200-1,000 pages of extra specifications that were developed and added to the scope for the firm proposal stage have anything to do with it?

Standards and Regulations

In an ever-evolving world of regulations, requirements, and legal ramifications, it can be all too easy to want to cover all the bases by adding a wide range of industry codes and standards to any project being put out for bid. Many assume that if the purchased equipment meets all the requirements of every developed code and standard then surely it will be a reliable and safe machine to operate with the best performance and energy efficiency. However, many of these codes and standards are developed with a tremendously broad range of machinery and equipment in mind and they may not always fit well with the specific project being developed. Compliance to these codes and standards may require very costly modifications to a manufacturer's standard product for little to no real benefit.

This article specifically addresses how such standards can impact the design of a centrifugal air compressor and take a relatively inexpensive project to an expensive project that exceeds the budget.

Preeminent among many factors that add tremendous cost to a project are wide-ranging industry standards such as those developed by the American Petroleum Institute (API). Some API standards that apply to centrifugal air compressors are API-617, API-672, and API-614. These referenced API standards, in particular, were developed primarily for the oil and gas industry and for machinery directly involved in the refinement of oil and production of chemical products, or for single-shaft, multistage centrifugal and axial air compressors of a critical nature that have no backup and are expected to run for years with only minor maintenance and instrument calibrations done while the unit is still in operation. These units also often have stand-alone, skid mounted lube oil systems (consisting of lube oil pumps, cooling and filtration systems) which are independent of

HOW CENTRIFUGAL AIR COMPRESSOR SPECIFICATIONS IMPACT COSTS

the air compressor skid itself. Most integrally-geared air compressors are used for general industry and manufacturing applications; however, API standards are still often applied.

The Centrifugal Compressor Section of CAGI consists of the following member companies:

- Atlas Copco Compressors
- FS-Elliott
- Hanwha Power Systems
- Ingersoll Rand
- Sullair Corporation

The Compressed Air and Gas Institute is the united voice of the compressed air industry, serving as the unbiased authority on technical, educational, promotional, and other matters that affect compressed air and gas equipment suppliers and their customers. CAGI educational resources include e-learning coursework, selection guides, videos and the *Compressed Air & Gas Handbook.* For more information, visit the CAGI web site at www.cagi.org

To manage this issue, many centrifugal air compressor manufacturers have made efforts, where economically feasible, to design their standard machines in accordance with relevant API standards. Typically, a standard air compressor with no modifications is designed in compliance with API 672 to some degree. To achieve higher compliance to API 672 becomes extremely expensive and it normally is not necessary.

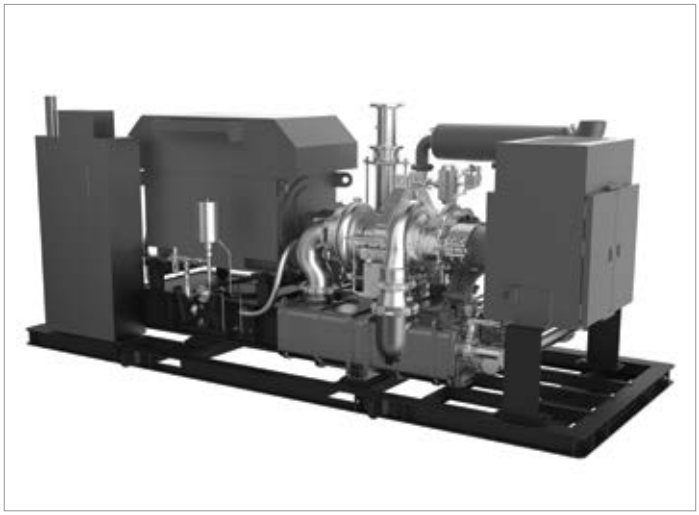
Another consideration to note, is that most atmospheric air compressors have their own integral lube oil system, and as such many aspects of the API 614 standard are not applicable. Requiring API 614 compliance becomes exceedingly difficult and very cost prohibitive for little, if any, overall benefit.

Instrumentation

Special instrumentation is another design element that can potentially increase costs, especially if there is a brand preference. If the production facility or plant has standardized instrumentations on air compressors in order to make spare parts inventory more simplistic, the specified instrumentations may increase the cost of the new machine since the air compressor manufacturer may not qualify for bulk discounts.

In some cases, the air compressor manufacturer could pay three times or more what the plant owner/operator pays for the instrumentation. The cost of the instrumentation then becomes an excessive cost. It is important to understand that brand and name recognition does not always equate to improved functionality over the standard instrumentation the air compressor manufacturer is offering. In many cases, in the event an instrument does need to be replaced later in the machine's life, it may be swapped for the instrument on the shelf at the customer's site with little, if any, modification to the air compressor. This is a key point that can be discussed during the bid phase with the air compressor manufacturer.

Another consideration is the calibration of sensors in the field after the air compressor is put in operation. In many specifications,



Shown are standard centrifugal air compressors used in general industry and manufacturing applications.

"block and bleed valves" are specified so that an instrument might be calibrated while an air compressor is still in operation. This is normally possible on process machines where multiple sensors are measuring the same variable and they "vote" on what the true measurement is and if it is within operational tolerances. This is not a common arrangement in most air compressors. Even if block and bleed valves are present, the machine will, in many cases, go into fault and shut down if it loses readings from a sensor as maintenance personnel try to perform calibrations while the air compressor is running. In this case, the block and bleed valves have not provided any useable functionality or value, but they have contributed to the excessive initial procurement costs.

Motor

A specialized motor can be another source of unnecessary expense. In many cases, manufacturers offer either Open Drip Proof (ODP) or Totally Enclosed Fan Cooled (TEFC) motors in smaller centrifugal air compressors, with Totally Enclosed Air to Air Cooled (TEAAC), Weather Protected type II (WPII) and water-cooled motors common in larger applications. Again, many "industry" specifications (API, IEEE, end user, etc.) that may seem common can begin to add a multitude of costs depending on type of motor specified, as well as scope additions, such as lightning arrestors, motor surge protectors, and large service factors.

Some owners/operators building new facilities will also try to standardize on one specific motor manufacturer, which may charge much more for a motor than what the air compressor manufacturer normally expends for a similar motor from a different manufacturer. It is important to evaluate both the air compressor manufacturer's standard offering and the requested specified motor cost to determine if the added requirements are worth the added cost.

Coolers

Most centrifugal air compressor manufacturers have cooler designs utilizing "standard" materials. In many cases, customers may specify other materials. These requirements should be evaluated and discussed in detail with the compressor manufacturers during the bid process to determine if the specified materials are, in fact, necessary for the application. Changing materials can have serious repercussions on heat transfer, and thus the size of the coolers required. As most air compressor manufacturers place the coolers under the main gear casing, a size change can become tremendously costly with major design implications; to say nothing of the added cost of more exotic materials.

Controls

Today, every major centrifugal air compressor manufacturer offers a microprocessor or programmable logic controller (PLC) based local air compressor controller with software developed to ensure reliable, safe, and energy efficient operation of the controlled equipment. In many instances, however, customer specifications call for very specific control systems, or even specific brands and third party developed software to run the machines. Sometimes, duplex control systems are even required to maintain air compressor functionality in the event of a controller failure, as is often seen in process critical equipment, with no backup for the main unit. These

HOW CENTRIFUGAL AIR COMPRESSOR SPECIFICATIONS IMPACT COSTS

API-compliant, heavy-spec centrifugal air compressors.

requirements begin adding to the procurement cost of the air compressors; often times for no real benefit as many customers have entire backup air compressors to allow for continued production operations in the event of an air compressor failure.

Testing and Documentation

Most manufacturers of centrifugal air compressors offer several options for unwitnessed or witnessed testing as well as quality documentation for the production facility, such as an inspection and test plan (ITP). These tests and documents usually add nominal costs to the project. Custom tests or documents will result in additional fees.

Customer hold, inspection, and test points on an ITP can add weeks to production. Special certifications, custom programming, converting symbology for documents like wiring diagrams or piping and instrumentation diagrams can all begin to take a toll on the final procurement cost. When evaluating an offering from a manufacturer, care should be taken to discuss vendor data requirements to ensure that both the manufacturer and purchaser are in agreement on what is required and understand both cost and lead time impacts.

Conclusion

In summary, the overall air compressor package and the cost to comply to standards and codes above and beyond the manufacturer's design must be evaluated against the overall requirement for the equipment being requested. If reliability is the most important concern, but the cost triples (or more) to meet the specifications, ordering a second stand-by unit may be a more prudent solution to ensure the compressed air system at the end destination achieves the desired results. Likewise, partial compliance to specifications can result in a unit that will meet the end goals while not designing to certain requirements that are both overly cost prohibitive to enact and provide minimal additional protection or function, if any, over the manufacturer's standard offering.

