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July 2017

INDUSTRIAL VACUUM & BLOWER SYSTEMS

- 12 Modern Woodcrafts Automates with Robotic Arms and Intelligent VSD Vacuum Pumps**
- 18 The Importance of Particle Velocity in Dilute Phase Pneumatic Conveying**

AERATION BLOWER SYSTEMS

- 24 Blower Requirements with DO Control**

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INDUSTRIAL VACUUM & BLOWER SYSTEMS

12 Modern Woodcrafts Automates with Robotic Arms and Intelligent VSD Vacuum Pumps

By Andy Nezelek and Todd Galpin, Atlas Copco, Industrial Vacuum Division

18 The Importance of Particle Velocity in Dilute Phase Pneumatic Conveying

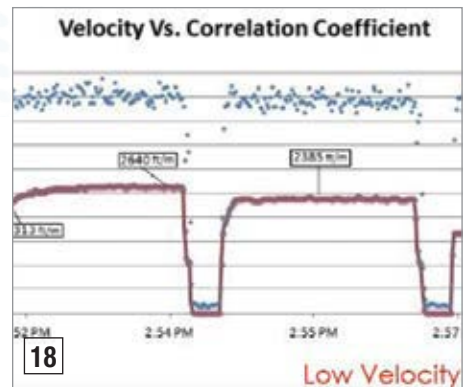
By Hank van Ormer, Van Ormer Consulting



AERATION BLOWER SYSTEMS

24 Blower Requirements with DO Control

By Tom Jenkins, JenTech Inc.



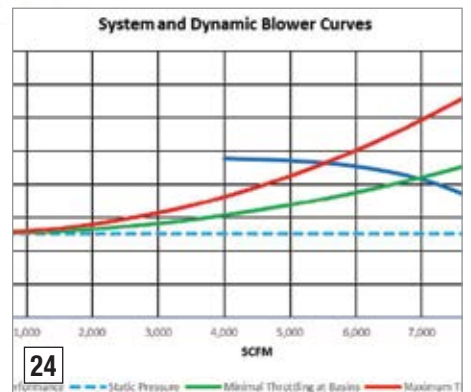
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FROM THE EDITOR



Our vacuum technology feature article is about one of the big “new” opportunities for win/win energy conservation projects – centralizing vacuum pressure systems. Modern Woodcrafts is an innovative Connecticut-based manufacturer of high-end architectural millwork components for building interiors. When they upgraded to an Anderson America Stratos Pro fully automated processing line with CNC routers, they decided to centralize their vacuum pressure system with variable speed drive vacuum pumps to save energy and reduce noise levels in the production area. Scott Thibodeau, Production Manager for Modern Woodcrafts, said, “We’re always taking steps to reduce noise pollution in our work environment. The Atlas Copco pumps are much quieter than the vane pumps to begin with, and because we centralized our vacuum system we were able to locate them in a dedicated room, directly adjacent to sawdust producing machines. That keeps our work environment quieter and our vacuum equipment cleaner.”

This Issue’s article on pneumatic conveying speaks to a common issue out there – how do we know if our specification is overkill? Hank van Ormer writes about how in open end pipe line suspension flow, or dilute phase pneumatic conveying, proper particle velocity is critical to continuing productivity and product quality. Until recently, measurement of actual particle velocity within the pipe has not been practical outside the laboratory. The plant operating personnel depend on a much less accurate metric – estimating the conveying air velocity in the pipe and relating that to particle velocity. The objective of his article is not to instruct upon how to design or engineer a well-operating dilute phase conveying system, but rather to bring awareness of the importance of knowing the proper particle velocity – to achieve optimum productivity and quality.

Every Issue of Blower & Vacuum Best Practices features an article on aeration blower technology and strategies for optimization in Water Resource Recovery Facilities (WRRF). Tom Jenkins, from JenTech Inc., provides us with a “must-file” article on how dissolved oxygen (DO) controls impact the selection and performance of aeration blowers.

Thank you for investing your time and efforts into **Blower & Vacuum Best Practices**.

ROD SMITH

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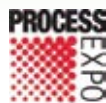
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TECHNOLOGY PICKS

New GAST Vacuum Pumps Provide Greater Flow and Deeper Vacuum

GAST Manufacturing Inc. – the leading designer and manufacturer of precision air products and member of IDEX Corporation’s Health & Science division – is introducing a new range of vacuum pumps and compressors to its extensive portfolio. These new products are simple in operation, robust and an effective source of compressed air. The three pump and compressor ranges include sixteen oil-free and oil-lubricated rotary vane models and, in a first for the organization, four claw pump models.

Announcing the new ranges, GAST Manufacturing’s Business Line Vice President for Rotary, Andre Goodson explains that the company has extensive knowledge of the pneumatic industry and its customers’ needs continually drive the development and introduction of new and innovative products.

“GAST is already renowned as a world-class manufacturer of vacuum pumps and compressors and these additions to our portfolio will provide customers with products that, compared to our traditional offering, can deliver even greater flow and deeper vacuum. The addition of claw pumps also perfectly complements our portfolio and opens up new industries and sectors

that we haven’t been able to participate in previously.” says Andre.

“Using simulation software and the latest manufacturing techniques, we believe that the performance of our new rotary vane and claw pump models are class-leading. The range is also more environmentally-friendly than ever and, thanks to extended maintenance

schedules, total cost of ownership is also significantly improved.” he says.

GAST Claw Pumps

Claw pumps are an often-overlooked technology due to a slightly higher initial cost. However, compared to oil-free rotary vane, claw pumps use significantly less horsepower to provide similar vacuum capability. They also provide 100% duty cycle and, with no carbon vanes and significantly less gear lubricant to replace, are quicker, easier and cheaper to maintain.

With only moderate energy consumption and very high efficiency, GAST’s four new claw pump models – PA.155, PA.315, VA.155 and VA.315 – use contactless rotors that are synchronized by gears without any lubrication in the pumping chamber. This frictionless operation avoids any residue (generated by rubbing during rotation) from contaminating the air supply; and means lower maintenance and operating costs, longer lasting performance and improved total cost of ownership.

With nominal capacities from 186 to 360m³/h at 60Hz, vacuum capability to 25.5"HgV and pressures up to 17psi, the GAST claw pump range is ideal for numerous vacuum, compression, aeration,



The GAST Claw Pump Model PA.155



The GAST Oil-Free Rotary Vane Model SC.100



TECHNOLOGY PICKS

extraction and drying applications in sectors including printing, environmental, medical, bulk material handling, CNC machining and vacuum hold-down.

GAST Oil-Free Rotary Vane Pumps

Adding to an already impressive portfolio of rotary vane pumps, two new oil-free models – SB.16 and SB.40 – being introduced feature an industrial Monobloc design with the rotor assembled directly on the motor shaft. This direct-drive design means fewer moving parts, making these new dry vacuum pumps extremely compact, reliable and easy to maintain. Additionally, a rear centrifugal fan ensures optimal cooling of the pump and each model is equipped with protective filters at the inlet and silencers at the outlet. Both models are also suitable for use as compressors.

A third model, the SC.100, has the rotor installed on the shaft and fixed by two bearings, with the motor being connected by a flexible coupling. The fan is installed between the pump housing and motor to ensure optimal cooling; and a robust and compact housing provides protection and keeps noise levels extremely low.

GAST's new oil-free rotary vane models offer nominal capacities from 19 to 150m³/h at 60Hz. All models provide vacuum in excess of 26"HgV and are ideal for applications including printing, conveying, wood/plastic presses, automated packaging and pick and place operations.

GAST Oil-Lubricated Rotary Vane Pumps

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machining, GAST's new ten-model range of oil-lubricated rotary vane pumps – including the LB.8, LC.12, LC20, LC.25, LC40, LC60, LC106, LC151, LC.205 and LC.305 – are ideal where the intake flow may require higher flow and deeper vacuum.

Additionally, and for applications where intake vapor is considerable, a WR version also features an integral system that separates oil and water condensate, which is then expelled when the pump is stopped.

All six oil-lubricated models offer nominal capacities from 9 to 365m³/h at 60Hz and total final pressures between 1.5 and 0.08 Torr.

Summarizing, Andre Goodson says that, thanks to their advanced performance, durability and ease of maintenance and serviceability, GAST products are trusted globally to operate in critical applications. “The introduction of these new pumps now provides us with a comprehensive product line, which will allow OEMs to minimize their product development timeline and investment and get to market faster than their competitors.” he says.

About Gast Manufacturing

Since 1921, Gast Manufacturing has been a leader in the design and manufacture of quality air-moving products. The company specializes in offering cost-effective solutions for a wide variety of industries, including industrial manufacturing, healthcare and environmental clean-up applications.

In 1998, Gast was acquired by IDEX Corporation and is part of the IDEX Health Science Technologies section. In 2006, Gast acquired JUN-AIR, the leading provider of quiet compressors for a variety of applications. These acquisitions allow its customers to take advantage of the broad product portfolios of both companies and solve their application requirements from the component level through complete compressor solutions.

Gast Manufacturing now sets the standard in the pneumatic industry. From its comprehensive product portfolio and customer services, to its dedicated OEM training, the company is continually committed to providing customers with a truly unforgettable experience.

For further information, call +1-269-926-6171, email gastmfg@idexcorp.com or visit www.gastmfg.com.

Kice Industries Introduces Upgraded Diverter Valve

Kice Industries announced it has introduced an upgraded Diverter Valve to its Diverter Valve line. The improved Diverter Valve is available for Kice Models 67Q2-2 through 67Q6-2 and 68Q2 through 68Q6 (2"OD – 6"OD line size).

“This improvement will help prolong the life of the equipment,” said Jeff Kice, Kice Industries. “The precise blade positioning reduces wear on the leading edge of the diverter blade. We also gave them highly visible position indicators to help operators easily determine proper diverting location without accessing the unit and taking the equipment offline”

Another improvement is the new guard which was engineered to remove potential pinch points, finger entry and equipment protection per safety standards ANSI B11.19-2010 and OSHA 1910.219.

