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March 2024

## Processing

26

**"Crazy" Systems  
& Maintenance**

- 16 **Acoustic Inspections in Pulp  
& Paper Industry**
- 20 **Air Storage in a Reciprocating  
Air Compressor Installation**
- 30 **Managing the Energy Cost  
of Nitrogen Generators**
- 38 **The AIM Act's Impact  
on HFC Gases**





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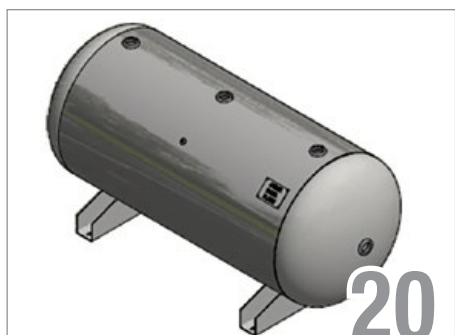
## SUSTAINABILITY & ENERGY/WATER CONSERVATION

### 16 Best Practices for Acoustic Inspections in the Pulp and Paper Industry

By Rob Milner, FLIR, a Teledyne Company

### 30 Managing the Energy Cost of On-Site Nitrogen Generators

By Hank Van Ormer, APenergy



## SAFETY & RELIABILITY

### 20 Using Air Storage to Balance Capacity in a Reciprocating Air Compressor Installation

By the Compressed Air & Gas Institute

### 38 The AIM Act's Impact on HFC Gases

By Taylor Ferranti, A-Gas

## EVERY ISSUE

### 4 From the Editor

### 6 Industry News

### 26 Subscriber Corner | "Crazy" Systems & Maintenance

Subscribers from  
Around the World

### 43 Compressed Air Technology News

### 49 Advertiser Index

### 50 The Marketplace | Jobs and Technology



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# FROM THE EDITOR



## Compressed Air Process Safety and Reliability

I just returned from the IPPE Show where I spoke, to the major manufacturers of thermoforming food packaging equipment, about compressed air quality. We reviewed locations where compressed air can touch the food products they package. They said they specify/request, “Clean, Dry, Compressed Air” but rarely encounter plants verifying compressed air quality.

Another take-away was the scarcity of maintenance personnel in food processing and packaging plants. Food packagers used to recruit service technicians from these plants – and the well has run dry. This makes the need for compressed air quality verification, using instruments like dew point monitors, more important than ever.

In order to raise awareness, our new Subscriber Corner Section, on page 26, invites readers to send pictures of “Crazy” Systems and Maintenance practices observed in the field.

Our “Energy/Water Conservation” features, this month, focus on acoustic inspections for compressed air leaks in the pulp and paper industry and on “Managing the Energy Cost of On-Site Nitrogen Generators.” Hank Van Ormer’s second article on this topic helps plants understand the compressed air costs related to higher nitrogen purities.

Few things improve system reliability like proper compressed air storage. We’d like to thank the Compressed Air & Gas Institute for sending us their article titled, “Using Air Storage to Balance Capacity in a Reciprocating Air Compressor Installation.”

We are now seeking speakers for the Best Practices 2024 EXPO & Conference taking place in Atlanta, October 29-31, 2024. To submit an abstract please visit <https://cabpexpo.com/>. Thank you and please mark your calendars to attend.

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

**RODERICK M. SMITH**

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# Compressed Air Industry News

## Atlas Copco Appoints New President and CEO

The Board of Directors of Atlas Copco AB has appointed Vagner Rego as the new President and CEO of Atlas Copco Group, effective May 1st, 2024. He will replace Mats Rahmström who has, as previously communicated, requested to leave his position after successfully leading the Group since 2017.

“Vagner Rego is an appreciated leader with a proven track-record in successfully growing and developing the Compressor Technique business area,” said Hans Stråberg, Chair of the Board. “With his extensive experience and in-depth business and technology knowledge he is very well suited to lead and further develop the Group”.

Vagner Rego, currently Senior Executive Vice President and President of the Compressor Technique business area, joined the Group in

1996 as a trainee engineer in his native country Brazil. In 2006 he was appointed Business Line Manager for Compressor Technique Service in Brazil and in 2010, he became Vice President Marketing and Sales for the Compressor Technique Service division, based in Belgium. He has also been General Manager for Power Technique’s Customer Center in Brazil. Before he took on his current position in 2017, he was President for the Compressor Technique Service division.

Vagner Rego is a Brazilian citizen and was born in 1972. He has a degree in mechanical engineering from Mackenzie University and an MBA from Ibmec Business School, both located in Brazil. Vagner Rego will be based in Stockholm, Sweden.

### About Atlas Copco Group

*Atlas Copco Group enables technology that transforms the future. We innovate to develop*

*products, services and solutions that are key to our customers’ success. Our four business areas offer compressed air and vacuum solutions, energy solutions, dewatering and industrial pumps, industrial power tools and assembly and machine vision solutions. In 2022, the Group had revenues of BSEK 141, and 49,000 employees. [www.atlascopcogroup.com](http://www.atlascopcogroup.com).*

## Rogers Machinery Celebrates 75 Years of Excellence

Rogers Machinery Company, Inc., a pioneer in compressor and vacuum system manufacturing, proudly marks its 75th anniversary, celebrating three-quarters of a century of innovation and steadfast commitment to their customers.

Founded in 1949 by WWII veterans Ned Rogers and Walter M. Novak, who served together aboard the U.S.S. Reno, Rogers Machinery emerged from the post-war era with a shared vision to establish a world-class compressor system manufacturing facility.

Current president and CEO, Andrew Ragen, proudly follows in the footsteps of his grandfather, Walter Novak, upholding the values and principles that have been the cornerstone of Rogers Machinery since its inception.

Andrew said, “Our 75th anniversary is a momentous occasion for all of us at Rogers Machinery. It is a celebration of our rich history, unwavering commitment, and the trust we have built with our customers over the years.”



Vagner Rego, Hans Stråberg and Mats Rahmström (left to right).



Rogers Machinery Company manufactures its own oil-free and oil lubricated compressor lines and proudly offers products and services from the most recognized names within the compressed air, vacuum, blower, and pumping industries. This diversity allows the company to tailor solutions for any industry or application, ensuring that customers receive the most efficient system and support to meet their specific needs.

As Rogers Machinery embarks on its next chapter, the company invites customers, partners, and industry stakeholders to join in celebrating this significant milestone. Discover the Rogers Machinery difference today and



Rogers Machinery Company, Portland, OR branch and corporate headquarters.



## MNG-PRO Series

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The MNG Pro Series Nitrogen Generators, utilizing highly efficient carbon molecular sieve (CMS), feature a new design that ensures optimal airflow within tanks. These generators enable the rapid and high-purity production of nitrogen gas at the desired quality (ranging from 95% to 99.999%).



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## Compressed Air Industry News

experience 75 years of unwavering commitment to quality and service.

### About Rogers Machinery Company

Rogers Machinery Company, Inc., founded in 1949 by WWII veterans Ned Rogers and Walter M. Novak, is a veteran-founded and veteran-owned company dedicated to providing high-quality utility equipment including compressed air, vacuum and pump systems and services. With a nationwide presence and branches in 13 states, Rogers Machinery is committed to innovation, excellence, and unmatched customer service. For more information, visit <https://rogers-machinery.com/>.

### John Bouchard & Sons Receives Woman Business Enterprise Certification

After over 120 years in business, John Bouchard & Sons Co. (JBS) is pleased to announce its certification as a Woman Business Enterprise (WBE).

Owner Lisa Bouchard Morgan said, “For over a century, the John Bouchard & Sons Co. tradition of innovation and excellence has helped create and maintain the systems that keep communities running. It’s my privilege to help carry our family’s business into the future, while holding strongly to our long-



120-year-old Family Business Receives Woman Business Enterprise (WBE) Certification.

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built values of integrity, service, quality and family.” Longtime JBS President & COO, William D. Morgan said, “Lisa’s increasing involvement over the last decade has prepared us well for the next steps of growth on our horizon.”

Building on its pump and rotating equipment expertise, JBS became a Gardner Denver air compressor distributor in 1991 and has since established itself as a premier air house, with stocking service centers in Nashville & Knoxville, Tennessee; Elizabethtown, Kentucky; and Evansville, Indiana. The company is an authorized distributor for Gardner Denver and many other industry-leading brands.

JBS has become a premier rebuilder of rotary screw airends of all makes and models, including Gardner Denver, Ingersoll Rand, Sullair, Quincy, Atlas Copco, Kaeser, Boge, Sullivan-Palatek, Elgi and others. Their in-house rebuild center in Kentucky provides some of the shortest rebuild lead times in the country. JBS has recently expanded their Rental Compressor fleet, which includes machines up to 300hp. Additionally, their new machine, in-stock inventory includes reciprocating and rotary screw compressors from 15hp to 200hp.

#### About John Bouchard & Sons

*Beginning as a Nashville machine shop in 1900, John Bouchard & Sons Co. is a fifth-generation, family-owned, diversified business serving modern industry through four fully-integrated divisions: The Construction division offers turnkey electrical, mechanical, plumbing, fire protection*

*and fabrication projects. Each of these disciplines also provide maintenance and repair to industrial, municipal, institutional and commercial customers. The Machine Services division provides field service and shop repair for all types of compressors, pumps, stamping presses, blowers, gear boxes and other rotating equipment, as well as general and CNC machine work. The Equipment Sales & Service division supplies and services compressed air, pumping, nitrogen generation and vacuum systems, as well as general pipe, valves and fittings. The Foundry division supplies municipal castings across the Mid-South. Visit [www.JBouchard.com](http://www.JBouchard.com) to learn more.*

#### JHFOSTER Promotes Oster to Senior VP of Compressed Air Sales

John Henry Foster Minnesota (JHFOSTER), a leading provider of automation solutions, announced it has promoted Clark Oster to Senior Vice President, Compressed Air Group Sales.

In his new role, Oster will have overall responsibility for the Compressed Air Group including sales, piping, installation, parts and customer service. He will also maintain responsibility for the company’s account managers. Previously, Oster was Vice President, Sales for JHFOSTER and has been with the company since 2018.



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## Compressed Air Industry News

“Clark is a key member of the team and has demonstrated his ability to develop our sales channels, partner network and cultivate client relationships,” said Nicholas Martino, CEO, JHFOSTER. “His strategic approach has not



Clark Oster, Senior Vice President, Compressed Air Group Sales, JHFOSTER.

only made him an extremely successful sales executive, but also a trusted advisor to our staff and customers. I am excited to recognize his contributions and know his leadership will be key as we enter the next phase of company growth.”

“As JHFOSTER continues to build upon a great team and culture, it has been my privilege to be part of that journey and success,” said Oster, Senior Vice President, Compressed Air Group. “I’m excited to elevate our core strengths to further align all facets of the Compressed Air Group from sales to service. Executing on these strategies will provide our customers with the best-in-class service they have come to

expect, and in turn will continue to drive our business objectives and results. I look forward to the opportunities ahead and the company’s continued success.”

### About JHFOSTER

JHFOSTER, headquartered in Eagan, MN, represents a strategic collection of industry-leading manufacturers, experienced engineers, support teams and automation & robotics distributors. We specialize in automation motion control, compressed air, and robotics to advance technology, drive innovation forward and deliver end-to-end solutions – across the nation and around globe. For more information, visit [www.jhfoster.com](http://www.jhfoster.com).