As discussed, specifying motors, instrumentation, coolers, controls and additional testing documentation more than what is included in a centrifugal standard machine will add additional costs to the project, possibly without benefit. It is important for the customer to review requirements, during the bidding process, with air compressor manufacturers to ensure an accurate quotation will be produced for an air compressor that will meet the needs of the application. BP

For more information, visit the CAGI website at www.cagi.org.

All photos courtesy of the Compressed Air and Gas Institute.

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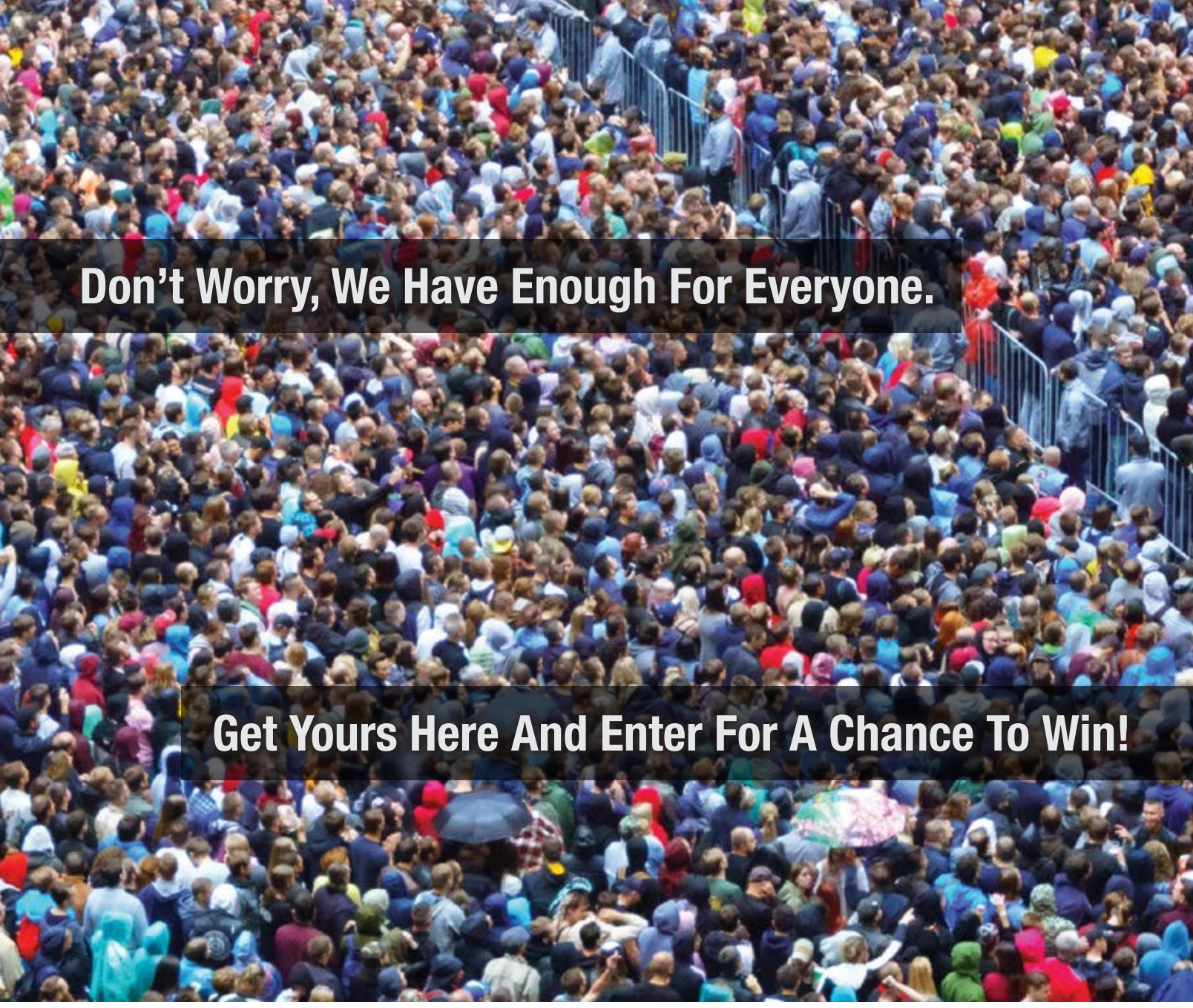

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PRODUCTIVITY, SUSTAINABILITY & ENERGY CONSERVATION

HOW TO DETECT AND ELIMINATE VARNISH in Oil-Injected Rotary-Screw Air Compressors

By Michael Caruso, AMSOIL INC.

A rotary screw air compressor lubricant test is performed at AMSOIL INC.

Varnish is a leading cause of airend failure in oil-flooded/injected rotary-screw air compressors. The purpose of this article is not to cover every scenario conducive to varnish formation, but to point out that many factors need to be considered when it occurs, and methods are available for its detection. Ultimately, it's up to both the oil manufacturer and maintenance professional to ensure the oil used is up to the task of resisting varnish and maximizing air compressor performance and life.

Common Signs and Causes of Varnish

Plugged filters, or an unexplained increase in discharge temperature, are late-stage indicators that varnish is present. In worst-case scenarios, varnish will glue the airend together, making it impossible to restart after

> "In worst-case scenarios, varnish will glue the airend together, making it impossible to restart after the machine cools requiring disassembly for cleaning or airend replacement."
>
> — Michael Caruso, AMSOIL INC.

the machine cools requiring disassembly for cleaning or airend replacement. Poor-quality oil is often to blame when varnish appears. Bad, poor or no preventive maintenance is an equally likely cause.

The lubricated components in an airend are quite simple and would easily survive in less severe environments using a basic light oil with sufficient rust and oxidation inhibitors. Rotary-screw air compressors present a substantially harsher operating environment compared to other high-speed applications. In an air compressor, high levels of heat and moisture act together with foaming, air entrainment and vaporization to greatly accelerate the natural oxidation process. Oil designers counteract these inherent problems with a blend of base oils and additives.

Excessive water and air compressor oil are a bad combination.

Hydrocarbon-derived base oils are most likely to form varnish in air compressors. They include American Petroleum Institute (API) Group I and II conventional oils, and Group III and (IV PAO) synthetic oils. Groups I and II will be advertised by air compressor oil manufacturers as mineral based and assigned a drain interval of 4,000 to 6,000 hours. Groups III and IV synthetics will likely be advertised as 8,000-hour oil and be specified as synthetic or PAO-based in marketing materials. There are also combinations of these base oils that are sold as semi-synthetic. Whatever the base oil, the consensus is synthetic oils will last longest in air compressor service under the same conditions.

Define "Normal" Operating Conditions

This discussion will center on 8,000-hour synthetic oils built with Group III, Group IV or a combination of the two for the varnish discussion. Oils of this type are very popular and have a long track record of success in general air compressor service. They are a mid-range class of oils built to reach their advertised drain interval with sustained discharge temperatures of 170°F to 212°F.

Most industrial-oil manufacturers produce at least one and most likely several oils of this class. Some manufacturers are specific about the operating conditions the oil is designed for and others are not. It's common for air compressor oils to be recommended for a specified number of hours "under normal conditions." Statements like this encompass the wide range of operating conditions that exist in the field, so it's important to determine what the oil manufacturer's definition of "normal" is before adopting maintenance practices for a new oil. The best way to learn more about any oil is to talk to the manufacturer.

Next, let's discuss ways to prevent varnish in your rotary screw air compressors.

HOW TO DETECT AND ELIMINATE VARNISH IN OIL-INJECTED ROTARY-SCREW AIR COMPRESSORS

Choosing the Correct Oil

The two most important things you can do to prevent varnish are choose the correct oil for your unique operating conditions and adapt your maintenance practices to those operating conditions. If your machine has been running the same synthetic oil trouble-free for years and the oil reaches its advertised drain interval, your maintenance practices, operating environment and oil quality are obviously working well together. There would be no need to change anything from an operational perspective, but a desire to change oil suppliers may be driven by price or other supplier-related issues.

Don't hesitate to ask any potential new supplier for evidence of their oil's performance. That evidence will most likely be data obtained through testing in rotary screw air compressors and or bench test results. Data from the rotary screw air compressor test may include oil analysis results throughout an 8,000 hour or longer test period with the test conditions provided. Lab bench tests may also be included describing the test conditions and relevance of the test to air compressor operation.

Resist the temptation to rely on the results of a single simple test such as the Rotating Pressure Vessel Oxidation Test (RPVOT). The RPVOT is designed to measure the remaining useful life of turbine oils. However, it used with new oils to suggest useful life. In theory, the higher the minutes the oxidation resistance of an oil survives in this test, the longer the oil will last in service. The correlation between this test's results and actual field performance is not established and is completely unreliable. Tests such as these should be considered as one of many data points and not the determining factor of oil quality.

Proper Maintenance Practices Often Solve Problems

If your synthetic air compressor oil is giving you problems, first review your maintenance practices. In most cases, proper maintenance can solve the problem. Also consider the source of the intake air. Is the air compressor taking in fumes, smoke or other airborne contaminants? After reviewing your air compressor holistically, your last option is to

consider changing oils. Your options will likely be more expensive, but the time saved and potential damage avoided can make them well worth the added expense.

