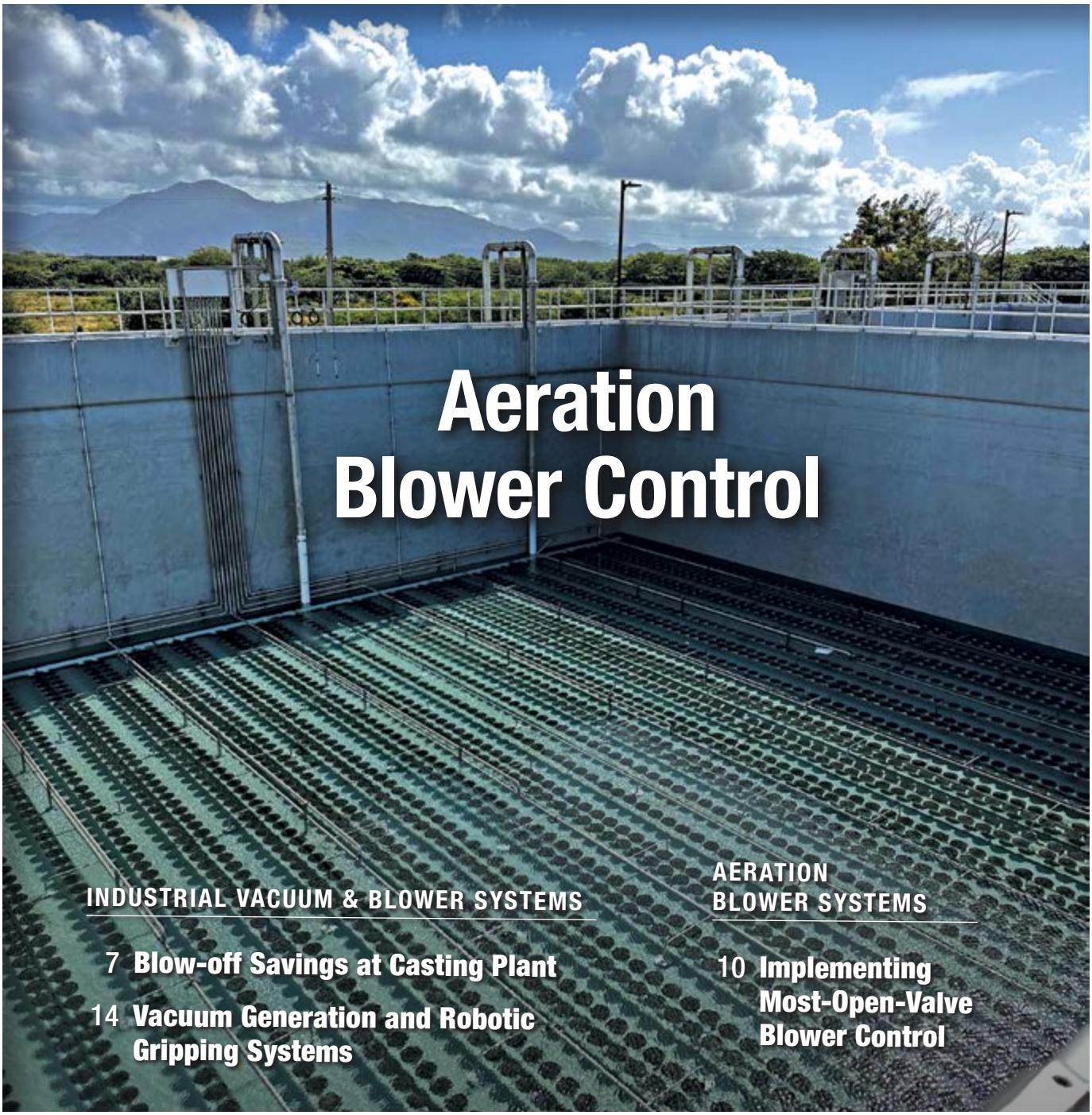
The Magazine for Quality & Reliability in Energy-Efficient Blower & Vacuum Systems

BLOWER & VACUUM BEST PRACTICES

blowervacuumbestpractices.com

August 2025



Aeration Blower Control

CUTTING ENERGY COSTS AND BUILDING A SUSTAINABLE FUTURE

with Busch Vacuum Solutions

Busch Vacuum Solutions is committed to helping you significantly reduce energy consumption and operating costs. Our advanced vacuum technology can lower energy costs by up to 50%, contributing to a greener future.