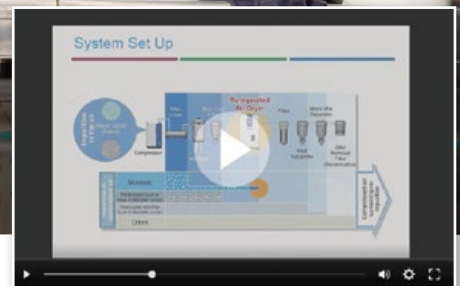
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## Hitachi Global Air Power Names New Vice President of Operations

Hitachi Global Air Power US, LLC, an industry leader in innovative compressed air solutions since 1965, announced Stephen Ballenger has joined the company as Vice President Operations effective November 20, 2023. Ballenger will lead the company's manufacturing in Michigan City, Indiana and has worked as a Lean consultant for Hitachi Global Air Power since July 2023.

"We are modernizing our operations using Lean methodology with great success and as a consultant, Steve has been an integral part of that transformation," said Hitachi Global Air Power President and CEO, John Randall. "He [Steve] brings a wealth of experience in not only Lean manufacturing, but in operations management, strategy development and continuous improvement. We are very excited to have Steve officially join our team and help us continue to build a truly world-class manufacturing operation."



Stephen Ballenger, Vice President Operations, Hitachi Global Air Power US, LLC.

Ballenger brings more than 40 years of management experience to Hitachi Global Air Power. Prior to the Vice President of Operations role, Ballenger was senior consultant for Lean Focus in Michigan City Indiana. He has also held senior operations leadership roles at Bosch USA, STIHL, GKN Automotive, and Camco Manufacturing. Ballenger specializes in bringing Lean Six Sigma and continuous improvement efficiency strategies to global and multi-site manufacturing environments. He holds a Bachelor of Science in Mechanical Engineering and a master's degree in industrial management from Clemson University.

## About Hitachi Global Air Power US, LLC

*We build the machines that power industry. We are Hitachi Global Air Power, a leading global industrial compressed air manufacturer. Headquartered in Michigan City, Indiana, our compressed air solutions power manufacturing operations all around the globe; from food and beverage, to pharmaceuticals and computer chips. Our portable compressors provide the air power to build roads and bridges, lay pipelines and aid in oil and gas mining and production. As part of Hitachi Industrial Equipment Systems Co., Ltd., Hitachi Global Air Power operates ISO 9001 certified factories in Michigan City, Indiana and Suzhou, China,*

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\* Units must be registered and less than four years old to qualify for free recycling. Older units can still be recycled but may incur a recycling charge. Contact us at [info@recycleoilsep.com](mailto:info@recycleoilsep.com) with any questions.

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## Compressed Air Industry News

and sales offices strategically located in Europe, Australia, Southeast Asia, and South and Latin America. Through brands Hitachi, Sullair, and Champion (Australia), our machines have provided legendary reliability, durability, and performance for more than 57 years. Our global network of engineering and quality experts are building next generation, highly efficient and environment-forward compressed air solutions in direct response to customer need. For more information, visit [www.sullair.com](http://www.sullair.com).

### Sauer Compressors Acquires Swedish Sales Partner

The Kiel-based compressor manufacturer Sauer Compressors has taken over its Swedish sales partner Söders Maskinservice AB with effect from 1 January 2024. The 100% company acquisition is intended to further expand Sauer Compressors' market presence in the Nordic countries. The new member of the group of companies will operate as Sauer Compressors Nordics AB in the future.

Sauer Compressors is the world's leading manufacturer of high-pressure reciprocating compressors for all gases and pressures up to 500 bar for commercial shipping, defense, general industry and offshore applications. In Sweden, the Sauer Compressors Group has been represented by Söders Maskinservice with locations in Oskarshamn and Kalmar for over 15 years. Founded in 1988, the family-owned company offers complete solutions in the fields of hydraulics, air and gas compressor technology and filtration. The company serves customers in a wide range of sectors, from industry to shipping. In addition to sales, the



Tommy Sjöberg (Technical Director Sauer Compressors Nordics), Anders Jacobi (Head of Hydraulics Division Sauer Compressors Nordics), Mats Söder (CEO Sauer Compressors Nordics), Hendrik Murmann (CEO Sauer Compressors Group) and Dirk Slotke (CSO Sauer Compressors Group) (left to right) are looking forward to continuing the good co-operation under the umbrella of the Sauer Compressors Group.

business also includes installation, service and maintenance of the systems. Following the company acquisition, the important hydraulics division will remain exclusively for the Swedish market under the name Söders Hydraulics.

"By taking over the successful company Söders Maskinservice, we can benefit from the expertise of our Swedish colleagues and strengthen our presence in Sweden and the Nordic countries," said Sauer Compressors CSO Dirk Slotke. The previous owner Mats Söder and all employees will remain with Sauer Compressors Nordic AB, which is now the 15th location of the Sauer Compressors Group worldwide.

#### About Sauer Compressors

Sauer Compressors is a medium-sized German group of companies with 15 international

subsidiaries. The company looks back on 140 years of history and over 90 years of experience in compressed air and gas technology. These days, the focus is on the development, manufacture and sale of oil-lubricated and oil-free medium- and high-pressure compressors for applications in commercial shipping, industry, offshore and the defense sector. The four product lines SAUER, HAUG, GIRODIN and EK focus on specific fields of application. The SAUER line comprises oil-lubricated high-pressure compressors for a wide variety of applications, while HAUG stands for oil-free and hermetically gas-tight compressors. The GIRODIN and EK lines offer special compressors for the naval market. The modern reciprocating compressors for compressing air as well as a variety of gases reach pressures of 20 to 500 bar.g. In addition to standard products, customized solutions are offered for every type of application for individual customers, OEMs and globally



active companies. With a worldwide network of representatives and partners, Sauer is always close to its customers. By supplementing the compressor range with high-quality accessories, engineering services, assembly and service concepts, Sauer provides complete system solutions right up to complete turnkey installations. For more information, visit [www.sauercompressors.com](http://www.sauercompressors.com).

### CAC Announces Upcoming 2024 Q1 and Q2 Training Schedule

The Compressed Air Challenge (CAC) has announced its training schedule for the first and second quarters of 2024. It includes sessions on “Fundamentals of Compressed Air Systems,” “Advanced Management of Compressed Air Systems,” and a new offering “Compressed Air System Assessment & Project Development.” These trainings are available both in-person and as webinars, offering flexibility for participants. Notably, sessions are scheduled at the University of Utah campus and several dates are set for webinars. Additionally, AirMaster+ Specialist Qualification training is planned for later in the year. For detailed information on dates, locations, and how to attend these sessions, visit the Compressed Air Challenge’s training calendar at [www.compressedairchallenge.org/calendar](http://www.compressedairchallenge.org/calendar).

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March 4 – 7, 11 am to 3:00 pm ET

### Fundamentals of Compressed Air Systems – Webinar

March 26 – 27, 11 am to 3:00 pm ET

### Advanced Management of Compressed Air Systems – In-Person – Utah

April 9-10, 8 am to 4:30 pm

### Fundamentals of Compressed Air Systems – Webinar

May 14 – 15 11 am to 3:00 pm ET

### Advanced Management of Compressed Air Systems – Webinar

June 24 – 27, 11 am to 3:00 pm ET

### About the CAC

The Compressed Air Challenge is a collaborative initiative involving various industry groups, manufacturers, distributors, facility operators, consultants, and government agencies. It focuses on providing educational resources, training, and practical guidance to improve the performance and efficiency of compressed air systems.

CAC aims to help industries reduce operating costs and improve productivity by optimizing compressed air systems. The CAC’s initiatives has contributed significantly to energy savings and operational efficiency in industries reliant on compressed air systems. For more information, you can visit the Compressed Air Challenge website [www.compressedairchallenge.org](http://www.compressedairchallenge.org).

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## Compressed Air Industry News

### Cummins Arabia to Distribute Sullivan Palatek Portables in UAE

In a strategic move that promises to reshape the landscape of the air compressor market in the UAE, Cummins Arabia has joined forces with Sullivan Palatek Asia (SPA). This alliance introduces SPA's Diesel Driven Portable Air Compressors to the UAE market, under the exclusive distribution of Cummins Arabia.

Sullivan Palatek, with a rich legacy in the compressor industry, mirrors Cummins' ethos of dependability and innovation. Their comprehensive range, designed for the demanding Middle Eastern conditions, complements Cummins Arabia's robust sales and service network. This synergy is further enhanced as the majority of Sullivan Palatek's compressors are powered by Cummins engines, enabling Cummins Arabia to provide unparalleled end-to-end support for both the compressor and engine, eliminating the need for third-party involvement.

"Uniting with Sullivan Palatek not only aligns with our values but also consolidates our position as a one-stop solution provider in the UAE. We are excited to offer our customers the combined excellence of Sullivan Palatek's compressors and our comprehensive support services," said Amit Deshpande, Managing Director of Cummins Arabia.

"Our decision to collaborate with Cummins Arabia stems from a transformative vision to redefine industry standards. Their extensive network and technical expertise in the region, combined with our longstanding trust among customers, notably in oil rigs across the Middle East, make this partnership an ideal match," Mr. Rajesh George, Regional Director of Sullivan Palatek Asia.

This collaboration is set to introduce innovative Sullivan Palatek products to the MEA/GCC markets, including the DOF1750H portable oil-

free compressor and other new ranges tailored to regional needs.

The partnership enhances Cummins Arabia's product range, reinforcing its commitment to providing integrated solutions across diverse sectors including Equipment Rental, Construction, and Oil & Gas. With a majority of Sullivan Palatek's range powered by Cummins engines, Cummins Arabia's well-established network and technical capabilities offer unmatched support in the field.

Initially focusing on the UAE, this agreement lays the foundation for a progressive expansion for Cummins Arabia, that is poised to explore broader opportunities with SPA's industrial compressors, aiming to strengthen its position in key market segments.

#### About Sullivan Palatek Asia

*Sullivan was founded in 1868, the company originated as an engineering service provider and has since transformed into manufacturing the most rugged and dependable rotatory screw compressors available on the market today. With more than 150 years of experience and expertise, Sullivan Palatek air compressors have been developed to be reliable, durable, and energy-efficient. We offer a wide range of Compressors from 185 to 1800 CFM at 7 bar to 42 bar in Portable and up to 450HP in Electrical Compressors. In addition to our core offerings, we have expanded our portfolio to encompass gas compressors, vacuum pumps, and Tanto DTH Rock Drills. For more information, visit [www.sullivan-palatek.com](http://www.sullivan-palatek.com)*



Cummins Arabia and Sullivan Palatek form strategic alliance to distribute portable air compressors in the UAE.



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# Best Practices for Acoustic Inspections in the Pulp and Paper Industry

By Rob Milner, FLIR, a Teledyne Company

*Pulp and paper mill sheet formation and pressing machinery.*

Detecting Compressed Air Leaks Can Lead to Reduced Energy Waste, Boosted Productivity, and Improved Profits for Paper Mills

► Many manufacturing industries including food and beverage, chemical, mining and pulp and paper are heavily reliant on the use of compressed air within their production processes. Paper mills are major industrial facilities that rely on compressed air throughout the entire process as it is used to separate and clean the raw pulp fiber, operate pneumatic tools, and even control valves.