Here are two examples of when changing oil types may be prudent:

Example No. 1 – heat: High temperatures reduce oil life and cause varnish. The hotter the temperature, the more frequently the oil should be changed. If your air compressor discharge temperature is in the range of 212°F or hotter and you are experiencing varnish issues, you may want to consider an ester type oil such as a Polyolester (POE). These oils do well controlling varnish and they last a long time. But they come at a higher price.

Example No. 2 – water: Operating in a high-humidity environment with short duty cycles, low discharge temperatures and poor maintenance practices can also force a change in oil type. Air compressor oil manufacturers often refer to their products' "fast water separation." Oil mixed with high levels of water will oxidize at a phenomenal rate and eventually produce thick, damaging goo that contains the same oxidative components as varnish. To prevent the problem, Group III or IV oils are designed to cleanly release water without forming an emulsion, allowing it to be periodically drained from the bottom of the reservoir. Some maintenance staff just don't know this or can't do it for operational reasons. Simply raising an abnormally low discharge temperature per the air compressor OEM's recommendation might take care of the problem. If not, you may want to consider converting to a Polyglycol (PAG)-based fluid.

PAG-based air compressor oils are excellent air compressor oils that don't form varnish and have the ability to dissolve water without damaging the machine, eliminating the need for manual removal. They are also likely incompatible with Group III or IV type oils and a proper conversion process using an ester oil as an intermediary flush may be required. If you consider converting to a PAG or POE, consult the air compressor or oil manufacturer before doing so. Some machines are built with hoses, seals and other materials that are incompatible with them.

Cleaning Varnish From an Air Compressor

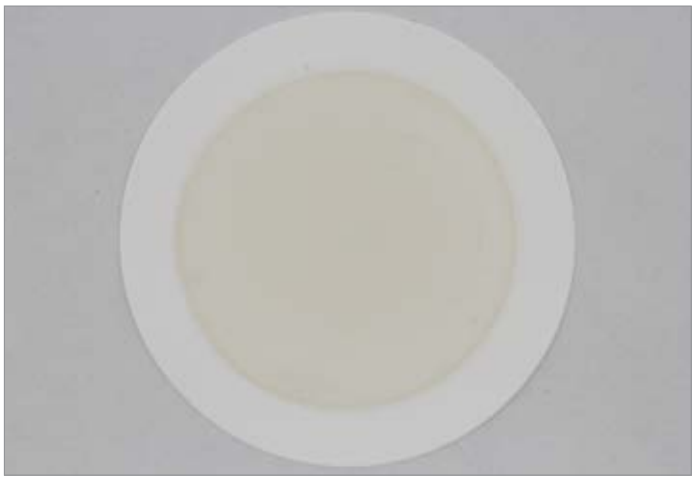
Whether your varnish and sludge problems were caused by using low-quality oil, the wrong type of oil for your conditions or incorrect maintenance practices, cleaning a dirty air compressor before introducing new oil is crucial.

Draining and refilling will not do the job adequately. It's important to remove as many of the oxidative byproducts remaining from the failed oil as possible since they can accelerate the oxidation of the new oil, severely shortening its service life. Many commercial cleaners are available and should be used per the manufacturer's instructions.

ASTM D7843 Test Method for Detecting Varnish

Besides periodic visual inspection, your last line of defense against varnish is oil analysis. Routine oil analysis will check viscosity, acid number, water, additive metals, wear metals and

HOW TO DETECT AND ELIMINATE VARNISH IN OIL-INJECTED ROTARY-SCREW AIR COMPRESSORS



Shown are final MPC results from two oils tested after running at identical conditions for 2,000 hours. Both oils have normal acid and viscosity numbers. The darker patch represents an oil that has failed at 2,000 hours of testing and has developed the potential to produce varnish. The lighter patch is an oil that is at little to no risk of producing varnish after 2,000 hours of testing under the same conditions.

possibly oxidation. The results are compared to the new oil baseline and anything out of the ordinary is flagged against established limits. Most labs will recommend actions based on the analysis ranging from no action to changing the oil.

Two primary indicators that an oil is reaching its end are kinematic viscosity and acid number. When they begin to rise, they will be flagged. The point at which the oil will become unserviceable is difficult to predict since the rise may be slow and steady or exponential. However, In the case of varnish these numbers can remain normal and you'd never suspect a problem exists.

Fortunately, another tool is available to help detect varnish. The ASTM D7843 test method uses membrane patch colorimetry (MPC) to measure the varnish potential of oil. The oil is prepped per the method and run through a membrane. The varnish-producing insoluble substances in the oil are captured and the color of the patch is assigned a rating of "Good," "Monitor," "Abnormal," or "Critical."

The test cost is reasonable, and it tells you what routine analysis cannot. It may not be practical to have this test run on every sample, but it is not unreasonable to check an oil you have no experience with every 2,000 hours until you establish it can handle your conditions. Be aware that if the machine has produced varnish previously and was not cleaned before the oil was changed, it's possible your new oil will come back with a bad MPC result.

Defeating Varnish is Team Effort

Varnish is an unfortunate risk many maintenance professionals will deal with at some time when operating rotary screw air compressors. But, with MPC and the right oil, you can limit its formation and improve compressor life and performance. Ultimately, defeating varnish is a team effort. The lubricant manufacturer has to design an oil that will work for the conditions, the maintenance staff must employ appropriate preventive maintenance practices, and the oil analysis lab must provide accurate results, including MPC when appropriate. BP

About the Author

Mike Caruso is an Industrial Products Manager at AMSOIL INC. He has worked in industrial product development at AMSOIL INC. for ten years and holds Society of Tribologists and Lubrication Engineers Certified Lubrication Specialist (CLS) and Oil Monitoring Analysts I (OMA 1) certifications; email: mcaruso@amsoil.com.

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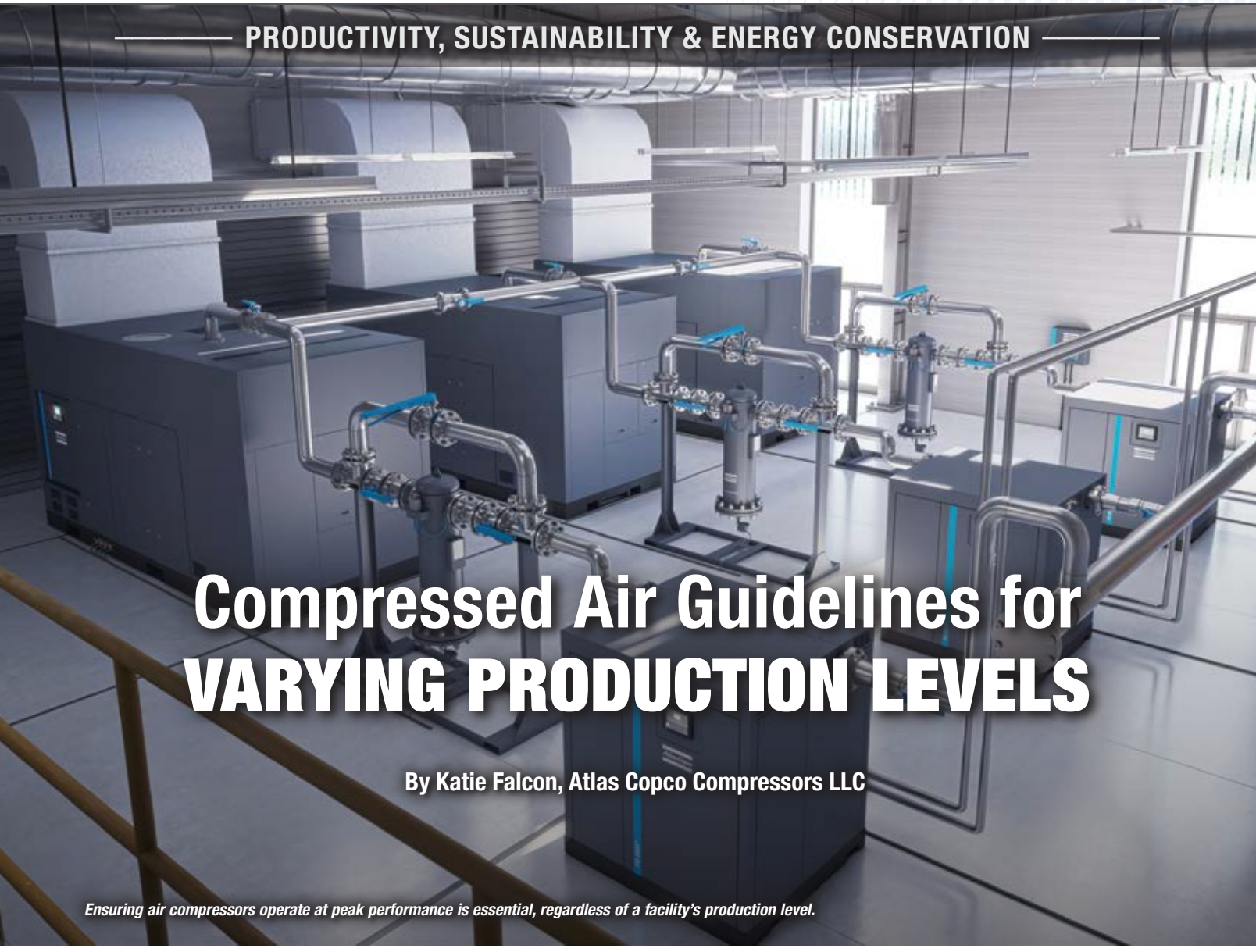


Compressed Air Guidelines for VARYING PRODUCTION LEVELS

By Katie Falcon, Atlas Copco Compressors LLC

Ensuring air compressors operate at peak performance is essential, regardless of a facility's production level.