Field conversion kits have been made available for operators, allowing for ease of conversion from a manually controlled diverter valve to an automatic valve.

“The guard's backplate mounts to the existing endplate bolt hole pattern,” said Kice. “Conversion kits are available for mounting the controls on either side of the valve.”

About Kice Diverter Valves

Kice 67-series Diverter Valves and 68-series Bin Fill Valves are heavy duty, cast iron valves with tightly-machined clearances;



The improved Diverter Valve is available for Kice Models 67Q2-2 through 67Q6-2 and 68Q2 through 68Q6 (2"OD – 6"OD line size).

TECHNOLOGY PICKS

meeting the critical need to terminate a pneumatic conveying system at multiple destinations.

About Kice Industries

Founded in 1946, Kice Industries is a fourth generation, family-owned business based in Wichita, Kan. with a team of approximately 300 employees. Kice Industries designs complete industrial air systems and builds most of the equipment specified for these systems. Applications include pneumatic conveying, dust control and aspiration. A multi-industry company, Kice Industries serves the grain, plastics, food, feed, wood and minerals industries. Just north of Wichita, the manufacturing and office facility totals 200,000 square feet on 25 acres. CFM Corporation a subsidiary of Kice Industries is a gray and ductile iron foundry located in Blackwell, OK. The foundry and machine shop is 65,000 square feet on 20 acres.

For more information, please visit www.kice.com

Celeroton Launches Turbo Compressors with Gas Bearings

Celeroton AG, a leading manufacturer of ultra-high-speed electrical drive systems with speeds up to 1 million rpm, has launched its first turbo compressors with gas bearings. They are unique in their weight and performance, being wear-free and oil-free, and obtaining the highest levels of energy efficiency.

The gas bearing turbo compressors CT-17-700.GB and CT-17-1000.GB, with a rated speed of 280,000 rpm in air, are unique turbo compressors based on their size, weight and high system efficiency. They offer 100% oil-free and lubricant-free compression of air, with infinite bearing lifetime in continuous operation, an outlet air pressure ratio up to 24 psi (1.65 bar), a mass flow of up to 24 g/s, maximum overall isentropic efficiency of 59% and a rated maximum power of 1 kW with a volume of just 530 cm³.

“With the development of our gas bearing turbo compressors we have achieved a historical milestone for high-speed turbo compressors,”

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says Christof Zwysig, Managing Director and Head of Research & Development at Celeroton. “The first client feedback on our compressors during field tests have been excellent and confirm the innovative performance of our new flagship product,” adds Martin Bartholet, Managing Director and Head of Sales at Celeroton.

The developed technology expands the opportunity for application areas, where the operation of miniaturized turbo compressors has been either limited or not even possible:

- Oil-free air supply of fuel cells
- Low-maintenance air conditioning and heat pumps with the highest performance (in stationary as well as mobile applications e.g. hybrid and electric cars)
- Mobile respirators and oxygen concentrators



New Celeroton Gas Bearing Turbo Compressor

- Decentralised pneumatics (pressure and vacuum generation)
- High-tech blowers

The Celeroton converters CC-230-3500 and CC-120-1000 are compatible with these turbo compressors and enable the sensorless speed control over the entire operating range. Therefore, Celeroton offers a one-stop air supply.

About Celeroton AG

The Swiss high-tech company Celeroton AG is a leading manufacturer of ultra-high-speed electrical drive systems and turbo compressors with speeds up to 1 million rpm. Faster, smaller, lighter and more efficient: Celeroton’s turbo compressors, converters and permanent-magnet motors are designed for the highest energy efficiency at the lowest volume and weight. Their innovation lies in the interdisciplinary know-how in the areas of aerodynamics, gas and magnetic bearings, mechanics, electromagnetics, electronics, control systems and software that allows for outstanding solutions in terms of compact size, efficiency and control performance.

Application areas of the turbo compressors include air supply systems for fuel cells, air conditioning and heat pumps, high-tech blowers, respirators and oxygen

concentrators and decentralized pneumatics. The motors and converters are applied in the medical and dental industry, in spindles for micromachining, and to drive rotating mirrors and prisms in optical systems, lasers and scanners.

For more information, visit www.celeroton.com email patrik.froeblich@celeroton.com or call +41 44 250 52 32.

Kenos Range of Gripping Tools Extends Piab Packaging and Palletizing Products

Piab extends its program of advanced packaging and palletizing products with the Kenos range of suction pad/foam grippers. The gripping systems – Kenos Vacuum Gripper (KVG), Kenos Sack Gripper (KSG) and Kenos Vacuum Gripper Layer (KVGL) – use Piab’s proprietary and energy efficient multi-stage vacuum ejector technology in combination with specially developed, high quality suction pads/foam to make flexible and efficient packaging and palletizing/de-palletizing tools.

Available with either check valve or flow resistance technology, and configured to use either integrated vacuum generation or an external vacuum generator (pump/blower), the grippers are able to satisfy the needs of various industrial segments

TECHNOLOGY PICKS



Piab's Kenos range of suction pad grippers are perfect for packaging and palletizing.

and practical applications. The technical foam or suction pads of varying dimensions and characteristics provide an excellent gripping surface.

Whereas the general use KVG series offers versatile and flexible gripping tools suitable for a wide range of applications, the more specialised sack gripper (KSG series) is a perfect solution for handling sacks of varying shape, material and weight. The integrated and modular vacuum generation enables a highly flexible system, and a version for external vacuum generation with side channel blower is also available should this be required due to conditions in the industrial environment.

The layer gripper (KVGL series) enables unique, simultaneous handling of complete layers of products, for example a pallet layer of drinks cans or tins of food. A modular system, it can be designed to fit many different dimensions and requirements. Typical applications include palletizing and de-palletizing in business segments such as general packaging, as well as the food and drinks industry.

“Suction pads or foam provide gripping tools that are very forgiving in terms of

positioning, which enables them to be used in less precise applications. The combined use of vacuum pads/foam and pushing bars guarantees optimal grip under all circumstances,” explains Josef Karbassi, Vice President of Piab’s Automation Division.

About Piab

Established in 1951, Piab designs innovative vacuum solutions that improve the energy-efficiency, productivity, and working environments of vacuum users around the world. As a reliable partner to many of the world’s largest manufacturers, Piab develops and manufactures a complete line of vacuum pumps, vacuum accessories, vacuum

conveyors and suction cups for a variety of automated material handling and factory automation processes. Piab utilizes COAX®, a completely new dimension in vacuum technology, in many of its original products and solutions. COAX® cartridges are smaller, more energy efficient and more reliable than conventional ejectors, and can be integrated directly into machinery. This allows for the design of a flexible, modular vacuum system. Piab is a worldwide organization with subsidiaries and distributors in almost 70 countries. Its headquarters are in Sweden.

For more information about Piab, visit www.piab.com.



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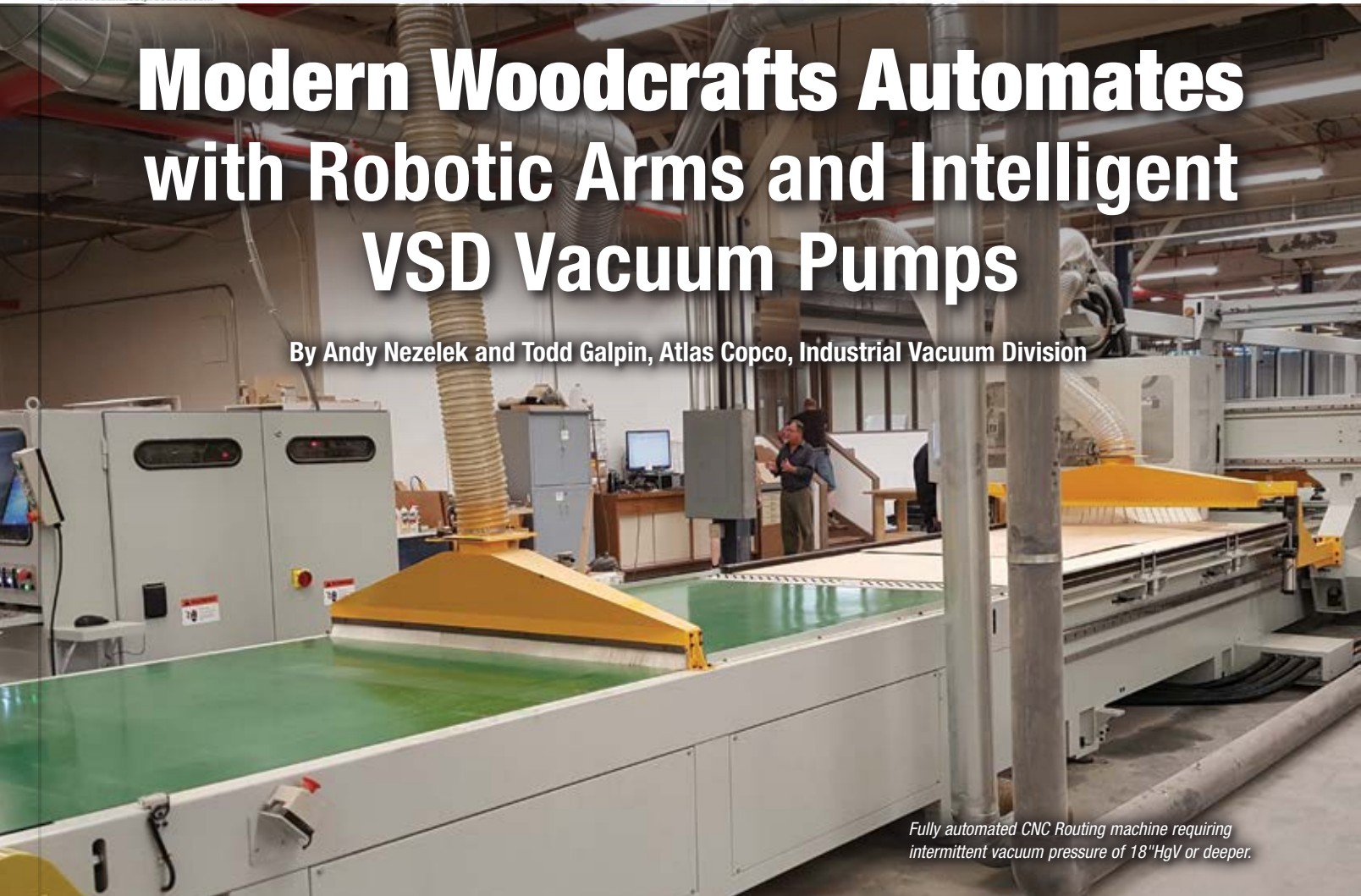
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Modern Woodcrafts Automates with Robotic Arms and Intelligent VSD Vacuum Pumps

By Andy Nezelek and Todd Galpin, Atlas Copco, Industrial Vacuum Division



Fully automated CNC Routing machine requiring intermittent vacuum pressure of 18"HgV or deeper.

