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August 2025

**Blower & Vacuum
Best Practices Inside!**



Water Conservation

**16 Balcones Recycling
Water Savings**

- 20 Choosing Nitrogen Gas Purity**
- 24 CGM Project Air Compressor Design**
- 30 Adiabatic Cooling Explained**
- 34 Industrial Sustainability Best Practices Conference Report**
- 38 Cooling System Pressure Control**

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COMPRESSED AIR SYSTEM FEATURES

16 Texas Recycling Plant Saves Water with Air-Cooled Air Compressors

By Troy Dreier, *Compressed Air Best Practices® Magazine*

20 Selecting the Appropriate Nitrogen Gas Purity Level for Your Application

By the Compressed Air & Gas Institute

24 Air Compressor Design Considerations for a Successful CGM Project

By Chris Ahnen, EnviroMix

34 Industrial Sustainability Best Practices 2025 EXPO & Conference Show Report

By Bill Smith, *Compressed Air Best Practices® Magazine*



COOLING SYSTEM FEATURES

30 How Adiabatic Technology Delivers Performance, Savings and Sustainability

By Kimberly Glasko, NIMBUS Advanced Process Cooling

38 Cooling System Pressure Control for Efficiency and Process Stability

By Clayton Penhallegon, Jr., Integrated Services Group

LATEST NEWS

10 Compressed Air Industry & Technology

12 Chiller & Cooling Industry & Technology

14 Industrial Energy & Water Conservation

EVERY ISSUE

- 6 From the Editor
- 8 Subscribers From Around the World
- 46 Column | Facility Maintenance
- 47 Column | Sales Engineering Skills
- 48 Real-World Installations & Maintenance
- 49 Advertiser Index
- 50 The Marketplace | Jobs and Technology



Cover image: Courtesy of Balcones Recycling

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» FROM THE EDITOR



Saving Water, Saving Money

The theme for this issue is water conservation, something compressed air and industrial cooling readers are equally concerned with. Water conservation could be prompted by the difficulty getting a strong local water supply, high municipal pricing or local restrictions. In any case, using less water is an imperative for many.

Our lead story comes from Florida, where Compressed Air Systems has a great deal of experience with both high ambient temperatures and water restrictions. According to Kyle Randall, Vice President and Director of Sales, 99% of its installations involve air-cooled air compressors. Kaeser Compressors estimates the customer in this case study, Balcones Recycling, saves 13,650,000 gallons of water each year by using air-cooled air compressors.

Adiabatic coolers save water by functioning like conventional dry coolers for much of the year, explains NIMBUS Advanced Process Cooling. On peak temperature days, they introduce a minimal amount of water into the airstream, lowering the air temperature and enhancing heat rejection. When ambient temperature reaches 95°F (35°C), the adiabatic cooling process might lower the air temperature to 78°F (26°C) after evaporation.

We're always happy to present an article from the Compressed Air & Gas Institute. This month, CAGI explains how to select the optimal nitrogen gas purity level for your application. Dropping the purity from 99.999% to 99.9% means a 40% reduction in both air compressor size and associated energy expense.

One of our top contributors, Clayton Penhalegon, is back with a look at cooling system pressure control. He's seen pressure variations of as much as 2:1 in many systems, and says +/- 30-50% variations are common in uncontrolled operations. If that sounds like your system, this article will be a huge help.

Enviromix offers three considerations for a successful compressed gas mixing (CGM) project using air compressors. CGM provides uniform mixing of water or wastewater tanks using programmed bursts of compressed air.

Finally, please enjoy the highlights of our first-ever Industrial Sustainability Best Practices EXPO & Conference, held in Barcelona, Spain, in June. Pulling off this two-day event was a year's worth of work for our team. We're thrilled it was a success.

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Industrial Cooling Workshop – Learn how to maximize energy and water savings. Led by experts from EVAPCO, Integrated Services Group, SPX Cooling Tech and 3M.

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Blower Engineering Workshop – This two-part workshop provides a deeper understanding of blower selection and specification for wastewater treatment and pneumatic conveying.

Sales Engineering Workshop – Improve the performance of cooling or compressed air technology sales engineers. Led by Mark Allen Roberts, CEO, OTB Solutions.

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We salute all Best Practices Magazine subscribers from around the world who own, operate, maintain, engineer and provide expertise for the on-site utilities (compressed air, nitrogen generation, vacuum, blowers, chillers, cooling towers and pumps) powering modern plant automation. This subscriber-driven monthly column hopes to build community and recognize all subscribers!



← Not many companies can boast a history going back over 100 years. Based in Louisville, KY, Atlas Machine & Supply has survived the Great Depression, the Great Louisville Flood and now Covid. It's still going strong. Pictured here are Kristin and Jeremy Breeding (congratulations, newlyweds!), Chad Wheatley, Ben Johnson, Logan East and Danny Kent (left to right). Visit <https://www.atlasmachine.com>.

→ Our Director of Sales caught up with the good-natured crew at OTC Industrial Sales during a visit to its Louisville, KY, office in May. Started in 1963, OTC is one of the country's largest industrial distributors and service providers. Pictured here are Jason Trott, Teresa Bartley, Stephanie Claypool and Madeline Trago (left to right). Visit <https://otcindustrial.com>.



↑ We found plenty of subscribers at the Automate show in Detroit, MI, this May, including Stephanie Breglio and Mike Tuohey of Piab (left to right). The company's booth was full of the latest vacuum generation tools for product handling, assembly and packaging. Visit <https://www.piab.com>.

Submission Guidelines

We invite our subscribers to send in pictures so we can see the people who read our Best Practices magazines! Those holding a recent magazine issue will receive first consideration. Please send a high-resolution picture as a JPG with a note describing the team and company to Troy Dreier at troy@airbestpractices.com.



It looks like our April feature on Industrial Pneumatic Systems of New Prague, MN, was a hit. Company owner Rob Hoffman (center) gathered his team to show off the write-up. IPS is an Atlas Copco distributor and has been in business since 2012. Visit <https://ipscompressors.com>.



A well-read crew from Solberg Manufacturing stopped by the grand opening of a BEKO Technologies desiccant dryer production facility in Smyrna, GA, one day before the Best Practices 2024 EXPO & Conference in Atlanta. Pictured here are Gunnar Solberg, Jamie Stebbins and Clint Browning (left to right). Visit <https://www.solbergmfg.com>.



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NEWS / Compressed Air Industry & Technology

BEKO TECHNOLOGIES Launches METPOINT VFS TI and TM Volumetric Flow Sensors for Compressed Air and Nitrogen

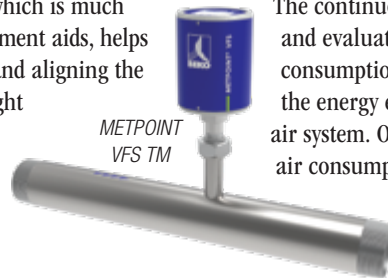
BEKO TECHNOLOGIES' new METPOINT VFS TI and METPOINT VFS TM volumetric flow meters are suitable for applications with compressed air or nitrogen. They simultaneously measure volume flow, flow rate, consumption and temperature.

With the METPOINT VFS TM, the sensor is pre-installed in a measuring section; subsequent alignment of the sensor is not necessary.

The METPOINT VFS TI is an insertion version with a shaft length of 220 or 400 mm. A switchable line laser assists with exact alignment when installing the sensor in existing

pipework. This unique feature, which is much simpler than conventional alignment aids, helps to avoid errors when installing and aligning the sensor. An additional time-of-flight sensor monitors the correct position of the METPOINT VFS TI during operation and provides additional safety.

The open sensor design of the METPOINT VFS devices prevents the accumulation of contamination on the sensor and thus ensures more reliable data acquisition. The sensors are encapsulated in stainless steel housings for protection.



The continuous measurement and evaluation of compressed air consumption significantly supports the energy efficiency of a compressed air system. Optimizing compressed air consumption and reducing energy consumption, e.g. by eliminating leaks, helps to minimize unnecessary operating costs. More

efficient use of compressed air leads to lower energy consumption, which in turn reduces CO₂ emissions. For more information, visit <https://www.beko-technologies.com>.

The Industrial Sustainability Best Practices Conference Concludes

The inaugural Industrial Sustainability Best Practices (ISBP) Conference was successfully held, June 17-18, 2025, in Barcelona, Spain. The event focused on high-impact energy and water conservation projects available in industrial compressed air, cooling water, nitrogen, blower and vacuum systems.

Attendees from 18 countries heard from 24 expert conference speakers from 15 countries who gave highly technical presentations and offered interactive discussions.

Carlos Capilla Camacho, Energy and Environmental Lead, Nestlé Waters & Premium Beverages, shared their four pillars of compressed air management at all plants: process optimization, competency, standardization and digitalization.



Carlos Capilla Camacho, Energy and Environmental Lead, Nestlé Waters & Premium Beverages

TEAM INDUSTRIAL, a leading Valencia-based distributor, presented on modern industrial vacuum and nitrogen system optimization. "This is a really interesting event for us. It serves as a great forum for factories, distributors, measurement instrument OEMs and engineering companies to share solutions to common issues in industrial compressed air, nitrogen, vacuum and cooling systems," said Alfred Roca, Sales Director, TEAM INDUSTRIAL.

Airmatic, a leading distributor in Catalonia, had Commercial Director Carles Gamito, provide an insightful presentation on how to efficiently deploy multiple VSD air compressors in one installation. "It has been a pleasure to participate in such an enriching technical event," said Gamito.

Attendees shared ideas and discovered new technologies in the Networking Expo featuring 19 Exhibitors. "Thank you so much for the great event and the outstanding organization," said Pablo Moya Fernández, General Manager, BOGE Compresores Ibérica.

"We'd like to thank the industry leaders who made this event possible by sponsoring and exhibiting," said Roderick M. Smith, Publisher. Official sponsors were Airmatic, BEKO Technologies, BOGE Compresores Ibérica, Compresores Josval, ELGi Compressors Europe, Eurovent Certification, Ingersoll Rand, Kaeser Compressores and The Analysts. For more information visit <https://cabpexpo.com/eu>.

Atlas Copco Group Acquires Spanish Air Compressor Manufacturer ABC Compressors

Arizaga Bastarrica y Compañía (ABC Compressors), a Spanish air compressor manufacturer, will become part of Atlas Copco Group.

ABC Compressors was founded in 1943 and is located in Eibar, Spain. The company also has an assembly unit in Suzhou, China, and sales offices in India, the U.S. and Mexico. In total, 319 employees will join Atlas Copco Group as part of the acquisition. The company produces reciprocating compressors for gas and air compression, used in several customer segments and applications.

"We are happy to welcome ABC Compressors to Atlas Copco Group. With this acquisition we add an innovative technology, which will enhance our offering within gas and air compression," said Philippe Ernens, Business Area President Compressor Technique.

In 2024, the company had revenues of approximately 84 MEUR (961 MSEK). The purchase price is not disclosed. The acquisition is expected to close during the third quarter 2025.

The company becomes part of the division Air and Gas Applications within the Compressor Technique Business Area. For more information, visit <https://www.atlascopcogroup.com>.

Comairco Canada Receives Top Honors at 2025 Sullair Conference

Comairco Canada was recognized with three major awards during the Sullair Conference held in Orlando, FL.

Sales Growth 2024 – North America (Stationary Oil-Flooded Compressors)

Awarded for outstanding year-over-year growth in sales of stationary oil-flooded air compressors across North America.

Sullair Platinum Distributor 2024

This distinction was awarded to only two distributors in North America, out of approximately 40. It recognizes distributors who have met sales objectives in all five key categories: oil-flooded stationary air compressors (5-50 hp), oil-flooded stationary air compressors (60-600 hp), oil-free air compressors, air treatment products and aftermarket/parts.

Sullair Cup 2024 – Distributor of the Year

The highest honor awarded annually by Sullair, this distinction recognizes one distributor across North America for exceptional performance, commitment and partnership.

This year's conference was especially meaningful as Sullair celebrates its 60th anniversary in 2025, marking six decades of innovation, reliability and leadership in the compressed air industry. Comairco is proud to be a long-standing partner of Sullair, and these awards reflect the strength and success of this enduring collaboration.

“This recognition is truly a team achievement. These awards belong to every Comairco (CEL) employee who contributes, day in and day out, to our success. We’re extremely proud of what we’ve accomplished together,” said David Nadeau, President, Comairco Canada. For more information, visit <https://comairco.com>.



Daniel Nadeau, David Nadeau and Eddy Nadeau of Comairco (left to right)

Metro Air Compressor Now Serving Northern Ohio, Offering Sullair Products

Metro Air Compressor has expanded its reach into Northern Ohio, offering its full range of compressed air products, expert services and rental options to industrial and commercial facilities across the region. With locations already established in Roseville, Saginaw and Gaylord, MI, the company's move into Ohio marks a natural next step in its mission to serve businesses throughout the Midwest with reliable, energy-efficient air systems and unmatched customer support.

The company is now offering compressed air service and support in the following Northern Ohio counties: Crawford, Erie, Fulton, Hancock, Henry, Huron, Lucas, Ottawa, Richland, Sandusky, Seneca, Williams, Wood and Wyandot.

Metro Air Compressor is a full-line distributor – not just an installer or repair shop. That means customers get access to top-quality equipment and experienced support throughout the full lifecycle of their compressed air systems. Its core services include air treatment products, compressed air service and maintenance, compressed air installations, compressed air rentals, parts and accessories and vacuums.

For customers planning a new facility, expanding operations or simplifying air compressor ownership, this flexible program offers real advantages such as no capital expenditures, no maintenance responsibilities, custom air quality and pressure levels, potential tax benefits and equipment upgrades included. This offering is now available throughout Northern Ohio, making it easier for companies to prioritize production while Metro Air Compressor handles the rest. For more information, visit <https://www.metroaircomp.com>.



Metro Air Compressor has expanded into Northern Ohio, offering Sullair compressed air products.

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NEWS Chiller & Cooling Industry & Technology

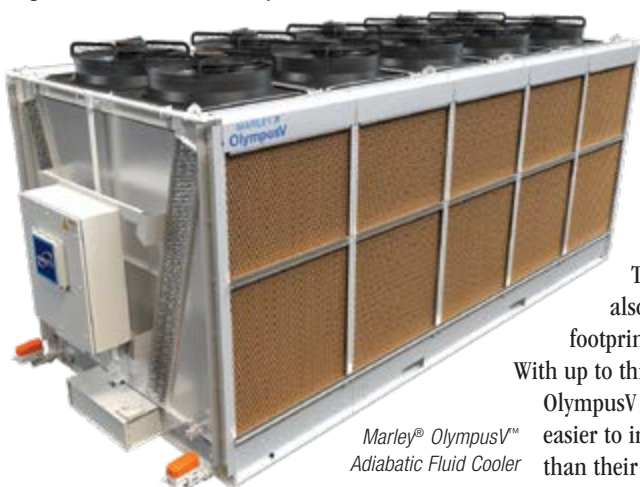
SPX Cooling Announces Capacity Expansion and CTI-Certified Dry Performance for Marley® OlympusV™

SPX Cooling Tech, an industry leader in the design and manufacture of evaporative cooling towers and fluid coolers, is now offering Marley® OlympusV™ Adiabatic Fluid Coolers in higher capacity models, designed to provide a flexible cooling solution for more operators and engineers of commercial HVAC, industrial process and data center systems.

OlympusV (pronounced o-lym-pus-vee) adiabatic products are designed to balance the water-saving benefits of an air-cooled heat rejection system with the energy efficiency of a water-cooled solution, according to Marshal Zabel, Senior Global Product Manager, SPX Cooling.

specified for projects with higher heat rejection duties, such as large-scale manufacturing applications or mission-critical operations.

In addition to the new product ranges, many OlympusV adiabatic fluid cooler models are now certified under the CTI Standard 201 program for dry operation.



Marley® OlympusV™
Adiabatic Fluid Cooler

“These products limit site water usage to only those times when ambient temperatures and cooling loads are at their highest, typically operating dry for the majority of annual hours,” said Zabel.

The newly available model sizes also offer greater flexibility for footprint and installation restrictions. With up to three times the original capacity, OlympusV adiabatic fluid coolers are now easier to install and require less total space than their smaller counterparts when being

“CTI-certified dry performance combined with accurate and genuine adiabatic ratings enables customers to better align projected water and energy requirements with real-world usage in their applications,” said Zabel.

OlympusV units include user-friendly, smart controls allowing operators to adjust water and energy usage based on the needs of their unique operating conditions. The CoolBoost® Opti AD control panel can prioritize savings of the associated onsite resource during peak cooling loads. For more information, visit <https://spxcooling.com>.

Johnson Controls Heat Pumps Drive Down Customer Costs by 53% and Reduce Carbon Emissions by 60%

Johnson Controls commercial heat pumps are delivering a competitive advantage to customers and partners across all industries – from global industrial and manufacturing organizations to hospitals, local municipalities and utilities – while having a positive impact on the environment. The results are significant: In 2024, Johnson Controls helped cut customers’ expenses by 53% and reduce emissions by 60% compared to conventional natural gas boilers.

organizations. Johnson Controls is helping to lead the transition to more sustainable refrigerants as well, offering heat pumps that use low and ultra-low global warming potential fluids.

Recent innovations include the 400-ton YORK® CYK Water-to-Water Compound Centrifugal Heat Pump, which meets high-temperature requirements of up to 180°F (82°C) and

is up to four times more efficient than traditional boiler and chiller combinations, reducing energy consumption and operational costs. Similarly, the YORK® YMAE modular air-to-water heat pump provides hot water up to 140°F (60°C) and ensures reliable heating even in harsh winter conditions, making it a versatile and resilient solution for various climates. For more information, visit <https://www.johnsoncontrols.com>.

“In this dynamic world, we are working in true partnership with our customers to deliver on multiple key priorities. Our state-of-the-art heat pumps ensure uptime, runtime and reliability. At the same time, cash is being conserved for growth as heating costs are cut by more than half, providing a significant competitive advantage,” said Katie McGinty, Vice President and Chief Sustainability and External Relations Officer, Johnson Controls.