Companies will experience periods of increased production, as well as periods of slower or stopped production. It's the nature of being in business. Understanding the implications of these business shifts for compressed-air installations (the powerhouse behind a facility's production) is key for ensuring that air compressors remain functional and efficient. Here are guidelines to ensure your facility's compressed-air system operates at top performance, no matter the speed of production.

Guidelines for Increased Compressed Air Usage

Is the business in ramp-up mode? Don't leave your compressed air installation out of the planning and prepping process. Your air compressor powers production throughout

> "There are a range of tools and services that are completely free of charge that can help you benchmark efficiency, find ways to expand, or ensure efficiency during a slowdown in demand."
>
> — Katie Falcon, Atlas Copco Compressors LLC

your facility, so preparing this equipment for heavy production is important to acceleration in production.

- Don't forget about the air compressor. One of the most essential aspects of shifting gears is your compressed air system. Without compressed air, production can't occur! Does the current air compressor have the capacity to keep up, and is it in shape to handle the demands that increased production brings on? Addressing these questions and keeping your compressed air system in mind prior to the increase in production will help mitigate issues down the road.

- Keeping up with demand. Are you buying an additional air compressor to keep up with increased demand? You might save money buying one large air compressor. Keep the old air compressor for backup – who knows when something unexpected may happen to the primary unit, which could cease production altogether.

- More compressed air = more downstream moisture. Is the system prepared to handle extra moisture the increase in compressed air will produce? Moisture can be detrimental to compressed air installations and end processes. Before ramping up production, determine whether the system's drying methods (from integrated air dryers, aftercoolers, or over-compression) can compensate for more moisture in the system.

- Got enough storage? Air receiver tanks provide temporary storage the system can use during peak demands. Upgrading the storage will help ensure a sufficient supply of air while decreasing the number of starts experienced by the air compressor motor.

It's important to plan and prepare compressed air systems for heavy production when the business is in ramp-up mode.

- Say hello to new technology. The last decade has seen a huge stride in compressed air technologies, especially with larger horsepower air compressors. Knowing the newest features and benefits of today's compressed air technologies is important – especially if the air compressor is more than 10 years old.

Guidelines for Stopping or Pausing Air Compressor Installations

Need to reduce production and switch off air compressors temporarily? If production is stopping, manually stop the air compressor – even if it is integrated into a central controller. If you don't, the machine might run at minimal capacity to compensate for small leaks in your compressed-air network.

- Variable Speed Drive (VSD) air compressors. Carry out a program stop. Make sure the electrical-power supply is left on to keep the capacitor bank charged and ready for restart.

- Water-cooled air compressors. After stopping the air compressor, isolate the water supply. This will stop condensation from forming inside the compressor element(s). Remember to turn it back on at start up! Ensure that any air-blast cooling systems are turned off.

- Oil-free air compressors. The main drive shaft needs to be manually rotated via the motor drive coupling, three complete rotations, once a

COMPRESSED AIR GUIDELINES FOR VARYING PRODUCTION LEVELS

week. This is to prevent the low- and high-pressure compression stages from seizing up during a long period of downtime. If the air compressor is a VSD version, turn the power supply back on after turning the air compressor over by hand to protect the inverter drive capacitors.

- Centrifugal air compressors. Carry out a program stop and leave the power supply on. They need to have the auxiliary oil pump left turned on electrically while the air compressor is shut down. This will maintain the oil temperature and periodically start up the auxiliary oil pump to circulate warm oil around the bearings during long periods of downtime.
- Gas generators and dryers (adsorption or refrigerant). These can be stopped manually and depressurized if required. When depressurizing gas generators, monitor the oxygen level in the machine room.

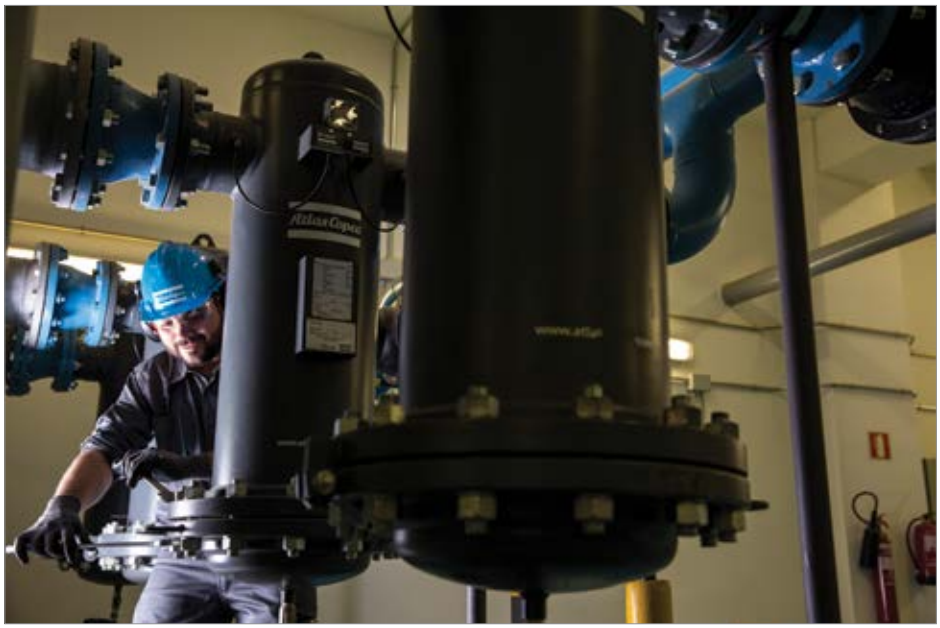
Guidelines for Restarting an Air Compressor Installation

1. Turn off the power supply to the air compressor.
2. Remove the drive shaft protection guard and turn the drive coupling to check that the air compressor is free to turn. If the air compressor turns freely, re-fit the guard and turn on the power supply to the air compressor.
3. Turn on the cooling water and air blast cooling system (if the air compressor is water cooled).
4. Close the air compressor air discharge valve and start the air compressor.
5. Slowly open the air-discharge valve until the air pressure equalizes between the air compressor and the air net. At this point the air compressor is back online.

Note: If the air compressor is connected to a sequence controller, ensure the air compressors are integrated onto the controller or optimizer.

How to Save on Energy Costs During Slower Production Periods

One benefit of reduced production is the potential for significant savings on monthly energy costs. Because compressed air accounts for a large amount of a plant's total energy costs, decreased production (and therefore decreased compressed air usage) can have a positive impact. Here's a look at energy-saving opportunities.



Be sure to follow the appropriate procedures when stopping or pausing air compressors.

1. Reduced unloaded running hours. Air demand in an industrial compressed air system fluctuates. Use this fluctuating demand to reduce unloaded running hours to optimizing energy efficiency.

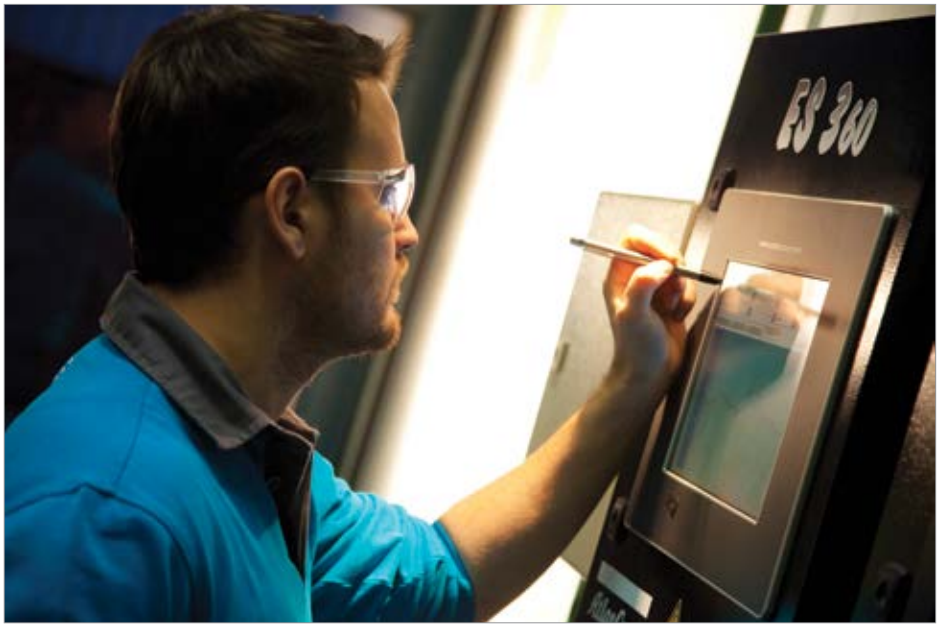
   - Air compressor controllers. These provide user-friendly ways to reduce unloaded running hours. If you have multiple air compressors, then the controller has likely been set up to do this automatically. If there is no central controller, then the air compressor pressure bands have probably been set up in a cascade method. This means that when the target air pressure is reached, the on-board controllers will stop the machines. If air compressors are left running unloaded after working hours, they still use as much as 25% of the energy consumed at full load. If there are leaks in the system, the air compressors may switch to loaded running occasionally, consuming even more energy.