▶ “We’re manufacturing better products faster, and technology is making it possible,” says Joe Legere, Executive Vice President for Modern Woodcrafts. The Plainville, Connecticut-based manufacturer of high-end architectural millwork components for building interiors has developed a reputation for exacting quality synonymous with the iconic New York City properties which feature its products.

The unusual paneling on the 101st floor of the Freedom Tower was milled by Modern Woodcrafts. So were the display cases for Tiffany’s and the famous oval bar in the Plaza Hotel. Three additional floors for the New York offices of Facebook are being built out using an old-school building material—vertical grain Douglas fir—milled and finished by Modern Woodcrafts.



“Our material store, cutting machine, router table, paint and finish systems, polisher, compressed air and vacuum systems—all are the best machinery available for the job we need them to do.”

— Joe Legere, Executive Vice President, Modern Woodcrafts

“The Facebook project was designed by Gehry Partners,” Legere explains. “They have a vision and our job is to turn it into reality. They specified vertical grain Doug fir for structural components, doors, casings and interior surfaces. It’s a beautiful material, shipped here from Portland, Oregon, and it’s a special challenge getting all the details right for every piece we work on.”

Fully Automated Material Store Increases Precision, Safety, Repeatability and Reduces Cost

While the Facebook build out involves primarily wood solids, Modern Woodcrafts is also known for milling sheet goods, such as wood veneers and MDF (medium density fiberboard) finished with urethane paint. “Our systems for sanding and polishing result in a perfect high-gloss finish that is repeatable on every panel,” says Legere. “The same mirror

finish you’d expect to see on a Steinway grand piano you can see on an architectural panel. We’re doing it every day.”

The integrated process that leads to perfectly finished components begins in the plant’s new material store. “One way we’re staying at the leading edge in our market is by researching the latest innovations and choosing the best machine for each process,” Legere explains. “Our new material store, operational in June 2017, is one example. It combines a physical data base of sheet goods with a robotic arm that handles materials and presents them to a cutting machine for processing. After a few minutes, a finished part emerges. All of this occurs with zero human interaction.”

The material store includes inventory of up to 2,500 sheets. To the untrained eye they may appear randomly stacked, but Legere says



Modern Woodcrafts upgraded to a Stratos Pro Fully Automated Processing Line, by Anderson America.

MODERN WOODCRAFTS AUTOMATES WITH ROBOTIC ARMS AND INTELLIGENT VSD VACUUM PUMPS

that's not the case. "The system knows where every sheet is located," he explains. "As sheet materials enter our system, they are individually measured since they often vary in thickness. The system remembers this information for every sheet using logic analogous to a computer hard drive, where bits of data are stored on a certain sector and moved around as needed. A robotic arm sorts and stores the sheets, then retrieves the most appropriate ones as needed for each specific project. It's sort of like a smart vending machine for sheet goods."

When a project is preparing to run, the robotic arm fetches the required materials and organizes it all to run in the proper sequence through the cutting machine. Production is continuously buffered and materials are delivered precisely as they're needed. While a sheet is being processed, the material store makes use of otherwise idle time to organize materials to optimize retrieval for projects in the queue.

"There are lots of safety issues involved with having our guys run a fork lift to pull a sheet here and a sheet there," Legere says, "and the time spent doing that is non-value added. Product can be damaged by friction and scratches, too. We've developed a fully-automated manufacturing cell geared towards eliminating human handling and ensuring a consistent and repeatable production rate and sequence. It leverages our lean philosophy and is helping us move to batch one production. We're planning for lights out manufacturing as well."

Legere says the material store presents a leap in production efficiency that can cut the lead time to build something custom from weeks down to days or even hours. "The price point for this technology is now about half what it was five years ago, and we are excited to be able to make the investment. The payback comes in multiple areas including a reduction in the non-value added labor of material handling, a reduction in



The centralized Atlas Copco models GHS 1300 VSD+ and one GHS 730 VSD+ minimize power draw during the vacuum off portion of the production cycle.

material damage from not using a fork lift, better finished product quality with less handling, and faster cycle times.”

Centralized VSD Vacuum Pressure System Quieter and More Energy Efficient

Modern Woodcrafts goes about its precision work with the assistance of vacuum pressure. “The work piece remains stationary while an automated cutting tool moves around it,” says Legere. “It’s held in place with vacuum pressure pulled from below, through a panel of MDF (medium density fiberboard). It looks solid but it’s actually porous. Since it has uniform density, we can pull vacuum evenly across the entire work surface. Strong, consistent vacuum pressure enables us to work faster and more precisely.”

Modern Woodcrafts recently upgraded its vacuum production with a pair of intelligent vacuum pumps with Variable Speed Drive (VSD) from Atlas Copco. One model GHS 1300 VSD+ and one GHS 730 VSD+ work cooperatively to provide the pressure required, typically 18”HgV or deeper, in real time. Both feature groundbreaking technology including Atlas Copco’s patented inlet valve that provides modulating vacuum control working in conjunction with VSD vacuum production. The result is a leap forward in energy efficiency compared to oil-sealed and dry vane vacuum pumps.

All GHS VSD+ Series vacuum pumps are plug and play systems delivered as a fully-enclosed, complete package with a small footprint. Atlas Copco’s industry-leading Elektronikon® control system is standard equipment, as is the SMARTlink remote monitoring solution.

“Modern Woodcrafts was running two router tables, each equipped with a pair of dry vane pumps, for a total of four pumps,” according to Todd Galpin, Regional Sales Manager - USA Region East for Atlas Copco Compressors LLC in West Springfield, Massachusetts. “The vane pumps either ran at full speed or were turned off. Modern Woodcrafts was looking for better efficiency, better overall performance, and lower noise levels. The project heated up quickly when one of the existing vane pumps failed.”

“One of the vane pumps stopped working, and even when they did work they were noisy,” says Scott Thibodeau, Production Manager for Modern Woodcrafts. “We’re always taking steps to reduce noise



Atlas Copco’s GHS VSD+ Series vacuum pumps are a new generation of intelligent, oil-sealed, rotary screw vacuum pumps with unrivaled performance capabilities:

- State-of-the-art vacuum technology with Variable Speed Drive (VSD+)
- Innovative inlet control valve for a leap forward in energy efficiency (around 50%)
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- Proven reliability and performance of Atlas Copco’s rotary screw element
- Superior performance against benchmarked oil-sealed and dry vane vacuum pumps
- Noise levels far below competing technologies
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- Integrated system in a single, compact enclosure with plug-and-play installation
- ISO 50001/14001 compliance for energy management and environmental commitments

MODERN WOODCRAFTS AUTOMATES WITH ROBOTIC ARMS AND INTELLIGENT VSD VACUUM PUMPS

pollution in our work environment. The Atlas Copco pumps are much quieter than the vane pumps to begin with, and because we centralized our vacuum system we were able to locate them in a dedicated room, directly adjacent to sawdust producing machines. That keeps our work environment quieter and our vacuum equipment cleaner.”

Vacuum is delivered to the router tables through a piping network and held at constant pressure right up to a control valve. When the valve opens, vacuum production instantly ramps up to meet the need. When a production cycle is done, the valve is closed and the pumps turn down or even shut down completely, according to demand.

“Much of the energy savings in this application occurs when vacuum to the router table is valved off,” Galpin explains. “While the vane pumps would continue to run, drawing full power, Atlas Copco’s VSD pump solution turns down automatically whenever demand drops, drawing only a few hp. It will even shut itself down and soft restart as needed. Modern Woodcrafts typically has a six-to-eight minute run cycle with vacuum on, followed by a two-to-four minute unload/clean/load cycle with vacuum off. Minimizing power draw during the vacuum off portion of the production cycle contributes significant energy savings.”

“I love the vacuum project,” says Legere. “Everything about it works as we hoped and anticipated, especially the efficiency, dependability and quietness of equipment. It was a complicated project and it took some time to get it all running with the best products for our needs. I appreciate that Atlas Copco made it right. Atlas Copco even assisted us in securing a financial incentive from Eversource, our power utility,

for investing in more efficient production machinery. From where I stand, Atlas Copco is the best for vacuum and also compressed air. Their variable speed technology is just fantastic because you only make what you need.”