Johnson Controls was among the first providers of heat pumps and today offers one of the world’s most comprehensive portfolios for commercial, institutional and industrial



A Johnson Controls large-scale heat pump used for district heating in Southern Germany

Carrier Announces \$1 Billion Investment in US Manufacturing Footprint

Carrier Global Corporation announced plans to invest an additional \$1 billion over five years in U.S. manufacturing, innovation and workforce expansion, in addition to its ongoing commitments to American operations. The investment is expected to create 4,000 highly-skilled jobs in R&D, manufacturing and field service.

“We are building for the future by creating high-quality, skilled trade careers and empowering American workers to lead the next generation of manufacturing. At the same time, it positions Carrier to capture the tremendous growth ahead in our industry and deliver smart,



Carrier headquarters in Palm Beach Gardens, Florida

differentiated solutions for our customers,” said David Gitlin, Chairman and CEO, Carrier.

The additional investment will fund the expansion of existing facilities and the construction of a new state-of-the-art manufacturing site to support the production of highly-engineered components for heat pumps and battery assemblies – both essential to Carrier’s Home Energy Management System (HEMS). It will also accelerate next-generation R&D, including innovations in liquid cooling for data centers and battery-enabled climate solutions technologies developed under Carrier Energy, the company’s bold, in-house start-up focused on optimizing home energy use and supporting grid flexibility.

Carrier’s TechVantage initiative, announced in January, is included in both the \$1 billion investment and the anticipated 4,000 jobs. The program aims to hire 1,000 U.S. service technicians and train more than 100,000 climate solutions service and sales professionals over the next five years. For more information, visit <https://www.carrier.com>.

Smardt Launches ECO AeroMod™ Modular Air-Cooled Chiller Platform

Smardt announced the launch of its Smardt ECO AeroMod™ modular air-cooled chiller platform. This milestone marks a strategic expansion beyond Smardt’s core oil-free centrifugal offering, introducing a high-performance solution engineered for scalable efficiency, modular flexibility and seamless integration across a wide range of commercial and industrial building types. The AeroMod platform is part of the newly introduced Smardt ECO™ line, designed to deliver top-tier performance using proven, non-oil-free refrigerant compressor technologies.

“AeroMod gives owners and operators the flexibility to scale cooling capacity without compromising on space or efficiency,” said Changiz Tolouee, Executive Vice President of Technology and Product Development, Smardt.

The Smardt ECO AeroMod features a modular design



Smardt
ECO AeroMod™

with 30 and 40 ton modules. Up to 10 units can be connected for a total of 400 tons. No clearance is required between modules, thanks to internal piping headers. This compact footprint and modularity allow for seamless expansion and simplified phasing of building cooling capacity. It uses low-GWP R-454B, and includes dual variable speed, scroll refrigerant compressors. There are EC fans with advanced airflow control and all-aluminum microchannel condenser coils.

Each AeroMod unit delivers superior part-load efficiency and built-in redundancy.

A single module can unload down to 15% capacity with precision chilled water temperature control. A full 10-module configuration supports dynamic turndown to below 2% of total load, ensuring optimized energy use even at minimal demand. For more information, visit <https://smardt.com>.

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NEWS / Industrial Energy & Water Conservation

Whirlpool Releases 2024 Sustainability Report, Highlighting Progress Toward Greenhouse Gas Reduction Goals

Whirlpool Corporation released its 2024 sustainability report, reiterating the company’s commitment to improving life at home via sustainable products and operations, employee and community support and continued transparency and accountability.



Whirlpool Corporation’s global headquarters in Benton Harbor, MI

“For more than 110 years, our products have been used daily in the homes of our consumers – an honor we aim to earn and keep each day,” said Marc Bitzer, Chairman and CEO, Whirlpool Corporation. “Their challenges become our challenges, inspiring us to continually innovate and move forward on our commitments to create products that are more resource-efficient, improve the sustainability of our manufacturing and invest in our people and the places we call home.”

Whirlpool Corporation reduced Scope 1 and 2 market-based emissions by 36% compared to 2023, driven equally by energy management activities and the divestiture of the company’s EMEA region. 2024 is the third consecutive year of double-digit reductions of Scope 1 and 2 emissions. The company also matched 100% of electricity consumption for U.S. plant operations not generated from onsite renewable energy through two virtual power purchasing agreements.

“We are determined to drive long-term, meaningful change, even when it means choosing the tougher path,” said Beat Stocker, Senior Director of Global Sustainability, Whirlpool Corporation. “We will continue to explore opportunities, remaining true to our value of integrity – making decisions that support our people and planet today and in the future.” For more information, visit <https://www.whirlpoolcorp.com>.

Billerud's Sustainability Work Gains International Recognition by A-list Ranking From CDP

Billerud, a world-leading company in high-performing paper and packaging materials, was recognized by CDP as one of the companies and organizations at the forefront globally in sustainability work, as well as transparency in sustainability reporting.

Billerud was placed on CDP’s A-list in the climate category out of a total of nearly 25,000 companies globally reviewed in 2024.

“Billerud’s ranking is both honorable and a testament to our systematic and long-standing sustainability work that is world-class in a global comparison. Production in our European operations is almost fossil-free. We are now continuing our journey to reduce fossil emissions in the American operations,” said Ulrika Wedberg, EVP Sustainability & Public Affairs, Billerud. “Billerud’s high-performance products in renewable paper and packaging materials also contribute to a fossil-free society by replacing other materials.”

Billerud’s new climate targets were recently approved by the Science Based Targets Initiative (SBTi), an important milestone in Billerud’s strategy to contribute to a low-carbon society. As part of the commitment, Billerud has set a target to reduce Scope 1 and 2 greenhouse gas emissions by 42% by 2030, with 2022 as the base year.

CDP is a global voluntary organization that aims to make environmental reporting and risk management a business norm

with the aim of providing information, insights and actions to promote a sustainable economy. For more information, visit <https://www.billerud.com>.



Billerud’s mill in Frövi, Sweden

Albemarle Corporation Publishes 2024 Sustainability Report

Albemarle Corporation, an American specialty chemicals manufacturing company based in Charlotte, NC, published its 2024 sustainability report.



Albemarle Corporation's plant in Kings Mountain, NC

“As a values-led organization, sustainability is foundational to how we choose to operate,” said Kent Masters, Chairman and CEO, Albemarle. “The initiatives outlined in this report speak to our commitment to creating a more resilient world. We remain dedicated to minimizing our environmental footprint, creating responsible and reliable products for our customers and engaging with our communities to foster positive outcomes.”

Due to efficiency improvements and increased procurement of renewable and carbon-free electricity, Albemarle remains on track to grow its energy storage business in a Scope 1 and 2 carbon intensity-neutral manner. In addition, its specialties and Ketjen segments also remain on track to meet their 2030 Scope 1 and 2 carbon emissions targets on an absolute basis. 24% of the company's total electricity consumed was generated from renewable sources, an increase from 16% the previous year.

Albemarle initiated a decarbonization roadmap to assess enterprise hot spots and identify intervention approaches, including electrification and renewable/carbon-free electricity, process changes and efficiency improvements, fuel substitutions and end-of-pipe solutions.

The company also expanded the development of externally verified Product Carbon Footprints to include more bromine and lithium products from locations in the U.S., Jordan and China. For more information, visit <https://www.albemarle.com>.

Imerys Achieves A List Rating from CDP for Climate Leadership

Imerys, a world leader in mineral-based specialty solutions, announced it has made the CDP Corporate Climate A List, increasing its score from B in 2023. Reaching this top score reflects the group's dedication to mitigating greenhouse gas emissions and achieving its ambitious targets, validated by the Science-Based Targets initiative (SBTi). The group's targets, consistent with the 2.7°F (1.5°C) pathway, translate to a 42% decrease in Scope 1 and 2 emissions and a 25% reduction in Scope 3 emissions by 2030, using 2021 as the base year.

In addition, Imerys has achieved a B- CDP Water score, corresponding to CDP “Management” level, which highlights the group's strengthened reporting and coordinated action on water issues.

The improved CDP ratings demonstrate Imerys's commitment not only to transparent communication to stakeholders, but also to implementing concrete decarbonization and sustainability initiatives across its operations and within its value chain. These include increasing energy efficiency and recovery, switching from fuel to biomass and transitioning to low-carbon and renewable energy sources.

Leah Wilson, Chief Sustainability Officer, Imerys, said, “This improved CDP rating is a testament to our continued efforts to strengthen our climate change strategy and accelerate our journey toward a low-carbon future. At Imerys, we are fully committed to achieving our SBTi-validated GHG reduction targets by leveraging multiple decarbonization levers across our operations. At the same time, we recognize the importance of responsible water management, and our CDP Water score reflects our efforts to enhance transparency and promote sustainable water practices. While these achievements are important milestones, we remain focused on further improving our sustainability performance and driving meaningful change in our industry.” For more information, visit <https://www.imerys.com>.

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Texas Recycling Plant Saves Water with Air-Cooled Air Compressors

By Troy Dreier, Senior Editor, Compressed Air Best Practices® Magazine

► Compressed Air Systems (CAS) began in 1963, founded by Richard “Dick” Hall in Mulberry, FL. The company expanded over the decades and now has a 30,000-square-foot headquarters in Tampa and a 4,000-square-foot facility in Central Florida. Hall’s four daughters are now the owners, and it’s still a family-run operation. It currently has 57 employees and is a distributor for Kaeser Compressors. Its 60-year anniversary celebration, delayed by Covid, will take place this fall.

The company had already created three compressed air systems for a local recycling firm when it got a call to design a fourth – this one far away in San Antonio, TX. The local recycler had been acquired by a Texas-based firm, Balcones Recycling, and the Florida company’s owner was brought in as a Business Development Manager. He told his new Balcones partners that Compressed Air Systems was the right company to create the compressed air system for its new high-tech recycling plant, and they listened. That’s how Compressed Air Systems left its usual distribution area – with permission from Kaeser for a cross-border assignment – to complete a job in the Lone Star State.

While the territory might have been different, the challenges were much the same. Conserving water is just as important in Texas as in Florida, thanks to water scarcity, local allowances and high costs for city water. This installation, like nearly all installations

Compressed Air Systems completed, relied on air-cooled air compressors.

The project started in June 2023. There are multiple compressed air applications in a waste management facility. This new recycling center uses laser-guided optical sorters to divide waste, with no human involvement on the sorting line. Laser optics determine what type of material each scrap is, then compressed air jets maneuver each piece to its collection area. Compressed air also powers handheld blow guns used for cleaning, as well as the bundling

and packaging system. The customer chose to power its blow guns with air compressors instead of industrial blowers so they’d have to force to drive debris out of small crevices.

Balcones was creating an entirely new facility, so the company would be working from scratch. Redundancy was critical for the customer, so the plan was to provide as much redundancy as possible. The processes called for a constant compressed air stream of 2,255 scfm at 115 psig. The company supplied four fixed speed, single stage rotary screw air compressors



Above: Balcones Recycling’s new facility in San Antonio, TX

The recycling plant’s compressed air system includes full redundancy.

supplying 888 scfm at 125 psig. These included built-in cyclonic moisture separators, which remove a significant percentage of the moisture from the compressed air. The compressed air room was an open-air enclosure on the facility’s north side, as far as possible from the drop-off area where large trucks kick up dust and debris.

Creating a Dry Compressed Air System for a Humid Environment

Removing moisture from the compressed air stream was critical, as it would ruin the high-priced laser optics used for sorting. Each of the 12 laser-guided optic components costs \$8,000 and requires 55 to 325 scfm at 80 psig. The dew point from a refrigerated compressed air dryer was good enough for these components, but the system would encounter critical issues if the dew point rose above 50°F (10°C).

Two 1,550-gallon wet storage tanks remove much of the condensate and some of the heat from the compressed air stream. The wet tanks are equipped with 500 gallon per hour mechanical float drains to remove condensate and cool the air. After that, the compressed air splits in parallel to four refrigerated cycling compressed air dryers equipped with zero-loss electronic drains. These were outfitted with oil and particulate filters on entry and exit. A three-way bypass valve allows the operator to stream the compressed air to one of the refrigerated cycling compressed air dryers, if needed, for servicing. Built with a thermal mass, these refrigerated cycling compressed air dryers are especially efficient. A cool pack similar to a medical ice pack is chilled and cools the air passively.

From there, the compressed air stream travels to two 1,550-gallon dry storage tanks. These tanks includes 2400 scfm electronic drains, which can send an alert if they detect moisture or a failure occurs. The compressed air system also includes a modular oil-water separator, which includes a notification alarm. The compressed air system’s components are linked with a Sigma Air Manager 4.0 management system that alerts operators if moisture is present. Tablet-sized, the wall-mounted system monitors air compressor performance and energy use, helping operators plan start and stop times with real-time monitoring. It can also email the maintenance department automatically when it detects a fault.

The compressed air system loads at 110 psi and unloads at 120 psi. The customer initially requested a system pressure of 125 psi, but CAS was able to show that level wasn’t needed, creating a more efficient and less expensive compressed air system.

Calculating Correction Factors for Refrigerated Compressed Air Dryers

While the work of designing the compressed air system would normally be done by a mechanical engineer, the customer trusted the company to do the work based on past successes. Kyle Randall, Vice President and Director of Sales, explains that his company received a spec detailing the compressed air requirements of the optical systems, handheld blow guns and packaging system, and created a detailed plan with full redundancy.

“They wanted to put this in an outdoor location,” said Randall. “We knew the heat and humidity in Texas are similar to Florida, so it could be very cold in the morning, very hot in the afternoon. There was dust outside, so variable speed drive air compressors weren’t something we wanted to use in this situation.



Kyle Randall, Vice President & Director of Sales, Compressed Air Systems

We liked the idea of having two full base load units and then trimming with the third air compressor. The control settings would ensure all air compressors get equal running time, and the fourth air compressor provides 50% redundancy. But, the real efficiency came



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» Texas Recycling Plant Saves Water with Air-Cooled Air Compressors



delivered from each unit, but because all four refrigerated compressed air dryers are cycling, totaling 4,520 scfm, and piped in parallel, they cycle off half the time. This is how the customer not only saves energy, but also add longevity to its refrigerated compressed air dryers.”

Water Savings with Air-Cooled Air Compressors

Air-cooled air compressors are the norm in Florida and Texas for a variety of reasons. The water table is filled with minerals, so any water sourced from the ground needs a lot of cleaning, and water-cooled systems require extra maintenance. The company has found water cooling systems tend to get clogged within two or three years. Using city water in South Florida is prohibitively expensive and can create environmental issues. For these reasons, nearly all the company’s installations include air-cooled air compressors.

Kaeser Compressors estimates the customer is saving 13,650,000 gallons of water each year by using air-cooled air compressors.

“Except in rare cases where air cooling would compromise reliability due to ambient conditions and a chilled water system is already in place, we recommend air-cooled air compressors as a more cost-effective solution for the customer,” said Neil Mehlretter, Technical Director, Kaeser Compressors. “It’s true that a water-cooled air compressor may have marginally higher efficiency, but this is

The recycling plant’s compressed air system includes over 1,000 feet of aluminum piping.

from using cycling refrigerated compressed air dryers, as well as keeping the demand as close to the air compressors as possible. We were hoping that the two main air compressors would run at full capacity, and the third air compressor would be about 70% loaded. If they needed more flow, it could go to 100%. That’s the most efficient we could get with that system.”

The purchase order was delivered by the end of 2023, and the compressed air system installed in May 2024. The company’s crew drove in from Florida to install the compressed air system and connect it with aluminum piping, creating a loop distribution system. The compressed air system includes over 1,000 feet of pipe with drops to conveyor belts and other work areas. Kaeser Compressors of Houston helped with the commissioning, which took three days.

The compressed air room is in a partially sheltered outside enclosure, which saves room in the recycling facility but also causes environmental challenges. To ensure proper functioning even with high ambient heat and humidity, the company oversized the refrigerated compressed air dryers by 30%. The goal was to ensure the dew point stays at 40°F (4°C) and never rises above 45°F (7°C). Sizing a refrigerated compressed air dryer correctly means applying the right correction factor.

“I’ve been doing this for 27 years, knowing the worst case scenario in Florida is usually

August,” Randall said. “In that month, your dew point or your humidity level is super high. Your correction factor is basically 30% above. Refrigerated compressed air dryers have their rated capacity based on a 100°F (38°C) ambient temperature with compressed air saturated at 100°F (38°C) and 100 psig. If you go above that, there is a correction factor table you can use. You put in your worst-case conditions and come up with the correction factor. I’ve typically seen that if you oversize to 30%, you’re fine. It’s a good number to use. For this application, I sized the refrigerated compressed air dryers to 1,130 scfm rated capacity with 888 scfm of compressed air



The bundling and packaging system is one of the recycling plant’s compressed air applications.

offset by the energy and maintenance costs of operating a chilled water system. If the chilled water system is not already in place, the costs of engineering, installation, plumbing and plant space would make it prohibitive.”

Kaeser Compressors estimates the customer is saving 13,650,000 gallons of water each year by using air-cooled air compressors.

Randall has learned to upsize the fan on his air-cooled air compressors by three to five horsepower (hp). This adds to the expense; however, the hot air expelled can be used in heat recovery projects. He has one customer in South Florida that uses the hot air from an air-cooled air compressor to dry paint on an assembly line.

When it’s time to choose between air-cooled and water-cooled air compressors, Randall has advice for his customers.

“It comes down to whether or not they already have cooling towers or cooling. If they’re designing a new compressed air system and it’s going to have access to chilled water, then they can look at water-cooled air compressors. They can oversize the air compressor a little bit more, and the air compressor room will stay nice and cool. We’ve had some customers, like one Florida theme park, for example, that needed water-cooled air compressors. You couldn’t get the heat out of the basement with air-cooled air compressors. There are instances where water-cooled air compressors are a great solution, but 99% of our sales are air-cooled air compressors.”

Maintenance for Air-Cooled Air Compressors

Air-cooled air compressors have special maintenance concerns, with cleanliness the chief issue. When located in a dusty environment, as with this San Antonio installation, adding filtration in front of the cooler will help. Randall prefers externally mounted, magnetic Permatron industrial air filters. Intensely dusty locations require adding a pre-filter dust eliminator before the main air filter.