   - Turning air compressors off. As referenced earlier, the shorter the production time, the more energy costs may be saved by switching air compressors off instead of letting them run unloaded. If production is reduced but not stopped, consider isolating unused areas of the factory and update your plan accordingly.

2. Eliminating air leaks. If the air compressor installation is older, air leaks can be a huge source of wasted energy. As much as 20% of total compressed air consumption could be lost through leaks – and 80% of air leaks aren't even audible. If you're still on-site and have time available, take the opportunity to check for leaks in your system. Doing so could save you money.

3. Reduced pressure band. As a rule of thumb for most air compressors, a reduction of 1% PSI will lead to a 2% savings in energy. The pressure settings of the air compressor should be adjusted until the lowest pressure can be reached and the pressure band reduced without affecting the application. If your air compressor installation has a centralized system responsible for multiple controllers, the network can be set to run within a narrow pressure band – ensuring that the compressed air network matches your precise needs. The controller can also allow you to manually or automatically create two different pressure bands to optimize energy use within different periods, drastically reducing energy costs at low-use times.

COMPRESSED AIR GUIDELINES FOR VARYING PRODUCTION LEVELS



A slow production period often represents an opportunity to save energy on the operation's compressed air system.

4. Energy recovery. One area that offers manufacturers a significant opportunity for savings is to recover the waste heat from air compressors. Without energy recovery, this heat is lost into the atmosphere through the cooling system and radiation. The amount of electrical energy that can be recovered depends on the size of the air compressor and the running hours. Typical recoveries are between 70-94 percent. Recovering heat from compressed air reduces the need for purchasing energy, which results in lower operating costs and CO_2 emissions. For example, you can produce hot water for washrooms or direct warm air into a workspace, warehouse, loading dock, or entryway. The savings can really add up.

5. Ensure the right air compressor type is Installed. Most production processes require different levels of demand in different periods, which could mean the air compressor is running off-load or idle for long periods. You can attain great savings if a fixed-speed air compressor can be replaced by a VSD unit, as it produces compressed air only as required. This also minimizes offload running of the air compressor.

Take the Guesswork Out of It

Compressed air should never rely on guess work. There are a range of tools and services that are completely free of charge that can help you benchmark efficiency, find ways to expand, or ensure efficiency during a slowdown in demand.

The key thing to remember is that any investment should come with a clear payback and ROI. If you don't get one, then don't purchase! From a cost and finance point of view, it could be argued there has never been a better time to make an investment in your air system. Often, the monthly cost for a new air compressor is less than the monthly savings, so the air compressor contributes to the bottom line from day one. If you think you've got the wrong machine for your needs, then there is no need to feel that you must live with it. BP

About the Author

Katie Falcon is a Content Developer for Atlas Copco Compressors LLC. Atlas Copco Compressors also wishes to thank its product marketing team for contributions to this article. For more information about guidelines for varying production levels, contact TJ Estes, Product Marketing Manager, Atlas Copco Compressors LLC, e-mail: tj.estes@atlascopco.com.

About Atlas Copco Compressors, LLC

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

All photos courtesy of Atlas Copco Compressors.

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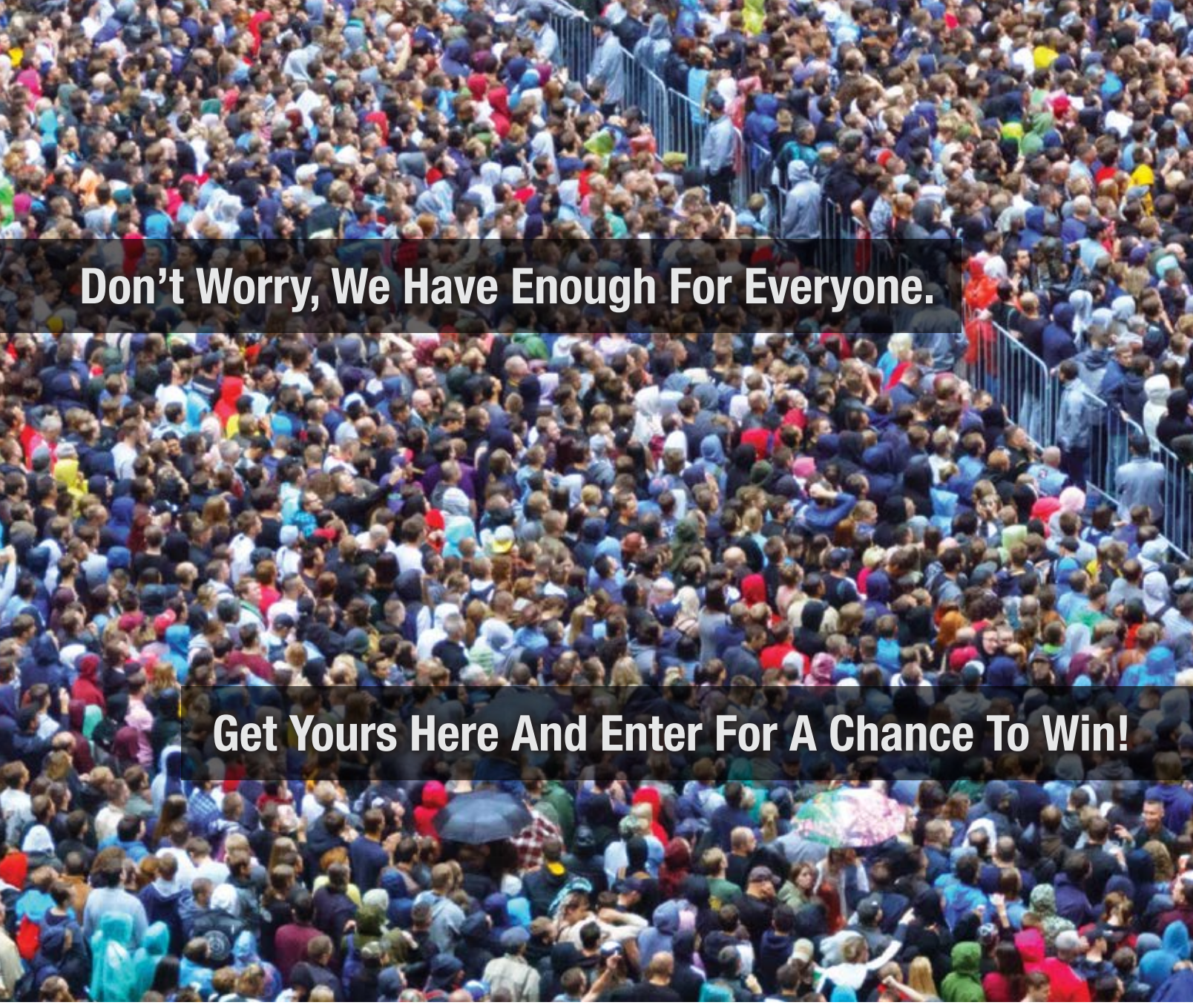

