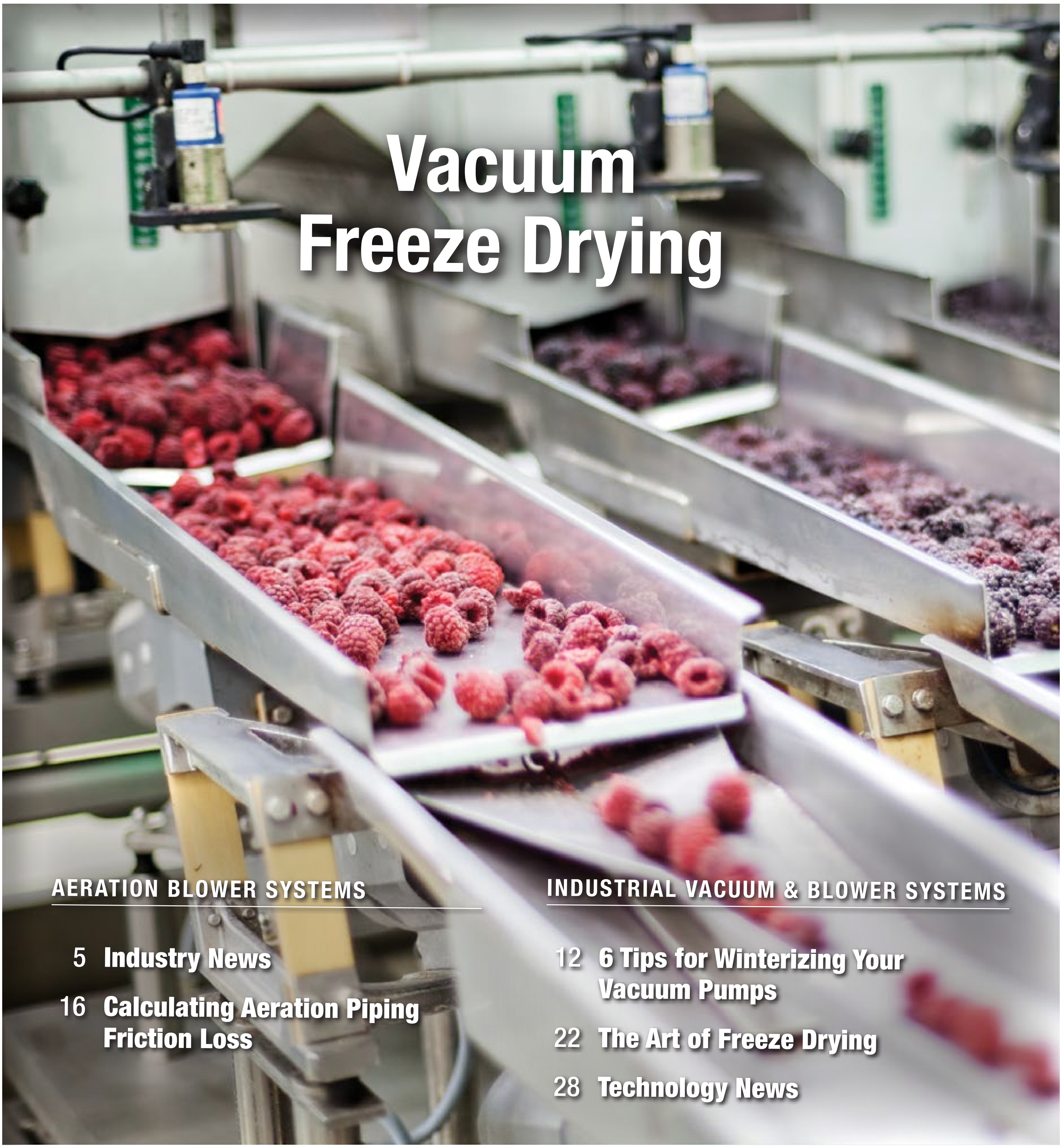
The Magazine for Quality & Reliability in Energy-Efficient Blower & Vacuum Systems

BLOWER & VACUUM BEST PRACTICES

blowervacuumbestpractices.com

May 2024



Vacuum Freeze Drying

AERATION BLOWER SYSTEMS

INDUSTRIAL VACUUM & BLOWER SYSTEMS

BLOWER & VACUUM BEST PRACTICES blowervacuumbestpractices.com

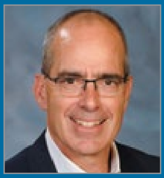
COMPRESSED AIR BEST PRACTICES airbestpractices.com

CHILLER & COOLING BEST PRACTICES coolingbestpractices.com

PROUDLY PRESENTING THE 2024 EXPERT WEBINAR SERIES

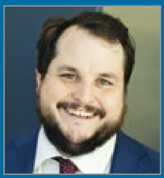
Mike Lenti
Senior Auditor, Compressed Air Consultants

Emma Larrabee
Marketing Manager, Zorn Compressor & Equipment



Tim Dugan, P.E.
President and Principal Engineer, Compression Engineering Corp.

Tom Jenkins, P.E.
President, JenTech Inc.