“Another thing to consider is that with air-cooled after-coolers, one side of the cooler contains oil, and the other side has air. They’re combo coolers,” Randall said. “You have

the oil cooler and then the air cooler on the other side. Keeping them clean and inspecting them is important. We’ve seen a lot in dusty environments where they should be blowing them off or using an air refrigeration cleaner. It’s a solution you can spray on, and it brings all the dirt off. You just wash it off with water and it’s environmentally safe.”

A lack of filtration for air-cooled air compressors leads to particles and dust fouling the oil and the airend, shortening equipment life. Bearings get clogged, leading to higher heat. Raising oil temperature by 10°F (6°C) cuts its life by a quarter, Randall noted. In this installation, the customer chose to get ongoing compressed air system maintenance through an annual contract with Kaeser Compressors of Houston.

“We’ve been a Kaeser dealer since 1986, when it came to America, and we collaborated with it when developing ideas and procedures. When designing a compressed air system, we don’t skimp on anything, including the valve, flex line and proper-size piping. We think about expanding for the future, if that’s a possibility, and making sure the compressed air system is piped correctly. We also paint all of our tanks Kaeser yellow to match. They last longer and look nice. Little details make the compressed air system look so good. We try to eliminate as many 90° turns as we can to keep the system flowing well with less pressure drop. I think Kaeser’s best practice is the same. We’re all on the same page.”

For more information on Compressed Air Systems, visit <https://www.compressedairsystems.com>. **BP**

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Selecting the Appropriate Nitrogen Gas Purity Level for Your Application

By the Compressed Air & Gas Institute

► What is more soul-warming than the aroma of a freshly opened bag of perfectly roasted coffee beans? Imagine waking up on a crisp, fall Sunday morning and you head to the kitchen to brew that much-anticipated cup of coffee. Upon opening the new bag of beans you are utterly disappointed to discover that the bag is full of spoiled coffee beans staring back at you. Your delicious coffee experience has been ruined by a bag of rancid coffee beans. Had the coffee producer packaged the freshly roasted beans in a hermetically sealed container that had been properly flushed and filled with the appropriate purity of nitrogen gas, the start to your Sunday would have been entirely different.

As nitrogen purity levels exceed 95%, the relationship becomes non-linear, requiring a larger nitrogen generator.

There are countless uses for nitrogen gas in industry and many other applications. Selecting the appropriate nitrogen purity for

Above: This complete nitrogen gas system includes an air compressor and a nitrogen generator.

the application is critical as it dictates the final quality of the product or process.

The level of nitrogen purity also affects the total lifecycle cost of the nitrogen system, including equipment costs, energy consumption and system maintenance. As the purity level of the nitrogen increases, so does the size of the nitrogen generating equipment and the air compressor that is required to feed the system. This is why selecting the appropriate purity level is so very important.

The typical purity range for nitrogen gas used in industrial applications is 95% to 99.999%. Within the nitrogen industry, the convention is to state nitrogen purity levels relative to oxygen content, since oxygen is the volatile

component which can spoil products and processes by causing unwanted oxidation.

Cryogenic liquid nitrogen is extremely pure at roughly 99.998% nitrogen. So, 99.998% nitrogen is stated as 20 ppm oxygen content. Liquid nitrogen is created by the process of cryogenic distillation. The temperature of the air is reduced to the point where it condenses into a liquid mixture of gases. The liquid air is heated and since different gases have different boiling temperatures, each gas boils off as an ultra-pure gas at its unique boiling temperature. Nitrogen, with a lower boiling point than oxygen and argon, boils off first and is separated and collected in a pure liquid state at roughly 99.998% purity.



A nitrogen generator

Pressure swing adsorption (PSA) nitrogen generators produce gaseous nitrogen through the process of adsorption, where clean, dry compressed air is flowed

Purity Level	Applications
Ultra-High Purity (UHP) – 99.999%+	Semiconductor manufacturing, electronics, research
High Purity – 99.9% to 99.999%	Laser cutting, heat treating, pharmaceutical manufacturing
Food Grade – 99% to 99.9%	Food packaging, winemaking, food processing
Medical Grade – 99%+	Cryopreservation, cryotherapy, medical imaging
Industrial Grade – 95% to 99%	Tire inflation, chemical blanketing
Fire Sprinkler Systems – 98%+	Corrosion prevention for fire sprinkler systems

Table 1. Nitrogen purity guide for various applications

through a special media called a carbon molecular sieve. The carbon molecular sieve selectively attracts the molecules of other gases like oxygen and argon and removes them from the airstream. What exits the sieve is a steady stream of high-purity nitrogen gas. A PSA nitrogen generator is more sustainable and environmentally friendly compared to the production of liquid nitrogen as the energy consumption is significantly lower. PSA nitrogen generating systems offer a wide range of nitrogen flow,

purity, dryness and pressure, and they can be designed for many different applications. Key to selecting the optimal PSA nitrogen generating solution is identifying the purity of nitrogen needed.

There are two main reasons to select the appropriate purity level for a nitrogen generation system. The first reason is financial and the second is directly related to the quality outcome of the product or process being influenced by the nitrogen gas.

Financial Considerations for Nitrogen Gas Purity Selection

PSA nitrogen generators can produce nitrogen gas across the entire industrial purity range (95-99.999%). However, both equipment costs and energy consumption rise proportionally with the desired increase in purity. As nitrogen purity levels exceed 95%, the relationship becomes non-linear, requiring a larger nitrogen generator. This is because achieving higher purity demands a greater volume of internal media to effectively capture and remove more oxygen molecules from the feed air stream.

Since the media is not 100% efficient and traps some nitrogen molecules, the increased size of the generator is not directly proportional to the purity increase in the nitrogen being produced. As a result, the size of the PSA nitrogen generator system grows disproportionately in relation to the increase in nitrogen purity.

The following is a real-world example showing how increasing the purity of



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» Selecting the Appropriate Nitrogen Gas Purity Level for Your Application



Nitrogen gas used in semiconductor manufacturing

nitrogen affects the size of the nitrogen generator: A customer requires a 1,000 standard cubic feet per hour (scfh) flow of nitrogen gas. When selecting the purity of nitrogen, the customer may default to the ultra-high purity level produced by cryogenic nitrogen, 99.998% or 20 ppm oxygen content. This results in a nitrogen generator that is twice the size and cost of a nitrogen generator that produces a lower purity level of nitrogen, 99.9% or 1,000 ppm oxygen content. Some applications do require ultra-high nitrogen purity, but many times applications will accept a lower purity level.

1,000 scfh of nitrogen at 99.999% purity requires a feed air compressor delivering slightly over 100 standard cubic feet per minute (scfm) of compressed air. This capacity requires a 25 horsepower (hp) air compressor. For 1,000 scfh of nitrogen at the lower purity of 99.9%, the inlet compressed air requirement would be just over 50 scfm, which equates to a 15 hp air compressor, a 40% reduction in both air compressor size and associated energy expense.

The desired nitrogen purity and its dryness also affect the required pressure dew

point of the compressed air that feeds the nitrogen generator. The drier and cleaner the compressed air that feeds the nitrogen

generator, the longer the service life of the media within the generator. Oil vapors can be removed by activated carbon filtration of the inlet air. Compressed air dried by a refrigerated compressed air dryer is typically sufficient, but if the ambient temperature is below 35°F (2°C) or the nitrogen must be extremely dry, a desiccant dryer may be used to achieve -40°F (-40°C) pressure dew point for the inlet air. Desiccant compressed air dryers consume 15-20% of their capacity for purge air, meaning this additional compressed air requirement must be factored into the overall compressed air demand, thus increasing both the size and cost of the air compressor.

You can see why selecting the appropriate, lowest acceptable nitrogen purity level is important when making return on investment decisions for a nitrogen generation system.

Quality Considerations for Nitrogen Gas Purity Selection

Oxidation occurs when oxygen molecules bond to a substance and create a new substance. This new substance has a different molecular structure than the original substance. This



Food packaging using nitrogen gas

change can have negative impacts upon a product or process.

Oxidation rates are specific to each substance and are determined by its reactivity to oxygen at a molecular level. The user of nitrogen must determine the maximum concentration of oxygen that will negatively impact their product or process. This is often related to the length of time that the product will be in storage and needs to resist oxidation to remain fresh. In the fresh cup of coffee example, if the coffee producer had packaged the beans at the appropriate nitrogen purity level – preventing oxidation over an extended period – the consumer would have a fresh and satisfying coffee experience. Some products or processes depend upon oxidation and simply cannot occur unless a specific concentration of oxygen exists. Combustion is such a process which requires fuel, oxygen and a heat source.

Unless the oxygen concentration is above the reaction threshold required for the specific fuel, no combustion will take place. Knowing the critical, allowable oxygen concentration for any process is required to determine the purity of nitrogen that the process needs. In summary, where product or process quality is concerned, there is no room for error when selecting a nitrogen purity level that avoids costly product spoilage or process contamination.

1,000 scfh of nitrogen at 99.999% purity requires a feed air compressor delivering slightly over 100 scfm of compressed air.

The Benefits of On-Site Nitrogen Gas Generation

Producing nitrogen locally is an excellent way to reduce nitrogen costs and ensure a continuous supply of nitrogen gas at the appropriate purity. The ideal nitrogen generation solution varies by application, based on the specific levels of nitrogen purity, flow, pressure and dryness that are required. Environmental factors such as air quality, humidity and temperature also affect the performance of the system. These variables significantly influence the selection of the complementary system components, such as air compressors, dryers and tank sizes. As a result, the

best approach to generating nitrogen is always tailored to the customer and their unique application.

In most cases, it is recommended that the supplier of the nitrogen generation equipment works very closely with the end-user of the nitrogen gas. Exploring the requirements of the nitrogen gas purity, quantity, pressure and dryness with the user's technical engineers ensures the nitrogen generation system is sized efficiently, and the product and/or process quality is stable.

Applying sound principles for system sizing and maintaining open communication

with the user about nitrogen gas purity requirements are key to the successful implementation of nitrogen generation equipment. **BP**

About 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. For more information, visit <https://www.cagi.org>.

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Air Compressor Design Considerations for a Successful CGM Project

By Chris Ahnen, Director of Engineering, EnviroMix



► Oil-lubricated rotary screw air compressors are efficient and beneficial for continuous air demand, plus they have straightforward routine maintenance requirements. Over the evolution of EnviroMix’s flagship product, BioMix™ Compressed Gas Mixing (CGM), the company’s engineering team has identified three main considerations for the design and installation of air compressor systems. These considerations have played a significant role in supporting successful, low-maintenance projects.

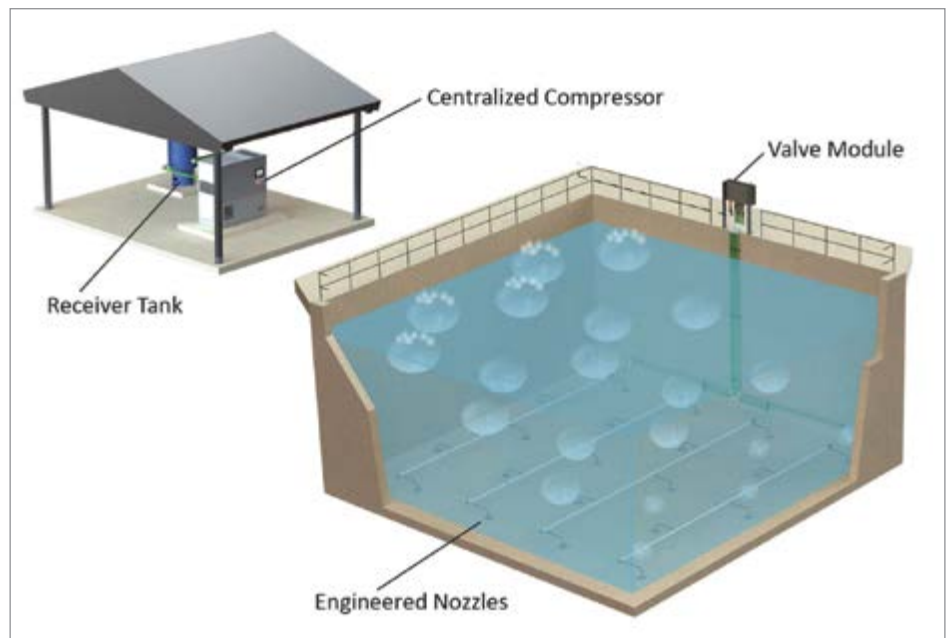
Compressed Gas Mixing Explained

CGM provides uniform mixing of water or wastewater tank contents by firing programmed, short-duration, high-intensity bursts of compressed air through engineered nozzles located near the tank floor. Mixing parameters – including pressure, sequence, duration and frequency – may be adjusted, either through operator input or automatic process feedback, to optimize power use and deliver ideally mixed conditions.

The process starts with a centralized air compressor system that can be used for

multiple applications, regardless of treatment process, liquid depth or solids concentration. The air compressor, which uses ambient air, modulates output to maintain system pressure while conserving energy when air demand is low. Charged by the air compressor, the

receiver tank supplies compressed air to the valve module. The valve module controls the mixing intensity and releases the bottled-up compressed air in high-pressure, high-velocity, timed bursts through groups of nozzles across the floor of the tank. Large volumes of



Above: An air compressor system installed under a canopy in Bradenton, FL

A typical equipment set-up for a CGM system

compressed air generate an upwelling motion and create circulatory currents, suspending solids and maintaining a completely mixed environment without transferring measurable oxygen.

The design duty cycle, which should be between 75% and 95%, is important for low maintenance operation of the air compressor.

Design Considerations for Compressed Gas Mixing

The most important elements in selecting and maintaining an oil-lubricated, rotary screw air compressor for a new CGM project are ensuring correct sizing, proper installation and routine maintenance. For each of these elements, there are specific considerations imperative to CGM projects.

Consideration 1: The Load Variation Impact on the Duty Cycle

Having designed hundreds of CGM projects, we have established the most effective way to calculate the compressed air demand needed to adequately mix a volume of wastewater, regardless of the number of tanks in operation. First, let’s outline a few definitions:

- The capacity of the air compressor is the air flow rate the machine is capable of producing. This is typically expressed in standard cubic feet per minute (scfm). The larger the compressed air demand of the application, the larger the machine’s required capacity.
- The air compressor’s operating pressure band covers the minimum to maximum capacity at which an air compressor can operate while cycling between loaded (compressing air) and unloaded (not compressing air) modes.
- Each compressed air system designed for continuous use must have an air receiver (or tank) that stores air and provides a buffer to fulfill demand. An air receiver’s capacity is measured in cubic feet or gallons.
- The air compressor’s duty cycle is the percentage of time the machine is loaded or compressing air. For example,



This compressed air system is protected from direct sun and rain at a facility in Orlando, FL.

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» Air Compressor Design Considerations for a Successful CGM Project

if the air compressor is loaded for three minutes and unloaded for one minute before beginning to compress air again, it has a 75% duty cycle.

Compressed air demand, air compressor capacity, pressure band settings and receiver tank size are all factors that must be considered when determining the air compressor duty cycle and ultimately the correct air compressor model for the application. When selecting an air compressor model, we use established air compressor industry guidelines while also considering these factors. The design duty cycle, which should be between 75% and 95%, is important for low maintenance operation of the air compressor.

If the air compressor is under- or overloaded for a long period of time, it can lead to permanent damage. As air is compressed, the rotary screw elements heat up from the work of compression and friction. Oil is injected into the compression chamber to lubricate moving components and cool the rotary screw elements. Once the air is compressed, the oil and compressed air enter the sump chamber which is coupled with an air-oil separator. This is where the bulk of the oil is removed, cooled in a separate process and recycled back into



This air compressor, receiver tank and valve module are housed under a tankside canopy in Monroe, NC.

the system. At this point in the air compression process, the compressed air contains moisture. It is important that the duty cycle of the air compressor heats the oil enough to remove condensate collected in the sump chamber

and separator element. If the oil does not reach a high enough temperature, over time water can overwhelm and destroy the air-oil separator element.

Large wastewater projects are frequently under construction for several years, with different configurations of operation used through multiple phases of construction. During construction, wastewater tanks are consistently taken in and out of service. The wastewater plant must continue to operate through construction, as there is nowhere else to divert the wastewater for treatment. Mixing equipment is installed in and around these upgraded or new wastewater tanks causing operating conditions to fluctuate and compressed air demand to change. The 75-95% preferred duty cycle used for plant design capacity can fall to 10-40% during phased construction due to tanks – and associated compressed air demand – being temporarily offline.

For periods of low demand due to phased construction, we add artificial demand to the air compressor system to keep the duty cycle in the optimal range. We do this through two different, short-term operational changes. The first approach is adding more air to the mixing system. This helps ensure the duty cycle is in



Exhaust ducts solve the issue of heat rejection at a facility in Olympia, WA.

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August 2025



Aeration Blower Control

INDUSTRIAL VACUUM & BLOWER SYSTEMS

- 7 **Blow-off Savings at Casting Plant**
- 14 **Vacuum Generation and Robotic Gripping Systems**

AERATION BLOWER SYSTEMS

- 10 **Implementing Most-Open-Valve Blower Control**

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INDUSTRIAL VACUUM & BLOWER SYSTEMS

7 **Blow-off Savings at Casting Plant**

By Alper Alten, AAPM Project Management and Consulting

14 **Vacuum Generation Source Selection for Robotic Gripping Systems**

By Kyle Kopac, Schmalz



AERATION BLOWER SYSTEMS

10 **What Is Most-Open-Valve Aeration Blower Control?**

By Bob Kisler, Hoffman & Lamson, and Doreen Tresca, SSI Aeration

EVERY ISSUE

4 **Blower & Vacuum Industry & Technology News**

15 **Advertiser Index**



Cover Image: Diffuser startup in clean water, capturing early performance checks and bubble pattern, courtesy of SSI Aeration

NEWS / Blower & Vacuum Industry & Technology

Atlas Copco Introduces Energy-Efficient DZS 600 and 1200 VSD+ Dry, Oil-Free Claw Vacuum Pumps

Clean technologies are of particular importance in vacuum technology because they are economically advantageous and environmentally friendly. With this in mind, Atlas Copco has developed the DZS 600 VSD+ and DZS 1200 VSD+. These dry, oil-free claw pumps are powerful, energy-efficient and easy to control and maintain. Users can save costs and consume fewer resources.