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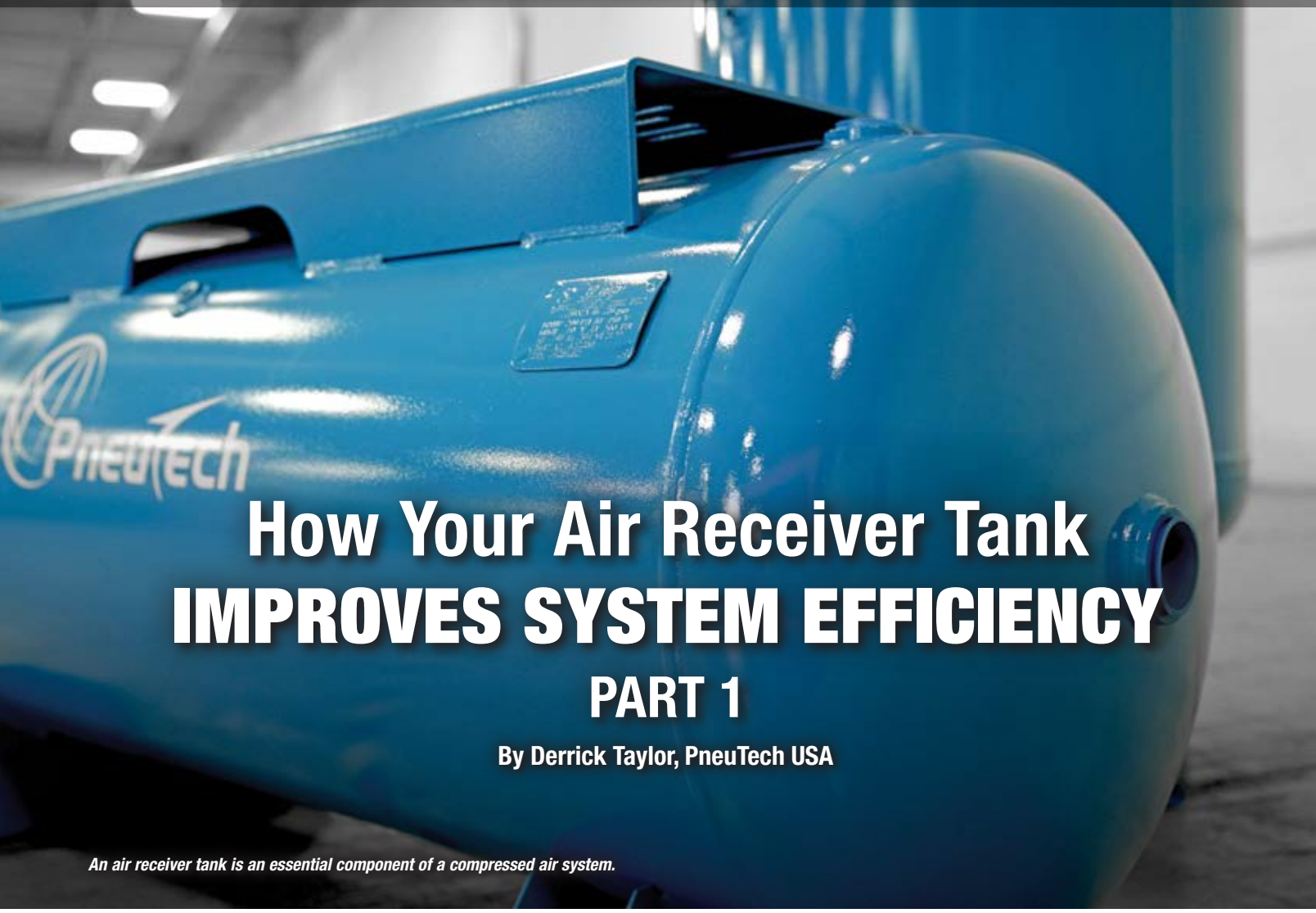

How Your Air Receiver Tank IMPROVES SYSTEM EFFICIENCY PART 1

By Derrick Taylor, PneuTech USA

An air receiver tank is an essential component of a compressed air system.

If you have a compressed air system, chances are you also have at least one air receiver tank. But do you know why you have an air receiver tank, and what it is doing for your system?

Air receiver tanks don't always get a lot of attention, but they are an essential component of a compressed air system. Having a properly sized air receiver tank ensures the safe and efficient operation of your system and provides a reservoir of extra power for use during periods of peak demand.

Why an Air Receiver Tank?

An air receiver tank (sometimes called an air compressor tank or compressed air storage tank) is a type of pressure vessel that receives air from the air compressor and holds it under pressure for future use. The tanks come in a range of sizes and in both vertical and horizontal configurations. An air receiver tank provides temporary storage for compressed air. It also helps your compressed air system

> "Ensuring adequate air storage capacity will go a long way toward improving the efficiency and performance of your compressed air system."
>
> — Derrick Taylor, PneuTech USA

run more efficiently. The air receiver tank has three main functions:

- It stores compressed air that can be used for short, high-demand events.
- It provides a steady air signal to air compressor controls.
- When used as a "wet tank," it acts as a secondary heat exchanger, increasing the efficiency of your air dryer.

Average Peaks with Compressed Air Storage

The primary role of an air receiver tank is to provide temporary storage for compressed air. Storing compressed air allows the system to average the peaks in compressed air demand over the course of a shift. You can think of your air receiver tank like a battery for your compressed air system, except it is storing air instead of chemical energy.

This air can be used to power short, high-demand events (up to 30 seconds) such as a quick burst of a sandblaster, dust collector pulse, or someone using a blowgun to dust themselves off. The air in the tank is available even when the air compressor is not running. Storing compressed air reduces sudden demands on your air compressor, prolonging the life of your system. Using an air receiver tank may also allow you to use a smaller horsepower air compressor for larger jobs.

Gain Air Compressor Control

The air receiver tank provides a steady stream of air-to-air control of an air compressor, eliminating short-cycling and over-pressurization. Uneven compressed air utilization causes uneven demand on the air compressor, resulting in rapid cycling of the air compressor controls as the air compressor turns on and off to meet moment-by-moment demand. Each time the system turns on and off (or loads/unloads) it is called a "cycle." It is better for the air compressor motor to keep these cycles as long as possible.

Air receiver tanks provide temporary storage for compressed air – and help compressed air systems operate more efficiently.

Over time, frequent short cycling will lead to premature failure of switches and other air compressor components. Rapid cycling can result in excessive wear of the motor contactor or even a direct motor short because of winding insulation. The air receiver tank eliminates short cycling and provides more consistent system pressure to controls.

A Secondary Heat Exchanger

As air is compressed under pressure, its temperature increases; this is a simple law of physics known as the Pressure-Temperature Law. Depending on the type of air compressor used, the air discharged from the air compressor may be as hot as 250°F to 350°F. This is too hot for most air-operated equipment to use directly.

Hotter air also contains more moisture, which will result in excess water vapor that will condense in control lines and tools if it is not removed. The condensed air must be cooled and dried before it is utilized. A heat exchanger is used to remove excess heat caused by compression. The air receiver tank acts as a secondary heat exchanger; as air sits in the tank or slowly flows through it, it naturally cools over time. The air receiver tank supports the work of a primary heat exchanger; lowering the temperature of the air an additional 5°F to 10°F is not uncommon.

How an Air Receiver Tank Boosts Efficiency

Adding an air receiver tank significantly improves the efficiency of your compressed air system and can even lower your energy and maintenance costs. They do this by:

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

"We're not just picking low-hanging fruit, we're walking on the fruit because compressed air represents such a major opportunity for energy reduction."

— Darren Borden, P.E., CEM, Energy Management Engineer, Corporate Health, Safety and Environment, Weston Foods

"We are committed to the protection of the environment and the conservation of natural resources, as well as quality. We knew a better way to approach compressed air would be one of the best ways to meet our goals."

— Carroll Bruckner, Maintenance Engineer, SumiRiko Tennessee

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

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.

"Implementation of the compressed air automation and data acquisition platform in combination with the upgrades to the system reduces the facility's annual energy consumption by 6,098,619 kWh per year, resulting in yearly savings of $600,000."

— Pascal van Putten, VPInstruments, and Tyler Costa, ALD, Inc. (feature article in June 2019 Issue).

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HOW YOUR AIR RECEIVER TANK IMPROVES SYSTEM EFFICIENCY

- Reducing waste of compressed air from excessive sump blowdowns.
- Lowing the pressure requirements for the air compressor and air network.
- Increasing the efficiency of the air dryer by reducing moisture.

Reduce Waste of Compressed Air

As the air compressor cycles on and off, compressed air can be wasted. Every time a rotary screw air compressor unloads, the sump tank (oil tank) is vented. Compressed air is released during the venting. Over time, this adds up to the loss of thousands of cubic feet of compressed air that could otherwise have been used to power processes in your facility. A properly sized air storage tank reduces frequent cycling and venting.

Reduce Air Compressor Operating Pressure

Your compressed air receiver tank is like a battery for your facility, providing an extra reservoir of compressed air you can draw on during periods of high demand. Without a store of compressed air to draw on, the system will have to operate at higher pressures so it is always ready to meet peak demands. In essence, you are asking your system to operate as if your facility is always running at maximum demand. This leads to increased energy use and wear and tear on the system.

Relying on your air receiver tank for high-demand events lets you reduce the overall operating pressures for your system, resulting in lower energy costs. You may also be able to purchase a smaller air compressor with lower cfm capacity by relying on your air receiver tank for high demand events. On average, every two psi decrease in your system decreases the energy demand by one percent. This can lead to hundreds or thousands of dollars in savings on your energy bills annually.

Yet another benefit of air receiver tanks is improved compressed air dryer efficiency.