The global consumption of paper and paperboard reached 408 million tons as recently as 2021. And today, mills are shifting from traditional paper to more sophisticated products like high-end packaging solutions and specialty papers. To keep up with growing demand, pulp and paper mills

need a constant supply of compressed air to maintain production.

Compressed air leaks may seem to some like a minimal problem that can be either delayed or ignored, yet over time they will result in significant energy waste, reduced productivity, and increased operating costs. One of the most

effective ways to detect compressed air leaks in pulp and paper mills is through the use of acoustic imaging cameras. Energy expenses, particularly in compressed air systems, account for a significant portion of total production costs in the pulp, paper, and board industry, making it crucial to address these challenges promptly.



Figure 1. Various stages of the paper production process.



### Acoustic Cameras Answer the Call

Acoustic imaging cameras have become a valuable and efficient resource for detecting compressed air leaks in pulp and paper production. These cameras offer the advantage of swiftly and precisely pinpointing the origin of air leaks, requiring minimal training from operators, even in the noisiest work environments. As a result, pulp and paper producers can promptly take corrective measures to decrease energy waste while optimizing the performance of their equipment to improve productivity and quality.

### How Acoustic Cameras Are Applied to Compressed Air Leaks

Compressed air is used in various stages of the paper production process, resulting in a pulp that is mixed with water and chemicals to create a slurry, and into paper products. Compressed air is used to mix and agitate the slurry to ensure a consistent and uniform mixture. Pulp slurry is then fed into a paper machine to form paper web. During this sheet creation stage, compressed air powers various pieces of pneumatic equipment used to regulate the flow of liquids and gases. Once the paper is formed, it undergoes a **pressing process** to remove excess water and flatten the sheet. Compressed air is used to power the pressing process to remove excess water and to facilitate the drying process.

Finally, coatings and final treatments are added to the paper to enhance its performance or appearance. This can include adding finishes like gloss or matte, coatings that make the paper water-resistant, or treatments that improve the print quality of the paper.

Compressed air is often used in the coating application process.

### Challenges of Detecting Compressed Air Leaks

Pulp and paper mills are typically complex facilities that often operate 24/7, with various stages of the paper production process running simultaneously. This creates a challenging environment for commonly used leak detection techniques, as there are numerous areas where leaks can occur. Some traditional leak detection methods, such as sniffers and leak spray, can also be limited in their effectiveness in detecting compressed air leaks in pulp and paper mills.

Sniffer tools use a detector wand to detect leaks from a unit filled with a tracer gas. The tool is moved over the part and detects the leak as it passes over it. The sensitivity of the probe, the speed of movement, and the distance from the part all determine the accuracy of leak detection. Sniffing techniques can locate leaks on a part and can detect even minute leaks. However, they are operator-dependent and can also miss leaks, making them unsuitable for high volume production environments. Leak spray involves applying a soapy solution to the suspected area of the leak and looking for bubbles but, again, this method can result in missing small leaks or leaks in hard-to-reach areas.



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## Best Practices for Acoustic Inspections in the Pulp and Paper Industry

### Proven Advantages of Acoustic Inspections

The most popular traditional method for identifying air compressor leaks is a single-transducer ultrasonic acoustic detector. This electronic device can detect high-frequency sounds that indicate air leaks. However, the traditional method of using a single-transducer ultrasonic system is like using a spot temperature sensor for thermography

inspections – it is functional, but can be time-consuming, and maintenance crews must often use them during scheduled downtime. Furthermore, to be effective, operators require extensive training and months of practice.

Acoustic cameras can detect and pinpoint the distinctive noise of a compressed air leak from a long distance, making it ideal for the noisy environment of large paper-making facilities.



A worker conducts an inspection looking for air leaks with the FLIR Si124-LD acoustic imaging camera.

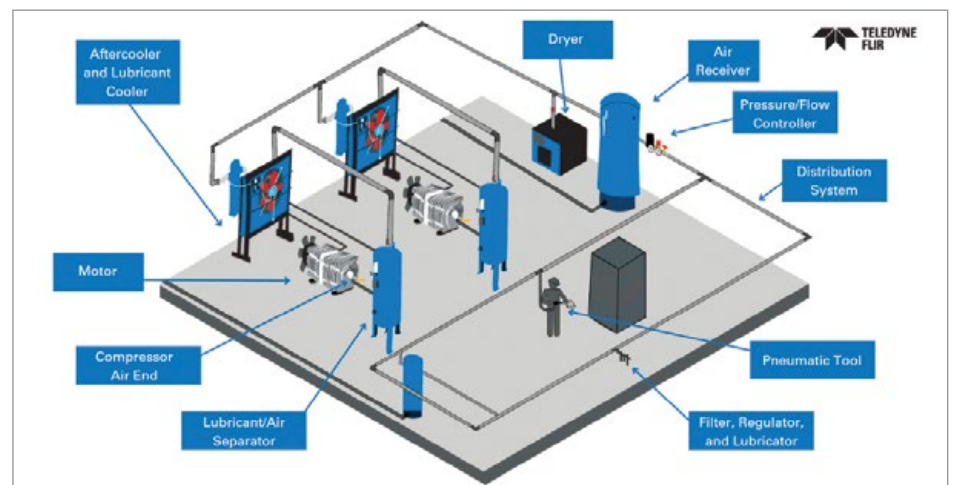


Fig. 2. Where to Look for Compressed Air Leaks in Paper Mills.

An advanced acoustic imaging camera can distinguish between sounds like an air leak despite background noise by identifying the specific acoustic signature of a leak through artificial intelligence (AI). The camera visually shows the location of the leak, saving the inspector a significant amount of time without potentially requiring months or years of training.

### Cost Savings

Detecting and repairing compressed air leaks using acoustic imaging cameras can also result in significant cost savings. By reducing energy consumption and improving the performance of equipment, mills can lower their operating costs and increase their profitability. To better visualize the total cost savings an acoustic imaging camera, a return-on-investment (ROI) calculator can be used. This comes in the form of an online tool that allows you to estimate the potential energy savings from detecting and repairing air leaks, in relation to the cost of the camera itself. Acoustic cameras can also provide on-camera and in-software leak quantification and cost analysis to help prioritize which leaks to fix first to achieve maximum savings.

### Conclusion

The paper-making industry has made strides in recent years to become more environmentally sustainable, with many mills implementing eco-friendly practices such as using recycled

materials, reducing waste, and utilizing renewable energy sources. Acoustic imaging utilizing AI, leak cost analysis and fleet management tools are fast becoming a key method for the industry to reduce energy usage while improving productivity and asset reliability. **BP**

### About Teledyne FLIR

Teledyne FLIR, a Teledyne Technologies company, is a world leader in intelligent sensing solutions for defense and industrial applications with approximately 4,000 employees worldwide. Founded in 1978, the company creates advanced technologies to help professionals make better, faster decisions that save lives and livelihoods. For more information, please visit [www.teledyneflir.com](http://www.teledyneflir.com).

### Author Biography

Rob Milner, global business development and engineering, has worked in business development and sales roles for FLIR, a Teledyne Company, for twenty years, where he has experience across multiple industrial vertical businesses. Milner holds a MSc (Metallurgical Engineering) and a BSc (Metallurgical Engineering). His work has been published in NACE on the topic of Carburization of Advanced Alloys in 1997.



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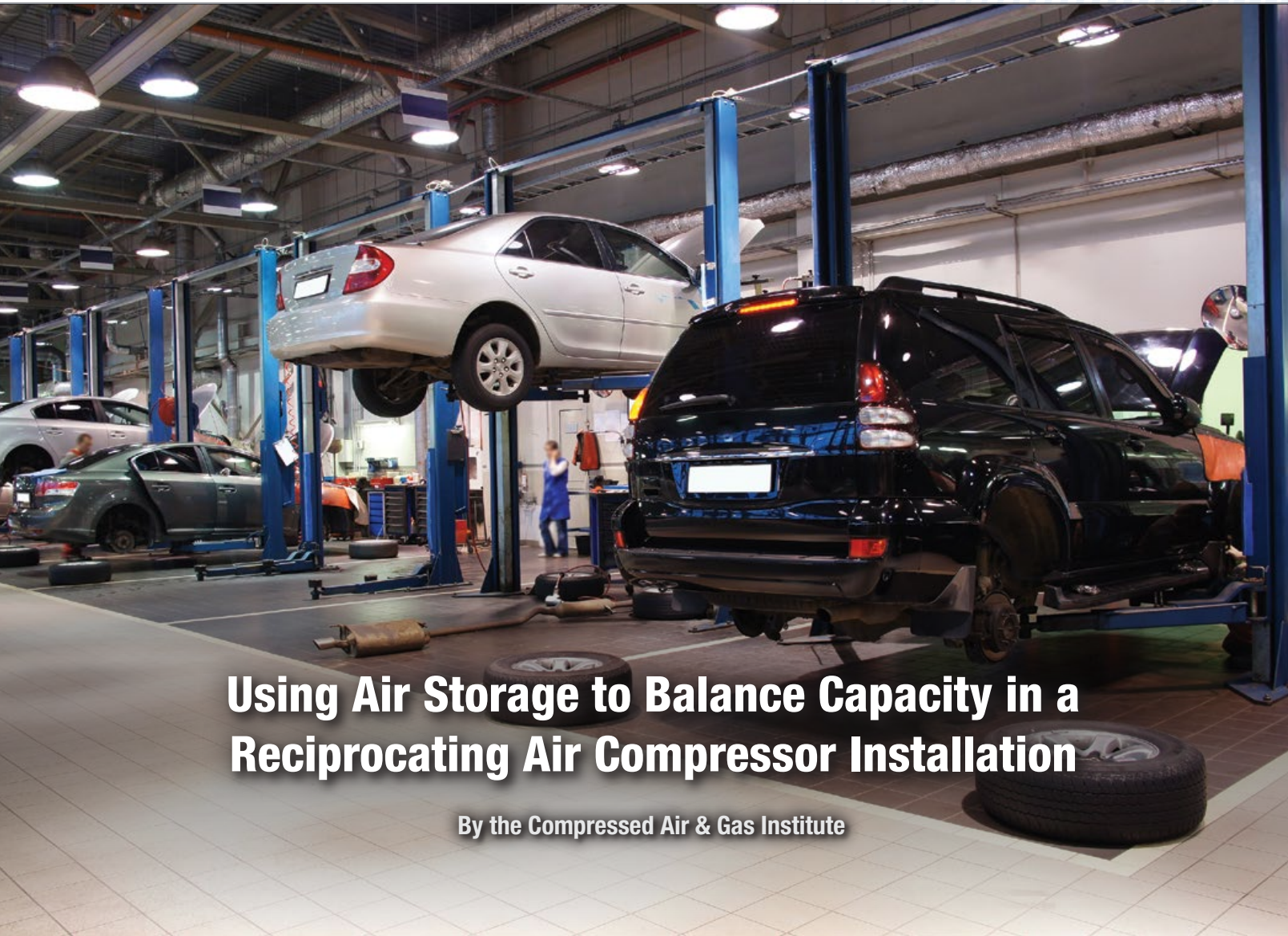
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## Using Air Storage to Balance Capacity in a Reciprocating Air Compressor Installation

By the Compressed Air & Gas Institute

► One of the components frequently included in a reciprocating air compressor is an air receiver, often referred to as an air tank. Proper air storage is a critical component of intermittent duty cycle because for brief moments, the system can provide more compressed air than would otherwise be provided by the compressor pump. The capacity of compressed air piping also contributes to the total capacity of the air storage system.