Phil Johnston, P.E.
Technical Manager, Woodard & Curran

Andrew Smith, P.E.
Co-Founder, SMARTCAir

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

JAN 11 **How to Boost the Energy Efficiency of Rotary Screw Air Compressors**
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, January 11, 2024 – 2:00PM EST

JAN 25 **ASME PTC13 in Action: Practical Approach to Blower System Performance Testing**
Presenter Julie Gass, Lead Mechanical Process Engineer, Black & Veatch and Hiran de Mel, Senior Project Manager and Principal Technologist, Jacobs – *Sponsored by Inovair*
Thursday, Jan 25, 2024 – 2:00PM EST

FEB 08 **Centrifugal vs Rotary Screw Air Compressor Performance: Full Load and Part Load Efficiency**
Presenter Mike Lenti, Senior Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery*
Thursday, February 8, 2024 – 2:00PM EST

FEB 22 **Storage Tank and Pipe Sizing for Large Plants: How to Meet CFM Needs**
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Unipipe*
Thursday, February 22, 2024 – 2:00PM EST

MAR 07 **Sizing Vacuum Pumps and Piping for Various Applications**
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Busch Vacuum Solutions*
Thursday, March 7, 2024 – 2:00PM EST

MAR 21 **Control of Distributed Systems with Multiple Air Compressor Rooms**
Presenter Tim Dugan, P.E., President, Compression Engineering Corporation – *Sponsored by CALMS Air and Comate Intelligent Sensor*
Thursday, March 21, 2024 – 2:00PM EST

APR 04 **Refrigerated vs. Desiccant Dryers – Choosing the Right One**
Presenter Don Van Ormer, Auditor, APEnergy – *Sponsored by Trace Analytics and BEKO Technologies*
Thursday, April 4, 2024 – 2:00PM EST

APR 18 **CTI STD-201RS Thermal Certification for Cooling System Heat Rejection Equipment Part 2**
Presenter Mike Womack, Thermal Certification Administrator, Cooling Technology Institute
Thursday, April 18, 2024 – 2:00PM EST

MAY 09 **How to Identify and Eliminate Artificial Demands**
Presenter Tom Taranto, Owner, Data Power Services – *Sponsored by Kaishan*
Thursday, May 9, 2024 – 2:00PM EST

MAY 23 **Sensors for Compressed Air Systems: Data Management and Analysis**
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by VPInstruments and Kaeser Compressors*
Thursday, May 23, 2024 – 2:00PM EST

JUN 13 **Advanced Aeration Control for Blowers**
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by APG-Neuros*
Thursday, June 13, 2024 – 2:00PM EST

JUN 20 **Simultaneous Cooling & Heating System Design**
Presenter Phil Johnston, P.E. Technical Manager, Woodard & Curran
Thursday, June 20, 2024 – 2:00PM EST

JUL 18 **How to Determine the Optimal Size of a Nitrogen Generator**
Presenter Mike Flowe, President, Flowe Nitrogen Systems – *Sponsored by Pneutech*
Thursday, July 18, 2024 – 2:00PM EST

JUL 25 **Instrumentation and Monitoring for Vacuum Systems**
Presenters Emma Larrabee, Marketing Manager and Todd Dunn, Vice President Sales & Marketing, Zorn Compressor & Equipment – *Sponsored by Quincy Compressor*
Thursday, July 25, 2024 – 2:00PM EST

AUG 08 **How to Diagnose and Fix Common Issues in Rotary Screw Air Compressors**
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, August 8, 2024 – 2:00PM EST

AUG 22 **Thermal Performance of Evaporative and Dry Cooling Systems**
Presenter Clayton Penhallegon, Jr., PE, Integrated Services Group – *Sponsored by EVAPCO*
Thursday, August 22, 2024 – 2:00PM EST

SEP 12 **Aeration Blower Sizing and Selection**
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by Kaeser Compressors*
Thursday, September 12, 2024 – 2:00PM EST

OCT 03 **Selecting PSA vs. Membrane Nitrogen Generation Systems**
Presenter Mike Flowe, President, Flowe Nitrogen Systems – *Sponsored by Pneumatech*
Thursday, October 3, 2024 – 2:00pm est

OCT 10 **How to Interpret Audit Data and Improve Your Compressed Air System**
Presenter Mauricio Uribe, Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery and BEKO Technologies*
Thursday, October 10, 2024 – 2:00PM EST

OCT 17 **Heat Recovery from Compressed Air Systems**
Presenter Don Van Ormer, Auditor, APEnergy – *Sponsored by Kaishan*
Thursday, October 17, 2024 – 2:00PM EST

NOV 21 **Power Consumption Curves for Vacuum Pumps: Fixed-Speed vs Variable-Speed**
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Rogers Machinery*
Thursday, November 21, 2024 – 2:00PM EST

DEC 12 **Compressed Air Leak Detection: Techniques, Methods, Tips, and Tools**
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Rogers Machinery and Teledyne FLIR*
Thursday, December 12, 2024 – 2:00PM EST

DEC 19 **Selection Criteria for Oil-Free Air Compressors**
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, December 19, 2024 – 2:00PM EST

Register for Free Today at airbestpractices.com/webinars

Missed a Webinar? Register to View from our Archives at https://www.airbestpractices.com/webinars

SPONSORED BY

FS-Curtis FS-Elliott · Rogers Machinery Company, Inc. · Kaeser Compressors · Unipipe · BEKO · Busch Vacuum Solutions · Pneutech · CALMS · Kaishan · VP Instruments · Evapco · Inovair · Teledyne FLIR · Neuros · Trace Analytics · Quincy Compressor · Pneumatech · Comate

INDUSTRIAL VACUUM & BLOWER SYSTEMS

AERATION BLOWER SYSTEMS

EVERY ISSUE

From the Editor

Industrial Vacuum & Blower Systems

Spring fever is beginning but as I write this letter, the temperature in Pittsburgh will fall to 27°F (-3°C) this evening. We hope you still find useful, if only for next year, the article sent to us by Robert Stevens from Busch Vacuum Solutions titled, "6 Maintenance Tips for Winterizing Your Vacuum Pumps."

I don't mind confessing, that I did not truly understand the key to freeze drying is the sublimation of ice water, and that vacuum systems are key to this process. I invite our subscribers to also dive into truly understanding this process by reading the article, extremely well written by Bryan Jensen from Rogers Machinery titled, "Freeze Drying and the Sublimation of Ice Water." He writes, "The key to sublimation, that is the phase change of a solid directly into a gas vapor without going through the liquid phase, is pressure; or more aptly, the lack of pressure."