Typical areas of application for vacuum pumps include CNC routing, pneumatic conveying systems and central vacuum systems. There, the oil-free, air-cooled DZS 600 VSD+ and DZS 1200 VSD+ series works reliably over a long service life.

“The DZS VSD+ series is simple and modular in design,” said Ahmed Elshaffie, Product Manager, Atlas Copco. It consists of the pump and gear chambers, which are separated

by seals. Its energy-efficient, low-wear operation is based on a special coating of the wetted parts and rotors as well as its simple operating principle. Two claws rotate without contact in opposite directions in the pump housing. This draws air into the pump chamber, compresses it and expels it again under pressure. In the gear chamber, two gear wheels synchronize the claw rotation. The non-return valve in the inlet flange prevents air from flowing back into the vacuum chamber when the pump is switched off. The pumps are driven directly by a flange-mounted motor via a coupling.

With their integrated VSD+ inverter drive with pressure setpoint control, these vacuum pumps can be operated at high rotor speeds. The motor speed adapts to the process load in an energy-efficient manner. “The DZS 600 VSD+ and DZS 1200 VSD+ models

can run continuously at their ultimate vacuum level without overheating,” said Elshaffie. Another important advantage is their variable use, as the compact pumps take up little space in rough vacuum applications. For more information, visit <https://www.atlascopco.com>.



NAVAC Expands Vacuum Technology Team with Strategic Hires

NAVAC Vacuum is excited to welcome William Schwerdtmann and Ryan Billings as Business Development Managers for the West Coast and East Coast, respectively. As NAVAC’s Vacuum Technology business experiences rapid growth, these key hires will strengthen the company’s presence in critical markets and drive new opportunities for expansion.

Schwerdtmann brings to NAVAC extensive experience in business development and technical expertise. He has held key roles at leading companies in the vacuum and industrial equipment sectors, where he has played a vital role in expanding vacuum business in the West Coast market – one of the most advanced and rapidly growing regions for vacuum technology. His proven ability to drive revenue growth, develop strategic partnerships and navigate highly

competitive markets makes him a valuable addition to the NAVAC team.

Billings joins NAVAC with a strong background in business development and a history of successfully capturing new opportunities in the vacuum technology industry. His expertise in working with major OEMs and developing lasting

customer relationships has contributed to significant business expansion in prior roles. With the East Coast being a dynamic and expanding market for NAVAC, Billing’s extensive industry knowledge and strategic insight will be instrumental in driving growth and strengthening NAVAC’s presence in the region.



William Schwerdtmann and Ryan Billings of NAVAC Vacuum (left to right)

“We are thrilled to welcome William and Ryan to the NAVAC team during this pivotal time,” said Mike DeLisi, Vice President, Vacuum Technology Business Unit, NAVAC. “Their industry expertise, technical acumen and business development skills align perfectly with our vision. With their leadership, we are confident in achieving our ambitious growth goals while continuing to provide top-tier vacuum solutions to our customers.” For more information, visit <https://navacvacuum.com>.

The Busch Group Adds centrotherm clean solutions Brand to Pfeiffer Vacuum+Fab Solutions

The Busch Group announced its brand centrotherm clean solutions will become part of Pfeiffer Vacuum+Fab Solutions. Effective September 2025, the gas abatement systems for the semiconductor industry previously offered under this brand will be integrated into the Pfeiffer portfolio and be available under this name in the future, uniting the two members of the global Busch Group.

By consolidating the product portfolio of centrotherm clean solutions under a single, unified brand, customers will benefit from the convenience of sourcing high-quality vacuum solutions for the semiconductor industry and related sectors from a one-stop, trusted supplier.

Within the group, Pfeiffer Vacuum+Fab Solutions is the renowned brand for high and ultra-high vacuum, providing innovative, cutting-edge solutions for demanding applications in research and development, analytics, industry and semiconductors.

Sami Busch, Co-Owner and Co-CEO, Busch Group, said “Bringing our product portfolio for the semiconductor industry together under our strong and well-established brand, Pfeiffer Vacuum+Fab Solutions, further streamlines our product offering. This enhances our ability to serve semiconductor and related industries with high-quality end-to-end solutions – not only for vacuum generation but also for related critical applications such as leak detection or contamination management. This step underscores our commitment to delivering exceptional value and support to our customers worldwide.”



centrotherm clean solutions headquarters in Blaubeuren, Germany

Busch acquired centrotherm clean solutions in 2023, implementing its industry-leading gas abatement expertise into its broader portfolio. The products now being integrated into the Pfeiffer brand are primarily used in the semiconductor industry, and also in the production of MEMS, LEDs, solar cells and flat panel displays. The offering comprises standardized gas abatement systems, as well as individual customized systems and overall environmental solutions. For more information, visit <https://www.buschvacuum.com>.



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NEWS / Blower & Vacuum Industry & Technology

AERZEN USA Launches Build America, Buy America-Compliant Aeration Blowers and Controls

Aerzen USA announced the launch of its new Build America, Buy America (BABA)-compliant aeration blowers and controls. These blowers and controls are designed to meet the requirements of the BABA Act and support domestic manufacturing jobs.

Aerzen USA maintains the highest quality and compliance standards with a full range of BABA-compliant aeration blowers and controls. This strategy allows the blowers and controls to meet the rigorous specifications required by the BABA Act, helping customers achieve performance and compliance.

The Aerzen team has invested significant effort in preparing for the BABA Act. Through close collaboration with suppliers, legal counsel, and the EPA, the company has made strategic supply chain decisions and expanded investments in U.S. manufacturing operations to achieve compliance with BABA requirements. As a result, Aerzen USA is well-positioned to provide municipal wastewater customers with dependable, high-quality products and services.

Greg Duffy, Director of Engineering, Aerzen USA, said, “BABA presents an exciting opportunity for Aerzen USA to highlight our advanced design and customization capabilities. As a proud employer of manufacturing jobs in the United States, we are fully committed to supporting our customers’ domestic preference for manufactured products. To meet these needs, Aerzen USA is actively

investing in domestic manufacturing, strengthening partnerships with U.S.-based suppliers and redesigning our packages to incorporate more U.S. content.”

The new BABA-compliant blowers from Aerzen USA are engineered to deliver performance and energy efficiency, making them an excellent choice for aeration applications. With a focus on sustainability and reliability, these blowers are built to last while providing a cost-effective solution. For more information, visit <https://www.aerzen.com/us>.



Aerzen USA's new BABA-compliant aeration blowers and controls

Gardner Denver Expands Sutorbilt® Line of Positive Displacement Blowers with Legend® Tri-Lobe Series

Gardner Denver announced the launch of the Sutorbilt® Legend® Tri-Lobe Series, an advanced positive displacement blower engineered for quieter

operation and enhanced versatility across industrial applications.

The Legend Tri-Lobe Series is designed to deliver up to 972 cfm airflow, 13 psig (0.9 barg) pressure and 15”Hg vacuum, making it an ideal choice for OEMs and industrial operators. Featuring a Tri-Lobe rotor design, this new series provides a more consistent flow profile while maintaining the robust performance and reliability the Gardner Denver Sutorbilt line is known for.

With a 3-5 dBA reduction in noise levels, the Legend Tri-Lobe offers quieter performance compared to the Legend Bi-Lobe, further improving operator comfort and system efficiency. It’s

backed by an industry-leading warranty – 24 months from shipment or 18 months from installation.

“With the launch of the Sutorbilt Legend Tri-Lobe Series, we’re reinforcing our commitment to delivering high-quality, long-lasting solutions for industrial applications,” said James Neill, Product Manager, Gardner Denver.

The Legend Tri-Lobe Series is designed for a wide range of industrial applications, including waste water treatment, vacuum excavation, chemical and plastics processing, cement and lime handling, and aquaculture and agriculture. For more information, visit <https://www.gardnerdenver.com>.



Gardner Denver's Sutorbilt® Legend® Tri-Lobe Series

Blow-off Savings at an Aluminum Casting Plant

By Alper Alten, Founder, AAPM Project Management and Consulting

► In modern manufacturing, efficiency is no longer a luxury – it's a necessity. Aluminum plants, with their complex machinery and high energy demands, are always seeking ways to optimize performance and reduce operational costs. One such opportunity presented itself in a continuous casting house of a major aluminum production plant in Turkey, where a seemingly routine application of compressed air was silently consuming significant energy and money.

This plant operated eight continuous casting lines producing high-quality aluminum coils for downstream processes. As with any high-speed manufacturing line, it included critical control points designed to ensure product quality. Compressed air was used in one of these stages to remove scrap aluminum pieces from the coil path. What initially seemed like a minor use of

compressed air soon revealed itself as a major source of inefficiency.

This article explores how a focused engineering intervention driven by data and a clear understanding of process requirements led to a transformative change. By switching from traditional compressed air systems to low-pressure industrial blowers the plant not only maintained product quality, but also achieved a dramatic reduction in energy use saving nearly \$455,000 annually (all amounts converted to USD).

Understanding the Process: Where and Why Blowoff Is Needed

In a continuous casting line, every element plays a vital role in shaping the final product, and even small inefficiencies can have far-reaching consequences. After molten aluminum passes through twin-roll casting, it solidifies into a thin, wide strip. To ensure the coil edges meet surface quality standards, side cutters are employed

immediately after the casting section. These cutters trim off the rough edges, generating small aluminum scraps.

Further down the line, just before the coiler that rolls the finished strip, are deflector rolls. Deflector rolls guide the aluminum strip into the coiler, ensuring alignment and tension control. However, there's a critical risk here: If any small aluminum pieces from the side cutting operation aren't properly removed, they can travel with the strip and become embedded in the coil. This contamination becomes a serious issue during cold rolling, where surface



The option chosen was a belt-driven, single-stage centrifugal blower.

Above: The continuous casting house of a major aluminum production plant in Turkey.

>> Blow-off Savings at an Aluminum Casting Plant

quality is paramount. To avoid damaging the machinery or the aluminum strip, the cold rolling line slows down or even halts when contamination occurs, causing costly production interruptions.

To prevent this, the plant used compressed air to blow away the cut pieces of aluminum before they reached the deflector rolls. Air jets are essential for protecting the product and downstream equipment. However, the solution came at a cost: A surprisingly high volume of compressed air was being used to perform a task that only required low-pressure air.

This mismatch between process need and energy input opened the door to a deeper investigation and a smarter solution.

High Compressed Air Demand for a Simple Task

At first glance, using compressed air to blow away aluminum scraps seemed like a standard, even modest, application. However, a closer look revealed a significant inefficiency hidden in plain sight.

Measurements taken at the deflector roll stations showed each continuous casting line consumed approximately 412 cfm (700 cubic meters per hour) of compressed air for

this cleaning task. With eight lines operating simultaneously, the total compressed air demand reached a staggering 3,296 cfm (5,600 m³/h) – a volume far greater than expected for what was essentially a simple blowing operation.

The plant's compressed air was supplied by three centralized 335 horsepower rotary screw air compressors, each capable of producing 1,350 cfm. These machines were operating at 102 psi (7 bar), far more than was required to move lightweight aluminum pieces. Yet, because the compressed air system was already in place and functional, it had gone unchallenged for years.

According to standard calculations provided by leading air compressor manufacturers, generating 3,296 cfm (5,600 m³/h) of compressed air at 102 psi (7 bar) with 70% efficiency would require roughly 825 kW (kilowatts) of power per hour. This substantial energy consumption was a serious ongoing cost for a task that didn't even require compressed air, just high volume and consistent flow.

The problem was clear: Compressed air was being used where it wasn't needed. The next step was to find an alternative

that could deliver the same functionality with lower energy input. That's where the innovation began.

The Solution: Replacing Compressed Air with Industrial Blowers

Once it was clear compressed air was being used for a low-pressure task, the focus shifted to finding a more efficient solution, one that delivered the same airflow with less energy use.

The plant's engineering team identified industrial blower technology as a strong alternative. Unlike air compressors, industrial blowers are designed to move large volumes of air at low pressure, making them ideal for applications like removing lightweight aluminum scraps. Among several options on the market, a belt-driven, single-stage centrifugal blower was chosen.

This industrial blower is capable of delivering 700 cfm (1,189 m³/h) of airflow at 0.7 psi (45 millibars) using 4 kW of power. Even when factoring in 66% system efficiency, this translated to an effective output of around 462 cfm (785 m³/h) per unit, which is more than enough to replace the 412 cfm (700 m³/h) of compressed air previously required for each casting line.

By installing one industrial blower per line, the plant eliminated the need for compressed air in this application. The total industrial blower energy requirement dropped to 32 kW for all eight lines, compared to the previous 825 kW drawn by the air compressors.

This simple switch not only ensured continued functionality on the production line, but also unlocked enormous energy savings. It showed how matching the right tool to the task yields results far beyond expectations.

Energy Savings and Financial Impact

The switch from a compressed air to an industrial blower system in the continuous casting lines brought immediate and



If the trimmed aluminum scraps aren't blown away, they'll get caught and wrapped into the foil during rolling.



Deflector rolls ensure accurate foil alignment, maintain proper tension and guide the aluminum strip smoothly before final coiling.

measurable improvements in energy efficiency and cost savings.

Before the change, the eight casting lines consumed around 825 kW per hour to operate the compressed air system for aluminum scrap removal. After replacing this system with industrial blowers, total energy consumption dropped to 32 kW per hour. That's a reduction of 793 kW every hour the lines ran.

With an industrial electricity rate of \$0.072 per kWh, the plant had been spending nearly \$57 per hour on this single application. Post-upgrade, the cost dropped to less than \$2 per hour. Spread over 8,000 operating hours per year, this resulted in an annual savings of over \$455,000.

This change also enhanced the efficiency of subsequent operations in the cold rolling mills. In cold rolling, the process speed can drop to half if aluminum particles remain on the surface after casting. With cleaner, well-prepared rolled aluminum thanks to the improved industrial blower system, cold rolling can now run at nearly double speed, significantly boosting productivity.

The switch to industrial blowers also helped reduce strain on the plant's central compressed air system, freeing up capacity for other critical applications and improving system reliability. Additionally,

industrial blower systems typically require less maintenance and experience fewer leaks than compressed air lines, offering long-term operational benefits.

This project demonstrated that even seemingly minor adjustments – when backed by data and thoughtful engineering – can drive significant improvements in sustainability and bottom-line performance.

Conclusion: Rethinking Air Use in Industry

Compressed air is a convenient and versatile utility embedded in industrial operations. However, in the case of this aluminum continuous casting plant, it wasn't the best or most efficient solution.

What started as a routine observation led to a transformative change. A critical look at one specific application revealed an opportunity for energy savings. By shifting from high-pressure compressed air to low-pressure, high-volume industrial blowers, the plant not only preserved product quality and process reliability,

but also unlocked over \$455,000 in annual savings.

This experience offers a powerful lesson: In energy-intensive industries, it pays to challenge assumptions. Every piece of equipment and utility used on the production floor should be continually re-evaluated against today's technology and efficiency standards. For tasks that don't require compressed air but only need airflow or motion, alternatives like industrial blower systems can be game-changers.

Sustainability doesn't always require massive investments or complex systems. Sometimes, sustainability begins with a simple question: Is there a smarter way to do this?

This is a reminder to engineers, plant managers, and decision-makers alike: Compressed air should be treated like any other valuable resource, and not wasted when it isn't needed. **BP**

About the Author

Alper Altın is the Founder and Engineering Consultant for AAPM Project Management and Consulting in Turkey. He's a Mechanical Engineer who graduated from the Technical University of Berlin with extensive experience in industrial projects across Germany and the United States. He has held senior roles as a Project Manager and Maintenance Manager in industrial operations in Turkey.



About AAPM Project Management and Consulting

The company provides consultancy services for national and international clients, implementing and managing projects. For more information, visit <https://www.aapm.com.tr>.

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What Is Most-Open-Valve Aeration Blower Control?

By Bob Kisler, Regional Sales Manager, Hoffman & Lamson,
and Doreen Tresca, Marketing Manager, SSI Aeration

► Most-Open-Valve (MOV) control is a common automatic dissolved oxygen (DO) control system. By reducing the required aeration blower discharge pressure, MOV can improve basin efficiency and reduce power requirements if the MOV and aeration blower controls are properly coordinated.

The main goal for operators is to maintain optimal DO levels. Insufficient aeration can lead to poor treatment, while over-aeration wastes energy without improving results. Since aeration can account for as much as 50 to 70% of a wastewater treatment plant's total energy use, avoiding excess air delivery is critical to overall energy efficiency. MOV addresses this by delivering only the air needed where it's needed and at the right time, maximizing performance and efficiency.

While MOV control offers significant energy savings and process stability through advanced air distribution strategies, its full potential can be realized when paired with high-efficiency diffuser technologies, such as fine bubble diffusers.

These systems not only require less air and energy to operate, but also provide a high

oxygen transfer efficiency (OTE), making them highly efficient for delivering oxygen to the biological process. Integrating fine bubble aeration with advanced MOV-based control strategies enhances both energy efficiency and biological process stability. This combination allows for more precise DO management and can lower aeration blower energy consumption by up to 40% compared to conventional aeration and control methods.

MOV Integrated in a Multi-Basin Aeration System

The control system must integrate all the process variables associated with the aeration requirements for each basin. Air flow demand must be controlled between basins. This is done by redirecting the aeration requirements between the basins. Although controlling the air flow of the blowers is the primary

consideration, a variety of other parameters such as DO, mixing limitations, flow control valve characteristics and safe aeration blower operating ranges must also be considered.

An aeration system design based on traditional control strategies and standard control products may be the reason the existing basin control system is not effectively controlling the DO aeration process. Ultimately, the biological health of the basin depends on maintaining a balanced and consistent DO profile that supports aerobic microbial activity without over- or under-aerating. Failure to manage these factors is a leading reason many DO control systems underperform or fail to deliver anticipated energy savings and process outcomes.

DO control systems have the additional challenge of being a non-linear process.

The combination of slow process reaction rates, transport delays and the ability to hold DO during process variations, such as weather events, makes it difficult to achieve stable control with typical Proportional-Integral-Derivative (PID) systems. This is where the Basin control algorithm comes into play. It eliminates the complexity, tuning and potential hunting issues associated with pressure control-based systems, while remaining responsive to process demand changes.



This medium-flow, multistage centrifugal blower is meant for water, wastewater and industrial air applications.