Key Solutions for Energy Efficiency:

ECOTORQUE Variable Speed Drives (VSD) - Adapt the pumping speed according to fluctuations in demand, optimizing energy use.

OTTO Digital Services - Set up predictive maintenance schedules to prevent unexpected downtime and maximize efficiency.

PLUS Vacuum Pumps - Designed for energy efficiency and reliability.

Central Vacuum System Units - Provide central vacuum supply, reducing energy consumption and costs.

Leak Detection - Identifies and addresses leaks to maintain ideal vacuum levels and efficiency.

Join the many companies that have partnered with Busch Vacuum Solutions to cut energy costs and build a sustainable future. Explore our comprehensive guide and solutions for maximizing efficiency and minimizing costs in your vacuum processes.

Ready to Cut Energy Costs and Go Green?

Contact us today and discover how we can help you reach your energy-efficiency goals.

Busch LLC | 1-800-USA-PUMP | **buschusa.com**

BUSCH
VACUUM SOLUTIONS

INDUSTRIAL VACUUM & BLOWER SYSTEMS

AERATION BLOWER SYSTEMS

EVERY ISSUE

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.

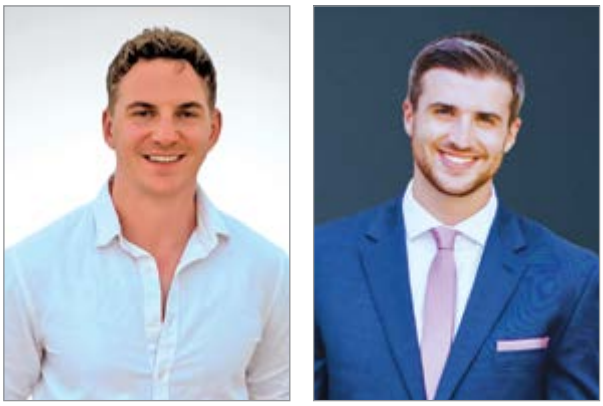
Atlas Copco's DZS 1200 VSD+

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.

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.

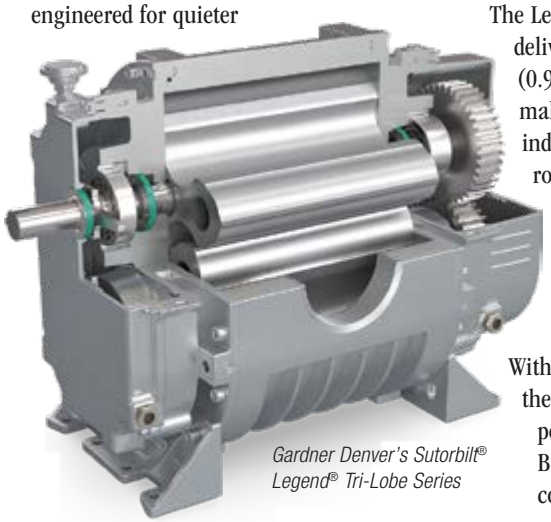
Greg Duffy, Director of Engineering, Aerzen USA, said, "BABA presents an exciting opportunity for Aerzen USA to highlight our advanced design and customization capabilities. As a proud employer of manufacturing jobs in the United States, we are fully committed to supporting our customers' domestic preference 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.



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

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.

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.

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

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.

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.

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

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

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 Alten 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.

To read articles on ***Blow-off Air System Assessments,*** please visit https://www.blowervacuumbestpractices.com/system-assessments/blow-off-air.

For expert presentations, visit our Webinar Archive Section dedicated to ***Blow-off Air System Assessments*** at https://www.blowervacuumbestpractices.com/magazine/webinars.