Aeration Blower Systems

We would once again like to thank Tom Jenkins, from JenTech Inc., for his valuable and reliable willingness to share his knowledge with our engineering firm subscribers who are designing wastewater treatment plants and specifying aeration blowers. His latest article is titled, "Calculating Aeration Piping Friction Loss." I'd also like to draw attention to the page 5 announcement of the new online interactive course he'll be teaching for the University of Wisconsin-Madison titled, "Blowers for Wastewater and Industrial Applications."

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

RODERICK M. SMITH
Editor
tel: 412-980-9901
rod@airbestpractices.com

Upcoming Webinars and Recent Webinar Recordings in the Archive

Receive 1.0 PDH Credit by attending our Expert Webinars or visit our Webinar Archives if you can't attend live. Complimentary registration at https://www.blowervacuumbestpractices.com/magazine/webinars

- **March 7, 2024:** Sizing Vacuum Pumps and Piping for Various Applications – *Presenter Andy Smiltneek, President, Growth Solutions Consultants*
  Sponsored by Busch Vacuum Solutions
- **June 13, 2024:** Advanced Aeration Control for Blowers – *Presenter Tom Jenkins, P.E., President, JenTech Inc.*
  Sponsored by APG-Neuros
- **July 25, 2024:** Instrumentation and Monitoring for Vacuum Systems – *Presenters Emma Larrabee, Marketing Manager and Todd Dunn, VP Sales & Marketing, Zorn Compressor & Equipment*
  Sponsored by Quincy Compressor

Blower & Vacuum Industry News

APG-Neuros Announces Major Project with Region of Peel

APG-Neuros announces its success in securing a significant project with the Region of Peel, located in Mississauga, Ontario, a suburb of the City of Toronto.

Following the award for the GE Booth wastewater treatment plant, Plant 1 Blower replacement, APG-Neuros has received a second award for GE Booth Plants 2 & 3. This achievement reflects the customers' recognition of APG-Neuros' expanding capabilities and innovative solutions. APG-Neuros' larger-sized products, reaching up to 4,950 HP, contribute to more effective design solutions for large capacity wastewater treatment plants, resulting in significant savings on capital and energy costs.

APG-Neuros Turbo Blowers Powering Innovation and Sustainability at the GE Booth WWTP.

APG-Neuros will supply a total of 18 Turbo Blowers, with sizes ranging from 200 to 800 HP, to the Peel Region Plants 1, 2 & 3 at GE Booth wastewater treatment plant. This strategic win reinforces APG-Neuros' standing position as a market leader in the wastewater treatment industry. APG-Neuros is committed to serving the municipality of Region of Peel and Ontario Clean Water Agency that operates the GE Booth Plants. APG-Neuros would like to thank the design engineering team at CIMA+ and Black & Veatch for their confidence.

About APG-Neuros

Founded in 2005, APG-Neuros participated in the successful introduction of the high-speed turbo blower technology in the wastewater treatment markets in North America, Western Europe and the Middle East. APG-Neuros turbo blowers are used in a variety of industrial applications and wastewater treatment processes, with over 1,700 units installed in North America and Europe, and more than 7,500 units worldwide. APG-Neuros is a market leader due to constantly driving and propelling innovation forward through the most technologically advanced products and aeration solutions to achieve maximum energy efficiency and operational flexibility for our customers. APG-Neuros' headquarters are located in Quebec, Canada, and its manufacturing and testing facility in Plattsburgh, NY, USA. For more information, visit https://apg-neuros.com/.

The University of Wisconsin Announces New Blower Course

The University of Wisconsin's Interpro announced a new online interactive course, *Blowers for Wastewater and Industrial Applications.* The instructor, Tom Jenkins, has over forty years of system design experience with all types of blowers. Application considerations, theory fundamentals, selection criteria, specification requirements, operating characteristics, and maintenance will be covered. Topics include:

- Basic Thermodynamics for Blowers
- Analysis Methods for Air Moving Systems
- Characteristics of PD and Dynamic Blowers
- Blower Control System Fundamentals
- Blower System Accessories

The course will consist of six 1.5-hour sessions and is eligible for 9 PDH or 0.9 CEU credits. For information, visit https://interpro.wisc.edu/courses/blowers-for-wastewater-and-industrial-applications/.

About Interpro

InterPro (Interdisciplinary Professional Programs) is part of the University of Wisconsin – Madison's College of Engineering. It offers a portfolio of professional education programs and services focused on the needs of engineers, operators, managers, technical professionals, and partner organizations. Learn more at https://interpro.wisc.edu/.

WISCONSIN UNIVERSITY OF WISCONSIN-MADISON

The University of Wisconsin – Madison Announces a New Blower Course.

Blower & Vacuum Industry News

Busch Family Honored with Made in Baden Award

The Busch family, owners of Busch Vacuum Solutions, were presented with the "Made in Baden" award.

Since 2016, the non-profit association "Badische Wirtschaft – Made in Baden" has been recognizing outstanding individuals in business, media, and culture who have strong ties to the Baden region. The "Made in Baden" award is presented by this active network and community of interest, which comprises leading companies in the region. Baden is part of the southwest German state of Baden-Württemberg.

The Busch family was honored for their extraordinary lifetime achievement and the entrepreneurial success of Busch Vacuum Solutions. Professor Hermann Simon, who coined the term "hidden champions" for medium-sized companies with global market leadership, praised Busch in his laudatory speech. "Hidden champions form the elite of the German

Kaya Busch, Ayhan Busch, Professor Hermann Simon, Sami Busch, Ayla Busch (left to right).

economy. I consider Busch to be one of the ten best in this elite. You can only become and remain a world market leader through constant innovation. Busch's innovative strength is outstanding."

In her thank you speech to the initiators and Professor Simon, Ayla Busch said, "Our family feels very connected to the Baden region and loves living here. Our corporate culture has also been strongly influenced by the down-to-earth people of Baden."