An Exciting Future

Legere emphasizes that the vacuum project is part of an ongoing effort at Modern Woodcrafts to achieve greater control over the flow of automated production. “All around the world we are seeing the growth of small, focused, smart factories with systems connected through the Internet of Things. Customers define their needs and manufacturers build to demand, quickly and to a very high standard of quality. The systems we’re integrating today are moving us farther in that direction. Our material store, cutting machine, router table, paint and finish systems, polisher, compressed air and vacuum systems—all are the best machinery available for the job we need them to do. Our growth also means we’re able to redeploy our people to work in other areas of our operation, including in technical roles controlling automation. The way forward is pretty exciting.” **BP**

For more information on Modern Woodcrafts visit www.modernwoodcrafts.com

For more information from the authors contact Todd Galpin, Regional Sales Manager - USA Region East, Atlas Copco Compressors at email: todd.galpin@us.atlascopco.com or Andrew Nezelek, Regional Sales Manager - Utility Vacuum, Atlas Copco Compressors at email: andrew.nezelek@us.atlascopco.com or visit www.atlascopco.us

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“All around the world we are seeing the growth of small, focused, smart factories with systems connected through the Internet of Things. Customers define their needs and manufacturers build to demand, quickly and to a very high standard of quality.”

— Joe Legere, Executive Vice President, Modern Woodcrafts

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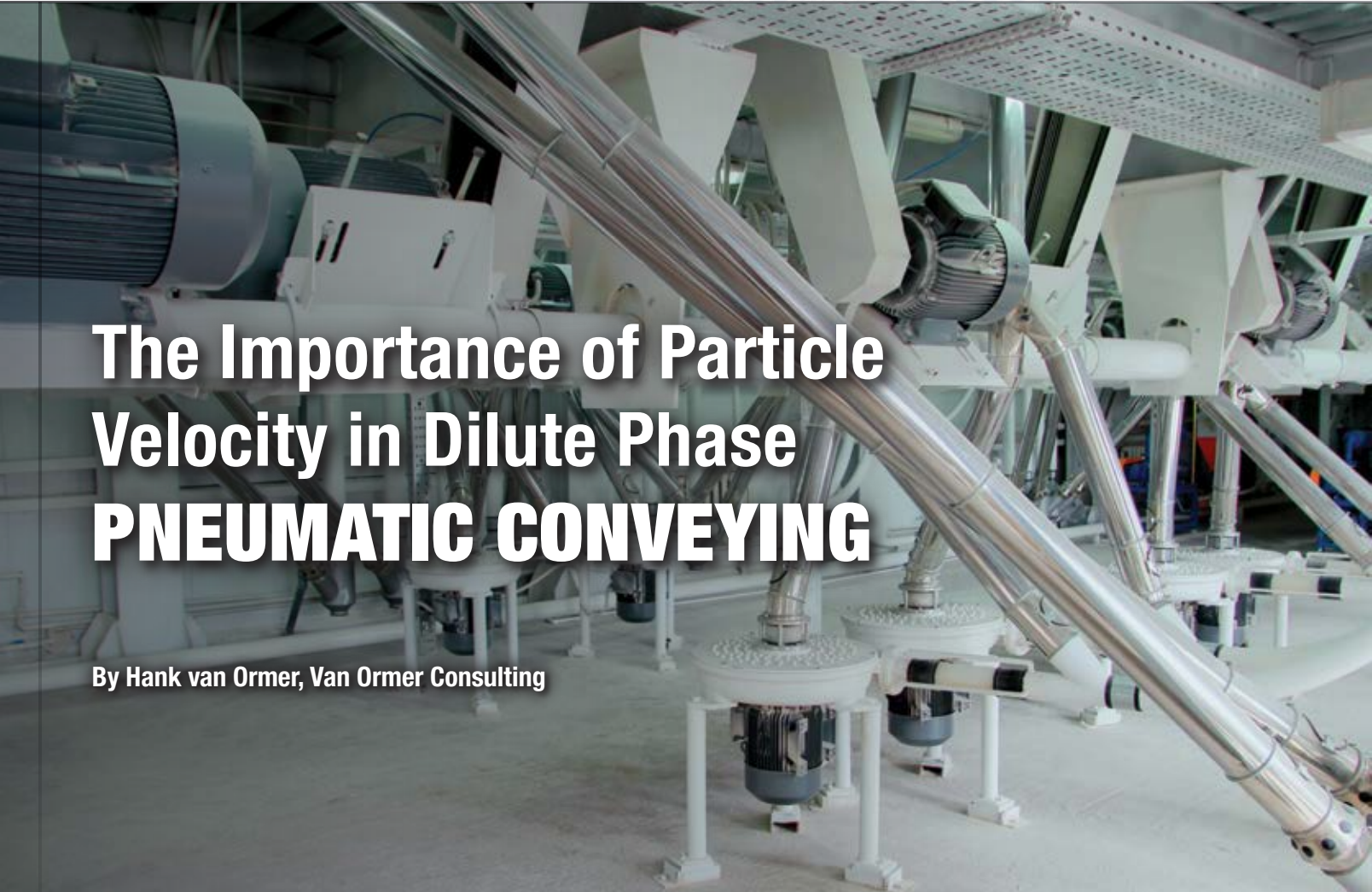
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The Importance of Particle Velocity in Dilute Phase PNEUMATIC CONVEYING

By Hank van Ormer, Van Ormer Consulting

► In open end pipe line suspension flow, or dilute phase pneumatic conveying, proper particle velocity is critical to continuing productivity and product quality. Until recently, measurement of actual particle velocity within the pipe has not been practical outside the laboratory. The plant operating personnel depend on a much less accurate metric — estimating the conveying air velocity in the pipe and relating that to particle velocity.

The objective of this article will not be how to design or engineer a well-operating dilute phase conveying system, but rather to bring awareness

of the importance of knowing the proper particle velocity – to achieve optimum productivity and quality. Identifying the actual particle velocity has always been somewhat of an art form rather than a technical accuracy. Most commonly, pipe line air velocity is calculated based on perceived or measured flow, actual or estimated pressure along the route, and then operated accordingly.

Accurate, non-invasive, particle velocity measurement devices are now available at reasonable cost that can monitor and control actual particle velocity at selected points in the pipe line. This brings a significant

COMMON MATERIALS ASSOCIATED WITH OPEN PIPE/SUSPENSION PNEUMATIC CONVEYING, AND THE IMPORTANCE OF PARTICLE VELOCITY CONTROL

Abrasives	Sand, Glass, Aluminum, Mineral Filled Pellets, Cement, Bauxites, Coal, Grains, Sugar, Carbon Black, Fly Ash, Cereal, and Starch, all cause significant pipe and elbow wear by too high particle velocity *	* Too low of velocity, particularly in horizontal pipe, will allow fall out of particles from the conveying air into the pipe, often leading to plugging and other issues.
Pelletized Resins	Friction at the pipe causes surface deterioration by too high particle velocity *	
Friable Materials	Pet food, Coffee Beans, Grains, and Cereal, all susceptible to breakage and dusting from too high particle velocity *	
Heat Sensitive Material	Sugar, Rubber Pellets, Clay, Hot Melt and Adhesives Wearing against the pipe and elbow walls, creates friction, heat, product build up and plugging from too high particle velocity *	

Figure 1

tool to plant operating personnel to identify and develop the proper operating conveying air velocity and particle velocity profile, even as variables may modify the requirements over time.

Conveying Air Velocity Measurement Formula

Conveying Air Velocity is a critical metric in pneumatic conveying and is easily measured and/or calculated with the proper data, including actual flow in inlet scfm (Nm³/h), and actual pipe line pressure in psig/BAR.

The basic formula for pipe line velocity is:

$$\text{Air flow in Inlet scfm} \div \text{the area of the pipe in sq ft} \div \text{compression ratios of the air in the pipe} = \text{fpm}$$

Example:

Using an entry pressure of 15 psig to the pipe and a blower flow rate of about 1,176 scfm in a 6" pipe (area .196 sq ft) will deliver a conveying air velocity of 3,000 fpm.

AIR FLOW AND PIPE LINE VELOCITY					
NOMINAL PIPE DIAMETER IN INCHES	PIPE AREA (SQUARE FEET)	VELOCITIES OF AIR IN PIPE (FEET/MINUTE)			
		2000	2500	3000	3500
		SCFM REQUIRED TO MEET VELOCITY AT 15 PSI (29.5 PSI)			
3/4"	0.0034	13.6	17.0	20.4	23.8
1"	0.0054	21.6	27	32.4	37.8
1 1/4"	0.00974	38.9	48.7	58.4	68.2
1 1/2"	0.01342	53.7	67.1	80.5	93.9
2"	0.02185	87.4	109.25	131.1	152.9
2 1/2"	0.03734	149.4	186.7	224.1	261.68
3"	0.049	196	245	294	343
4"	0.087	348	435	522	609
5"	0.136	544	680	816	952
6"	0.196	784	980	1176	1372
8"	0.349	1396	1745	2097	2443

Figure 2

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THE IMPORTANCE OF PARTICLE VELOCITY IN DILUTE PHASE PNEUMATIC CONVEYING

Selecting the Air Volume Required

There are some very accurate guidelines to follow when applying compressed air to move material in an open tube or pipe.

- Entry pressure should be 6 to 15 psig entry and at or near atmospheric pressure at the end of the run. To calculate the required volume (scfm) of flow to achieve the desired velocity, use 15 psig (29.5 psia or about 2 ratios) to determine the air flow needed.
- Velocities above 2,000 fpm (33 fps) will keep a great deal of material in suspension within the flowing air stream. Below this, some significant amounts may fall out and stay in the tube. Therefore, about 2,000 fpm is often the recommended minimum velocity.
- As the material to be carried within the air stream gets heavier, the velocities required will increase up to about 7,000 fpm (116 fps), after which great care must be taken that the “sandblast effect” does not harm the piping or tubing. Damage from the “sandblast effect” can start to occur anywhere from 3,000 fpm to 7,000 fpm depending on pipe line configuration, and the abrasiveness of the flowing material.