Unlike liquid, air is a gas that can be compressed, allowing different volumes of air to occupy a fixed storage space. Capacity is

increased with higher storage pressure, the higher pressure squeezes more air molecules into this fixed space, increasing its density. While density impacts pressure, it should be noted that temperature also impacts air pressure. A higher temperature speeds up the movement of air molecules and therefore increases air pressure. Likewise, a lower temperature decreases air pressure.

For purposes of describing air storage, the remainder of the article discusses principles using a constant air temperature. Under constant temperature, the amount of storage



capacity is a function of the physical size of the air storage system and the actual measured pressure of the air. Capacity increases when the quantity of air flowing into the storage system is greater than that flowing to the application. Capacity decreases when the air flow used by the application exceeds the quantity being supplied.

## Calculating Capacity

Since most US equipment capacity and usage is measured in cubic feet per minute (CFM), it is important to make this measurement consistent in excess capacity of compressed air. CFM is normally defined at standard inlet conditions which would be about 14.7 psi at sea level.

Therefore, a comparison of capacity addition relates to that same mass of air, or 14.7 psi.

In a compressed air storage tank, adding 14.7 psi of pressure amounts to that same amount of added cubic foot capacity. Likewise, adding 29.4 psi would double the cubic foot capacity and adding 147 psi would increase the cubic foot capacity ten times, etc. The increase is

Tank Capacity Cubic Ft	Air Pipe Capacity Cubic Ft	Total Storage Capacity Cubic Ft	Cut in Pressure	Cut out Pressure	Added Storage Capacity Cubic Ft
16	2	18	125	139.7	18
16	2	18	125	154.4	36

proportional to the percentage increase of the base sea level inlet pressure.

Example: A typical compressor with a 16 cubic foot air receiver (about 120 gallons) plus two cubic feet of pipe capacity might operate with a minimum pressure of 125 psi. Extra capacity is added as the pressure increases. An increase equal to atmospheric pressure (14.7 psi) becomes proportional to the capacity of the air receiver and pipe. Thus, increasing the base pressure above the minimum pressure of 125

psi to 139.7 psi adds 18 cubic feet of capacity to the 18 cubic foot air storage. Likewise, doubling the 14.7 psi increase (29.4 psi) to 154.4 psi would add 36 cubic feet of extra capacity.

- Gallons / 7.48 = Cubic Feet
- Added Storage = CF \* ΔP / 14.7  
CF is Cubic Feet of tank + air pipe storage  
ΔP = Change of pressure in PSI  
14.7 represents atmospheric pressure at sea level

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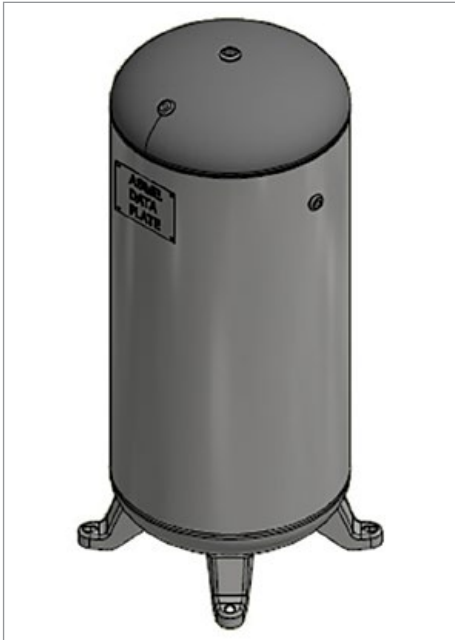
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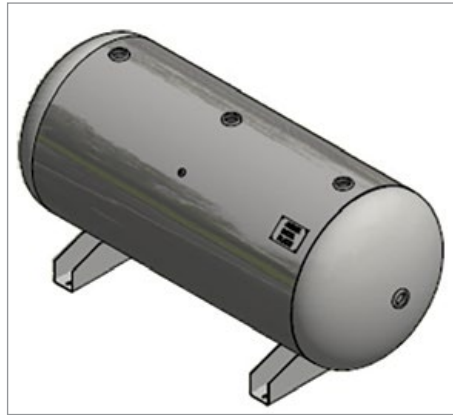
## Using Air Storage to Balance Capacity in a Reciprocating Air Compressor Installation



Vertical Air Receiver

### Example 1

$$\begin{aligned}\text{Added Storage} &= CF * \Delta P / 14.7 \\ &= 18 * (139.7 - 125) / 14.7 \\ &= 18\end{aligned}$$



Horizontal Air Receiver

### Example 2

$$\begin{aligned}\text{Added Storage} &= CF * \Delta P / 14.7 \\ &= 18 * (154.4 - 125) / 14.7 \\ &= 36\end{aligned}$$

### Applications

Intermittent demand can occur in many commercial applications from automotive repair, small manufacturing, or air bursting. The key ingredient is that while there may be numerous uses of air in small but steady volumes, there tends to be a temporary high-volume use of compressed air that is disproportionately much greater than the normal usage. Such an example might occur in a body shop that blows compressed air into

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a car to clean it up. The air is used only for a short moment, but also disproportionately uses more compressed air than the other air operated devices. As a result, this application could depend on the capacity of stored air.

In an air bursting application, the use of compressed air might be only for a single purpose, on for only a brief moment, but then could be off for hours or even days. The quick blasts of air are used to start a marine engine or bubble large quantities of water, etc. Since the stored air capacity is needed only occasionally, there is plenty of time for the compressor to restore the air receiver for its next air burst use. In this case, a small compressor might be adequate to operate for hours and pump up a very large air receiver to high pressure.

### Using Storage and Capacity to Control the Number of Motor Starts

Air storage also provides balance for start/stop air compressors. Due to the brief starting load placed on an electric motor, it is commonly recommended that the motor start no more than seven times per hour.

In an example using a 16 cubic foot tank (about 120 gallons) plus two cubic feet of pipe capacity, a 35 cfm compressor, average demand of 10 cfm and a pressure range that starts at 125 psi but stops at 150 psi, we can calculate the number of motor starts per hour. Once the compressor reaches its shut off pressure of 150 psi, the differential capacity of compressed air in cubic feet is 18 times 25 psi, divided by 14.7 psi, or 30.6 cubic feet. At a demand rate of 10

cfm, it would take 3.06 minutes to draw the air pressure down to 125 psi.

$$\begin{aligned}\text{Added Storage} &= \text{CF} * \Delta P / 14.7 \\ &= (16 + 2) * (150-125) / 14.7 \\ &= 30.6\end{aligned}$$

$$\begin{aligned}\text{Drawdown} &= \text{Added Storage} / \text{Demand} \\ &= 30.6 / 10 \\ &= 3.06 \text{ minutes}\end{aligned}$$

During the pump-up phase, the rate of increase would be 25 cfm (35 cfm for the compressor less 10 cfm for the demand.) By increasing the 18 cubic feet of storage 25 psi, divided by

14.7 psi and with a 25 cfm pump up rate takes 1.22 minutes.

$$\begin{aligned}\text{Added Storage} &= \text{CF} * \Delta P / 14.7 \\ &= (16 + 2) * (150-125) / 14.7 \\ &= 30.6\end{aligned}$$

$$\begin{aligned}\text{Pump Up} &= \text{Added Storage} / \text{Rate of Increase} \\ &= \text{Added Storage} / \\ &\quad (\text{Capacity} - \text{Demand}) \\ &= 30.6 / (35 - 10) \\ &= 1.22 \text{ minutes}\end{aligned}$$

The combined cycle of 3.06 minutes for drawdown plus the 1.22 minutes of pump up



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## Using Air Storage to Balance Capacity in a Reciprocating Air Compressor Installation

comes to 4.28 minutes, or 14.02 motor starts per hour.

Since the recommended motor start rate is 7 times per hour, an adjustment to the system or operation is needed. One technique would involve adding tank storage capacity. By doubling the tank size to 32 cubic feet plus 2 cubic feet of pipe capacity, the draw down time for the above example would change to 5.78 minutes and the pump-up time would change to 2.31 minutes. The combined cycle time would increase to 8.09 minutes, or 7.42 motor starts per hour.

A second technique to reduce motor starts is increasing the pressure differential. If the pressure range was able to start at 120 psi but stopped at 175 psi, the cycle time more than

doubles because its capacity at 18 cubic feet times 55 psi, divided by 14.7 psi, is 67.3 cubic feet, or 6.73 minutes when demand is 10 cfm. Likewise, the pump-up time is 18 cubic feet of storage times 55 psi, divided by 14.7 psi or 2.69 minutes when adding 25 cfm to capacity. The combined cycle time would increase to 9.42 minutes, or 6.37 motor starts per hour. By simply increasing the differential pressure, the compressor runs longer, stays shut off longer, and therefore has fewer motor starts.

A third technique to reduce motor starts is use of a second compressor that alternates with the first compressor. Therefore, in the above example, even though the system incurs 14.02 motor starts per hour, the load on each individual compressor motor is limited to about seven starts per hour.

### The Compressed Air and Gas Institute (CAGI)

The Compressed Air and Gas Institute (CAGI) 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.

The Reciprocating Compressor Section consists of the following member companies:

- Atlas Copco Compressors LLC
- FS-Curtis
- Gardner Denver, Inc.
- Ingersoll Rand
- Jenny Products, Inc.
- Quincy Compressor
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*All photos are courtesy of the Compressed Air and Gas Institute.*

For more information, visit the CAGI website at [www.cagi.org](http://www.cagi.org) or follow us on LinkedIn.

Compressor Capacity	Demand	Storage Capacity	Cutoff Pressure	Drawdown Time	Cut-in Pressure	Pump up Time	Total Cycle Time	Starts per
CFM	CFM	Cubic Ft	PSI	Minutes	PSI	Minutes	Minutes	Hour
35	10	18	150	3.06	125	1.22	4.28	14.02
35	10	34	150	5.78	125	2.31	8.09	7.42
35	10	18	175	6.73	120	2.69	9.42	6.37

### Location of Compressed Air Storage

Even if storage is in balance to meet the needs of the operation and intermittent capacity, attention still needs to be directed to the location of air storage. In the body shop application where a high volume of air is used to clean and blow out a car, the compressed air must transfer through the air treatment system, piping, distribution point and the air tool. If any of these components have air flow limits below the demand of the application, the stored air that is available in the system may not flow to the application when needed. The symptom is a loss of pressure at the application point even though the pressure is adequate upstream. While it might first appear that the compressor capacity is inadequate, the real issue is distributing the air to where it is needed. One way to solve this constraint is to place part of the compressed air storage near the high use application and ensure the remaining pipe is sized to accommodate the needed flow rate.

### Summary

Compressed air storage provides versatile balance in applications where demand is variable. It allows demand to exceed supply on an intermittent basis. It allows a compressor system to balance its starts and stops within the limitations of the electric motor. When storage is properly placed within the air system, it provides a cost-effective method of air filtration and air delivery.