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

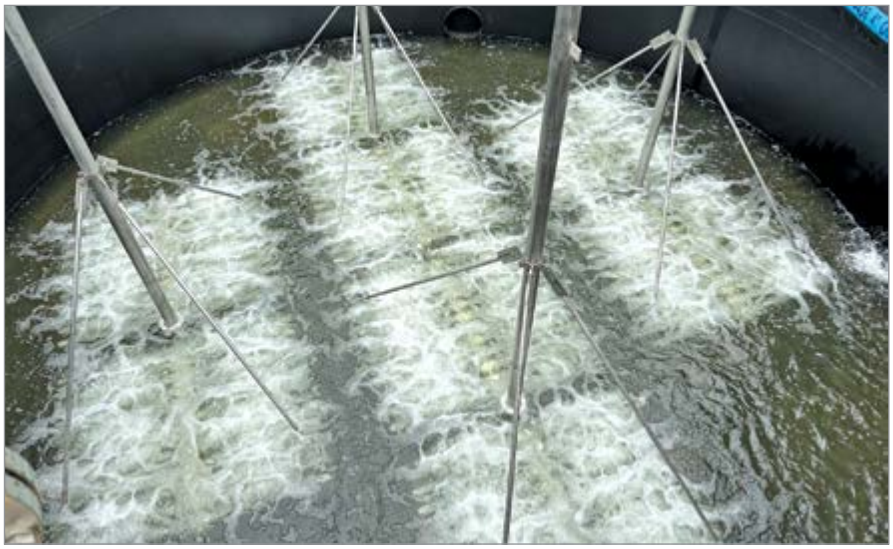
Legacy controllers had limitations between devices, whether they were electrical or pneumatic. Modern control technology combines a variety of communications protocols and control functions into one controller. The programming may be more involved, but stability and performance are improved. Total process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

To read similar articles on ***Aeration Blowers,*** visit https://www.blowervacuumbestpractices.com/technology/aeration-blowers.

Visit our Webinar Archives to listen to expert presentations on ***Aeration Blowers*** at https://www.blowervacuumbestpractices.com/magazine/webinars.

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.

About SSI Aeration

With nearly 30 years of experience, SSI Aeration is a global leader in wastewater treatment technologies, specializing in energy-efficient fine bubble diffusers and MBBR systems. Backed by engineering expertise and worldwide support, SSI delivers reliable, innovative solutions that help facilities operate cleaner and smarter. For more information, visit https://www.ssiaeration.com.

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?
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?

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

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.

To read similar ***Vacuum Generation*** articles, visit https://www.blowervacuumbestpractices.com/technology/vac-generation.

Visit our Webinar Archives to listen to expert presentations on ***Vacuum Generation*** at https://www.blowervacuumbestpractices.com/magazine/webinars.

Advertising/Editorial
Rod Smith
rod@airbestpractices.com • Tel: 412-980-9901

Subscriptions Administration
Patricia Smith
patricia@airbestpractices.com • Tel: 412-980-9902

A Publication of
Smith Onandia Communications LLC
37 McMurray Rd., Suite 104, Pittsburgh, PA 15241

Blower & Vacuum Best Practices is published quarterly and mailed together with Compressed Air Best Practices®.

EurusBlower

High Quality Blowers at an Excellent Value

Eurus Blower is a $100 million corporation with 55 years of experience building high quality positive displacement blowers.

Don't be fooled into paying more. Receive the same quality and performance while profiting from significant savings.

ZCS824 Vacuum Truck Blower

ZDL Series Bulk Truck Blowers

ISB Series Screw Blowers

EBox Blower Package

MB Series Bi-lobe & ZG Series Tri-lobe Blowers

ZZ Series Drop-in Replacement Blowers

Multistage Centrifugal Blower

RR & ZR series Large Rotary Blowers

Flows from 30 to 44,425 cfm / Pressure to 15 psi. / Vacuum to 15" Hg.

For more info contact Eurus Blower, Inc. / 3701 S. Harvard Ave. / Suite A, #544 / Tulsa, OK 74135
tel: 918-361-0285 / email: sales@eurusblower.com / www.eurusblower.com