These limits are general guidelines and not to replace the conveyor system manufacturers recommendations or test data.

Some Key Points:

- As the pressure within the pipe falls due to restrictions and/or nearing the open end, the conveying air velocity will increase. For example, if the entry conveying air velocity is 3,000 fpm at 15 psig start, and the volume stays the same, it will be 6,000 fpm at the 0 psig open end exit. Anywhere along the line when there is a pressure reduction with a fixed flow, the conveying air velocity will increase accordingly. Conversely, should the pressure start to build up in the line, the conveying air velocity will fall.
- Most engineers refer to the conveying air velocity and assume the particle velocity will somewhat lower. This difference between air velocity and particle velocity will vary with such factors as particle size, weight, shape, etc.
- Particle velocity will also be impacted by the pipe line configuration and material. At bends or elbows, the change in direction can cause the particles to impact on the walls and with each other leading to the inevitable reduction in particle velocity and possible product deterioration through particle degradation.

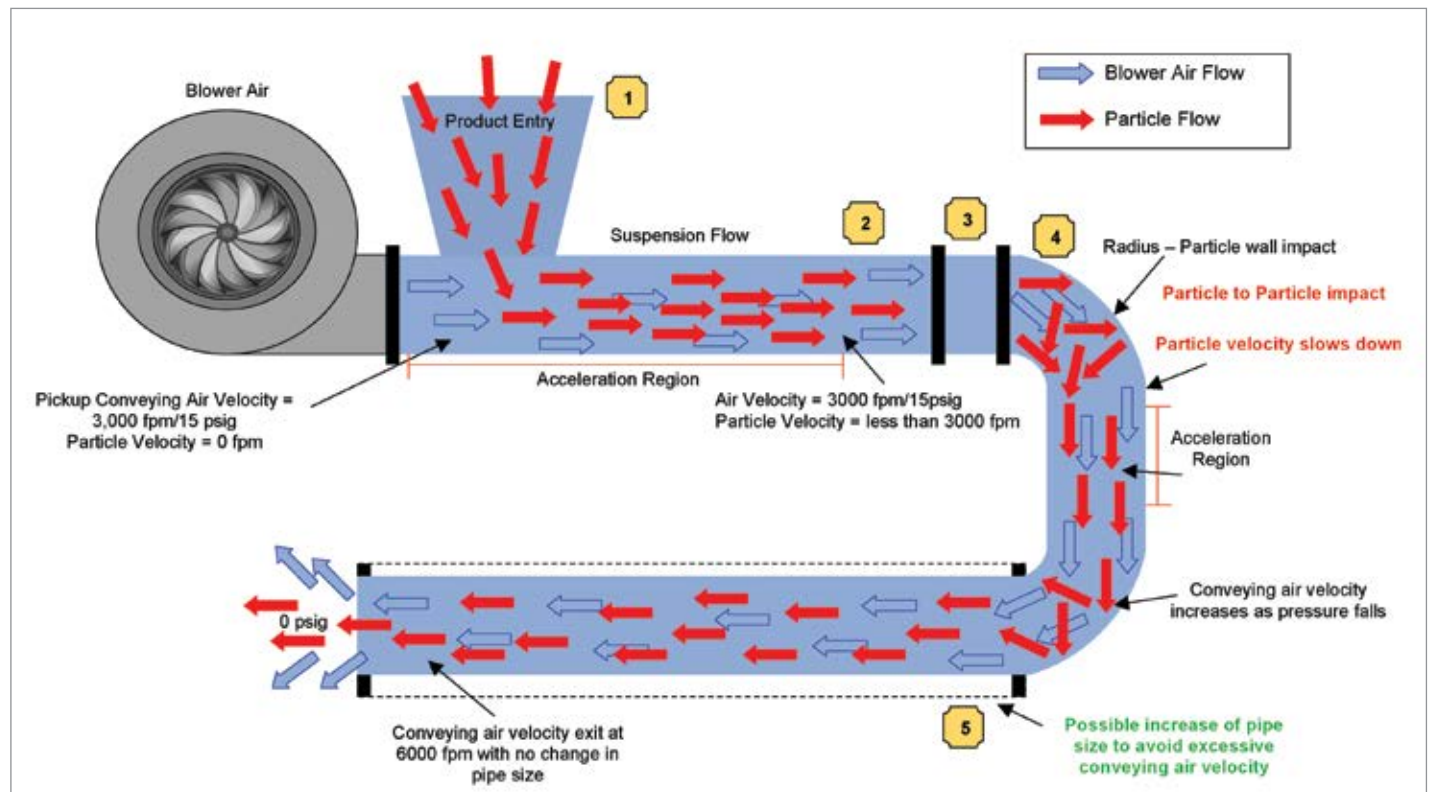


Figure 3. Basic Anatomy of Suspension Particle Flow, Open Pipe Pneumatic Conveying

- Horizontal lines are usually the most critical with regard to particle velocity. The magnitude of these issues is exacerbated with any bend or change of direction.

Understanding the specific dilute phase pneumatic conveying profile is very important; identifying where particle measurement is critical. The particle velocity should be measured directly near these points, possibly along with the simultaneous conveying air velocity at the same locations.

Figure 3 shows some relatively fundamental, common dilute phase system issues that may evolve in any system to illustrate this point. Knowing your conveying air and particle velocity operating profile should help keep many of these issues in the “rearview mirror”.

1. Conveying air from blower product pickup

At pipe line entry, the air from the blower 1,176 scfm at 15 psig into a 6" pipe is 3,000 fpm velocity; the particle velocity of the product is 0 at this point.

2. Acceleration area

From 1 to 2 is the acceleration area where the particle velocity has to accelerate to its terminal velocity (the maximum it can reach in the specific conveying air stream). It is very important that in this area the pipe line stays straight with no bends or elbows since it is not yet at proper particle velocity to stay in suspension and this could lead to significant product fall out.

3. Typical bend or elbows

From 2 to 3, the particles enter an elbow, the conveying air will probably go through the turn with much less effect on velocity than the material particles. Depending on the particle size, weight, shape, and pipe line configuration, it may impact on the side walls of the outside radius. This may be combined with some level of particle to particle impact which altogether can cause product degradation and a resultant reduction in particle velocity. If there is enough reduction and fall out in the elbow, there may

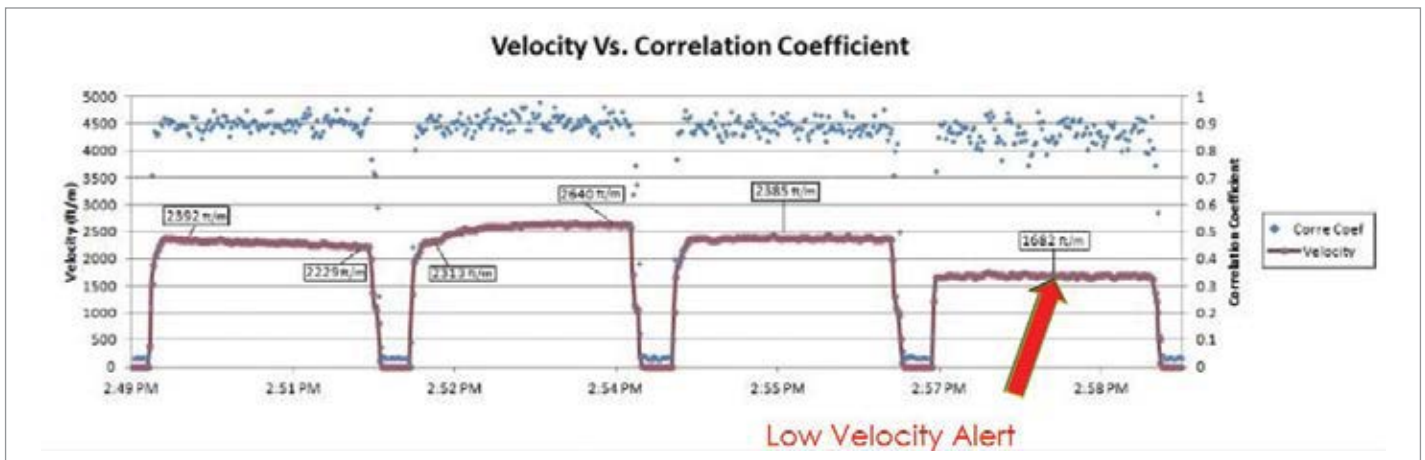


Figure 4. Velocity Monitoring, Railcar Unloading – courtesy www.auburnsys.com

THE IMPORTANCE OF PARTICLE VELOCITY IN DILUTE PHASE PNEUMATIC CONVEYING

be a critical acceleration area following the elbow to be identified to avoid additional issues. The ability to measure what is actually going on in the pipe on site can lead to modifications or velocity control to improve productivity and quality.

4. Second Bend

Same as first bend, hopefully not inside another acceleration area.

5. From 4 to 5 final run of pipe to exit

As the flowing conveying air stream and material flow get close to the exit, the pipe line pressure continues to fall causing a continuing increase in velocity. One popular fix for this is to “upsized” the pipe to the proper size to lower flow velocities to the proper level. Proper measurement, or conveying air and particle velocity will be very effective here.

Measuring Particle Velocity Directly

Proper particle velocity measurement and control can:

- Improve productivity
- Improve product quality
- Reduce and control energy cost to optimum levels

Conclusion

Today’s estimating particle velocity in dilute or suspension pneumatic conveying is more of an art form than an accurate measured science. The introduction of commercially available direct particle velocity measurement instruments at reasonable cost now provides plant operators an effective tool to identify and control the critical operating parameter of “actual particle velocity” under all conditions.

Too often, what we think is optimum velocity (as tested by the conveying equipment supplier), is a fixed value. For optimum performance in productivity, product quality and energy operating expense, the actual velocity must be adjustable. Consider these thoughts:

Why adjustable particle velocity?