The capacity of air storage is a function of both the physical size of the storage and the amount of pressure exceeding the minimum needs of the system. Proper balance of this storage when combined with appropriate compressor capacity should meet the needs of the application while also enhancing the operation of the air compressor. **BP**

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## "Crazy" Systems & Maintenance



In the real world, our subscribers (sales engineers, service technicians and facility maintenance personnel) regularly witness "crazy" on-site utility (compressed air, vacuum, blowers, chillers, cooling towers, pumps...) system designs and maintenance practices. This subscriber-driven monthly column hopes to raise awareness, provide a learning opportunity and have a bit of fun!

### Big Compressed Air Leak on a Flour Dust Collector in a Commercial Bakery\*

Mike Lenti is a Senior Auditor with Compressed Air Consultants, based in the Charlotte, North Carolina region. Visit <https://www.loweraircost.com/>

He writes: "Compressed Air Consultants performed a compressed air system audit at a commercial bakery. The primary objective of the audit was to determine the constituents of demand that have contributed to the increase in demand over the last couple of years."

"Below is the distribution makeup of the compressed air usage for the facility. Note the largest area consumer of air in the plant resides in the Flour Room area. This anomaly is due to a malfunctioning dust collector."

"The pilot valve assembly on a 3/4" solenoid valve on the Flour dust collector located on the roof has come disconnected allowing 175 Scfm of air to continuously blow. The supply of air and primary isolation valve for the Flour dust collector is located in the Flour Room.

The malfunctioning pilot assembly valve is consuming 175 Scfm and represents 16% of the entire system demand. The malfunctioning solenoid valve is the primary reason the plant can no longer support full production with two (2) air compressors."

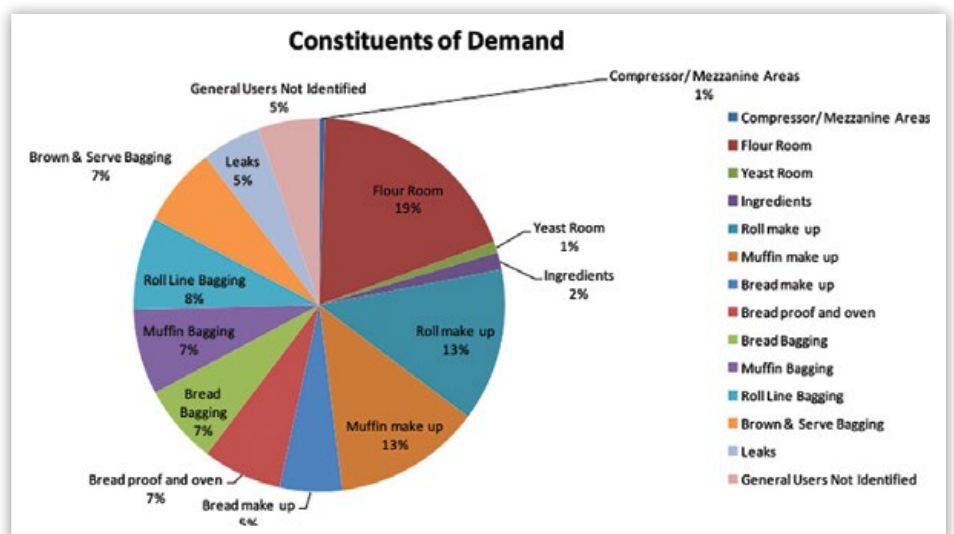


Image credit: Mike Lenti, Senior Auditor, Compressed Air Consultants

“During the study we shut off the supply of compressed air to the Flour dust collector during full production and noted that the reduction in demand enabled the third on line compressor to unload, time out, and shut off. This test confirmed the plant can in fact operate on two air compressors if the pilot solenoid valve on this dust collector is restored.”

\*This is an excerpt from an article Mr. Lenti published in Compressed Air Best Practices<sup>®</sup> Magazine titled, “Commercial Bakery Compressed Air Audit Optimizes the Constituents of Demand.” The full article can be found at <https://www.airbestpractices.com/industries/food/commercial-bakery-compressed-air-audit-optimizes-the-constituents-of-demand>



The pilot valve assembly on a 3/4" solenoid valve on the Flour dust collector located on the roof has come disconnected allowing 175 Scfm of air to continuously blow. Photo credit: Mike Lenti, Senior Auditor, Compressed Air Consultants

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AIRMATIC was founded in 1977 in Sabadell (Barcelona area) and is a solutions specialist in compressed air and woodworking machinery systems. They provide expert service, sales and engineering to the Barcelona and Tarragona regions in Spain. Pictured are Josep Marquino and Carles Gamito at their Sabadell headquarters (left to right). Visit <https://www.airmatic.es/>



SERFRIAIR is a specialist in compressed air treatment, specialty gas generation and chilled water systems in Spain and Portugal. The firm has two warehouses for fast deliveries in the Barcelona area. Pictured are Juan Garrido, Iván Garrido and Antonio Carmona at their new Badalona headquarters (left to right). Visit <https://serfriair.es/>

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## Managing the Energy Cost of On-Site Nitrogen Generators

By Hank Van Ormer, Technical Director, APenergy

► Do you know and track the annual generated nitrogen energy cost per SCFM? Do you know what factors drive this value and what action you can take to control the optimum lower levels?

APenergy often finds on-site nitrogen generators included in the plant compressed air system reviews and audits we perform. As these facilities-based nitrogen generators have

become more and more popular, we have also noticed a very significant lack of fundamental knowledge of the true relationship of the energy cost per scfm/cf of compressed air and the energy cost per scfm/yr of nitrogen.

We have found that often the thought is that a little extra percent increase in nitrogen purity is a good step.

This can be a very expensive decision unless you have an accurate energy cost of the compressed air supply and subsequently the resulting energy cost of the nitrogen. This article identifies the increased energy cost in compressed air required as the purity level goes up and how the generated nitrogen volume drops. It will focus, most importantly, on the actual energy dollars per scfm/year of the generated nitrogen.



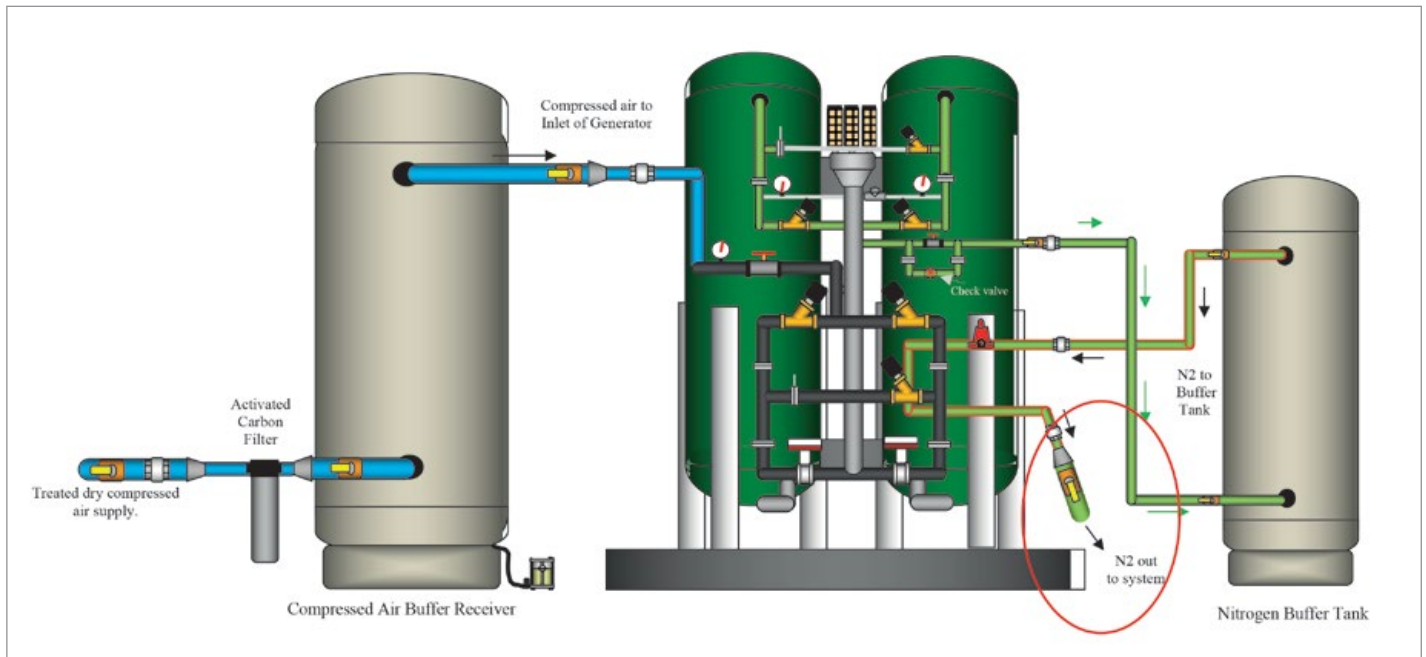


Figure 1. Typical PSA Installation with Lubricated Dry Air from a Central Air Supply.

#### Some Basic Key Points to Consider

- The energy cost per scfm of the nitrogen is directly driven by the energy cost to produce the compressed air to deliver the nitrogen at the required purity level consistently.
- Identifying the correct purity level and controlling the level is absolutely critical to control the energy cost to operate the nitrogen system.
- Do you know the actual energy cost of the dry compressed air in either a dedicated nitrogen supply or from the facilities central compressed air supply? If not you **cannot** identify the nitrogen energy cost.



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## Managing the Energy Cost of On-Site Nitrogen Generators

- We have audited literally thousands of compressed air systems over the years. Very few knew their energy cost/scfm/year until they reviewed our report.
- In this article we intend to illustrate the magnitude of potential wasted energy dollars when the compressed air system and the on-site nitrogen generation system are not properly monitored and controlled.

### Two types of Nitrogen Generators: PSA (Pressure Swing Adsorption) and Selective Membrane Separation

PSA sends the compressed air through two storage tanks, filled with carbon molecular sieve (cms). This material traps the oxygen on its surface and allows the nitrogen to go to the using process:

PSA units have a capture cycle and a purge cycle to clear the bed. When this occurs, the compressed air is redirected to the second tower for the adsorption to continue uninterrupted. (See Fig. 1 & 2 for basic installation guidance).