Increase Dryer Efficiency

The heat exchanger function of the air receiver tank helps to improve the efficiency of your air dryer. As air passes slowly through the receiver tank, it cools. Cooler air can't hold as much moisture as warm air, so excess moisture condenses and falls out of the air as a liquid. The water drains out of a valve at the bottom of the tank. By removing some moisture in advance, the air receiver tank reduces the amount of work the air dryer needs to do. This improved efficiency translates to additional energy savings for your system.

Other Air Receiver Tank Benefits

Air receiver tanks improve the efficiency and performance of your system in other ways, as well. Additional benefits include:

- Cycle count reduction: As explained, the air receiver tank reduces cycle counts for your air compressor by evening out peaks in compressed air demands. Lower cycle counts add up to lower energy use and less wear and tear on other system components, extending the life of your air compressor.
- Pulsation dampening: The air receiver tank functions as a pulsation dampening device, absorbing vibrations from the air compressor motor and pulsations in the air stream. This reduces fatigue on piping and other system components.
- Dirt removal: Particulates can enter the airstream due to corrosion within the system, motor exhaust from the air compressor, or particulates in facility air. Many of these particulates will fall out of the air along with condensate within the air receiver tank. The excess dirt is then simply drained away

HOW YOUR AIR RECEIVER TANK IMPROVES SYSTEM EFFICIENCY

with the liquids. As a result, the air entering the air dryer is both cleaner and drier than air directly from the air compressor.

Types of Air Receiver Tanks

Air receiver tanks come in many different sizes and configurations. It's also important to know there are two types of compressed air storage: wet and dry. The tanks are the same; the difference is in how they are installed.

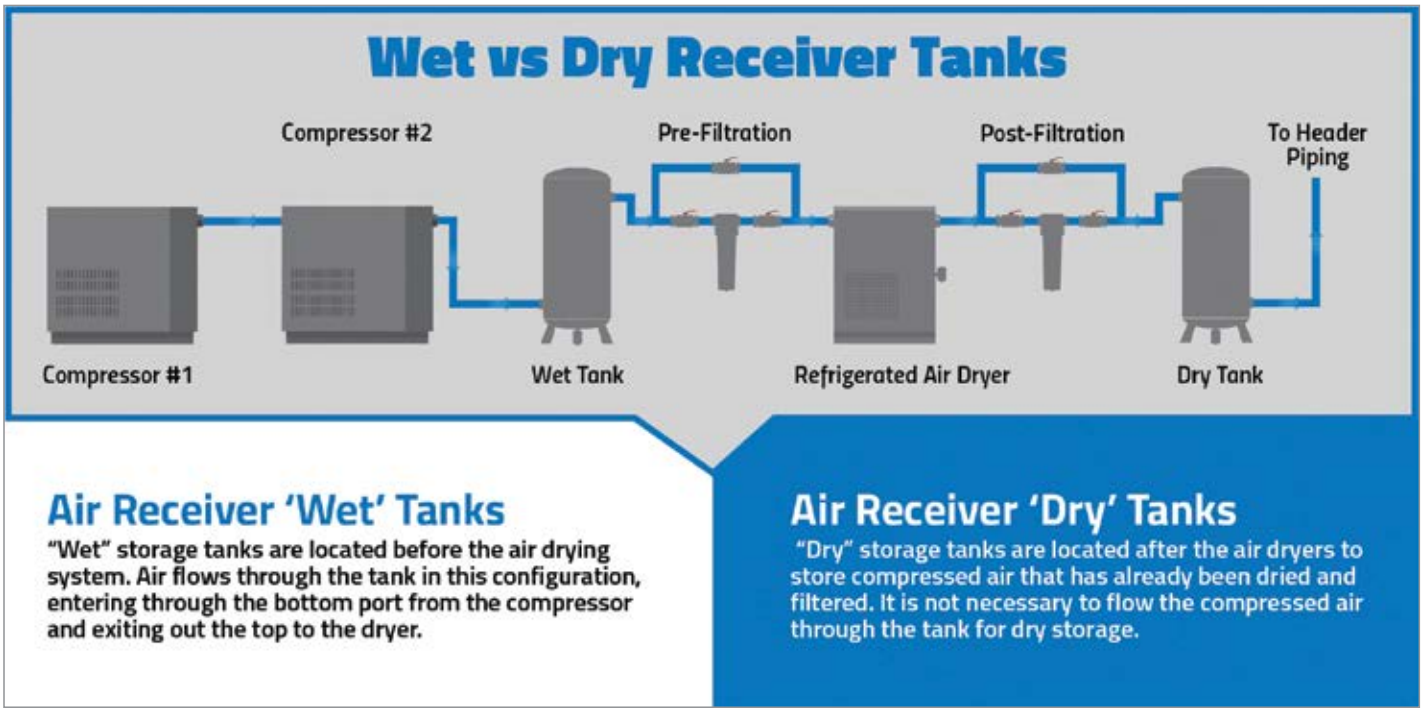
"Wet" storage tanks are located before the air drying system. Air flows through the tank in this configuration, entering through the bottom port from the air compressor and exiting out the top to the dryer.

- Wet storage increases the efficiency of your air dryer by allowing excess water and lubricant to condense out of the air before it hits the dryer.
- A wet air storage tank also prolongs the life of the pre-filter element, which is located in between the wet storage tank and the dryer. Since the air going through the filter is cleaner and dryer than it would be directly out of the air compressor, slugging of the filter with liquids is minimized, along with resulting pressure drop on the air dryer side of the system.
- The air compressor does not experience backpressure because the air does not go through filtration before entering the tank. This results in a steadier pressure signal to the air compressor controller.

"Dry" storage tanks are located after the air dryers to store compressed air that has already been dried and filtered. It is not necessary to flow the compressed air through the tank for dry storage.

- Dry compressed air is ready to use right out of the tank, so it is immediately available in the case of a high-demand event.
- Dry storage reduces the burden on your air dryer during high-demand events. Without a dry air tank, air from the wet tank will have to go through the air dryer before it is used. During periods of high demand, the dryer is at risk of becoming over-capacitated as the system tries to pull air through at higher volumes than the dryer is rated for. If the dryer cannot keep up with the demand, drying efficiency is reduced, potentially leading to unwanted water in the air lines.

Most applications require a combination of wet and dry storage for optimal efficiency and performance.



Optimizing Compressed Air System Performance

The air receiver tank is an unsung hero in the world of compressed air equipment. Ensuring adequate air storage capacity will go a long way toward improving the efficiency and performance of your compressed air system. A compressed air system designer can help you find the right storage volume and wet/dry ratio for your application and air use patterns.

The best news? An air receiver tank is a relatively small investment when compared to the total cost of your compressed air system and associated energy bills – and once installed, your tank will last for many years if cared for properly. Adding more storage is a cost-effective system upgrade with a high ROI. Once you understand all of the ways that your air receiver tank enhances your system, it's an easy decision to make. BP

About the Author

Derrick Taylor is co-founder and General Manager of PneuTech USA, email: Derrick.taylor@pneutech.com, tel: 888-966-9007, Ext. 4000. He brings more than 20 years of direct experience in compressed air service, installation, sales and system design. Taylor is also co-owner of Fluid-Aire Dynamics, a leading distributor of industrial compressed air equipment in the Chicago, Milwaukee, Minneapolis and San Antonio markets.

About PneuTech

PneuTech is a global manufacturer of air compressors, air dryers and compressed air equipment. For more information, visit https://pneutech.com/usa/.

All photos courtesy of PneuTech USA.

To read similar articles on ***Compressed Air Storage***, visit https://airbestpractices.com/system-assessments/piping-storage.

COMPRESSED AIR SYSTEM TECHNOLOGY NEWS

New Atlas Copco Air-Nitrogen Packages Simplify Ordering

Atlas Copco Compressors has bundled some of its most popular air and nitrogen offerings into five convenient packages to facilitate easier ordering and financing. Suitable for multiple industries, the new packages are being offered in an effort to help customers take advantage of some incredible finance rates, in addition to helping customers who might be suffering with or concerned about the reported national shortage of CO_2.

In many industries, nitrogen can replace CO_2 for inerting, bottling and purging – not only significantly reducing greenhouse gas emissions, but also saving up to 70% on monthly costs. A recent case study published by Atlas Copco and based on a brewery in the state of Washington highlights the benefits that can be realized by moving to on-site nitrogen for several key processes. It also outlines a solution that can eliminate up to two-thirds of the average annual costs of using CO_2 for the same processes.

Through Atlas Copco's nitrogen initiative, customers have the potential to save significant amounts of money every month, with zero limitations on the amount of nitrogen they can produce and use. After five years, the nitrogen generators are wholly owned, and the monthly payment would be zero. Additionally, by utilizing nitrogen over CO_2, greenhouse gas emissions can be reduced by dozens of metric tons annually.