- Product characteristics will change the optimum velocity
 - Freshness of product
 - Supplier
 - Environmental conditions
 - Incorrect blending

How can we adjust the particle velocity during operation?

- Adjust the flow as required in a timely manner reacting to the instrument signal.
 - Electronic flow control valve
- Apply blower between 40% and 80% of its full range
 - Control flow with variable speed drive today, signal to control
 - Better reaction
 - More energy efficient
 - Use inlet valve turndown and or blow off or both
 - Apply selected, multiple blower units to fit conditions

Knowing and controlling particle velocity in a proactive manner, allows corrective action by plant operating personnel before there are negative consequences. Today’s modern, non-invasive, continual particle velocity monitoring and control instruments can be a major part of this program. **BP**

For more information contact Hank van Ormer at email: hankvanormer@aol.com.

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Blower Requirements with DO Control

By Tom Jenkins, JenTech Inc.

► The capacity and pressure requirements of blowers in a Water Resource Recovery Facility (WRRF) are determined by the aeration system. When systems are manually controlled blowers often operate at constant flow and pressure day in, day out. When the aeration system is automatically controlled to maintain a set dissolved oxygen (DO), however, the blower's flow and system pressure vary constantly. Understanding these variations will help designers and suppliers optimize blower performance.

Aeration Dictates Flow Rates

In a WRRF the blowers are designed to meet worst case loads. The biochemical oxygen demand (BOD) is the primary factor determining the necessary air flow rate.

The aeration basin wastewater contains dissolved and particulate pollutants. The pollutants are primarily organic (carbonaceous)

compounds and ammonia (NH_3). Clumps of microorganisms, referred to as floc particles, metabolize the organic compounds and convert the ammonia to nitrate (NO_3). To accomplish these processes, they utilize oxygen dissolved in the mixed liquor. Byproducts of the biological activity, water and carbon dioxide, are released into the mixed liquor. [See Figure 1.]

In most WRRFs the dissolved oxygen originates in air bubbles introduced in the bottom of the aeration basin by diffusers. The air is delivered to diffusers by blowers. Approximately 1.1 pounds of oxygen is required to metabolize 1.0 pound of BOD, and 4.6 pounds of oxygen is required to convert 1.0 pound of NH_3 to NO_3 . The oxygen needed by the process can be converted to a mass flow rate of air.

The air flow rate for wastewater applications is often expressed as SCFM (Standard Cubic Feet per Minute). This appears to be a volumetric flow



“The aeration basins constitute the most critical use of air in most WRRFs. Automatic DO control modulates the blower system output to match biological demand for oxygen.”

— Tom Jenkins, JenTech Inc.

rate, but the defined standard conditions establish a fixed density, and therefore it is effectively a mass flow rate. In the wastewater industry standard conditions are 68°F, 14.7 psia, and 36% relative humidity, resulting in a density of 0.075 lb/ft³. Air is 21% oxygen by weight, establishing the mass of oxygen delivered in each SCFM.

Some air flow meters measure mass flow and others measure volumetric flow. The two types may be mixed in a single DO control system. This is not an issue with feedback based DO control – the system simply adjusts the blowers and aeration basins until the DO concentration reaches setpoint.

Another complicating factor is that blowers are volumetric devices. Blower manufacturers prefer to work in ICFM (Inlet Cubic Feet per Minute), the volumetric flow at the blower inlet connection. Another term used is ACFM (Actual Cubic Feet per Minute). It is important to always define the temperature and pressure of the volumetric flow rate under consideration to avoid errors.

It is possible to convert between standard conditions and actual conditions:

$$ACFM = SCFM \cdot T_a / (p_a \cdot 35.92)$$

Where:

- ACFM = Actual volumetric flow rate, ft³/min
- SCFM = Flow rate at standard conditions, ft³/min
- T_a = Actual air temperature, °R
- p_a = Actual air pressure, psia

This formula ignores relative humidity. For most process calculations the resulting error is negligible.

The process demand for oxygen varies widely in most municipal WRRFs. Rain events, industrial loads, and internal process sidestreams impact the biological oxygen needed. The most common variation is the result of daily (diurnal) fluctuations in wastewater flow to the plant as population activity varies during the day. [See Figure 2.]

A DO control system modulates blower air flow rate to match process demand. The designer’s selection of modulation technique is based on blower type and economics. Dynamic (centrifugal) blowers may be modulated by throttling, inlet and discharge guide vanes, or variable frequency drives (VFDs). VFD control is the most energy efficient method for dynamic blowers. Positive displacement (PD) blowers must be modulated by variable speed usually by using VFDs.

Other Air Demands

The typical WRRF has other processes using air. In some cases, these other processes will increase both the total air requirement and the variability needed to match blower output to the process.

Post-aeration is used to elevate the DO of the plant effluent prior to discharge to the receiving water.

In many facilities aerobic digesters are used to reduce the volume of sludge (microorganisms from the aeration process) prior to disposal or beneficial use. Aerobic digesters do not operate continuously. Periodic removal of excess water from the digesters results in changing water depth. Aerobic digestion increases the total blower flow rate requirements.

Some plants use an equalization (EQ) basin to decrease the impact of load changes from diurnal flow variations and rain events. The basins are aerated to avoid septicity and odors. The water level in an EQ basin fluctuates. This changes both the required air flow and the backpressure.

Most WRRFs use open channels to distribute the wastewater to various processes. It is necessary to aerate these channels to avoid odors and eliminate solids settling. The depth of the channels is typically much lower than the depth of the aeration basins. This means that the channel’s air pressure is lower.

Many facilities have a single set of blowers discharging into a common air header. The various processes all tap air from this header. This raises the pressure of the total air flow to match the highest pressure. Excess pressure is reduced by throttling the air flow to other processes.

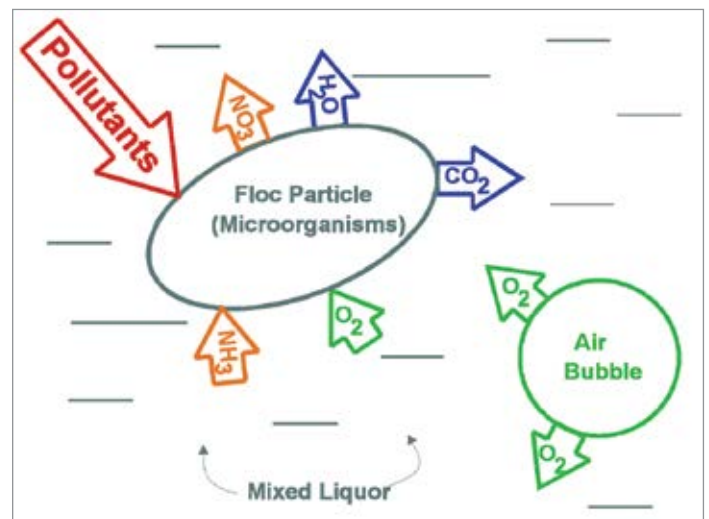


Figure 1: The Biological Process in Aeration Basins

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BLOWER REQUIREMENTS WITH DO CONTROL

It may be more cost effective to use separate blowers for processes, such as channel aeration and digestion, that have low or variable pressure requirements. The additional equipment cost is recovered through lower energy cost.

Pressure Requirements

Blower discharge pressure has as much impact on blower power as flow rate. A DO control system can have an impact on discharge pressure. Pressure considerations need to be included in equipment selection. Note that blowers do not actually produce pressure. Blowers produce air flow, and the system resistance to flow creates pressure.

For most aeration processes the largest single component of the discharge pressure is the submergence of the diffusers in the wastewater. This results in static pressure that must be overcome before any air flow can occur. Static pressure is typically 80% to 90% of total discharge pressure. The second factor in system pressure is the friction loss resulting from air moving through pipe, fittings, valves, and diffusers. This friction loss is proportional to the square of the flow rate.

The combined total pressure can be calculated and plotted against the flow rate, creating the system curve:

$$P_{total} = d \cdot 0.433 + k_f \cdot Q^2$$

Where:

- P_{total} = Total discharge pressure, psig
- d = Depth of water at top of diffuser, ft
- k_f = Constant of proportionality for friction, psi/SCFM²
- Q = Air flow rate, SCFM

If an operating point of flow and pressure is known, either from calculation or measurement, the constant k_f can be calculated:

$$k_f = (P_{actual} - d \cdot 0.433) / Q_{actual}^2$$

Where:

- P_{actual} = Measured or calculated discharge pressure, psig
- Q_{actual} = Measured or calculated air flow rate, SCFM