Membrane Separation uses a selective membrane to remove the oxygen only from

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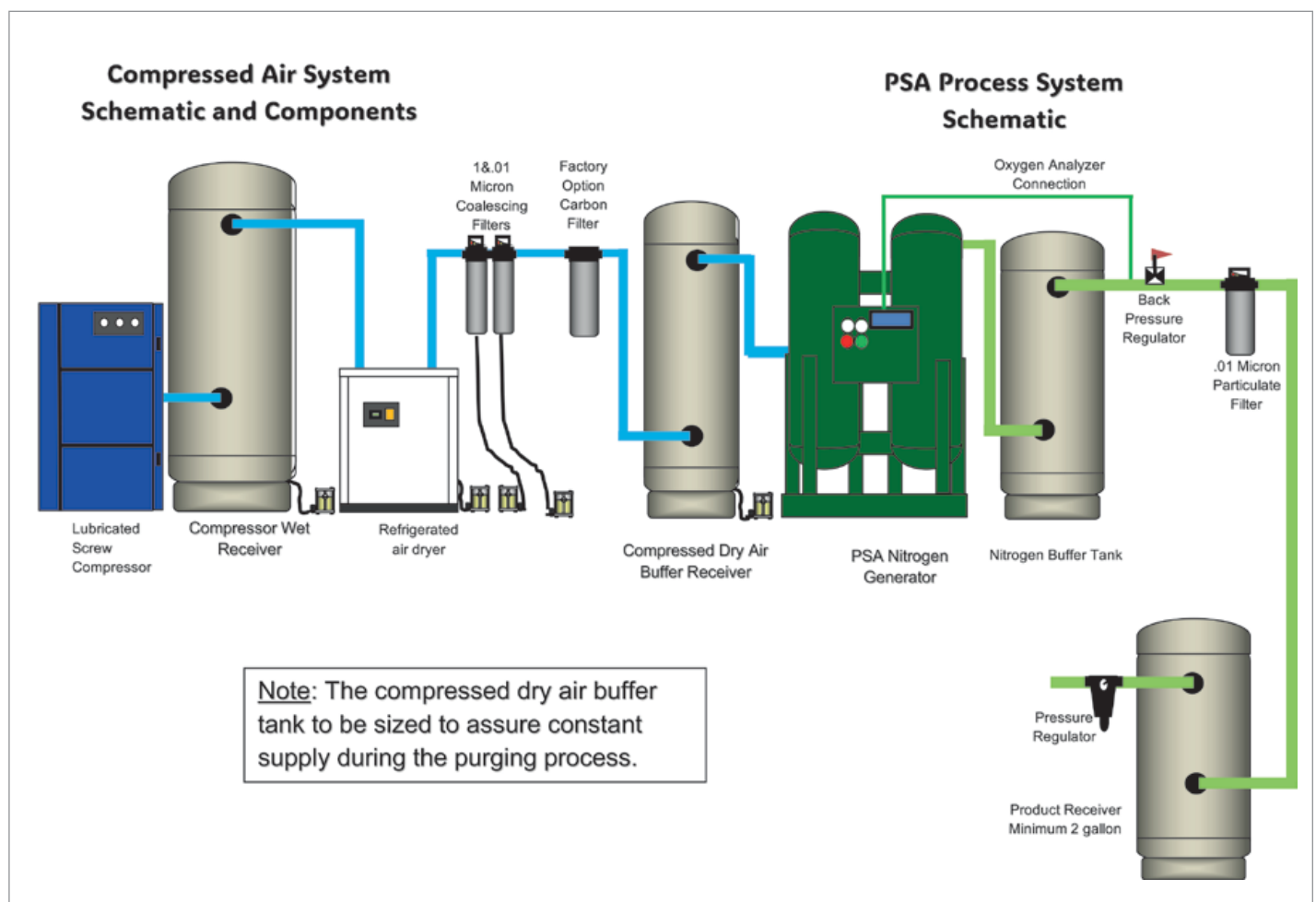


Figure 2. Typical PSA Installation with a Dedicated Lubricated Compressor and Refrigerated Air Dryer.

the compressed air stream, thus flowing the nitrogen to the system. It is a constant flow of compressed air and nitrogen

As we go into some of the production and efficiency performance in general for both types, we will call these guidelines as “typical” and for “exact” performance contact the manufacturer. What we hope to do here is show the reader the process and basic performance indicators – to guide you to proper action and questions.

PSA units are generally applied for nitrogen at higher volumes and/or higher purity levels when required. Selective membrane units are generally selected for lower Nitrogen volumes and lower purity levels.

### Rules to Remember

There are several cardinal rules for both types of systems.

- Before you select and operate, identify the minimum required nitrogen purity required (% of nitrogen).
- Control and monitor that the process remains at the specified nitrogen purity. Controls are available on most quality generator units.
- Don't raise the nitrogen purity unless you know the impact on the energy cost of (compressed air usage) and feel it's worth it.

We have calculated a sample energy cost of compressed air produced by a single stage, lubricant cooled, rotary screw compressor 200 horsepower air compressor: capacity 1000 cfm;

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## Managing the Energy Cost of On-Site Nitrogen Generators

BHP 220; ME - .96, Motor input HP – 230 HP x .746 = 182kw – 5 days a week, 24 hours a day – 6240 hr/yr

- Energy cost at \$.10/kwh = 182kw x .10 x 6240 ÷ 1000 = \$113.48/cfm/yr. Take that to \$114scfm/yr for dry air, this is a **very conservative** value.

Changes in the Electric Energy Rate (kwh) and operating hours will change the value proportionately. Other things that affect the compressed air supply electric cost scfm/year are type of compressor, type of capacity control

as applied, effective storage, piping size and configuration, etc.

### The following Tables 1 & 2 may surprise you:

- These costs are based on the compressed air supply delivering compressed air at 100 psig discharge pressure (\$114/scfm/yr). Each psig above that will increase the input power to a “Positive Displacement” air compressor – about 2 % per psig (i.e.: 10 psig higher will raise the input power to the air compressor about 5%). For other types of air compressors contact the OEM.

- Inlet Temperature To The Generator – these ratings are based on inlet air temperature of the DRY compressed air about 55°F to 70°F. At higher temperatures over the 70-75°F level, the nitrogen recovery value will start to deteriorate.
- Note that as the inlet pressure to the N<sub>2</sub> generator goes up, so does the compressed air used. Worse, the recovery value (of nitrogen) falls significantly. The referenced pressure range of 90 psig to 140 psig is relatively common. The net result is at 95%

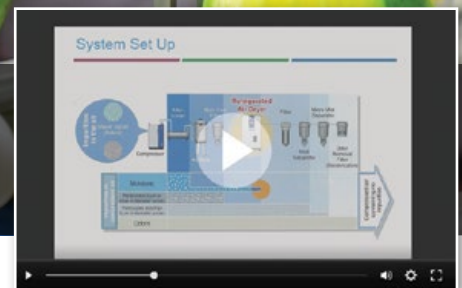
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purity, energy cost is \$228 scfm/yr. for nitrogen. When the purity level is 99.999% this becomes \$9,913 scfm/yr. for nitrogen! These ratios reflect a general performance curve for specific units on site. For precise numbers contact the OEMs to get specific answers to your questions.

### Comments

- Each model number is a fixed volume of compressed air going through a specific membrane nitrogen generator. The 145 psig fixed volume is greater than the 100 psig.

Note: As you raise the pressure, the volume of compressed air required goes

up – the recovered nitrogen goes down as the purity level increases. Similar to the PSA generator shown in table one.

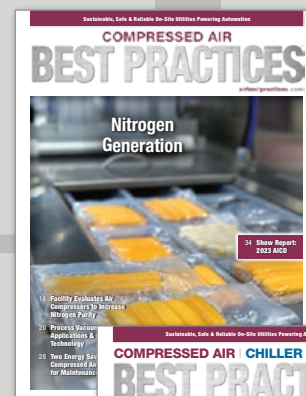
- For specific data on specific membrane nitrogen generators contact the manufacturer.
- Typical membrane generators may increase the recovered nitrogen 55% to 60% or more depending on operating conditions. This may increase the compressed air required up to 45% to 50% more. For accuracy contact the equipment manufacturer.
- Inlet compressed air temperature has the opposite effect on performance in

**Table 1: Typical values for estimating the effect on Nitrogen Production Energy annual cost when increasing the inlet pressure to a PSA Nitrogen Generator to raise the purity level**

Dry CA Inlet Pressure	Nitrogen Purity Level	scfm CA Delivered \$/scfm/yr	Recovered Nitrogen scfm	Energy Cost scfm/yr N <sub>2</sub>
90 psig	95%	2 scfm \$228.00	1 scfm N <sub>2</sub>	\$ 228 scfm/yr N <sub>2</sub>
100 psig	97%	4.1 scfm \$467.40	.8 scfm N <sub>2</sub>	\$ 584 scfm/yr N <sub>2</sub>
110 psig	99.4%	7.1 scfm \$809.40	.56 scfm N <sub>2</sub>	\$ 1445 scfm/yr N <sub>2</sub>
120 psig	99.9%	8.8 scfm 1003.20	.47 scfm N <sub>2</sub>	\$ 2134 scfm/yr N <sub>2</sub>
130 psig	99.99%	10.5 scfm \$1197.00	.38 scfm N <sub>2</sub>	\$ 3150 scfm/yr N <sub>2</sub>
140 psig	99.999%	20 scfm \$2280.00	.23 scfm N <sub>2</sub>	\$ 9913 scfm/yr N <sub>2</sub>

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selective membrane generators than with PSA units. As the inlet temperature increases, the recovery will improve while colder inlet temperatures have a negative impact.

- Most manufacturers basic performance data is based on 75°F ambient and 75°F inlet temperature to the nitrogen generators. Most refrigerated dryers can deliver 75°F compressed air. Normal generator operating ranges are usually 50°F to 120°F. In the case of membrane separation, you should check with the OEM for what impact your proposed and actual operating temperatures will have on the life and performance of the membrane fibers. There are special fibers available for many extreme conditions.

### Primary Take-Aways

- Know the minimum nitrogen purity level required and control at that level. Don't increase unless you know the cost.
- To be sure, always check with the manufacturer. **BP**

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**Table 2: Nitrogen Outlet Flows at Different Purity Levels and Inlet Compressed Air Pressures to a Specific Selective Membrane Generators**

COMPRESSED AIR	100 PSIG INLET PRESSURE				145 PSIG INLET PRESSURE INCREASED FIXED FLOW			
NI Purity	95.0%	97.0%	99.0%	99.5%	95.0%	97.0%	99.0%	99.5%
Model 1 Scfm N <sub>2</sub>	11.6	7.6	3.6	2.5	19.6	13.0	6.6	4.6
Model 2 Scfm N <sub>2</sub>	17.7	11.7	5.6	4.0	29.5	19.8	10.1	7.2
Model 3 Scfm N <sub>2</sub>	24.6	16.4	8.2	5.9	40.5	27.4	14.3	9.5
Model 4 Scfm N <sub>2</sub>	35.9	24.0	12.1	8.4	59.2	40.1	21.0	14.2
Model 5 Scfm N <sub>2</sub>	57.5	38.4	19.3	13.7	94.7	64.1	33.5	22.8
Model 6 Scfm N <sub>2</sub>	80.3	53.8	27.0	19.0	132.4	89.7	46.9	33.7
Model 7 Scfm N <sub>2</sub>	229.6	153.5	76.7	55.0	378.4	256.1	133.5	94.9
Model 8 Scfm N <sub>2</sub>	287.7	192.2	95.6	70.1	474.2	320.8	156.7	119.7

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# The AIM Act's Impact on HFC Gases

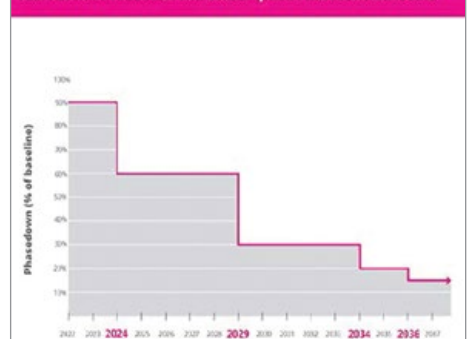
By Taylor Ferranti, Commercial Vice-President  
of Refrigerant Management, A-Gas

► HFC gases are a crucial part of a functioning, modern society. From keeping groceries cold and fresh to powering the AC in people's cars, these gases are an integral part of maintaining our safety and health. However, because these gases have high Global Warming Potential (GWP), federal and local governments are regulating HFC production and importation over the next decade and beyond.