Above: The Bentleyville, PA, home of Hoffman & Lamson

Today, basin aeration is commonly done using control valves. As the basin experiences changes in DO concentration, control valves adjust air flow to control the DO for each basin or control zone. To lessen the impact of control valves and the non-linear nature of control valves, blower control systems have relied on maintaining constant pressure.

MOV logic was introduced to not only eliminate excess system pressure, but also improve DO control in multiple basins and eliminate the complexity of tuning and potential hunting issues associated with pressure control valve-based systems. The function of MOV is keeping basin flow control valves in the most open position at all times to reduce restriction and pressure drop.

Future-Proofing with Advanced Control Strategies

There has been an evolution in how MOV has been implemented. The first implementation was through pressure management by manipulation of the pressure set point. By moving away from pressure set point and using the basin flow control valves, there was an increase in additional tuning and instability. This reduced tuning issues, providing a more stable process and more accurate and optimized power consumption than systems based on general-purpose hardware and generic logic.

Wastewater treatment operators are faced with many challenges. Reducing operating budgets, increasing plant operating efficiency, staying in compliance and meeting management directives to increase sustainability are just a few. Strategies that improve process stability while lowering energy consumption are no longer just for operational costs, but are essential for climate action.

Implementing control systems such as MOV enables facilities to minimize aeration blower energy demand while achieving precise DO control. When paired with

high-efficiency diffuser technologies and optimized aeration blower management, these systems support both operation and sustainability goals.

Upgrading existing facilities with energy-efficient equipment and intelligent control logic is one of the most impactful ways operators can contribute to global sustainability efforts. Whether managing a city plant or treating high-strength waste from food processing or manufacturing, optimized aeration plays a central role in reducing energy consumption and limiting greenhouse gas emissions. Using advanced control strategies such as MOV and high-efficiency diffusers, facilities can meet today's compliance benchmarks while also future-proofing their infrastructure against increasingly stringent environmental regulations.

How to Implement an MOV Control System

Aeration blowers operate in one of two ways: maintaining set flow rates and allowing pressure variance. If constant pressure is maintained and flow varies, the pressure setting is a problem. Setting system pressure too high wastes energy. MOV is a major step forward in minimizing wasted power.

In pressure-based systems, MOV functions by using the least amount of pressure to achieve proper aeration. Aeration blower control systems have relied on maintaining constant pressure to minimize the impact of valve adjustments on adjacent basins. Previous pressure control systems also used pressure to regulate aeration blowers when demand changes at the tank, causing the basin control valves to modulate.

First, start with all valves open. This results in the least amount of system pressure. The process begins by adjusting the valve at the first basin to meet basin aeration requirements. Continue this process with each basin until all valves are adjusted to meet aeration needs. A change in one basin's requirements results in adjusting all basins' valves.

If there is a change in the pressure set point at each basin and a decrease in the pressure by a fixed increment, this would cause a decrease in aeration blower flow rate and total system air flow to drop the pressure. This initiates all basin valves to open to increase their air flow rate. The restriction decrease would drop system pressure, forcing the pressure control loop to increase blower air flow again. After a few adjustments, the system stabilizes to the desired air flow for all basins, reducing system pressure.



A diffuser installation in Colombia using advanced membrane materials.

When applied correctly, MOV delivers a range of performance, energy and operational benefits that significantly enhance overall plant efficiency. By supplying oxygen precisely as needed according to operator-defined DO set points, MOV systems help maintain optimized and stable biological treatment. This not only improves treatment outcomes, but also minimizes energy consumption, as aeration blowers are no longer overcompensating with excess pressure or flow. The reduced mechanical strain on aeration blowers and valves extends equipment life and lowers maintenance demands.

>> What Is Most-Open-Valve Aeration Blower Control?

The Benefits of MOV Control

- Provide oxygen as needed by the process as defined by the operator-provided set point
- Reduce aeration energy by reducing system pressure
- Improved, stable biological processes
- Reduce energy consumption by reducing horsepower requirements
- Reduce wear and tear on aeration blowers and valves due to less variation of process needs
- Eliminate tuning challenges of a pressure-based cascade control system
- Accurate DO control, less overshooting of process needs
- Achieve proper airflow requirements at minimum operating pressure while also reducing hunting of aeration blowers and valves
- Integrate start-up, sequencing, control and management of all aeration equipment
- High-efficiency fine bubble diffusers can improve oxygen transfer performance and deliver up to 20-40% additional energy savings over conventional coarse bubble systems
- Advanced membrane materials in fine bubble diffusers can reduce fouling and cleaning frequency, helping maintain like-new diffuser performance over time and lowering long-term operational costs

When MOV control is combined with high-efficiency fine bubble diffuser systems, the results are amplified. Fine bubble diffusers offer significantly higher oxygen transfer efficiency compared to coarse bubble systems, allowing facilities to meet oxygen demand with substantially lower airflow, minimizing the amount of energy needed.

High-efficiency diffusers can be equipped with advanced membrane materials that offer a higher resistance to fouling and scaling. This allows the diffuser to maintain near-original performance over time, reducing the frequency of required maintenance and ensuring consistent oxygen delivery. Over the long term, plant operators who choose an upgraded membrane material will see lower operational expenses.

The combination of MOV control logic and high-efficiency diffuser technology offers a practical approach to improving aeration system performance while addressing current energy, regulatory and operational objectives.

Flow-Based Systems and Fine Bubble Diffusers

Legacy controllers had limitations between devices, whether they were electrical or pneumatic. Modern control technology combines a variety of communications protocols and control functions into one controller. The programming may be more

involved, but stability and performance are improved. Total process flow demand is matched with the air flow supplied by multiple aeration blowers and combines multiple process air flows.

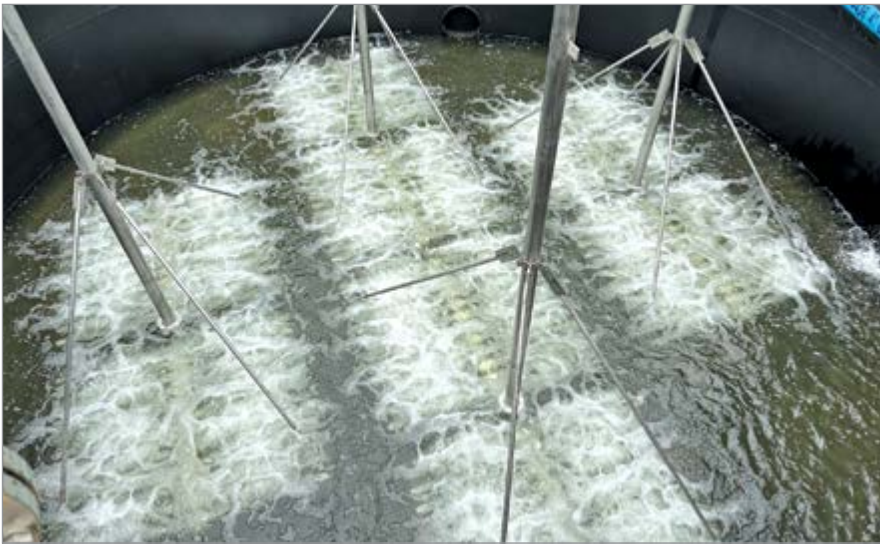
Fine bubble diffusers respond effectively to incremental changes in airflow, enabling precise and stable DO control at the basin level. Their uniform air distribution and efficient mixing characteristics minimize the need for high system pressures, which aligns well with MOV strategies aimed at reducing aeration blower discharge pressure.

In MOV-based systems, the controller accesses the position of every valve in a system, making required adjustments to each valve to match the requirement of each basin. This provides control based on actual process needs per basin and uses the aeration blower controls to match total air flow to process demand. It uses basin flow control valves to divide the total air flow to the basins in proportion to their individual demands.

Air is then divided and redirected in proportion to process demand needs per basin. If one basin has excess flow, then another basin will have insufficient flow. The valve at the basin with insufficient flow



Installation crews installing an SSI disc diffuser aeration system.



This retrievable aeration grid allows for easy maintenance and monitoring without draining the system.

will open, and, if there is excess flow at another basin, that valve will close to meet that basin's needs. One valve is always in the maximum open position.

Fine bubble diffusers are well suited to complement flow-based control logic. Pairing the technologies supports greater turndown and more refined load-following capabilities. Together, the system allows the operator greater flexibility in how air is distributed across basins, allowing for tighter control of DO concentrations and more efficient energy usage.

Conclusion: MOV Control Provides a Powerful Framework

MOV has caused uncertainty for designing engineers, programmers and operators. Despite all the misconceptions with MOV and the potential confusion and complexity of applying it, MOV control reduces power consumption by minimizing system pressure drop through basin air flow control valves. MOV can be adapted for basin aeration by

maintaining aeration blower discharge pressure or air flow rate.

For a successful MOV system, it is important to synchronize between the multiple components of DO, pressure and flow control. The control of each aeration blower affects the others and should be considered as parts of a system.

The future of energy-efficient wastewater treatment lies in the integration of advanced control strategies with high-performance aeration technologies. MOV control provides a powerful framework for minimizing aeration blower energy use and stabilizing dissolved oxygen delivery by maintaining the lowest effective system pressure. When paired with fine bubble aeration, which offers superior oxygen transfer efficiency at lower airflow rates, the result is a highly optimized aeration system that enhances biological performance, reduces operational costs and supports long-term sustainability goals. Together, MOV and fine bubble diffusion

represent a best-in-class approach for modern wastewater treatment – delivering measurable benefits in compliance, energy savings and process stability. **BP**

About the Authors

Bob Kisler has over 35 years in the aeration blower industry, concentrating on procedures and process improvement. He focuses on variable frequency drives, PLC controls and programming to reach maximum energy savings and process improvement for aeration blower applications. He provides consultations to develop technical solutions, as well as assistance on energy savings with centrifugal blower technologies.



Doreen Tresca is a strategic marketing leader with over 15 years of experience driving growth for B2B brands in the water and wastewater industry.

She currently leads global marketing and communications at SSI Aeration, supporting international sales and operations across the municipal and industrial sectors.



About Hoffman & Lamson

Hoffman and Lamson are trusted leaders in centrifugal blower and exhauster technology, with over a century of engineering excellence serving water, wastewater and industrial markets worldwide. As part of Gardner Denver's Nash Division, it offers a broad range of high-efficiency blower systems – customizable, energy-saving and built for durability across demanding air and gas applications. For more information, visit <https://www.hoffmanandlamson.com>.

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Vacuum Generation Source Selection for Robotic Gripping Systems

By Kyle Kopac, Supervisor, Product Management, Vacuum Automation, Schmalz

► Suction rate, nozzle diameter, degree of evacuation, generator intelligence and air or energy consumption! These are only a few of the factors engineers need to consider when determining the best vacuum generation source for a custom-engineered gripping system.

At Schmalz, engineers regularly work with customers in the packaging, logistics, wood, metal, glass, plastics, food, beverage, pharmaceutical, chemical and composites industries to develop gripping systems meeting their specific environment and needs.

Engineers need to consider many factors when deciding what will work best for a customer's application. Our company is the resource for custom area gripper applications with layer grippers, palletizers and spider gripping systems. Our engineers take into account a myriad of factors to determine what vacuum generation source will work best for the need.

Listed roughly in the order of importance, these factors include:

1. What degree of evacuation (or vacuum level) is the generator capable of reaching, and does that meet the requirements of the tool?
2. What are the maximum and minimum suction rates required by the tool or product?

Above: A vacuum terminal with integrated IO-Link or Ethernet interface.

3. What kind of environment will the system be used in? Will there be dirt and debris contamination, extreme temperatures, liquid contamination, electrical conductivity or static discharge?
4. What intelligence is required of the generator? Does it need to have a vacuum switch, built-in valves, Ethernet or an IO-Link?
5. Considering the project requirements, what is the availability or lead time of the vacuum generator itself?
6. What is the cost of the generator as a complete package? This includes cabling, mounting equipment and the cost of time to integrate it into the system.
7. What is the generator's air and energy consumption?
8. Given the customer or manufacturing facility requirements, what is the serviceability of the generator?
9. What is the noise level of the generator?

The answers to these questions drive the design of the system. We offer a wide range of vacuum generation options, and the engineers use the answers as they review them and consider how the system will be used.

The options most used in layer grippers, palletizers and spider gripping systems are vacuum blowers, vacuum pumps, compact ejectors, compact terminals and basic ejectors.

Robot Grippers Made-to-Measure

When a project requires suction spider grippers, engineers design them individually

according to the application's specific needs. All versions of these grippers are derived from a basic modular design that can be flexibly optimized for complex handling tasks.

The grippers are beneficial in numerous automation processes and across various industries. For example, they are particularly useful in the automation of handling sequences in manufacturing, assembly and quality inspection processes. They also help interlink robots in presses and bending centers, as well as in picking operations in warehouses and distribution centers using industrial robots or gantries.

In addition, they are used in the automation of plastic injection molding and thermoforming machines, wood and plastic machining centers, waterjet, laser and punching machines. Finally, the grippers are adept at handling metal profiles, blanks, stones, sheet material, car body parts, glass and ceramic components and solar panels.

The basic components of these grippers are made of aluminum, steel tube and plastic, which enables fast cycles. In addition, the grippers provide increased process reliability through integrated system monitoring and sensor technology.

System Solutions for Palletizing Applications

When a modular layer gripping system is needed for handling complete or partially loaded workpiece layers, engineers can

choose from a light version for loads up to 77 lbs (35 kg), a standard version for loads up to 551 lbs (250 kg) and a full version that includes a global vacuum. These complete gripping systems are ready to connect for industrial robots, cobots or gantries, can handle workpiece layers such as cardboard boxes, glasses and cans and are ideal for end-of-line palletizing.

The SPZ is a layer gripper used to connect to industrial robots or gantries to typically handle homogenous workpiece layers. It has a load capacity of up to 551 lbs (250 kg). The SPZ-MC is a modular layer gripper with three different gripping principles: suction cup carpet, global vacuum and mechanical clamping. It can grip almost any workpiece layer regardless of height, including shrink-wrapped products and open-top boxes.

The ZLW is a turnkey solution for lightweight gripping and is used mostly in collaborative robotic applications or lighter-payload industrial robots, as it doesn't add much to the overall payload. Its contoured shape ensures there are no sharp edges or extrusions that could hurt a person collaborating with the robot. It is individually configurable in length and width, and has a maximum load capacity of 77 lbs (35 kg).

Functional Testing of Custom Gripping Systems

Once engineers design and build a custom system, they thoroughly test it through trials using original workpieces from the customer.

This testing step is an important part of the creation process and ensures excellent performance and a high degree of safety. During the testing, engineers identify possible weak points and determine suitable solutions. As a result, they're able to guarantee systems operate smoothly and can be integrated into a customer's processes easily. **BP**



About the Author

Kyle Kopac is the Supervisor, Product Management, Vacuum Automation at Schmalz, where he leads product strategy and development for vacuum-based automation solutions.

About Schmalz

Schmalz is a leader in vacuum industrial automation and ergonomic material handling solutions. For more information, visit <https://www.schmalz.com>.

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the appropriate range. For wastewater processes with a limit to how much compressed air can be introduced in the tank for mixing, we use a second approach: We add an exhaust valve and muffler after the compressor air outlet, then adjust demand by opening or closing the valve.

For periods of low demand, we add artificial demand to the air compressor system to keep the duty cycle in the optimal range.

Consideration 2: Installation Impacts on Future Operation and Maintenance

When designing the installation space for the air compressor, two important issues must be addressed: how the environment surrounding the air compressor impacts performance and how the air compressor is accessed for maintenance. For each project, we work closely with the consulting engineer during design to make sure the heat rejection of the air compressor is properly considered. Air compressors can be installed inside a building, in an environmental enclosure or outside under a canopy. Each of these options has positives and negatives, and is often driven by climate: Weather that is too hot or too cold can negatively impact air compressor performance.

For air compressors installed outdoors, ensure the ambient temperature limits of the air compressor are adhered to and a proper structure is built to shield the air compressor from direct sun and rain. A typical ambient temperature range for oil-lubricated screw air compressors is 32° to 115°F (0-46°C). If ambient temperatures are outside of this range, there are two design solutions: an environmental enclosure or a canopy.

- If the ambient temperature minimum is below 32°F (0°C), the air compressor needs to be housed in an environmental enclosure to prevent freezing of condensate. This enclosure includes heaters and fans with louver systems. It also shields the air compressor from exposure to direct sun and rain, and provides sound attenuation.
- If the ambient temperature limits can be maintained without an enclosure, a canopy is sufficient to shield the air compressor from exposure to direct sun and rain. Ensure the proper



Heat is conveyed out of the air compressor room by an exhaust duct at a facility in Somersworth, NH.



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>> Air Compressor Design Considerations for a Successful CGM Project

height, overhang dimensions and air compressor spacing are maintained in the canopy design.

- If the ambient temperature maximum is over 115°F (46°C), some air compressors have an optional high ambient temperature package that can be added, which typically raises the upper limit 5° to 7°F (3-4°C). This option still requires a canopy to protect the air compressor from direct sun and rain.

For air compressors installed indoors, make sure heat rejection is properly considered, specifically related to the HVAC design. If the room has an inadequate HVAC design, the air compressor will overheat under normal operating conditions as the ambient temperature in the enclosed space increases because the rejected heat is not adequately removed. The air compressor then shuts down when its maximum allowable ambient temperature is reached. We have encountered this situation on several projects. To address the issue, a fan or exhaust duct can be installed in the air compressor room. An exhaust fan with inlet louvers can be used to transfer the heat out



Indoor duty and standby air compressors at a facility in Castle Rock, CO

of the air compressor room, replacing it with cooler ambient air. Adding an exhaust duct to the top of the air compressor, where heat is rejected, is another good solution for removing heat. The heat is conveyed up and out of the room through the duct.

Another often overlooked consideration is providing clearance around the air compressor to ensure access by plant operators and maintenance technicians. If access is limited or restricted, maintenance is more likely to be neglected. Typically, daily maintenance



Two exhaust fans are incorporated into an environmental enclosure at a facility in Widefield, CO

activities include checking the air compressor oil level, air compressor aird discharge temperature, air compressor dryer pressure dew point and air compressor condensate discharge points. Monthly and quarterly maintenance activities include cleaning the compressed air dryer condenser, checking the aftercooler cooling elements for debris, checking and replacing air filter elements and replacing oil and oil water separator elements. These activities require the bodywork panels of the air compressor and compressed air dryer to be removed, allowing access to certain hardware. Provide a minimum of 36 inches around and above the air compressor for maintenance access.