The recipients of Baden's leading business award are distinguished by their professional achievements, voluntary commitment and philanthropic behavior in the social sector. Criteria for the award include having a company headquarters in Baden and promoting the image of the Baden region.

This year, in addition to the Busch family, Johann Soder, COO of SEW Eurodrive, a manufacturer of drive technology, and Jonas Andrulis, co-founder and CEO of Aleph Alpha, an AI company working towards compliance with European data protection regulations, were also honored.

About Busch Vacuum Solutions

Busch Vacuum Solutions offers vacuum and pressure solutions from individual vacuum pumps, blowers, and compressors to tailor-made vacuum systems. In addition to vacuum equipment, Busch is also a global service provider. Busch USA headquarters is in Virginia Beach, VA, and part of the global Busch family-owned company with over 3,800 employees in 45 countries. For more information, visit www.buschusa.com.

Black & Veatch Selected for Toronto WWTP Upgrade Project

Serving over 3.6 million customers, Toronto Water is one of the largest municipal water, wastewater and stormwater utilities in North America. Toronto Water's Humber Treatment Plant is located at the mouth of the Humber River in Etobicoke, a suburb west of downtown Toronto. This plant is Toronto's second largest wastewater treatment facility, serving a population of approximately 662,000. As part of Toronto's large-scale Capital Improvements Program (CIP), the Humber Treatment Plant – South Plant required upgrades to address aging infrastructure and

Blower & Vacuum Industry News

buildings, optimize operational performance, and address community concerns.

Toronto Water was looking for a supplier with global wastewater treatment resources and experience with engineering and construction for tight urban spaces. Black & Veatch was selected to work with the City of Toronto's Engineering & Construction Services (ECS) division and provide detailed design, program management, and construction management services for the South Plant upgrades. During the design phase, Black & Veatch determined that only one process train (comprising of one aeration tank and four final clarifiers) could be taken out of service at any given time to maintain existing facility operations throughout construction. The team performed multiple constructability reviews to develop a feasible sequencing plan, avoiding operational disruptions and ensuring compliance with effluent discharge requirements set by the Ministry of the Environment, Conservation and Parks (MECP). City of Toronto ECS and Black & Veatch in conjunction with Toronto Water fostered a collaborative owner/contractor relationship through effective communication and regular team-building meetings.

Updates to the Humber Treatment South Plant included aeration tank modernizations, ferrous chloride feed system replacements, a new Return Activated Sludge (RAS) building, final clarifiers enhancements, electrical substation upgrades, and a new effluent pumping station.

Like most CIPs in major cities, the Humber Treatment Plant upgrades came with numerous challenges that the team had to overcome.

Upgrades to the wastewater treatment plant support millions of residents in Canada's largest city.

In Tunnel Gallery T19, an existing pipe that collected effluent from the final clarifiers needed to be removed to make space for a new scum tank. The effluent conduit discharged to an outfall to Lake Ontario; since it was located below lake level, the galleries were in danger of flooding if the pipe was ever breached. To protect the pipe and proactively reduce the risk of flooding, the team cut an opening into the effluent conduit and sent a professional diver to insert a plug and install a plate with a gasket. From the tunnel side, a plate was welded on and the pipe was filled with grout and encased flush to the wall.

With substantial completion achieved in November 2022, the modernized Humber Treatment Plant handles 125 million gallons per day (473 million liters per day) to keep up with Toronto's rapidly growing population. Construction was strategically sequenced to mitigate any disruptions to facility operations. These upgrades create safer conditions for utility staff, ensure reliability of wastewater treatment processes, and maintain the beautiful City of Toronto landscape.

About Black & Veatch

Black & Veatch is a 100-percent employee-owned global engineering, procurement, consulting and construction company with a more than 100-year track record of innovation in sustainable infrastructure. Since 1915, we have helped our clients improve the lives of people around the world by addressing the resilience and reliability of our most important infrastructure assets. Our revenues in 2022 were US$4.3 billion. Follow us on www.bv.com and on social media.

Carolina Water Service of North Carolina Acquires Carteret County Water System

Carolina Water Service of North Carolina (CWSNC) and Carteret County have closed on CWSNC's acquisition of the Carteret County water system. CWSNC began its partnership with Carteret County in 2020 when CWSNC was the successful bidder for the Carteret County water system. In January 2022, CWSNC became the contract operator for the water system. With this purchase, CWSNC adds approximately 1,200 water service customers in the North River/Mill Creek and Merrimon areas of Carteret County.

"We have a strong track record in North Carolina and Carteret County. Our team's level of customer service and commitment to the community has enabled County leadership to entrust us with providing critical service for public health, safety and economic development," said Don Denton, President of CWSNC. "We take this responsibility seriously and look forward to continuing to serve Carteret County."

The North Carolina Utilities Commission approved the transaction under a law enacted in 2018 which allows municipalities in North Carolina to sell water and wastewater systems for a price based on fair market value. The Carteret County water system purchase by CWSNC is the first to be completed in North Carolina utilizing the fair market value law. Prior to enactment of this law, it was difficult for a municipality to determine the fair value of a water or wastewater system that it was interested in selling to a regulated utility. The law makes it possible for local governments to assess the value and benefits of selling their systems to regulated investor-owned utilities.

Tommy Burns, Carteret County Manager said the law, "gives communities an alternative to value their systems when considering being acquired by an investor-owned water utility." He said, "Carteret County didn't enter into the decision to sell the water system lightly. We conducted our due diligence and found we were unable to continue delivering quality service to the community without continued, significant rate impact. Carolina Water is the local expert and will be able to support upgrades for quality service. State legislation allowed our community to receive a fair price, funds which will be used to enhance the lives of our residents."

Blower & Vacuum Industry News

Denton said, "The Fair Market Value law doesn't require municipalities to sell. It simply supports those which need to or want to do so for a number of different reasons like investment needs, water supply concerns or other priorities. Water and wastewater services are our core focus at Carolina Water Service. We are excited to continue sharing our expertise in Carteret County."