## Introduction to the AIM Act and Supply

The AIM (American Innovation and Manufacturing) Act was finalized by the US government at the end of 2021. This legislation introduced a phase-down plan for virgin HFC gases. From now through 2036, the US will reduce the production and importation of virgin HFCs by granting relevant businesses

AIM Act HFC Production and Consumption Phasedown Schedule



a set number of HFC allowances (or quota), which will decrease over time. Plus, state governments, such as in California, are introducing additional GWP-based HFC regulations. These will impact the sale, distribution, and entrance of bulk virgin HFCs or HFC blends into California commerce.

As the demand for refrigerant gases will increase, so will the demand for cooling. Businesses will still need to maintain old equipment. With diminishing availability of supply, the market will turn to reclaimed gases to make up the difference. The good news is that the AIM Act has no impact on reclaimed

HFCs, meaning they can be purchased without using HFC allowances. Plus, reclaimed HFCs offer the same performance quality as virgin refrigerants. Reclaimed refrigerants must meet the same standards (AHRI-700) as virgin refrigerants, and are considered equally effective.

### Reclaimed Gases

#### The case for circular HFCs

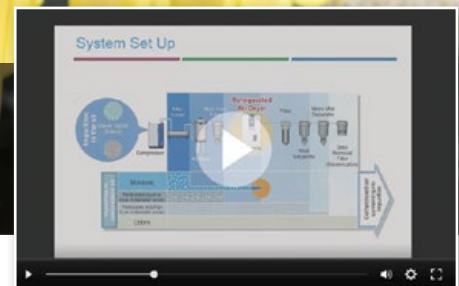
Circular business models reduce waste for more efficient resource usage. By relying on existing products, we make better use of what we already have, avoiding the need to produce the equivalent quantity of virgin

refrigerants. Circularity also incentivizes people to avoid leaking or venting refrigerants into the atmosphere. Turning to reclaimed HFCs enables participation in the circular economy and delivers benefits from a sustainable business model. In some cases, doing so could reduce the risk of interruptions to your business because of issues like supply chain availability.

To be properly reclaimed, HFC gases must be contained and recovered, never leaking into the atmosphere. Learning the safest and most effective processes out in the field will ensure businesses have a steady supply of HFCs. For

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## The AIM Act's Impact on HFC Gases

example, venting HFC gases and releasing refrigerants into the atmosphere is not only illegal, it contributes to environmental harm and depletes the supply source for these gases.

Ensure proper recovery by capturing HFCs in recovery cylinders and never venting. Then, you can work with a reclamation partner to turn the gas back into a usable product. Once a reclaimers has the material, they can get to work on separating, processing, and reclaiming the gases before laboratory testing and analysis to certify them for quality assurance purposes.

### Mixed Refrigerants

There's been a misconception in the field that mixed refrigerants cannot be reclaimed, and if they are, they're of inferior quality. That's simply not true. While separation is an additional, complex step in the reclamation process, it is still best to reclaim mixed refrigerants.

Well before the introduction of the AIM Act, A-Gas began heavily investing in separation technology. Instead of instituting penalties for mixed refrigerants, which many reclaimers do, A-Gas compensates those who work

with us to reclaim their used refrigerants, regardless of their condition. But, to gain the most value and highest purity through the reclamation process, it's smart to avoid mixing refrigerants.

### An Experienced Reclamation Partner A-Gas offers unparalleled experience with HFC phase-down

In choosing a reclamation partner, it's important to work with an organization that has the experience, capacity, and relevant technology needed to provide the highest-quality product possible. A-Gas is a global

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## The AIM Act's Impact on HFC Gases

company with offices in Europe, the UK, and Australia – places that are leaps ahead of the US in their phase-down schedules – as well as other countries that are just beginning their phasedowns. A-Gas' global offices share best practices across our locations, which has equipped the US team with the necessary information to be best prepared.

With that knowledge, A-Gas invested in becoming the leading EPA-Certified reclaimer with the capacity to handle a massive increase in demand before the AIM Act came about. A-Gas' lifecycle refrigerant management approach provides businesses with a singular partner for their refrigerant recovery, reclamation, and supply needs.

Luckily, the phase-down will take place over time. For now, businesses should look to minimize their allowance usage with reclaimed HFCs. When HFCs are used, selling them to reclamation companies will generate additional income for businesses to use on future equipment costs while ensuring the continued availability of HFCs during the transition.

A-Gas has the technology, capacity, and experience to guide businesses through these legislative shifts. A-Gas offers consultation

for long-term planning, throughout the phase-down and beyond. If businesses don't have a plan for navigating a restricted HFC supply chain, it would be beneficial to get one in place.

A-Gas also offers EPA-compliant refrigerant removal via its Rapid Recovery<sup>®</sup> service, the largest refrigerant recovery service in the world. Proper, safe recovery is the bedrock of lifecycle refrigerant management, without which reclamation or reuse cannot occur. Rapid Recovery<sup>®</sup> is an on-site service, making it easy for businesses to stay compliant and participate in the circular economy.

Additionally, Rapid Exchange<sup>®</sup> offers a simple on-site cylinder swap, where A-Gas goes to a customer's location and exchanges full recovery tanks for clean, empty, and in-date cylinders, providing the business with EPA documentation. A-Gas will then pay the business for its used gases. Businesses can also purchase reclaimed refrigerants directly through A-Gas, without exchanging or recovering their own gases. **BP**

To learn more about the lifecycle refrigerant management services A-Gas offers, click here: <https://www.agas.com/us/products-services/refrigerant-services/>

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# Compressed Air Technology News

## SUTO iTEC Launches S606 and S605 Breathing Air Analyzers

SUTO iTEC announced the launch of two new products, the S605 Portable Breathing Air Analyzer and the S606 Stationary Breathing Air Quality Monitor. These innovative instruments are designed to set new standards in safety and quality assurance for breathing air filling stations and compressed breathing air systems.

The S605 Portable Breathing Air Analyzer is a state-of-the-art solution engineered to uphold the highest safety and quality standards in various industries. It employs advanced sensor technology to measure critical parameters, including oxygen (O<sub>2</sub>) levels, carbon dioxide (CO<sub>2</sub>) levels, carbon monoxide (CO) concentration, dew point, and oil vapor, ensuring precise readings. Adhering to standards such as EN 12021, with

preset thresholds for different international standards, the S605 ensures simplicity in usage and compliance.

Its compact and lightweight design makes it ideal for diverse settings, providing instant access to vital air quality information. The integration of a USB port for 4G dongle connection allows for remote monitoring through the S4A Software without the need for Wi-Fi. The data logger with reporting function logs measurement data for export and analysis, facilitating the creation of powerful PDF reports at the point of use.

The S606 Stationary Breathing Air Quality Monitor is engineered for continuous 24/7 measurement of air quality in breathing air filling stations and compressed breathing air systems. The S606 ensures compliance with industry standards. It comprehensively

analyzes parameters including oxygen (O<sub>2</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), oil vapor, water vapor, and other impurities. Providing continuous readings for quick and effortless monitoring, the S606 is crucial for maintaining optimum safety conditions. Its plug & play solution simplifies installation with a one-gas inlet setup, eliminating the need for multiple connections.

The data logging and reporting feature records measurements over extended periods, facilitating comprehensive analysis and compliance documentation. The user-friendly interface with intuitive controls and a clear display enables easy configuration, operation, and real-time data visualization.

The configurable alarm and warning system triggers audible and visual alarms for immediate attention to maintain air safety. Equipped with Modbus/TCP and Modbus/RTU interfaces, the S606 seamlessly integrates into existing monitoring systems. Its robust and reliable design ensures durability under the demanding conditions of breathing air filling stations and compressed air systems.

SUTO iTEC is committed to providing state-of-the-art solutions that prioritize safety and quality in breathing air applications. These new analyzers represent a significant step forward in ensuring the well-being of professionals in various industries.

*For more information, visit [www.suto-itec.com](http://www.suto-itec.com).*



*The S605 Portable Breathing Air Analyzer and the S606 Stationary Breathing Air Quality Monitor (left to right).*



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## Compressed Air Technology News

### Air Products Membrane Solutions Announces Nitrogen Generation Milestone

Air Products, the global leader in the production of gas separation and purification membranes, has announced a milestone – there are now 2,000 seagoing vessels worldwide utilizing membrane-based nitrogen generation systems from Air Products Membrane Solutions.

Air Products was the first company to install a membrane-based nitrogen generation system onboard a ship in 1984. Today, ships from over 50 countries are utilizing Air Products Membrane Solutions' nitrogen generators designed and manufactured at Air Products' facility in Norway.

"This is a tremendous milestone for Air Products Membrane Solutions. Almost four decades after pioneering this technology, Air Products continues to innovate and support the energy transition by providing membrane systems to alternative fuel ships, enabling a cleaner future," said Dr. Erin Sorensen, General Manager, Air Products Membrane Solutions.

Air Products Membrane Solutions' membrane-based nitrogen generation systems enable large ships to efficiently switch from traditional heavy fuels to cleaner alternative fuels while at sea, resulting in reduced emissions during the transport of goods.

Air Products Membrane Solutions specializes in the development of hollow fiber membrane separators and systems for onsite gas generation. Air Products designs, engineers,

manufactures, and markets a full portfolio of PRISM<sup>®</sup> Membrane Separators, Marine Systems, and Engineered-to-Order Systems. Air Products' systems are also designed to create more sustainable energy sources and raise productivity across a variety of industries and applications.

The number of ships using marine-based membrane systems has grown markedly in recent years. As the world's most experienced supplier of marine-based membrane systems, Air Products Membrane Solutions engineers and fabricates turnkey systems for shipboard and land-based applications including alternative fuel systems, chemical tankers, oil platforms, and liquified natural gas (LNG) applications.

Additional Air Products Membrane Solutions key offerings include:

- PRISM<sup>®</sup> Membrane Separators – Consist of thousands of polymeric hollow fibers that act as a molecular filter to separate gases into individual elements, including methane, nitrogen or hydrogen. Offered to value-added packagers as an original equipment manufacturer component inside specialized systems. Industries served include aerospace, offshore drilling, food and beverage, transportation, and defense.
- Engineered-to-Order-Systems – Large industrial membrane systems for nitrogen generation and process gas applications, which are fully customized to customer specifications serving the oil and gas industry, ammonia plants, chemical manufacturing facilities, and renewable diesel production.



*Air Products Membrane Solutions' membrane-based nitrogen generation system.*

## Compressed Air Technology News

- **Global Service and Support** – Provides maintenance and optimization of membrane systems, offering health checks, replacement parts, remote monitoring, and other services to keep membranes operating at peak performance.