"In the current situation, we have focused on packages that can add value to the bottom line from day one," said Paul Humphreys, Vice President of Communications and Branding at Atlas Copco. "With the new finance plans, we are working to ensure that the monthly savings are always greater than the monthly payments, providing positive cash flow from the start."

This is all possible thanks to the latest editions to Atlas Copco's full nitrogen generation range. The cost-effective NGMs 1–3 range features membrane technology and offers a highly efficient, compact, and simple on-site solution for low-flow N_2 requirements, with the added benefits of minimal maintenance and operational costs. There are three models in the new NGMs range, and each can be wall-mounted to save coveted space and provide a fit even in small facilities.

The NGMs generators boast an extremely fast start-up time, taking only a few seconds to produce nitrogen at the outlet. This results in maximum uptime assurance and a continuous availability of nitrogen 24 hours a day, seven days a week. Additionally, the generator offers zero performance loss at high ambient temperatures, along with low service requirements.

The generators are supplied as an all-in-one, integrated package complete with filters. Fitted with pressure gauges to ensure accurate system monitoring at all times, the ready-to-use units are housed in a fully enclosed protective canopy. No specialist installation or commissioning is required – only a supply of dry compressed air. Optional features include an oxygen sensor and an economizer valve set – which uses two differential pressure valves to cut off the nitrogen supply to avoid wasting power and can lead to a dramatic increase in savings.

The packages also include Atlas Copco's range of oil-injected screw air compressors, which offer high efficiency, low noise, and small footprint to ensure the packages can be fitted just about anywhere.

Atlas Copco Compressors has bundled some of its most popular air and nitrogen offerings into five convenient packages.

About Atlas Copco Compressors

Atlas Copco Compressors LLC is part of the Compressor Technique Business Area,

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

SA Performance Introduces 12,000+ Hour Food Grade Lubricant

The new Dura-Life FG extended-life food grade compressor lubricant from SA Performance provides over 12,000 operating hours of varnish resistant performance, when monitored by quarterly oil analysis. The latest product in SAP's growing line of food grade compressor fluids, Dura-Life FG uses a proprietary blend of unique base fluids and additives for enhanced thermal stability, helping to better handle high temperature environments where standard food grade lubricants have fallen short in the past.

In addition to an enhanced operating life, Dura-Life FG includes a patented NSF HX-1 additive technology to preserve and protect the fluid from microbial contamination – a first in food grade lubricants. This technology has been proven effective in protecting the lubricant against the formation of yeast, mold, bacteria, and food-borne microorganisms throughout the life of the product.

With its wide range of viscosities, Dura-Life FG is suitable for use in rotary screw, rotary vane, and reciprocating compressors, along with many vacuum pumps. To learn more about Dura-Life FG, contact a SA Performance representative at 904-723-4946 or email info@saperformance.net.

Dura-Life FG's 12,000+ hour life is based on system discharge temperatures of 200oF, Certified USDA/NSF H1 compliant, FDA 21 CFR 178.35 compliant, Kosher and Parve certified.

About SA Performance

SA Performance offers a complete line of high-performance compressor lubricants, all manufactured in facilities with ISO9001 and ISO21469 certifications, with multiple distribution points across the United States, to best serve their customers. SA Performance also offers complete air end remanufacturing services including rotor balancing and machine work, performed in-house at their own specialized facility. Pairing compressor expertise with lubricant knowledge has helped SA Performance become a leading partner across the compressed air industry. For more information, visit www.saperformance.net.

COMPRESSED AIR SYSTEM TECHNOLOGY NEWS

Vert Secures Funding from Investors

Outstanding progress at Vert Technologies, the Edinburgh-based leading-edge compressor manufacturer, has secured it nearly three quarters of a million pounds in new funding from a clutch of existing investors, including Par Equity, Equity Gap, Aero Den and the Scottish Investment Bank, the investment arm of Scottish Enterprise.

Vert's chief executive, Dr Phil Harris, said, "This is a highly gratifying vote of confidence from investors with intimate knowledge of the progress we have been making over the past 18 months in bringing innovation to the global compressor market. "With the additional funding we will be ramping up both sales and production, putting ourselves in a position to bring our exciting new products and technology to a wider audience from which we anticipate substantial take-up".

Award-winning innovation from Vert Technologies is set to hit the market once the present Covid-19 emergency subsides. Its new Vert A150 compressor, alongside its A100 model, incorporate a design that has been hailed as one of the biggest advances in the compressed air industry in the last 40 years. The product range will be further extended towards the end of the year with the launch of a sub-25kg compressor model aimed primarily at the fibre optic installation market.

Development projects are also in the pipeline to extend the reach of the high-pressure Vert technology into the refrigeration market, an application for which it is ideally placed. A new, quiet vacuum concept product, powered by the Vert Conical Rotary Compressor (CRC) technology, which is capable of continuous operation, has also now been developed.

Outstanding progress at Vert Technologies has secured it nearly three quarters of a million pounds in new funding from a clutch of existing investors.

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The current Vert A150 compressor offers 5.3 ACFM (150 lpm) flow and 145 psi (10 bar) pressure. Fitted with an optional variable speed drive the A150 flow increases to 7 ACFM (200 lpm) at 100 psi (6.8 bar). The impressively quiet, compact unit fits neatly under a bench or in a van, so can be sited close to the point of use, whilst the low levels of vibration ensure minimal impact on surrounding equipment.

The compressor's unique combination of benefits also includes a 100% duty cycle for maximum productivity, meaning that it can run continuously. Connecting to a standard 240V power source with quick coupling of the compressed air connection, it does not require the expensive installation of other rival compressors.

Dr Harris said, "We continue to accelerate sales of our compressor units. We are also excited about the potential to exploit the benefits of our technology across a variety of markets, which is why we are particularly pleased with the potential of our CRC technology for the high-pressure refrigeration market as well as in vacuum."

Founded in 2013, Vert employs 15 people at its Technology Manufacturing and Design Centre on the southern edge of Edinburgh. The CRC technology has won multiple awards since the first working prototype was produced in 2014 and led to the company securing a prestigious government grant in 2019 from the UK Department of Business, Energy, and Industrial Strategy (BEIS).

About Vert

Vert is a technology pioneer continuing to advance one of the biggest innovations in the compressed air industry for over 40 years. The unique, patented Vert Conical Rotary Technology differs from traditional compression methods producing high pressure in a single stage from a scalable, low noise unit which is capable of continuous operation. Founded in 2013, Vert employs 15 people at its Technology Manufacturing and Design Centre on the southern edge of Edinburgh. The CRC technology has won multiple awards since the first working prototype was produced in 2014 and led to the company securing a prestigious government grant in 2019 from the UK Department of Business, Energy, and Industrial Strategy (BEIS). For more information, visit www.vertrotors.com.

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COMPRESSED AIR SYSTEM TECHNOLOGY NEWS

ABB IE5 SynRM Motors Deliver Ultra-Premium Energy Efficiency

ABB's award-winning synchronous reluctance (SynRM) motors offer a new first choice to meet the growing global demand for improved energy efficiency. These motors now meet the new IE5 ultra-premium energy efficiency class defined by the International Electrotechnical Commission (IEC).

The IE5 ultra-premium SynRM motors offer up to 50% lower energy losses and significantly lower energy consumption than the commonly used IE2 induction motors. ABB first introduced SynRM technology in 2011, and case studies in industrial installations have demonstrated energy savings of up to 25%, depending on the application.

The IE5 level of efficiency is made possible by the SynRM design, which combines the performance advantages of permanent magnet technology with the simplicity and service-friendliness of an induction platform. To ensure an environmentally friendly design, the permanent magnets do not feature rare earth materials.

"Climate change and environmental responsibility are driving huge changes across all industries," said Tero Helpio, Global Product Manager, IEC LV motors, ABB Motion. "We have responded to this challenge with our IE5 ultra-premium motors that meet the most stringent energy efficiency standards. These motors offer industrial users a great opportunity to reduce their electricity usage and reduce CO_2 emissions while also benefiting from increased productivity and lower life-cycle costs."

Additional benefits of the IE5 SynRM motor are lower bearing and winding temperatures for enhanced reliability and long life. The design also creates less motor noise for a better working environment.

ABB IE5 SynRM motors can be used in a wide range of demanding industrial applications where they offer accurate control and high efficiency across the whole speed range, even at partial loads. This makes them an ideal upgrade option for standard induction motors in pumps, fans, and compressors as well as in more demanding applications like extruders, concha mixers, winches, and conveyors. IE5 SynRM motors are an easy replacement for induction motors as they have the same size and output power, so no mechanical modifications are required.

The IE5 SynRM motors meet the requirements of the efficiency class defined in IEC TS 60034-30-2 and are available with output power of 5.5 to 315 kilowatt (kW) in frame sizes IEC 132-315. They can be specified as part of a high-efficiency motor and drive package with ABB variable speed drives (VSDs).

ABB IE5 ultra-premium SynRM motors offer up to 50% lower energy losses compared to IE2 motors.

About ABB Motion

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