In 2017, the North Carolina's State Water Infrastructure Authority estimated the state was facing up to $26 billion in water and wastewater infrastructure needs over 20 years. North Carolina is not alone as the nation's water and wastewater systems are reaching the end of their lifespan and facing a need for critical investment.

Customers will receive a welcome letter in the mail with information about customer service and more.

About Carolina Water Service of North Carolina

Carolina Water Service, Inc. of North Carolina is a private water and wastewater utility provider delivering safe and reliable service across 38 counties in North Carolina. Carolina Water Service, Inc. of North Carolina cares about the health and wellbeing of customers, employees and the environment. Employees actively contribute to the communities where they live and work. This commitment is expressed in the Company Purpose: "We help people enjoy a better life and communities thrive." For more information, visit https://www.myutility.us/carolinawater.

Ridgewood Infrastructure Acquires Waste Resources Management

Ridgewood Infrastructure LLC ("Ridgewood"), a leading infrastructure investor in the U.S., announced the acquisition of Waste Resources Management ("WRM"), a mission-critical provider of liquids and wastewater collection, treatment, and disposal serving the commercial and industrial market.

"WRM is an industry leader, operating a strategically advantaged, vertically integrated network of wastewater treatment facilities and related specialized rolling stock across several high-growth states," said Ryan Stewart, Partner at Ridgewood. "WRM services are essential to its diversified customer base. We look forward to working with the WRM management team to scale the business and further enhance its service offerings."

Ryan Wurgler, CEO of WRM, said, "We are excited to join forces with Ridgewood Infrastructure, which shares our focus on fostering long-term partnerships with customers and our commitment to operational excellence and sustainability. Ridgewood has a proven track record as the leader investing in U.S. water sector infrastructure and in helping companies like ours achieve transformational growth."

Ross Posner, Managing Partner of Ridgewood Infrastructure said, "We are thrilled to add WRM to our portfolio and look forward to working together to take the company to the next level. Ridgewood's investment in WRM exemplifies our continued ability to create differentiated investments in essential water and wastewater infrastructure on behalf of our investors."

Ridgewood was advised by Houlihan Lokey and Kirkland & Ellis.

About Ridgewood Infrastructure

Ridgewood Infrastructure is a leading infrastructure investor in the U.S. lower middle market with sectors of focus including Water, Energy Transition, Transportation, and Utilities. For more information, visit www.ridgewoodinfrastructure.com.

About WRM

WRM is a mission-critical provider of liquids and wastewater collection, treatment, and disposal services. WRM controls the full value chain of liquids and wastewater management including numerous treatment facilities located in high-growth regions of the U.S. For more information, visit www.wrmco.com.

Ridgewood Infrastructure®

Ridgewood Infrastructure extends its leadership position in the U.S. water sector with the acquisition of waste resources management.

6 Maintenance Tips for Winterizing Your Vacuum Pumps

By Robert Stevens, Engineering and Marketing Manager, Busch Vacuum Solutions

When cold weather approaches, safeguarding the performance and longevity of your vacuum pumps becomes a top priority. Cold conditions pose unique challenges that can affect the reliability and efficiency of these crucial industrial components. At Busch Vacuum Solutions, we understand the importance of winterization in preventing corrosion, freezing and other potential damage. In this guide, we'll share tips to ensure your vacuum pumps continue to operate optimally during the colder months.

Certain vacuum pump oils are available with improved corrosion resistance that can help you to protect your vacuum pump during wintertime.

1. Periodic Start-Ups

Much like a car engine, vacuum pumps left idle, especially in cold weather, benefit from occasional start-ups. This practice ensures the distribution of oil on lubricated components, preventing corrosion. Additionally, periodic warming of the pump helps clear any condensation, further mitigating the risk of corrosion.

2. End-of-Season Oil Changes

Lubricating oil can thicken over time, exacerbated by the presence of contaminants. Cold weather can further increase the viscosity of the oil, leading to a higher starting current being required, potentially causing inconvenient power trips. Consider servicing your vacuum pump, including an oil change, before anticipated cold weather or a shutdown. Changing to fresh oil at the end of a season removes contaminants, providing superior protection to lubricated components.

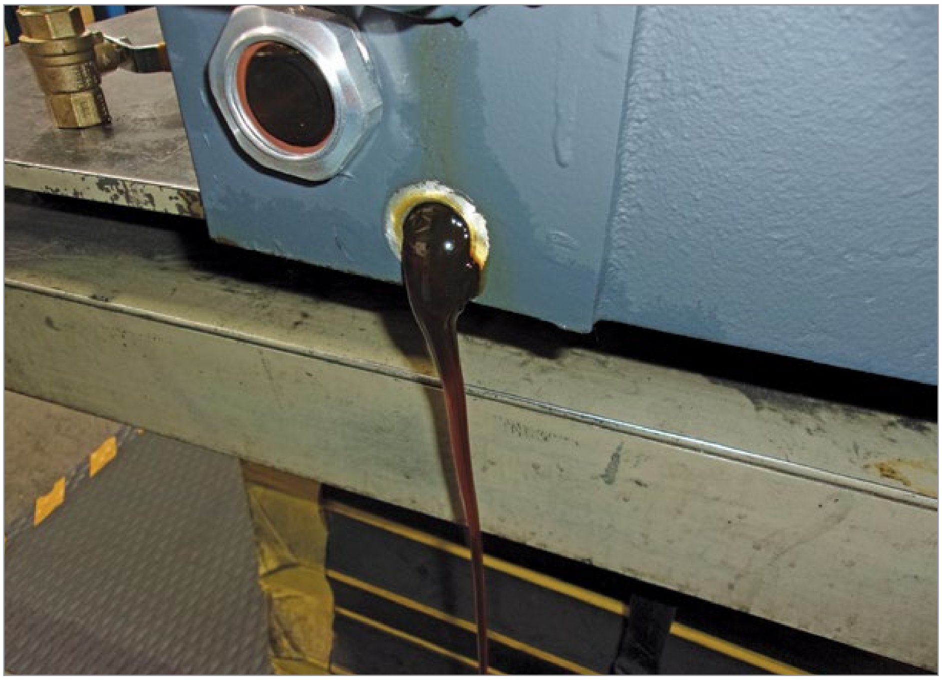
Special vacuum pump oils are also available with improved corrosion resistance and can help you to protect your vacuum pump during wintertime.