### About Air Products

*Air Products is a world-leading industrial gases company in operation for over 80 years focused on serving energy, environmental, and emerging markets. The Company has two growth pillars driven by sustainability. Air Products' base business provides essential industrial gases, related equipment and applications expertise to customers in dozens of industries, including refining, chemicals, metals, electronics, manufacturing, and food. The Company also develops, engineers, builds, owns and operates some of the world's largest clean hydrogen projects supporting the transition to low- and zero-carbon energy in the heavy-duty transportation and industrial sectors. Additionally, Air Products is the world leader in the supply of liquefied natural gas process technology and equipment, and provides turbomachinery, membrane systems and cryogenic containers globally. The Company had fiscal 2023 sales of \$12.6 billion from operations in approximately 50 countries and has a current market capitalization of about \$60 billion. Approximately 23,000 passionate, talented and committed employees from diverse backgrounds are driven by Air Products' higher purpose to create innovative solutions that benefit the environment, enhance sustainability and reimagine what's possible to address the challenges facing customers, communities, and the world. For more information, visit [www.airproducts.com](http://www.airproducts.com).*

### Festo Introduces DHPL Long-Stroke Parallel Gripper

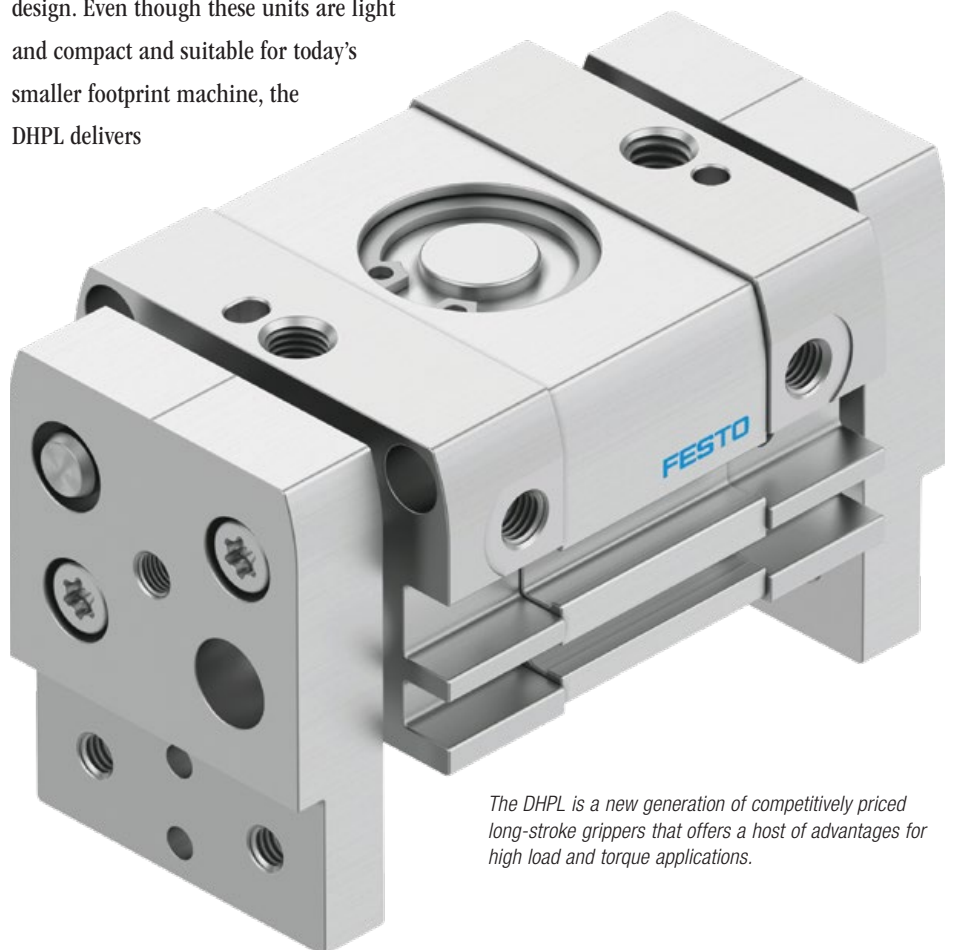
From recently completed production lines, Festo introduces the DHPL, a new generation of competitively priced long-stroke grippers that offers a host of advantages for high load and torque applications. The DHPL is interchangeable with competitive long-stroke grippers. It provides the added benefits of lighter weight, higher precision, and no maintenance. The new long-stroke gripper is ideal for stacking boxes, gripping plates and shaped parts, and keeping bags open.

The long-stroke DHPL parallel gripper features  $\leq 0.03$  mm repetition accuracy due to three rugged guide rods and a rack and pinion design. Even though these units are light and compact and suitable for today's smaller footprint machine, the DHPL delivers

high load and torque grip. Force ratings range from 40 N to 750 N. Jaw stroke ranges from 20 mm to 200 mm. This gripper gives machine builders and end-use customers flexibility in mounting options and sensor placement. Positioning pin holes ensure the DHPL gripper mounts in the precise position of the gripper it replaces. Jaw interfaces allow for fingers and brackets to be added. Fingers and brackets enable the perfect grip for the part. Pneumatic end-position cushioning is standard and can be adjusted for optimal performance according to the moving mass and speed.

### About Festo U.S.

*Festo is a leading manufacturer of pneumatic and electromechanical systems, components, and*



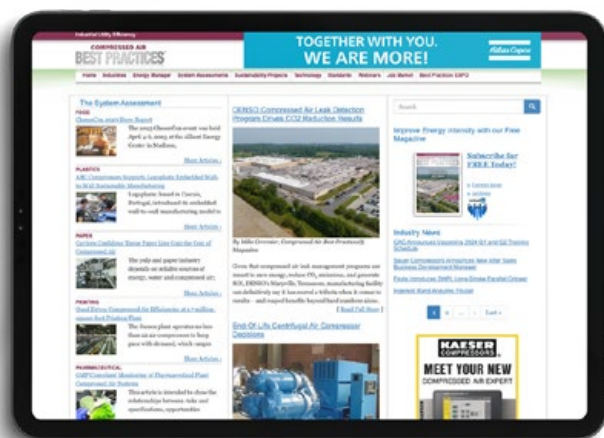
*The DHPL is a new generation of competitively priced long-stroke grippers that offers a host of advantages for high load and torque applications.*





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### The Magazine for Sustainable, Safe and Reliable Compressed Air Systems

Compressed Air Best Practices® is part of a family of magazines dedicated to **Sustainable, Safe and Reliable On-Site Utilities Powering Automation**. The U.S. Department of Energy estimates compressed air represents 30% of industrial energy use. Each issue features expert articles on how to conduct **Best Practice System Assessments** to reduce energy consumption while enhancing **Sustainability, Safety and Reliability**.

*"We design around a specific number of plastic product production machines...we have the correct compressed air flows with clean air and stable pressure."*

— Leandro Sponchiado, Technical Director USA, Logoplaste  
(April 2023 Issue)

*"The cast for our airends is so durable that we can now use some of our learning to make older airends more efficient as remanufactured airends."*

— John Randall, President & CEO, Hitachi Global Air Power  
(July 2023 Issue)

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## Compressed Air Technology News

controls for process and industrial automation. Celebrating more than 50 years in the U.S., Festo Corporation has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Through advanced technical and industrial education, Festo Didactic Learning Systems and its partners prepare workers for current and future manufacturing technologies. For more information on the new grippers and the advantages of working within the Festo ecosystem – the ecosystem that leads to less engineering overhead, fast time to market, and seamless connectivity – visit [www.festo.com](http://www.festo.com).

### Proportion-Air Introduces Electro-Pneumatic Pressure Regulator

Engineers and other manufacturing professionals looking for a single device that regulates pressure extremely accurately while handling high flows will find it in the Proportion-Air QB4 electro-pneumatic proportional pressure regulator.

The QB4 pressure control valve is a complete electronic pressure regulating package consisting of a pilot unit with two solenoid valves, closed loop electronic controls and an internal volume booster. The internal pressure transducer monitors the output pressure for

closed loop control and provides a monitor signal representing active pressure. The analog monitor signal is constantly compared against the command signal to achieve a desired set pressure. This compact package can be mounted in nearly any orientation (exception: only vertical with full scale pressures below 10 PSI) and is nearly immune to the rigors of the industrial environment.

The QB4 boasts accuracy of 0.4%, regulating pressures up to 150 PSIG or equivalent. The device will accommodate flow rates up to 200 SCFM forward and exhaust. The QB4 high flow control valve also provides an electrical

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monitor signal for output to a panel meter or controller for data acquisition and/or quality assurance needs. The integrated volume booster does not have stamped gaskets, special molded diaphragm or seal parts. All parts related to normal maintenance are standard o-rings.

This versatile unit can be modified in numerous ways to meet the most demanding applications, like tire building. Options include customizable pressure ranges, manifold materials, command and monitor signals and more. Nearly any pressure unit of measure can be specified, including psi, bar and inches of water column, among many others. Options for vacuum control, vacuum through positive pressure, absolute pressure, and standard gauge pressure models are all available.

#### About Proportion-Air

*Proportion-Air makes proportional electronic air pressure regulators and air flow control valves for engineers, scientists and manufacturing professionals who need precision and innovation in pressure control. Together with our Burling Valve industrial process regulators and Protect-Air USA line of miniature regulators, we are committed to superior customer service, knowledgeable technical support and getting exactly the right pneumatic product to the right customer every time. Learn more at <https://proportionair.com/>.*



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Mikropor	7	<a href="http://www.mikroporamerica.com">www.mikroporamerica.com</a>
Best Practices 2024 EXPO	8, 15, 27, 33, 37, 40, 44, 48	<a href="http://www.cabpexpo.com">www.cabpexpo.com</a>
Sullivan-Palatek	9	<a href="http://www.sullivan-palatek.com">www.sullivan-palatek.com</a>
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Applied System Technologies	13	<a href="http://www.appliedsystemtech.com">www.appliedsystemtech.com</a>
Hertz Kompressoren	17	<a href="http://www.hertz-kompressoren.com">www.hertz-kompressoren.com</a>
Tamturbo	19	<a href="http://www.tamturbo.com">www.tamturbo.com</a>
Quincy	21	<a href="http://www.quincycompressor.com">www.quincycompressor.com</a>
Anest Iwata	23	<a href="http://www.anestiwata.com">www.anestiwata.com</a>
Compressed Air and Gas Institute	25	<a href="http://www.cagi.org/personnel-certification">www.cagi.org/personnel-certification</a>
Compressed Air Challenge	31	<a href="http://www.compressedairchallenge.org">www.compressedairchallenge.org</a>

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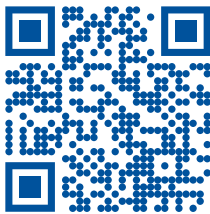


## Membrane Dryer

# DRYPOINT® MDi



Given several measured values by the sensor, the **DRYPOINT® MDi** control software decides in cycles if and for how long the complete purge air volume has to be provided to achieve and stabilize the required degree of drying. This process is implemented via a targeted timed sequence of a solenoid valve. The period of the two process sections described below therefore varies in each cycle to keep the degree of drying within the specified tolerance range.



## Energy Efficient

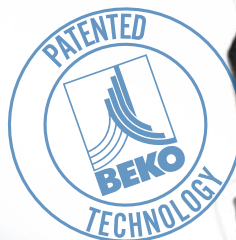
The only dryer in the world that is able to maintain a stable PDP between 50 and -15 °F and only uses the amount of purge air actually required to achieve the set degree of drying.

## User Selectable PDP

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