Consideration 3: The Importance of Moisture Control

The refrigerated compressed air dryer removes the bulk of the moisture vapor from the compressed air. When functioning properly, it lowers the compressed air dewpoint to between 35° and 40°F (2-4°C). As the compressed air cools, water vapor condenses and is removed by an automatic drain attached to the compressed air dryer. When the compressed air dryer is not functioning properly, warm compressed air passes through the compressed air dryer. This compressed air begins to cool in the piping between the air compressor and the downstream components. As the air cools, water condenses in the system.

For air compressors installed indoors, make sure heat rejection is properly considered, specifically related to the HVAC design.

EnviroMix’s CGM system uses spool valves that open and close rapidly to deliver compressed air through engineered nozzles at the tank floor. These form large bubbles to mix the wastewater tank. The spool valves operate best when they have clean, dry compressed air passing through them. If too much water passes through them, over time the valve lubricant washes away, causing the valves to dry out, lock up and fail. We have seen a few installations in which a compressed air dryer’s failure went unnoticed. A few months after the compressed air dryer failure, valves began to fail. For this reason, at the beginning of each project, we advise the operations staff on the importance of consistently maintaining the refrigerated compressed air

dryer. We suggest they check the refrigerated compressed air dryer pressure dew point daily. If a failure occurs, it does not take long for water exposure of the downstream spool valves to necessitate cleaning and relubrication, causing downtime.

When an oil-lubricated rotary screw air compressor is correctly sized, installation factors are properly considered and maintenance is consistent, the team can be confident in the project’s success. **BP**

About the Author

Chris Ahnen, Director of Engineering, EnviroMix, is an industry professional with a Bachelor’s Degree in mechanical engineering from Michigan Technological



University. He has 13 years of experience in design, project management, manufacturing and controls systems implementation across multiple industries. At EnviroMix, he is responsible for product delivery, startup, testing and training on many projects.

About EnviroMix

Headquartered in Charleston, SC, EnviroMix designs and manufactures solutions for the water and wastewater industry that reduce energy costs and help meet nutrient removal limits. Using patented and proprietary technology, the company provides complete mixing systems, biological process controls and energy management solutions to enhance plant performance. For more information, visit <https://enviro-mix.com>.

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How Adiabatic Technology Delivers Performance, Savings and Sustainability

By Kimberly Glasko, Marketing Manager, NIMBUS Advanced Process Cooling



► As facility managers, industrial engineers and procurement professionals strive to meet rising demands for energy efficiency, water conservation and sustainability, cooling systems have taken center stage. Among the various technologies reshaping the industrial and commercial cooling landscape, adiabatic cooling stands out as a compelling alternative to traditional methods.

This article explores the evolving role of adiabatic cooling, its technical advantages and why it's gaining traction across industries.

Cooling Systems Are Under Pressure

Cooling systems in industrial and commercial settings face a growing list of challenges. Facility loads are increasing, especially in high-density applications, while energy, water and maintenance costs are scrutinized more than ever.

According to industry experts, five key concerns are driving a shift in expectations for cooling systems. Energy efficiency and sustainability remain top priorities, as cooling systems are significant energy consumers and contribute to carbon emissions, especially in regions where fossil fuels dominate the energy grid. At the same time, high heat loads in applications like industrial manufacturing demand more compact, powerful and efficient cooling solutions. Water scarcity is another pressing issue, with industrial facilities under increasing pressure to minimize water use due to limited access and rising costs. Reliability and maintenance also play a critical role, as downtime can be costly. Facility managers now favor durable systems that require minimal upkeep to reduce the risk of operational disruptions. Finally, cost and return on investment (ROI) are essential considerations. Higher upfront costs are only acceptable when they promise a strong ROI, ideally by delivering lower operating costs within three years.

Overlaying these issues are evolving regulations around water and energy use, stricter environmental compliance standards and decarbonization targets. Against this backdrop, the case for rethinking traditional cooling approaches becomes clear.

Above: NIMBUS Advanced Process Cooling headquarters in Anniston, AL

What Is Adiabatic Cooling?

Adiabatic cooling is a hybrid method that marries the benefits of air and water cooling without the excessive consumption or maintenance associated with both.

Throughout most of the year, adiabatic systems operate dry, much like conventional dry coolers. During peak design periods – when ambient dry-bulb temperatures rise – adiabatic systems activate an evaporative cooling phase. Water is introduced into the airstream ahead of the coils, reducing the air temperature as the water evaporates. This precooled air enhances heat rejection when it passes through the coil, resulting in lower process fluid temperatures without the need for mechanical refrigeration.

Here's an example of how that plays out in practice: When ambient temperature reaches 95°F (35°C), the adiabatic cooling process lowers the air temperature to 78°F (26°C) after evaporation. As a result, the process fluid returns at a temperature of 85°F (29°C), effectively maintaining the desired cooling performance even under high external temperatures.

This closed-loop process doesn't use a constant water supply or rely on a drain connection. Spray is only used when needed and is not recirculated



Multiple adiabatic coolers used for trim cooling

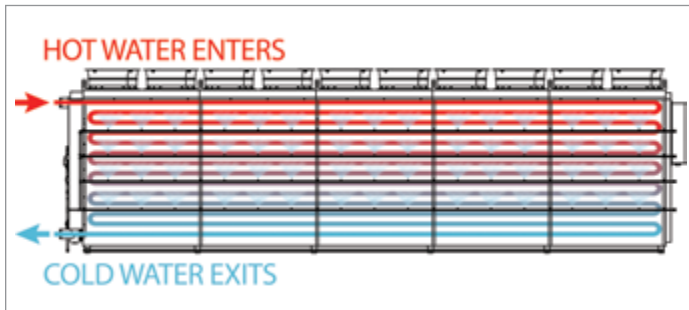
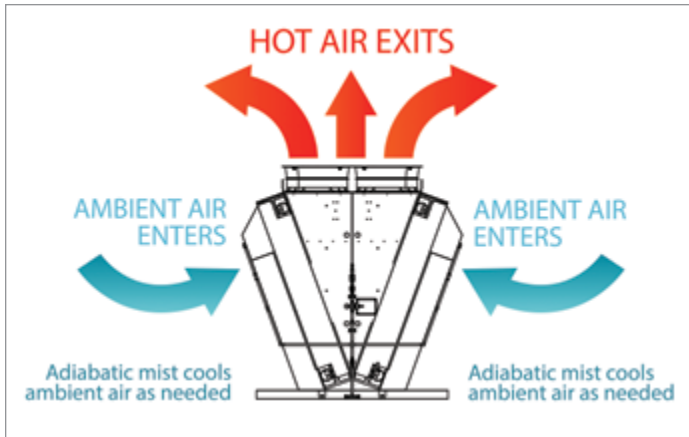


Image 1 and 2: The heat exchange process in an adiabatic cooler

from a sump, virtually eliminating chemical treatment, blowdown and Legionella concerns. Annual water use is a fraction of that in open-loop or closed-loop evaporative towers.

Adiabatic vs. Traditional Cooling

At its core, an adiabatic spray system includes the parts shown in Image 3.

Furthering advancements of the standard adiabatic system, high-efficiency electronically commutated (EC) motors and intelligent control algorithms optimize power and water use for real-time conditions, minimizing resource use and maximizing efficiency.

Adiabatic cooling offers a compelling middle ground between traditional dry coolers and cooling towers by balancing performance, efficiency and resource use. Compared to cooling towers – which are known for their low energy use and high water consumption, moderate Legionella risk and intensive maintenance needs – adiabatic coolers deliver energy efficiency with significantly lower water use and no Legionella risk. While cooling towers typically have a lower first cost (CapEx), they come with higher ongoing operating costs (OpEx) due to water use and chemical treatment requirements. Adiabatic systems, by contrast, offer a moderate upfront investment and operating costs, along with reduced maintenance demands. In terms of footprint, cooling towers are the most compact, but adiabatic systems still maintain a reasonably small footprint, making them a practical and efficient solution for many facilities.

The main objections to adiabatic systems tend to be their upfront cost, glycol use and footprint requirements. However, these can be mitigated with strong ROI modeling, space-efficient vertical designs and isolated glycol loops via heat exchangers.

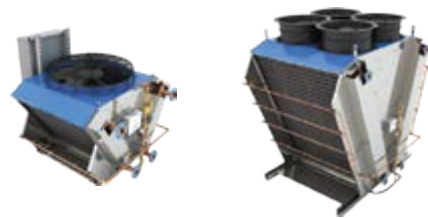
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>> How Adiabatic Technology Delivers Performance, Savings and Sustainability



Image 3: Parts of an adiabatic spray cooling system

Some assume adiabatic systems consume as much water as cooling towers or run water year-round. This is not true. The water use depends primarily on the project location and the process fluid temperatures. These systems only use water on peak design days with respect to their installation location, and run dry the rest of the year.

Real-World Results: Making the Business Case

Facility managers and industrial engineers are often faced with the challenge of justifying new technologies not just on technical merit, but also on their bottom-line impact. In response, Nimbus Advanced Process Cooling works closely with customers to provide detailed, location-specific ROI analyses clearly illustrating

the financial advantages of switching to adiabatic cooling.

The ROI evaluation begins by comparing total operating costs between existing equipment – such as open cooling towers with heat exchangers – and adiabatic coolers. This includes critical factors like estimated water usage, drain fees, chemical treatment for the sump, ongoing maintenance and energy consumption. These inputs are then contrasted using local variables: relevant utility costs, including power, water and sewer rates from regional municipalities.

Annual uses, chemical costs and maintenance expenses are estimated using standardized formulas based on the type and

frequency of service required. This creates a comprehensive view of both the current system's cost of ownership and the projected costs with an adiabatic replacement. Recently, Nimbus compared an existing evaporative tower with its adiabatic fluid cooler in the Iowa market. The result was striking: the customer achieved a full return on investment in under one year.

These findings are not an anomaly. In many cases, depending on the climate, energy rates and water availability, facility managers can expect payback periods of three years or less. This quick ROI – paired with reduced risk of bacterial growth, lower maintenance burdens and significantly lower water and chemical use – makes adiabatic cooling an attractive option for industries looking to improve efficiency and sustainability.

Adiabatic Cooling in Practice: Where it Works Best

Adiabatic cooling systems offer a compelling solution for any application with high cooling loads, limited water or rising energy costs, and are ideal for a variety of applications where efficiency, sustainability and performance are paramount. Growing facilities and industrial manufacturing operations benefit from the ability to deliver precise temperature control with minimal maintenance requirements. In the power generation sector, adiabatic cooling helps minimize environmental impact while maintaining reliable performance. Hospitals and schools favor this technology for its cleaner operation and reduced risk of Legionella, supporting healthier environments.



An adiabatic cooler used for chiller support



Adiabatic coolers featuring motor disconnect switches for on-site controls integration

Looking Ahead: Innovation and the Role of Sustainability

As demand for sustainability continues to rise, adiabatic cooling systems are evolving rapidly through a range of innovations. Advances in water efficiency are driven by increasingly sophisticated water management technologies. At the same time, the use of advanced materials – such as more efficient heat transfer coils and specialized fluids – is enhancing overall system performance. Smart controls and IoT capabilities are enabling adaptive systems that optimize the balance between water and energy use based on real-time feedback. Additionally, hybrid integration is gaining traction, as adiabatic systems are increasingly combined with other smart technologies such as free cooling, energy storage and renewable power sources to maximize efficiency and sustainability.

Rather than focusing solely on the product level, forward-thinking designers are optimizing cooling performance at the system level. This holistic approach accounts for building design, operational schedules, local climate and energy sourcing to achieve sustainability goals.

“Water and energy conservation are no longer nice-to-have,” explains Jim Dyer, President, NIMBUS. “They’re must-haves, especially in regions facing supply constraints.”

Evaluating Adiabatic Cooling for Your Facility

How can a facility manager determine whether or not adiabatic cooling is the right fit? The first step is to assess the facility’s specific needs and constraints. This includes evaluating cooling load requirements, target temperatures, the local climate (particularly whether the area is dry or humid), available space for installation, utility costs, resource availability and the facility’s maintenance capabilities and staffing levels. Next, it’s important to evaluate the return on investment and total cost of ownership. Partnering with a supplier to model system performance and operating costs can provide valuable insights. This analysis should account for capital expenses (CapEx), ongoing energy, water and sewer costs, maintenance and chemical treatment requirements and the expected service life of the system.

Planning for integration is also essential. While adiabatic systems typically require minimal changes to overall operation, they

may necessitate updates to maintenance procedures or the introduction of glycol. In some cases, heat exchangers can be used to isolate glycol from the rest of the system. Finally, educating stakeholders is crucial. Sharing data, addressing misconceptions and involving teams from operations, finance and sustainability early in the process helps build consensus. A projected three-year ROI, along with benefits including reduced compliance risk and improved environmental performance, can make a compelling case for adoption.

As pressures mount on resources and budgets alike, adiabatic cooling delivers where it counts, in performance, reliability and responsibility. Ready to explore adiabatic cooling for your next project? Start by

partnering with a trusted supplier to evaluate your options and quantify the impact. **BP**

About the Author

Kimberly Glasko is a Marketing Director at NIMBUS Advanced Process Cooling with 13 years of B2B experience in strategic marketing for industries including industrial coatings, healthcare and process cooling.



About NIMBUS

NIMBUS Advanced Process Cooling is headquartered in Anniston, AL. NIMBUS is a research, development and manufacturing group that believes cooling can be achieved in ways that are effective, efficient, reliable and responsible. For more information, visit <https://nimbus.cool>.

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The Industrial Sustainability Best Practices EXPO & Conference Show Report

By Bill Smith, Regional Sales Manager, Compressed Air Best Practices® Magazine

► *Compressed Air Best Practices® Magazine* launched its first event in Europe, the Industrial Sustainability Best Practices EXPO & Conference, in June 2025 in Barcelona, Spain. Designed to educate and connect factories and specifying engineers on the optimization of industrial compressed air, vacuum and cooling water systems, the event featured 12 hours of conference sessions, exhibits and the first Compressed Air Challenge training session to take place in Europe.

Above: Mariluz Acevedo Rocha of Kaeser Compresores presented practical ideas for reducing air compressor room energy consumption.

“In Europe, an estimated 87 TWh of all industrial electricity is used for the generation of compressed air, emitting around 84,000 kt of CO₂ annually,” said Andrew Still, Industry Projects Manager – Energy, SMC Corporation of America.

This show report recaps the conference’s highlights and key moments, and shares updates from the event’s sponsors (listed alphabetically).

Industrial Sustainability Best Practices EXPO & Conference Sessions

The first third of the conference dove deep into advanced air compressor control and monitoring with presentations from four global air compressor manufacturers. The Energy and Environmental Lead for Nestlé Waters & Premium Beverages, Carlos Capilla Camacho, shared his organization’s four pillars of compressed air management: process optimization, competency, standardization and digitalization. Alberto Saiz Galbadon, General Manager of TEAM INDUSTRIAL, gave



Compressed Air Challenge instructor Juan Londono presented Level 1 Fundamentals of Compressed Air Systems training.



Carlos Capilla Camacho, Energy and Environmental Lead, Nestlé Waters & Premium Beverages, presented on compressed air management.

perspective on modern industrial vacuum system optimization.

Topics in the second third of the conference included cooling tower thermal certification, compressed air redundancy strategies, pipe sizing and system design, compressed air quality for food and beverage, residual oil content monitoring and nitrogen generation. The final two sessions explored reducing compressed air use on the demand side, reducing air pressures plant-wide, remote auditing technology and chiller energy savings.

Networking Exhibits at the Industrial Sustainability Best Practices EXPO & Conference

Airmatic is a comprehensive solutions provider for compressed air, vacuum and industrial refrigeration systems in northeastern Spain. “Looking towards the future, we believe that

compressed air is no longer just a simple utility, but a strategic pillar of industrial energy efficiency and sustainability,” said Carles Gamito, Commercial Director, Airmatic. “More and more, plants are asking us for solutions with interconnected VSD air compressors, heat recovery systems and intelligent control. The continuous measurement of flow rates, performance and quality parameters is already the standard for projects we carry out.” Airmatic complements its services with leak audits and compressed air quality audits.

The Analysts, co-founded by Josh Wamser and Menno Verbeek, held a ribbon cutting to introduce its new organization dedicated to helping compressed air users around the world optimize their systems.

“Our goal is to break down boundaries that have been built over the years, and show how

we can support compressed air users better if we work together,” said Josh Wamser. The company’s slogan is “More Minds, Better Results.” Menno Verbeek spoke about a project where a local distributor served as customer liaison, while other collaborators played roles in plant pneumatics, gap study data collection, instrumentation, leak detection and remote data review. “We can’t replace the local distributors and service companies. In fact, they play a huge role in our success,” said Wamser. “We use alignment and realignment throughout the process to ensure we’re delivering optimal savings, with frequent peer review to ensure we’ve identified the appropriate solutions.”

BEKO Technologies displayed its portable METPOINT mobile measurement unit for dew point, pressure, volume flow, oil content and data logging with local and cloud monitoring



Alberto Sáiz Galbadón, General Manager, TEAM INDUSTRIAL, presented on modern industrial vacuum system optimization.



Carles Gamito, Miquel Burgués and Joel Martínez of Airmatic (left to right).



Josh Wamser (left) and Menno Verbeek (middle) of The Analysts and Nina Bizjak (right) of ERLIK at The Analysts’ ribbon cutting ceremony in the exhibit hall.



Carles Gamito of Airmatic presenting on VSD air compressor integration.

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capabilities. Also on display was the BEKOKAT hydrocarbon removal system (18-12,000 m³/h) for oil-free compressed air systems. Sarah Deckers, Focus Industry Manager, presented “Compressed Air Quality for the Food & Beverage Industry,” and provided air quality recommendations for indirect, incidental and direct contact with food products.