3. Yearly Coolant Changes

For pumps with coolants, such as our COBRA dry screw vacuum pumps, annual coolant changes are recommended to prevent degradation that may impact the fluid's ability to prevent freezing. Opt for certified premixed coolant with known performance properties, concentration and corrosion protection.

Changing to fresh oil at the end of a season removes contaminants, providing superior protection to lubricated components.

6 Maintenance Tips for Winterizing Your Vacuum Pumps



Lubricating oil can thicken over time – especially in cold weather – and is exacerbated by the presence of contaminants.

4. Water-Cooled Pumps

In pumps directly cooled with water, ensure continuous water flow during cold weather to prevent freezing. Draining the water from the pump during extended periods of inactivity, especially in sub-zero temperatures, is good practice to avoid potential freezing and subsequent damage.

5. Insulation and Heat Tracing

Regularly inspect the condition of lagging materials (materials used to insulate the pump to reduce heat transfer and energy loss) that provide heat insulation to vacuum pumps and associated pipework. Look for signs of damage, wear or moisture ingress, and confirm secure installation. Pay special attention to areas where lagging may have been removed for maintenance or where accidental damage could occur. For systems with heat tracing (the use of electrical cables to maintain or elevate the temperature of the pump or its components), ensure it functions correctly. Consider using a thermal imaging camera to identify hot spots, especially if heat tracing is absent. Note that meaningful thermal imaging results without heat tracing require the contents to be hotter than the ambient temperature.

6. Filtration Maintenance

Regularly check and empty filtration systems that collect water to prevent freezing-induced cracking. Those with polycarbonate bowls can be especially brittle and prone to cracking. Ensure water-separating filters are emptied before any shutdown to avoid complications during inactive periods.

Proactive winterization measures are crucial for maintaining the reliability and efficiency of your vacuum pumps, ensuring your equipment is well-prepared to handle the challenges of the winter season. Don't let the cold compromise your operations – safeguard your investment with these expert maintenance tips. BP

About Busch Vacuum Pumps and Systems

Busch Vacuum Pumps and Systems is one of the largest manufacturers of vacuum pumps, blowers and compressors in the world. Our products are at the forefront of vacuum and low-pressure technology. For more information, visit www.buschvacuum.com.

All images courtesy of Busch Vacuum Pumps and Systems.

For similar articles on ***Industrial Vacuum Technology,*** visit https://www.blowervacuumbestpractices.com/technology.

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

BLOWER & VACUUM BEST PRACTICES blowervacuumbestpractices.com | COMPRESSED AIR BEST PRACTICES airbestpractices.com | CHILLER & COOLING BEST PRACTICES coolingbestpractices.com

PROUDLY PRESENTING THE 2024 EXPERT WEBINAR SERIES

Don Van Ormer
Auditor, APEnergy

Julie Gass
Lead Mechanical Process Engineer, Black & Veatch

Andy Smiltneek
President, Growth Solutions Consultants

Mike Flowe
President, Flowe Nitrogen Systems

Hiran de Mel
Senior Project Manager and Principal Technologist, Jacobs

Tom Taranto
Owner, Data Power Services

Todd Dunn
Vice President Sales & Marketing, Zorn Compressor & Equipment

JAN 11 — **How to Boost the Energy Efficiency of Rotary Screw Air Compressors**
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, January 11, 2024 – 2:00PM EST

JAN 25 — **ASME PTC13 in Action: Practical Approach to Blower System Performance Testing**
Presenter Julie Gass, Lead Mechanical Process Engineer, Black & Veatch and Hiran de Mel, Senior Project Manager and Principal Technologist, Jacobs – *Sponsored by Inovair*
Thursday, Jan 25, 2024 – 2:00PM EST

FEB 08 — **Centrifugal vs Rotary Screw Air Compressor Performance: Full Load and Part Load Efficiency**
Presenter Mike Lenti, Senior Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery*
Thursday, February 8, 2024 – 2:00PM EST

FEB 22 — **Storage Tank and Pipe Sizing for Large Plants: How to Meet CFM Needs**
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Unipipe*
Thursday, February 22, 2024 – 2:00PM EST

MAR 07 — **Sizing Vacuum Pumps and Piping for Various Applications**
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Busch Vacuum Solutions*
Thursday, March 7, 2024 – 2:00PM EST

MAR 21 — **Control of Distributed Systems with Multiple Air Compressor Rooms**
Presenter Tim Dugan, P.E., President, Compression Engineering Corporation – *Sponsored by CALMS Air and Comate Intelligent Sensor*
Thursday, March 21, 2024 – 2:00PM EST

APR 04 — **Refrigerated vs. Desiccant Dryers – Choosing the Right One**
Presenter Don Van Ormer, Auditor, APEnergy – *Sponsored by Trace Analytics and BEKO Technologies*
Thursday, April 4, 2024 – 2:00PM EST

APR 18 — **CTI STD-201RS Thermal Certification for Cooling System Heat Rejection Equipment Part 2**
Presenter Mike Womack, Thermal Certification Administrator, Cooling Technology Institute
Thursday, April 18, 2024 – 2:00PM EST

MAY 09 — **How to Identify and Eliminate Artificial Demands**
Presenter Tom Taranto, Owner, Data Power Services – *Sponsored by Kaishan*
Thursday, May 9, 2024 – 2:00PM EST