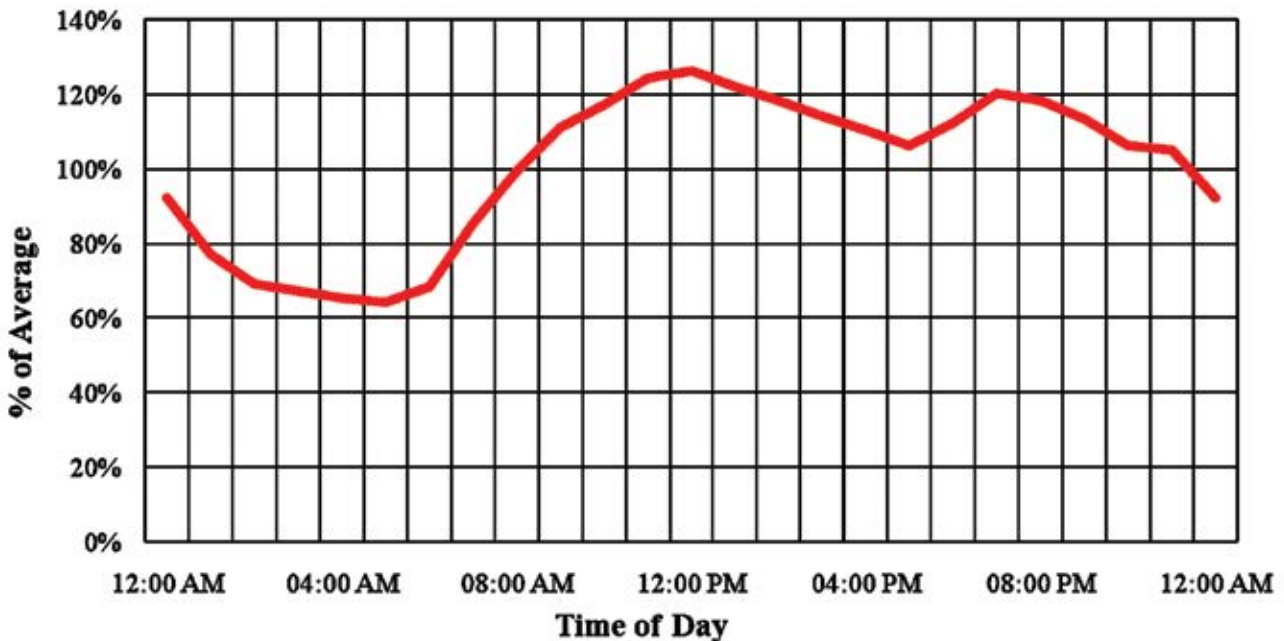


Figure 2: Typical WRRF Diurnal Flow Variations

BLOWER REQUIREMENTS WITH DO CONTROL

DO control systems often employ throttling valves at the aeration basins to control the proportion of total flow that each basin receives. This results in a family of system curves as the system restriction increases with increased throttling of the basin flow control valves. In effect the value of k_T varies with valve position. [See Figure 3.] For dynamic blowers, unless the blower is modulated to compensate for pressure changes, the total delivered air flow will be reduced as the pressure increases. The intersection of the blower performance curve with the system curve identifies the actual operating point as throttling fluctuates. The blower system must be designed to accommodate worst case throttling conditions, although in normal operation pressure should be lower than the maximum.

For positive displacement blowers the performance “curve” is approximately a vertical line. The total blower air flow delivered to the system will not change when basin valves are throttled, but power consumption will increase with increased throttling.

Constant Pressure and Most-Open-Valve Control

In older DO control systems the blowers were operated at constant pressure. This was done to minimize the impact of one basin’s throttling

on adjacent basins. Maintaining constant pressure was employed so blowers would modulate in response to throttling the basin valves. Constant pressure operation unfortunately resulted in increased power consumption, since excess pressure was created by the blowers and then lost in throttling.

As energy cost rose and control capabilities improved, techniques were developed to minimize parasitic pressure losses from basin valve throttling. These techniques are collectively known as Most-Open-Valve (MOV) control. Early MOV controls operated by altering the blower pressure setpoint when basin valves approached limits of travel. Current MOV logic uses advanced control capabilities to directly coordinate blower and basin air flow and valve positions to minimize pressure losses.

Limiting Factors

The flow and pressure delivered by the blower system cannot be infinitely varied to match changing process demand. There are limitations on blowers, aeration equipment, and the process that constrain the useable operating range. In most DO control systems a master control panel clamps the flow and pressure to stay within these constraints.

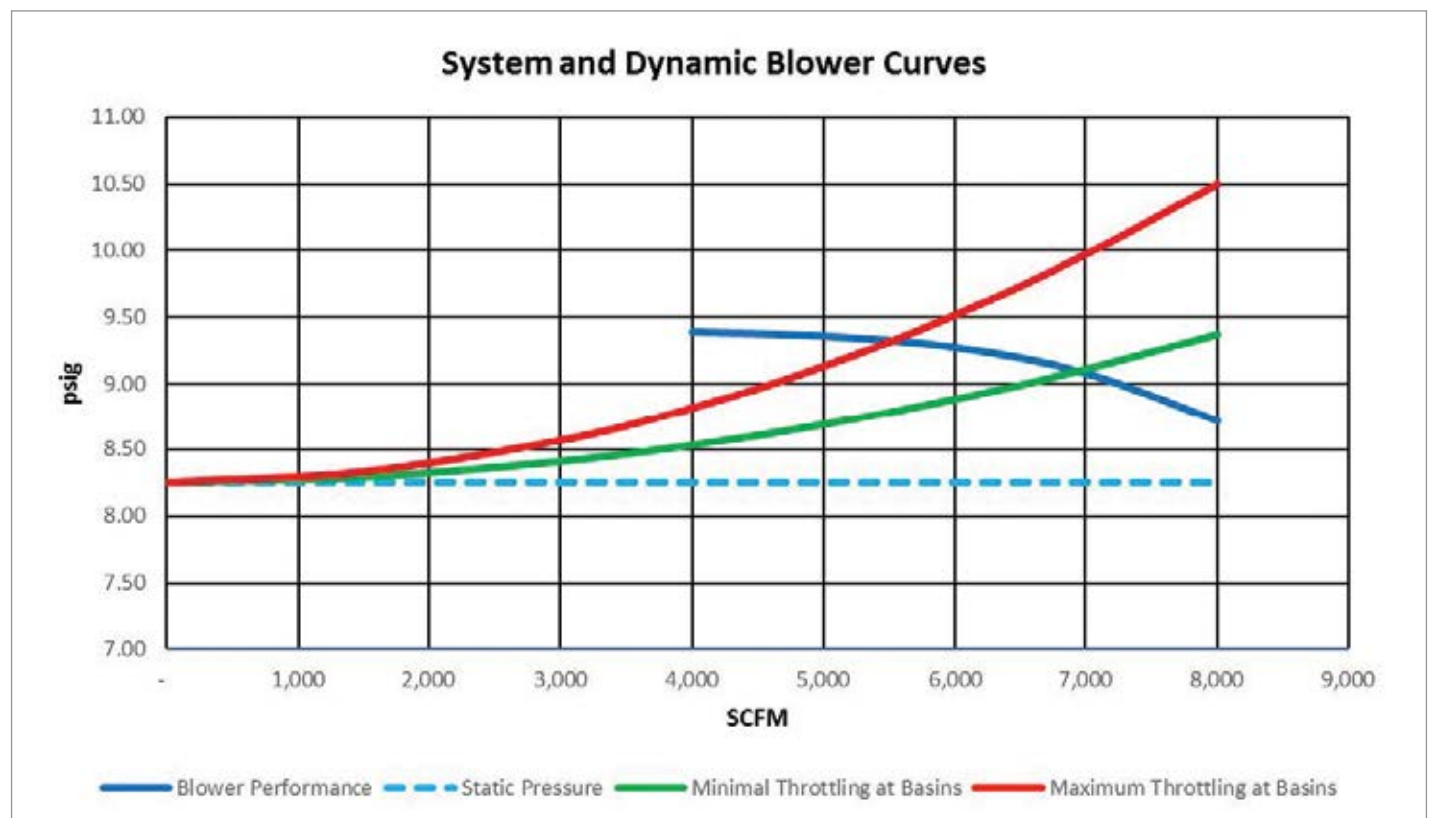


Figure 3: System Curve

Pressure limits are generally a function of blower configuration. If dynamic blowers experience excess flow restriction, resulting in low flow and high discharge pressure, they experience damaging pulsating flow, called surge. Excess pressure on PD blowers will result in motor overload or damage to bearings and rotors.

High flow rates can cause motor overload for both dynamic and PD blowers. Low flow demand can also be a problem – most blowers are limited to a minimum of about 50% of design flow. If the DO control tries to operate the blowers below minimum overheating of blower or motor may result. The DO control's master control panel should coordinate starting and stopping multiple blowers as required to maintain operation within safe limits.

The diffusers that introduce air into the bottom of the aeration tank also have a fixed operating range. If the flow is too low, air isn't released uniformly across the face of the diffuser. This allows biological fouling to partially block the diffusers. If the air flow is too high the resulting pressure differential across diffuser membranes can cause physical damage.

The process itself has a minimum air flow rate, the result of needing to keep floc particles suspended in the wastewater. This mixing air flow is typically between 0.08 and 0.12 SCFM per square foot of water surface.

Conclusion

The aeration basins constitute the most critical use of air in most WRRFs. Automatic DO control modulates the blower system output to match biological demand for oxygen. Other aerated processes can increase total blower air flow requirements. The DO control system should also limit air flow and the resulting pressure to stay within the safe operating ranges. Including these factors in system design is necessary for optimizing aeration systems. **BP**

For more information contact Tom Jenkins, President, JenTech Inc. at email: info@jentechinc.com or visit www.jentechinc.com. Mr. Jenkins has texts now available in hardcopy and electronic versions titled *Aeration Control and Facility Design* at www.riley.com and www.e-wef.org/store

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BLOWER & VACUUM SYSTEM INDUSTRY NEWS

Busch Vacuum Grand Opening Event at New Service Center in Austin, Texas

Busch LLC, a leading provider of vacuum pumps, compressors and blowers in the USA, recently held their official grand opening of their new 4400 sq. ft. service facility in Austin, Texas.

Many of Busch's medium and high vacuum customers, as well as the local chamber of commerce, attended the grand opening. The theme of the event, "Welcome to Vacuum Care. The Future of Vacuum Service", describes the purpose of opening the new Austin location – to enhance Busch vacuum service quality through state-of-the-art equipment and processes.

Attendees were able to tour and learn more about the new service center, which offers single piece flow re-manufacturing with four flow line capabilities that can now process an increased amount of units per day, from disassembly to testing. "Our number one priority is to best support our customers with both our products and service capabilities, so we were pleased to see such great interest in learning about our new facility, which aims to provide an even higher quality of service to our medium and high vacuum customers," said Charlie Kane, General Manager of Busch LLC.