BOGE Compresores Ibérica displayed an IMT PN LASER pressure swing adsorption nitrogen generator with an H₂Kat hydrogen catalyst, which introduces tiny amounts of hydrogen to remove remaining oxygen molecules, boosting nitrogen purity from 99.9% to 99.999% purity. In Europe, BOGE is launching T Series low-pressure turbo and high-pressure turbo

oil-free direct coupled air compressors with airfoil bearings.

Compresores JOSVAL, a Spanish air compressor manufacturer since 1958, displayed a 15 hp (11 kW) IBERUS Series (7.5-60 hp) VSD rotary screw air compressor. Features of the IBERUS Series include a soft starter to prevent intensity peaks during start-up and prolong the useful life of transmission elements, and a dual plug system that enables the air compressor to continue operation in on/off mode in the event of a drive failure.

Ian Butler, Business Partnerships Manager for Eurovent Certification, presented “Sizing Equipment for Reliability: Certifying

Cooling Tower Thermal Performance” to demonstrate how cooling towers that don’t meet thermal performance needs can negatively impact customers and manufacturing processes.

ELGi Compressors Europe displayed its EG Series oil-flooded rotary screw air compressor with a 10-year airend warranty with no limitation on running hours, a permanent magnet motor and intelligent thermostatic valve. The EG Series is available in 11-250 kW in both fixed speed and VSD models. ELGi has also developed an OSBIC process (oil separation by impact and centrifugal action) to separate air and oil with minimum pressure drop.



Sara Deckers, Mario Comella and Rainer Stützel of BEKO Technologies (left to right) with the BEKOKAT hydrocarbon removal system.



Pablo Moya, Francisco Ortiz and Victor Atienza of BOGE Compresores Ibérica (left to right).



Enrique Fernandez of Compresores Josval with the IBERUS Series air compressor.



Ian Butler, Mustafa Dilsen, Japhet Habimana, Taha Ouilali and Jennifer Preston of Eurovent Certification (left to right).



Jose Maria Moreno, Niccolo Casini and Victor Escolano of ELGi Compressors (left to right) with the EG Series air compressor.



Leandro Huertas Lopez, David Sanchez, Mario Baena Simón, Isidoro Galera and Luis Pérez Almeida of Ingersoll Rand (left to right).



Karina Gómez, Ignacio García, Jaime Casanova and Mariano Lausin of Kaeser Compresores (left to right).



Alfred Roca, TEAM INDUSTRIAL, presented “Key Elements to Ensure Efficient and Reliable Nitrogen Generation”

Ingersoll Rand energy and control engineer Mario Baena Simón presented “Compressed Air Systems: Integral Management and Artificial Demand.” Mario shared that reducing pressure by 1 bar (14.5 psi) saves 7% in electricity consumption. He recommends compressed air users maintain a maximum pressure drop of no more than 10% of generated pressure. He also recommends using enough air storage for at least 20% of the generated flow.

According to Ignacio García, General Manager, Kaeser Compresores, the company is developing new features for its CSG oil-free screw air compressors, its MOBILAIR portable air compressors and the SIGMA CONTROL local intelligence controller. Key Account

Manager Mariluz Acevedo Rocha presented “Practical Ideas for Reducing Air Compressor Room Energy Consumption,” which offered advanced insights on managing plant pressure and pressure drop, deploying variable frequency drives and heat recovery.

Many attendees shared that they had not experienced an event before where industrial sustainability experts gathered to share

best practices with design engineers and system operators.

“This is a really interesting event for us. It serves as a great forum for factories, equipment companies and engineering companies to share thoughts and solutions to common issues in industrial compressed air, vacuum and cooling systems,” said Alfred Roca, Sales Director, TEAM INDUSTRIAL. **BP**

To learn more about the **Best Practices 2025 EXPO & Conference** in Kansas City, visit <https://cabpexpo.com>.



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Cooling System Pressure Control for Efficiency and Process Stability

By Clayton Penhallegon, Jr., P.E., President, Integrated Services Group

► Controlling cooling water flow is a critical element of high-performance cooling systems. Fortunately, pressure is a straightforward measurement that can be used as a cost-effective control input for flow control systems. Proper interpretation of pressure readings is required for accurate control at desired rates. This article covers pressure reading methods, control strategies and practical tips.

Process cooling systems are linked systems of devices that remove heat from machines and process materials. Because process requirements can be variable and equipment condition changes over time, the components of these linked systems are designed with various control functions to enable cooling operations to meet the required needs without over- or under-cooling, neither of which is desirable.

Under-cooling of equipment or product could result in machines overheating or incompletely cooled and consequently off-spec products. Over-cooling can result in excessively long cycle times and inefficient operation from

required product reheating or excessive cooling equipment operation. Given the alternatives, many systems tend toward over-cooling with the use of additional devices to mitigate potential ill effects. While functionally adequate, this results in further total system complexity and even lower system efficiency.

ISG has observed pressure variations of as much as 2:1 in many systems, and +/- 30-50% variations are common in uncontrolled operations.

The generally changeable aspects of heat transfer that underlie process cooling are (1) the temperature difference between the cooling medium and the cooled device or material and (2) the flow rate of the cooling medium. Note that many other factors are part of the complete cooling system function, such as the heat exchanger designs and materials and the selection of the cooling medium, but these are all assumed to be fixed and established in any given situation. Practically speaking, the only elements we have immediate control over are the temperatures and flows.

Cooling system temperatures are typically controlled by the settings on chillers or cooling towers, and this is commonly recognized and used in cooling system design to achieve desired operation and performance. For more on optimizing temperatures, read “Evaluating Process Cooling Supply Temperatures” (January-February 2025).

Typical Flow Conditions in Cooling Systems

The other commonly controllable component, flow, is not often controlled directly. Instead, pumps are selected and systems designed to provide pressures expected to result in adequate flows. Because pressure is straightforward to measure, it is easy to determine pumps’ output pressure (“head,” more precisely, but convertible to and measured in cooling systems as pressure) and the pressure at different points in a system. These systems are started up and, as long as everything seems to work well enough, little additional thought is given to the operation.

It is extremely common to see pressure gauges on the suction and discharges of pumps, the in and out points of system machines and at

Above: This cooling tower pump system uses single-pressure flow control in multiple application loops.

other points of interest in a cooling system. Pressure gauges are relatively inexpensive and frequently fitted with good range decals showing the acceptable ranges for given devices.

Unfortunately, the pressure, and, consequently, the flow, are somewhat random in many systems depending on how many pumps are on and how many lines are operating. Operators typically watch the pressure gauges and turn pumps on or off as needed to stay in a target range. This requires vigilance for consistency. It's seldom maintained at night and on weekends.

This "fiddle factor" manual operation results in potentially significant variations in the actual flow to any given device, making the actual cooling effect inconsistent over time. Integrated Services Group (ISG) has observed pressure variations of as much as 2:1 in many systems when evaluating plants, and +/- 30-50% variations are common in uncontrolled operations.

Potential for Constructive Pressure Control

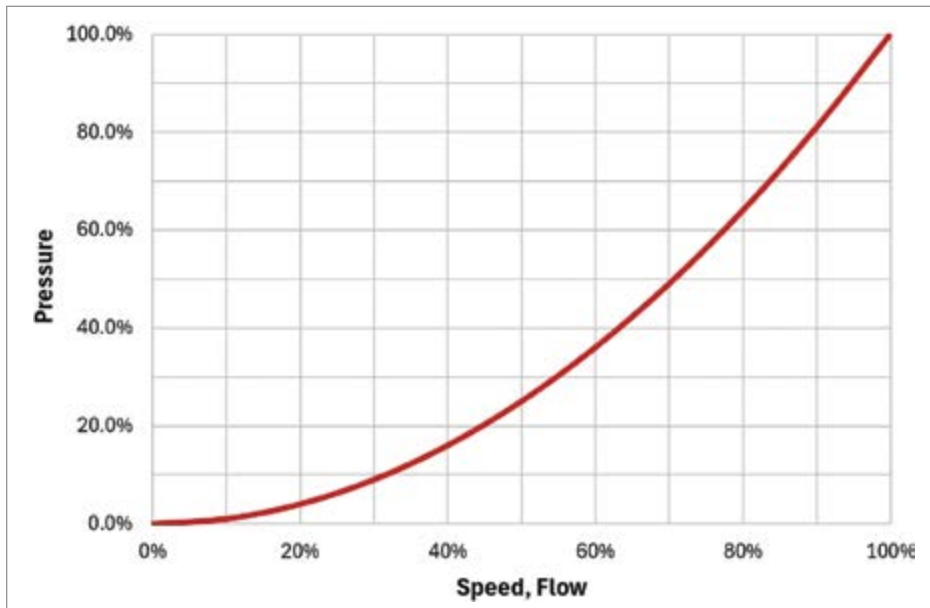
Because pressure and flow are linked, pressure can be used intelligently to control flow. This requires understanding the relationship between pressure and flow, then using that understanding to implement pressure control functions to enable reasonably accurate flow management. Using pressure control well



These gauges include decals showing the normal range of operation.

allows plants to control flows to individual devices to a narrow range of potentially +/- 5-10%, depending on the distribution piping design, plant size and other factors. The resulting stable operation is what really matters in production operations.

Note that system design can play a critical role in the ability of plants to have uniform pressure and flow throughout their systems, however, that subject is beyond the scope of this article.



The curve for an ideal flow pressure

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>> Cooling System Pressure Control for Efficiency and Process Stability

Many historical approaches to piping system design were based on material economy and not process uniformity and energy efficiency. In

many cases, there are significant opportunities to improve the piping in new systems or system modifications.

When considering the use of pressure as a proxy for flow, several questions arise:

- What is the correct flow and how do plants verify this?
- Is this a constant value or does it change?
- How much pressure is needed for the correct flow?
- How do plants control pumps to ensure the required pressure?

This article will address these questions.

The Relationship Between Pressure and Flow

Perhaps surprisingly, pressure and flow are not linearly related. In other words, doubling pressure does not double flow. Instead, there is a flow-squared to pressure relationship. This means, for a given device (a heat exchanger, valve or other fitting and even a straight run of pipe), doubling flow requires increasing pressure by four times!

Looking strictly at the motivating pressure and flow, and assuming a constant system (no control valve operations or other dynamic changes to the flow system), the following equation applies:

$$P2 = P1 \times \left(\frac{F2}{F1}\right)^2$$

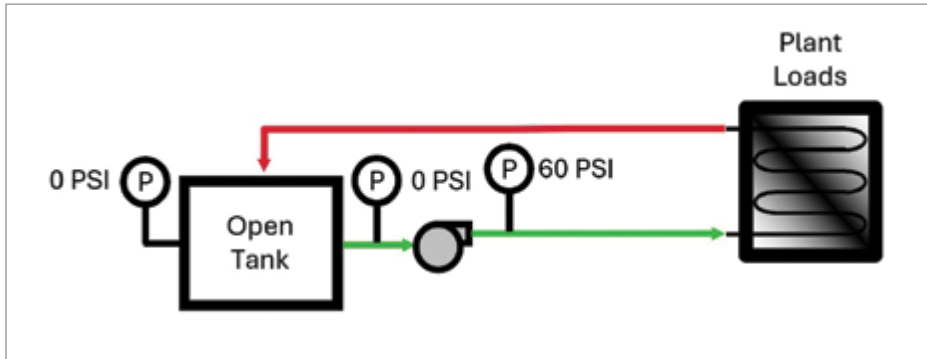
Or, to solve for the flow resulting from a pressure change:

$$F2 = F1 \times \sqrt{(P2/P1)}$$

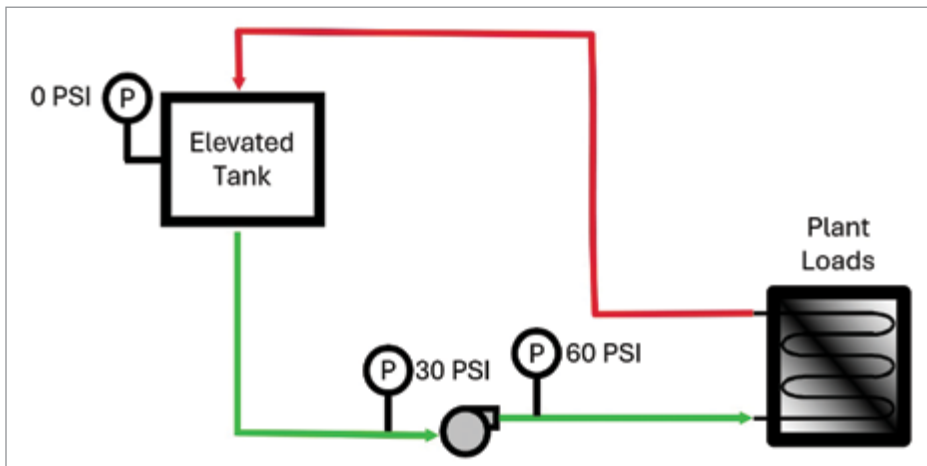
This means doubling the portion of the pressure being used to actually drive (or motivate) the flow, not the total measured pressure which may include other factors such as closed system minimum pressures (from the expansion tank and make-up water control) and fixed elevation components in systems with elevated cooling towers or tanks.

This concept can be graphically displayed as follows for prototypical flow systems:

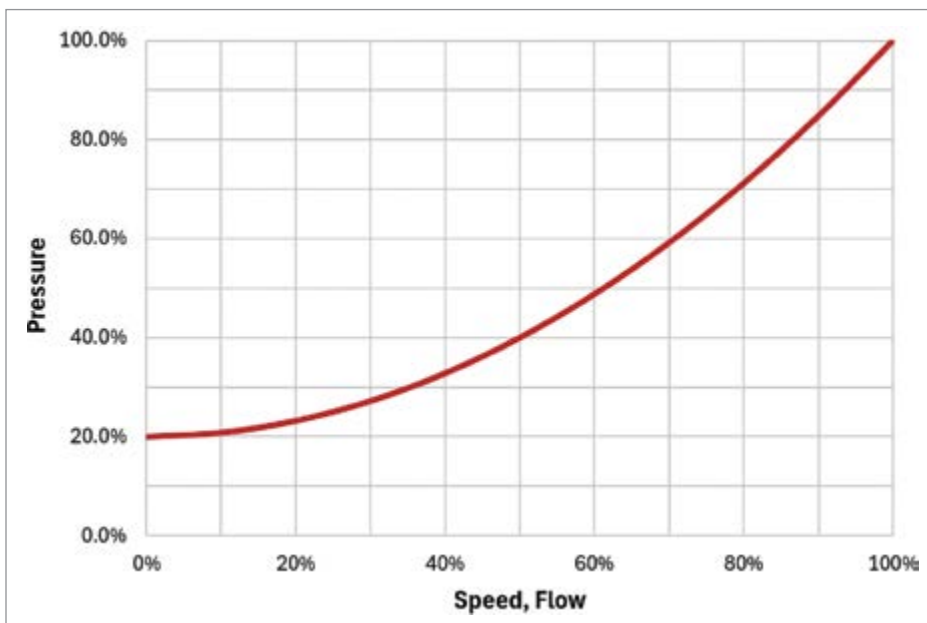
In a simple closed system with fixed components (including pumps, piping and



The schematic for a simple flow loop



Flow loop example schematic with above-zero reference pressure



Flow and pressure graph illustrating above-zero reference pressure

heat transfer devices) where the pump is speed-controlled with a variable frequency drive (VFD), the flow varies linearly with the pump speed within a normal flow range while pressure varies as described previously. The required pump power varies according to the power to flow cubed relationship described in detail in the “Pump and Fan Affinity Laws Power Calculations” sidebar in the article “Holistic Controls for Superior Cooling Systems Efficiency, Pt.2” (May 2024).

Pressure Measurements in Cooling Systems

It is vital when using pressure measurements as control inputs to correctly understand what the reading means and what part of it is the flow-motivating component.

Consider the example of a pump discharge pressure gauge showing 60 psi (4.1 barg). If this pump is connected to a ground-level tank that is open to the atmosphere and to which the process flow returns, then approximately the entire 60 psi (4.1 barg) is available to drive the system flow. (For clarity, this article ignores modest elevation differences, such as the fluid level in the tank or the height of the pressure sensor. In practice, these should be considered to maintain the best possible accuracy.)

If the pump is connected to a suction header in a closed system with a reference pressure setting of 30 psi (2.1 barg) – the make-up water pressure control valve and expansion tank are set to 30 psi (2.1 barg) – and it has the same 60 psi discharge pressure, then the system only has 30 psi (2.1 barg) to create the flow. The pump doesn’t have to work as hard to reach the 60 psi (4.1 barg) so the power will be lower, but the focus here is on the pressure indication. That’s what we have to understand for pressure-flow control operation.

Even though the two gauges read the same discharge pressure, the two systems’ flow capability is significantly different. The good news is the difference isn’t half, as the pressure-to-flow relationship is not linear. Using the formula from above and the two net flow motivating pressures from the examples, the flow in the closed system would be approximately 71% of the open system flow.

$$F2 = 100\% \times \sqrt{\frac{30}{60}} = 70.7\% \text{ of } F1$$

Whether this is enough flow depends on the specific circumstances. In any case, this clearly illustrates that the key challenge in analyzing and controlling pressure and, hence, flow, is understanding and measuring the correct pressure values.

Differential Pressure Measurements

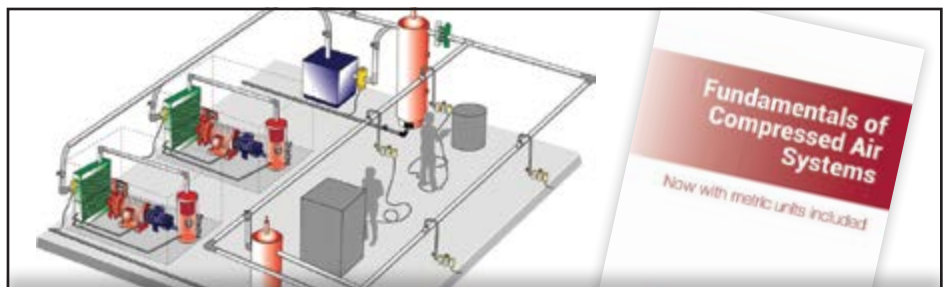
As noted previously, the effective pressure driving the flow, and which must be controlled, is most often not the same as the readily readable gauge pressure in typical locations, such as at the pump outlet or discharge header, or at the inlet to cooled devices such as refrigeration compressors, chillers or process machinery. The simple gauge pressure must be adjusted to account for various elements of the total system, such as:

- elevation of the water (the weight of the water and the height of the system)
- external pressure inputs such as make-up water and/or expansion tanks
- required pressure to return the water to the cooling equipment

The confusion about how much pressure is usefully available arises in different situations, such as when a system is pumping to an elevated location such as a cooling tower above a roof, or in a closed, pressurized system. For this reason, in many cases the ideal pressure measurement for control is one between the supply piping and the return piping in a relevant location.