MAY 23 — **Sensors for Compressed Air Systems: Data Management and Analysis**
Presenter Andrew Smith, P.E., Co-Founder, SMARTCAir – *Sponsored by VPInstruments and Kaeser Compressors*
Thursday, May 23, 2024 – 2:00PM EST

JUN 13 — **Advanced Aeration Control for Blowers**
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by APG-Neuros*
Thursday, June 13, 2024 – 2:00PM EST

JUN 20 — **Simultaneous Cooling & Heating System Design**
Presenter Phil Johnston, P.E. Technical Manager, Woodard & Curran
Thursday, June 20, 2024 – 2:00PM EST

JUL 18 — **How to Determine the Optimal Size of a Nitrogen Generator**
Presenter Mike Flowe, President, Flowe Nitrogen Systems – *Sponsored by Pneutech*
Thursday, July 18, 2024 – 2:00PM EST

JUL 25 — **Instrumentation and Monitoring for Vacuum Systems**
Presenters Emma Larrabee, Marketing Manager and Todd Dunn, Vice President Sales & Marketing, Zorn Compressor & Equipment – *Sponsored by Quincy Compressor*
Thursday, July 25, 2024 – 2:00PM EST

AUG 08 — **How to Diagnose and Fix Common Issues in Rotary Screw Air Compressors**
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, August 8, 2024 – 2:00PM EST

AUG 22 — **Thermal Performance of Evaporative and Dry Cooling Systems**
Presenter Clayton Penhallegon, Jr., PE, Integrated Services Group – *Sponsored by EVAPCO*
Thursday, August 22, 2024 – 2:00PM EST

SEP 12 — **Aeration Blower Sizing and Selection**
Presenter Tom Jenkins P.E., President, JenTech Inc. – *Sponsored by Kaeser Compressors*
Thursday, September 12, 2024 – 2:00PM EST

OCT 03 — **Selecting PSA vs. Membrane Nitrogen Generation Systems**
Presenter Mike Flowe, President, Flowe Nitrogen Systems – *Sponsored by Pneumatech*
Thursday, October 3, 2024 – 2:00pm est

OCT 10 — **How to Interpret Audit Data and Improve Your Compressed Air System**
Presenter Mauricio Uribe, Auditor, Compressed Air Consultants – *Sponsored by Rogers Machinery and BEKO Technologies*
Thursday, October 10, 2024 – 2:00PM EST

OCT 17 — **Heat Recovery from Compressed Air Systems**
Presenter Don Van Ormer, Auditor, APEnergy – *Sponsored by Kaishan*
Thursday, October 17, 2024 – 2:00PM EST

NOV 21 — **Power Consumption Curves for Vacuum Pumps: Fixed-Speed vs Variable-Speed**
Presenter Andy Smiltneek, President, Growth Solutions Consultants – *Sponsored by Rogers Machinery*
Thursday, November 21, 2024 – 2:00PM EST

DEC 12 — **Compressed Air Leak Detection: Techniques, Methods, Tips, and Tools**
Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Rogers Machinery and Teledyne FLIR*
Thursday, December 12, 2024 – 2:00PM EST

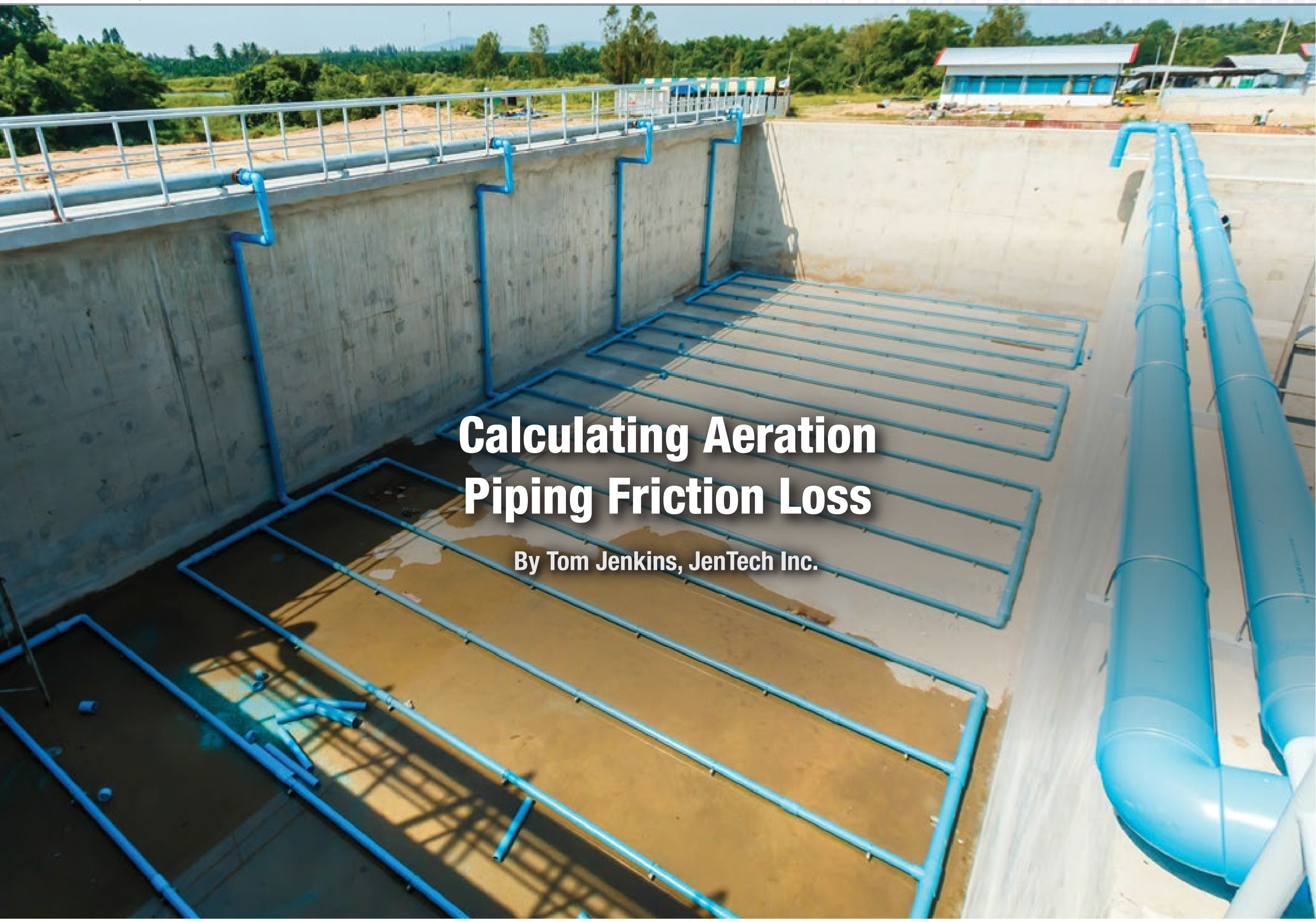
DEC 19 — **Selection Criteria for Oil-Free Air Compressors**
Presenter TBD – *Sponsored by FS-Curtis/FS-Elliott*
Thursday, December 19, 2024 – 2:00PM EST