Some of the building's features are additional space, a training center, a fully exhausted disassembly area and visual planning by way of large screens in each area tracking actual movements in the flow lines. Additionally, the new facility offers climate controls for the service area and state-of-the-art process measurement capability of all hard parts. A visitor walkway allows visitors to view the production area without entering it, and customers will be able to track their repairs via the web in real time. The new Busch facility also has the potential to serve as a distribution hub for vacuum pumps and parts.



Busch LLC recently held their official grand opening of their new 4400 sq. ft. service facility in Austin, Texas.

Busch LLC, the U.S. company of Busch Vacuum Pumps and Systems, manufactures a variety of vacuum pumps, blowers and compressors at its site in Virginia Beach (Virginia). Furthermore, customized vacuum systems for all industrial applications are designed and assembled at the Virginia Beach site. Busch LLC offers a range of services – including field service, training and remanufactured vacuum pumps – performed by highly qualified technicians in order to optimize the efficiency of operations. Furthermore, Busch stocks over 10,000 Busch Genuine Spare Parts and therefore offers fast turnaround times to meet any customer requirement.

Visit www.buschusa.com to learn more about Busch solutions for medium and high vacuum applications.

Colfax Announces Acquisition of Siemens Turbomachinery Equipment GmbH

Colfax Corporation ("Colfax") (NYSE: CFX), a leading global manufacturer of gas- and fluid-handling and fabrication technology products and services, announced that it has entered into a binding agreement to acquire Siemens Turbomachinery Equipment GmbH (STE) from Siemens AG for a cash consideration of approximately €195 million.

STE, an innovator in the international turbomachinery business, develops, produces and distributes single-stage compressors and small steam turbines for environmental and industrial applications. The acquisition will be integrated into Colfax's Howden business platform, broadening Howden's range of compression solutions and expanding its product offering into small steam turbines. STE also diversifies Howden's served end-markets and increases its presence in applications with attractive growth potential. For the fiscal year ended September 2016, STE had revenues of €146 million.

"I am delighted to welcome the Siemens Turbomachinery Equipment team to Colfax," said Matt Trerotola, President and Chief Executive Officer of Colfax. "STE's brands reach as far back as 1899, and the business has thousands of satisfied customers and installations around the world. We are excited by the opportunities created by combining STE with Howden's global footprint, continuous improvement culture and aftermarket capabilities. The acquisition expands our end markets and product portfolio in environmental and industrial markets worldwide. We look forward to continuing to innovate and grow together."

"We are very pleased to have entered into an agreement with a prestigious strategic purchaser such as Colfax. Colfax, with its subsidiary Howden, is the ideal purchaser to strengthen the business' overall

competitive position. The sale enables the business to successfully expand in its core business of compressor production for numerous applications, including small steam turbines and associated services,” said Christopher Rossi, CEO of the Dresser-Rand business, part of Siemens Power and Gas Division.

Closing of the acquisition is expected in the fourth quarter 2017 following completion of carve-out activities and fulfillment of customary closing conditions, including receipt of applicable regulatory approvals.

About Colfax Corporation

Colfax Corporation is a diversified global manufacturing and engineering company that provides gas- and fluid-handling and fabrication technology products and services to customers around the world under the Howden, Colfax Fluid Handling and ESAB brands. Colfax believes that its brands are among the most highly recognized in each of the markets that it serves. Colfax is traded on the NYSE under the ticker “CFX.”

Additional information about Colfax is available at www.colfaxcorp.com.

Aerzen USA Opens New Houston, TX Office

Aerzen USA is in a growth and expansion mode. Not only is the company adding-on to the Coatesville, Pennsylvania headquarters, recently we opened our first regional sales office in Houston, Texas. The Gulf Coast of the United States is a highly concentrated area for major refining and petrochemical plants, requiring many Aerzen pneumatic conveying and process gas applications.

Aerzen USA has established many customers in the region over the years and expects to see even more opportunity in this region as this office provides us the ability to get closer to our customers. “End-customer focus is a key to realizing our 2022 vision and goals. Establishment of this office in Houston will allow us to better serve our customers in this region and support their efforts to improve reliability, efficiency and performance of their production processes. Working more closely with our customers is the key to our mutual success.” says Tony Morris, President of Aerzen USA.

The new office space features several areas including a lobby, open workspace, conference room, private offices, kitchen area and a training room. On April 20th, Aerzen USA celebrated the occasion with an open house event. The event was well attended by the Aerzen USA management team, members of our industrial sales team and process

gas application engineers.

Several customers and business partners in the Houston area attended the event to tour the new office and meet the staff members.

The Houston office is presently staffed by sales people as well as application and technical support engineers. The addition of this regional office and staff position Aerzen USA well for future growth.

About Aerzen USA

Aerzen USA is a wholly-owned division of the German manufacturer, Aerzener Maschinenfabrik GmbH, and has been a recognized world leader in the production of rotary positive displacement machines since 1868. Aerzen USA is based in Coatesville, PA.

For more information, visit www.aerzenusa.com.

Leybold Simplifies Repairs and Maintenance Through Augmented Reality

Leybold GmbH, a German company of the Atlas Copco Group, is the first vacuum pump manufacturer to test the diverse application possibilities of Augmented Reality (AR). While executing tasks, service technicians obtain useful additional information and graphical documentation, partly in 3D. Leybold plans to extend the scalable AR apps to other product areas such as training, repair and maintenance purposes.

The real-time visualizations and context-related information concepts are not new to the renowned pump manufacturer. Since the year 2016, Leybold has been using the advantages of Augmented Reality for the dry pumping system DRYVAC. It quickly became apparent that the data provided to customers and service technicians dealing with Leybold products offer additional benefits. These positive experiences have prompted Leybold to extend Augmented Reality to other areas.



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Blower & Vacuum Best Practices is a technical magazine dedicated to discovering Energy Savings in industrial blower and vacuum systems and in municipal wastewater aeration blower systems. Our editorial focus is on case studies and technical articles where application and system knowledge drives technology selection, creating energy savings in projects delivering excellent ROI's.

"A more recent innovation is to control the aeration blowers off of total air flow instead of header pressure."

– Julia Gass, P.E., Black & Veatch (September 2016 Issue)

"Busch designed a customized central vacuum system for the furniture manufacturer, consisting of eight identical Mink claw vacuum pumps, each equipped with a suction capacity of 300 m³/h."

– Uli Merkle, Busch Vacuum Pumps and Systems (feature article in July 2016 Issue)

From WWTP Aeration Blowers to Centralized Vacuum Systems

Our readers have embraced energy management practices as the next step. Our diverse key subscribers work at multi-factory manufacturing organizations and are targets to consider options such as VSD vacuum pumps in newly centralized systems. On the municipal side, over 1,000+ operators at wastewater treatment plants (WWTP's) and blower sales channels receive the magazine. Lastly, a growing group of industrial blower and vacuum OEM design engineers are looking for technologies able to improve their machines.

"Our engineering optimizes blower packages for each field – identifying, for example, the optimal conveying velocities for over 50 types of wheat flour!"

– Todd Smith, General Manager, Coperion K-Tron
(Powder Show Report in a 2016 Issue)

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BLOWER & VACUUM SYSTEM INDUSTRY NEWS

Augmented Reality therefore offers its customers and technicians a wide range of possibilities to perform their service tasks – even without the specialists. Step-by-step instructions fed into the eyesight range of technicians enable a lower error rate. Moreover, the training effort for the technicians is minimized through this visual support and the insertion of interactive content with understandable instructions and checklists.

For the purpose of illustration, high resolution 3D graphics are projected onto the pumps exactly where the tasks have to be carried out. The relevant photo and audio functions can easily be embedded in the respective application. If necessary, different evaluations can be generated.

By using the pilot applications, the realistic presentation possibilities of AR applications on smartphones and tablets are evident. Also, the Microsoft HoloLens glasses can be used. With these Augmented Reality glasses, technicians can work and train without having to hold a device in their hands.

"We see a great potential for applications in the field of Augmented Reality, especially in industrial processes, and this digital strategy is not only a strong market trend, but also meets the challenges of our customers and technicians in the field," said Eckart Roettger, President of Industrial Vacuum Service, elaborating on the value of AR processes. "Instead of taking the instructions from a manual, apprentices have the whole procedure on the object visualized within the display. This will generate a great impact on the value and use of information," explains Eckart Roettger.

Leybold is working on this project with REFLEKT ONE, a software for industrial applications from the Munich-based specialist for Augmented

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and Virtual Reality RE'FLEKT. "Many customers know the benefits of Augmented Reality. The problem, however, is to create tailor-made applications for a variety of products. The scalability of our platform makes it easy for the customer to do it themselves," explains RE'FLEKT CEO Wolfgang Stelzle, on the main motivation to rely on REFLEKT ONE.

One of the main advantages is sustainability: once the software is fully installed, any number of AR applications can be created for training and service scenarios of all products. This results in significant advantages for the customer in terms of downtime, response times and operating costs.

BLOWER & VACUUM SYSTEM INDUSTRY NEWS



About Leybold

Leybold is a part of the Vacuum Solution Division within the Atlas Copco's Compressor Technique business area and offers a broad range of advanced vacuum solutions for use in manufacturing and analytical processes, as well as for research purposes. The core capabilities center on the development of application- and customer-specific systems for the creation of vacuums and extraction of processing gases. Fields of application are secondary metallurgy, heat treatment,

automotive industry, coating technologies, solar and thin films such as displays, research & development, analytical instruments, as well as classic industrial processes. Visit www.leybold.com

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and services focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries. In 2016, Atlas Copco had revenues of 11 Billion Euros and more than 45 000 employees. Since 1952, Atlas Copco is present in Germany. Under the roof of two holdings located in Essen, more than 20 production and sales companies are gathered (February 2017). By end of 2016, the group employed about 3800 people, including about 100 trainees. www.atlascopco.de

To learn more about Leybold, please visit www.leybold.com

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