Using differential pressure readings across devices is an affordable and cost-effective means of indicating flow through critical items like chillers and heat exchangers.

Differential pressure (DP) measurement uses a pressure transducer reading the difference in pressure between two separate points, commonly between a supply pipe and a return pipe, although these sensors are also frequently used to read pressure drop across particular devices such as chillers and heat exchangers. (In a sense, all pressure readings are differential readings, as conventional single



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pressure gauges and transducers read the difference between the measured pressure and the local atmospheric pressure.)

DP is calculated simply as

$$DP = P_{high} - P_{low}$$

and shares the same psi units as single-pressure readings.

For distribution system DP, the two pressure connections will be on the supply and return pipes, giving the difference between the two pipes and indicating the actual pressure available to induce flow in the connected equipment. Reading the DP across a particular device requires connecting the DP sensor to the cooling water inlet and outlet piping. This negates the effect of external system pressures. The remaining DP reflects the actual pressure difference through the device.

Using DP readings across devices is an affordable and cost-effective means of showing flow through critical items including chillers and heat exchangers. However, the DP reading must be initially calibrated using a reliable means – such as a clamp-on flow meter – and periodically checked to maintain accurate flow readings. This is described further below.

Pressure Measurements Selection for Control in Cooling Systems

In control system design, part of the challenge is selecting the ideal pressure measurement for each control application. The choice of pressure measurement type (single vs. DP) includes several factors that must be balanced in each case. These include:

- **Appropriate reading:** Does the basic reading type correctly indicate (possibly with some mathematical modification) the needed condition? This can vary depending on how the controls will use the input.
- **Location:** Does the connection location properly measure the reading desired?
- **Quantity:** Will a single reading be adequate or are multiple readings necessary for the required control?

Some applications are best performed using several sensors and “low man” control, such as with different departments in a multi-process plant or large systems with different standard conditions.

- **Accessibility:** Can the sensor be installed and connecting piping run to enable routine maintenance of the sensor and the piping?
- **Cost:** Does the selected type of sensor, the particular device and the installation approach meet the requirements at a reasonable cost?

In general, DP sensing is the most certain method for obtaining satisfactory results. In some cases, there are less expensive and simpler approaches that can be applied to sensors while meeting requirements. For example, a single chiller condenser cooling application with an elevated cooling tower could be reasonably controlled using a typical single pressure sensor at the chiller inlet if (1) the piping in the system is sufficiently large so flow losses are modest compared to the elevation head, and (2) the tower return is to open top basins with essentially no backpressure variation with flow (spray nozzles would not meet this criterion). In this case, the controls can subtract the elevation head from the read value and derive a useful indication of the actual condenser pressure drop.

Part of the decision process is considering the impact of the reading. An approach that would be fully justified on a system controlling several 200 horsepower (hp) pumps for a whole plant system might not make sense if it were only on a single 25 hp pump simple loop system.

Using Pressure Measurements for Control

While the pressure reading quality is vital, the control application logic is equally important for effective pressure-based control. The two elements must function correctly together to achieve satisfactory flow control of the actual cooling loads in the plant. Critically, control program performance must remain stable throughout the operating range of the particular applications.

This can be challenging given the underlying flow change-squared relationship between pressure and flow. This non-linearity can cause control stability issues in applications with large operating ranges, which cooling system controls often encounter given the typically expected variations in operation. These include machines turned on and off (from five-day/two-day schedules, seasonal output variations and evening schedules), seasonal temperatures resulting in opportunities for variable flow (resulting in pump savings) and other inherent aspects of cooling systems operation.

These load (and consequently flow) variations can result in common speed control ranges



A differential pressure transducer with a three-valve manifold and piped blowdowns

of 70-95% in many systems. ISG has often implemented speed ranges of 40-100% in efficient closed loops with high efficiency design. Appropriate control logic function selection is critical in these instances to have stable, correct speed control performance.

When done poorly, pressure-based speed control results in hunting, where the speed output continuously cycles between high and low values, and jumpy systems where the speed output is inconsistent and unstable. Either of these conditions leads to the controlled pumps' VFDs being put in hand, and the entire benefit of the effort is lost.

One additional, frequently critical, step in commissioning pressure control logic is calibrating the required pressure to the target flow, for example when setting up chiller condenser pumps and other specific device configurations. This is typically done using temporary flow meters to set control pressure setpoints or ranges correlated to the desired flows. This step is not used on every device in a system-wide control application as there are too many potential control points for device-specific

calibration. Instead, readings at representative sample devices are used to develop the required pressure at the specific sensing locations for the required overall system flows.



This single pressure sensor installation includes a manual blowdown port and gauge.

Several control logic approaches can be applied in various cases, irrespective of the type of pressure sensing. Examples include:

Single setpoint PID control: Using the pressure reading in a PID function to adjust pump speed. This is the most common use found, but it can be unstable in some cases. Up and down hunting often results in widely variable applications.

Multiple single-setpoint PID control: Using two or more instances (typically not more than 4 or 5) of pressure readings through independent PID functions and control off the higher calculated speed (the point with the greatest negative deviation from setpoint). This can also lead to hunting, but with potentially multiple, overlapping instances.

Linear range control: Using the pressure input to a linear output range, where the pressure directly correlates to an output speed. This simple approach is typically applied in small systems with a narrow pressure input range over an inverse speed output range. For example, 50 psi (3.4 barg)

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equals 51 Hz while 48 psi (3.3 barg) equals 60 Hz. The two psi input variation results in a 15% pump speed change with the lower pressure driving the higher pump speed. This method gives a near flat flow output over a fairly wide flow range in fixed flow loop applications such as with multiple chiller condensers or refrigeration compressors. However, the devices must have similar flow-pressure drop characteristics.

Hybrid or enhanced methods: Using the pressure with some modifications or adjustments (such as subtracting an expansion tank pressure reference) as an input to one of the preceding approaches. These methods can provide capable flow control

but can also be complicated and erratic if not carefully implemented.

The choice of different logic approaches is influenced by the general application and other potential complexities, such as an elevation offset. In addition to being fundamentally sound, the control logic in each case must also yield good results, with the system stable and performing as desired. Different approaches can be taken to improve the performance of control functions such as:

PID dampening: Adjust the PID settings, such as the cycle time or proportional, integral, derivative factors to slow down an erratic system. This must be used cautiously, as it can

result in a system that is too slow to respond to significant input changes, such as major step load additions or incremental pumps starting.

Multi-step range PIDs: Using two or more – typically no more than three or four – separate and independent PID functions with linked step ranges where the input forces the selection of one PID's output based on the input range. For example, three PIDs where one is selected for the input range of 20 (1.4 barg) or less to 30 psi (2.1 barg), one from 30-40 psi (2.1-2.8 barg), and one from 40 psi (2.8 barg) and above. Each PID can be tuned in a respective range for good performance to minimize the non-linearity of the pressure input's effect on the resulting flow.

Practical Tips for Pressure Measurements in Cooling Systems

Once the decision is made to use pressure inputs for control, there are a variety of steps that can be taken to improve the quality of the readings and the longevity of the sensors. In general, the following tips will help ensure and maintain good pressure control results for the long term.

1. Select high-quality devices within reason. There is no need for ¼% accuracy, heavy industry-type devices (which typically cost over \$2000 for a single pressure sensor), as proper installation and maintenance are more important than extreme precision. Good quality HVAC devices of ½ to 1% accuracy (which typically cost under \$500 for a single pressure sensor) are satisfactory.

2. Install with larger piping for a lower chance of blockage. Use a minimum of ½-inch diameter pipe for total connection loop lengths (supply pipe to sensor and back to return pipe) of 50 feet or less, and ¾-inch pipe over 50 feet. Do not use ¼ or 3/8-inch tube for the loop or there won't be enough flow to periodically purge the loop to ensure good readings.

3. Pay particular attention to blowdown capabilities. Cooling tower loops that can pick up ambient dust and debris are highly susceptible to fouling on both single-pressure and DP applications, as particulates can collect in the pressure sensing connections and plug the pipes. This is extremely common in practice. Fully closed chilled water systems are less likely to have this problem, but they still need to be purged periodically. Purge open systems monthly or quarterly, and closed systems semi-annually or annually.

4. Regularly perform manual or automatic blowdown. Institute maintenance work orders to manually blow down the sensor loops (which requires bypass valving to allow flow through the piping while isolating the sensor) or implement an automatic blowdown for improved long-term reliability.

5. Don't always use a DP sensor. Some applications can use a single pressure sensor with good results and lower installation costs. This requires clearly understanding the application and measurement components.

6. Do not use pump skid-located sensors. Unless in specific locations where the application supports their use on or near the pumps, avoid these sensors. Many factory-packaged solutions use integrated sensors with VFDs, and while these are better than across-the-line pump operation and no pressure sensing, they do not deliver the results available from more effective pressure sensing.



This ISG packaged DP sensor assembly includes automatic blowdown.

Algebraic input modification: Applying adjustments or other modifications to the pressure reading to improve the performance of the control logic. This would be in addition to other basic adjustments such as subtracting an elevation offset.

The challenge in many cases is having the control logic perform as required and still be comprehensible to the system operators and other users. Understanding how it should work is necessary so users can assess normal performance and adjust setpoints as needed. If the system can't be understood, it will likely be overridden to a fixed speed, defeating the point of the controls. This happens more often than one would hope!

Conclusion

Effective flow control is vital to satisfactory cooling system performance. Properly applied, pressure-based control is a cost-effective and reliable means of managing flows. This article has laid out the theoretical basis for using pressure-based control, described methods of measuring and applying pressure sensing

inputs in control systems and provided field-proven practical tips for implementing and operating these controls.

Please contact the author with any questions or comments. This article reflects lessons learned from numerous real-world examples. The author would be grateful to hear any reader's experiences of this type of problem and Hard Knocks University-learned solutions. **BP**

About the Author

Clayton Penhallegon, Jr. is President and Managing Member of Integrated Services Group, which specializes in industrial cooling water system operational effectiveness and



cost reduction. He has worked for over 35 years with various industries including plastics, paper, wood products, metal containers, and textiles. He holds a Bachelor of Mechanical Engineering from Georgia Tech, an MBA from Georgia State University and is a registered PE in Georgia.

About Integrated Services Group

Integrated Services Group performs industrial cooling water system operational effectiveness and cost reduction technical services. Its services include system assessments, new and upgrade system design, system start-up and retrocommissioning and high efficiency control design and implementation. ISG celebrated its 25th anniversary in 2022 and serves clients throughout North America. For information, visit <https://www.isg-energy.com>.

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FACILITY MAINTENANCE

Create a Detailed Data Logging System and Let the Data Run the Show

By John Bilsky, Facilities Specialist, Gentex Corporation



When I began my career with Gentex Corporation in 2003, the company had three compressed air systems. Today, it has 12, with more on the way. As the company grew, I found the need to data log our compressed air operations. Data logging allowed me to proactively monitor the compressed air systems' pressure, air flow, dew point, power, temperature, cooling water and any other parameters I wanted with the touch of a button.

Today, we have continuous data logging of over 2,000 data inputs which allows us to benchmark and view the compressed air, water treatment and nitrogen processes.

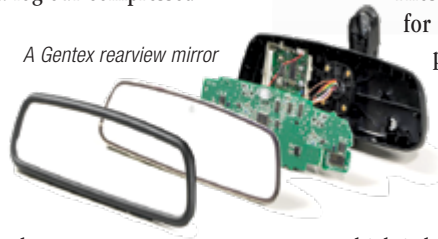
Because production seldom shuts down, it's difficult to perform maintenance and troubleshoot problems. Data logging lets me know when quality specs are slipping so I can pinpoint equipment malfunctions.

Our continuous output of data is also linked to alarms. For example, high dew points are now a thing of the past. When a benchmark threshold is reached, I get a page alerting me to the potential problem. Equipment faults can occur at any time. It's quicker and more efficient to be notified by a data logging system than to wait for a phone call from production. Since we started this system, production has seldom seen an issue with compressed air equipment faults. I can now be in 12 buildings at once.



A point-of-use compressed air flow meter and pressure transmitters with displays

For me, being able to monitor and track our compressed air systems makes it easy to respond to unexpected changes in quality and usage. These changes could be a higher than normal flow rate for a production line, increased dew points or a sudden pressure drop.



A Gentex rearview mirror

Another benefit of data logging is the ability to generate reports from the collected data. These visual representations of how the compressed air system works can be generated on the spot, which is helpful when speaking with management or anyone unfamiliar with compressed air systems.

Manufacturing process changes can also impact compressed air use. Production line managers often change processes to solve problems. In many cases, compressed air pressure is increased or equipment is left on when not needed. By using data logging charts, it often becomes apparent that changing pressure and increasing flow are unnecessary and cost the company money.

When plans to expand production or build new plants are discussed, data reports should play an important part. Our data shows the cfm each production line uses, total system cfm and when the compressed air system reaches capacity. That data makes justifying additional compressed air equipment easier.

Data can be any information recorded for immediate or future use. In a manufacturing facility, real-time data turns an operator's work from reactive repairs to proactive maintenance. Choose the best place for probes and let the data run the show! **BP**

About the Author

John Bilsky is the Facilities Specialist for compressed air, nitrogen and purified water at Gentex Corporation. He's experienced in engineering design, engineering improvements and maintenance for compressed air, nitrogen and water purification systems supporting production, R&D and lab services. For more information, visit <https://www.linkedin.com/in/john-bilsky-24715b10/>.

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The Mindset of a Closer: Why Attitude Is Everything

By Mark Allen Roberts, CEO, OTB Solutions



Working with compressed air distributors, cooling system reps and industrial equipment manufacturers, I often hear one question: How do we convert our quotes into closed sales revenue?

Often, my response surprises clients and prospects asking for help: Do you have a sales skills issue or a sales closing mindset issue? Could you have both? Shouldn't we find out the answer before launching a sales, closing and coaching program to increase our close rates?

Manufacturers and distributors have strong market knowledge, application experience and engineering proficiency. We shouldn't be surprised when they grow frustrated with pipelines with millions of dollars in sales quotes that don't produce revenue.

There's one limiting belief I often see in this market that negatively impacts sales close rates: "If I quote a product and or service, the buyer will buy when they are ready."

Having a closing mindset is critical in improving sales close rates. Top salespeople know that before you win in the market, you must win in your mind.

What Role Does Mindset Play in Sales Success?

What separates the top 10% is how they respond to obstacles. They have a strong sales mindset. Do you have team members in sales roles who lack the necessary skills and desire to succeed?

Closing isn't an event, it's a mindset.

Many salespeople treat closing like a final hurdle: awkward, nerve-wracking and something to be survived. But closers view it differently. For them, the close is the natural result of value delivered, trust earned and problems solved.

If you don't believe in what you're selling, the prospect won't either. Mindset begins with internal conviction.

Here's how the right mindset transforms your ability to close:

Belief in Your Value: "I'm not taking their money – I'm helping them invest in a better outcome."

Detachment from Outcome: "I'm here to help them win, not to get a yes at all costs."



Mark Allen Roberts will conduct a Sales Engineering Workshop at the Best Practices 2025 EXPO & Conference in Kansas City. Visit <https://cabpexpo.com/sales-engineering-workshop/>.

Resilience After Rejection: "That wasn't a failure – it was feedback."

Abundance Over Scarcity: "I don't chase sales – I attract them by showing up with clarity, energy and empathy."

Ownership and Proactivity: "It's my job to create clarity and momentum. No one else will do it for me."

Closing isn't about clever lines or last-minute deals. It's about showing up with conviction and calm certainty. Closing comes from mindset, not manipulation.

If you want to close more, don't just study techniques. Assess and then build the mindset of someone who believes in what they're offering and the value they bring to every conversation.

In sales, mindset isn't part of the game; it is the game! **BP**

About the Author

Mark Allen Roberts is the CEO of OTB Solutions, which provides professional training and coaching. Visit <https://www.nosmokeandmirrors.com>.

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Real-World Installations & Maintenance

Edited by Troy Dreier, Senior Editor, Compressed Air Best Practices® Magazine

There's much we can learn from real-world compressed air, blower, vacuum, chiller and cooling tower installations. This column asks readers to share lessons learned from system installations and maintenance practices they encounter in the real world.

A Mountain of Trouble

Cat Air of Sydney, Australia, was founded by Steven Willcox in 2011 to provide compressed air system design, monitoring, management, air purity testing and auditing. Visit <https://catair.com.au>.

A materials resource facility that sorts waste for recycling called Cat Air to learn if air purity problems could be contributing to its equipment failures. The hundreds of pneumatic valves in this system require clean, dry compressed air to function properly, Willcox notes. His first recommendation was to relocate the air compressors. Sadly, OpEx has not yet been allocated for the task.

Having a clean air compressor room is critical, as debris gets sucked into air compressors, clogging coolers and inlet filters and causing overheating.



Giving Compressed Air Piping the Squeeze

Proair of Sonora, Mexico, has been providing compressed air and energy management solutions to industrial facilities for over 25 years. Its services include design, installation and maintenance. Visit <https://pro-air.mx>.

The purchasing department at this automotive production plant believed it was saving money by buying a less expensive, smaller-sized filter. However, its bargain filter led to a major pressure drop in the compressed air system due to the smaller diameter of the filter's inlet and outlet connections.

The compressed air piping in this system was reduced to fit the filter's inlet connection, leading to a major pressure drop.

Submission Guidelines

We invite subscribers to share stories and photos of remarkable system installations they've come across. Email Troy Dreier at troy@airbestpractices.com. Please send a high-resolution image as a JPG or GIF file and a note describing the installation. If we publish your submission, we'll thank you with a \$25 Amazon gift card.



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