Register for Free Today at airbestpractices.com/webinars

Missed a Webinar? Register to View from our Archives at https://www.airbestpractices.com/webinars

SPONSORED BY

FS-CURTIS | FS-ELLIOTT | ROGERS MACHINERY COMPANY, INC. | KAESER COMPRESSORS | unipipe | BEKO | BUSCH VACUUM SOLUTIONS | Pneutech | CALMS | KAISHAN | VP INSTRUMENTS | evapco | inovair | TELEDYNE FLIR | APG Neuros | TRACE Analytics | Quincy | pneumatech | COMATE



Calculating Aeration Piping Friction Loss

By Tom Jenkins, JenTech Inc.

In order to properly identify the performance requirements of a blower it is necessary to identify the inlet and discharge pressures. The friction losses in the inlet and discharge piping must be calculated to determine the total pressure requirement. This article details a simplified procedure for calculating piping losses.

Basics

The factors that affect pressure drop through air piping are largely intuitive.

- Flow rate (fluid velocity)
- Pipe diameter
- Pipe length and fitting losses
- Pipe interior roughness
- Fluid density
- Fluid viscosity

The influence of these parameters may be obvious, but the mathematical relationships between them are not. The equations for calculating pressure drop can be complex and intimidating. Calculation is further complicated by the need to assume values for several of the parameters. The result is that pressure drop calculations are not precise, and ±10% should be considered reasonable accuracy. In order to accommodate this uncertainty, it is suggested that the design include the means to accommodate pressure excursions above and below the calculated values.

Alternate Methods

The classic method for calculating pressure drop is the Darcy-Weisbach equation, which appears in many forms. One common form is:

$$\Delta p_f = f \cdot \frac{L}{D} \cdot \frac{\rho \cdot V^2}{2}$$

Where:

Δp_f = pressure drop, lb_f/ft^2

f = friction coefficient, dimensionless

L = length of pipe, ft

D = pipe diameter (or hydraulic diameter for non-circular ducts), ft

ρ = fluid density, slugs/ft^3 (Note: 1 slug = 1lbm · 32.174)

V = velocity of fluid, ft/sec

The Darcy-Weisbach equation is taught in most fluid dynamics classes. It has the advantage of being applicable to any fluid and duct material. However, determination of the friction factor, f, can be challenging. It requires calculating the relative roughness (ε/D) and the Reynolds number (Re). These values in turn are used to determine the friction factor, f. This can be obtained graphically by using a Moody diagram or by iterative solution of the Colebrook equation.

Determining pressure drop for air flowing through a steel pipe is a common problem. Using Darcy-Weisbach can be cumbersome and time consuming. The Compressed Air and Gas Institute (CAGI) has presented an empirical equation that can be solved by iteration. (See Chapter 8, Compressed Air & Gas Handbook, https://www.cagi.org/resource-library) This formula can be written using convenient units as:

$$\Delta p_f = 0.07 \cdot \frac{q_{std}^{1.85}}{d^5 \cdot p_m} \cdot \frac{T}{T_{std}} \cdot \frac{L}{100}$$

Where:

Δp_f = pressure drop from friction, psi

q_{std} = air flow rate, scfm; scfm defined as air at 68°F, 14.7 psia, 36% Relative Humidity (RH)

d = pipe diameter, in

T = absolute air temperature, °R

L = total length of pipe, feet

pm = mean system absolute pressure, psia

$$p_m = p_{initial} - \frac{\Delta p_f}{2} = p_{final} + \frac{\Delta p_f}{2}$$

Note that the impact of relative humidity in these calculations is negligible and is ignored.

To solve for Δpf an initial value is assumed, pm is calculated, and the assumed value used to calculate a new Δpf. The process is repeated until the desired accuracy is achieved. Sufficient convergence usually occurs after two or three iterations.

Calculating Aeration Piping Friction Loss

Pipe Fittings

Air distribution systems rarely, if ever, consist of just straight pipe runs. In practice, pipe fittings often create greater pressure losses than the system's straight pipe. There are multiple ways to account for the effect of the elbows, tees, and other elements in a system. One of the most convenient is to include the effect of fittings by converting them to an equivalent length of straight pipe.

The equivalent lengths of fittings may be defined in terms of length/diameter (L/D). The tabulated value is multiplied by the nominal pipe size in feet to determine the equivalent length in feet.

$$L_{equivalent} = L/D \cdot \frac{ID_{inches}}{12}$$

Equivalent Lengths of Pipe Fittings

Fitting	Length / Diameter, L/D
Gate Valve (full open)	13
Butterfly Valve (full open)	20
Check Valve (full open)	135
90° Standard Elbow	30
90° Long Radius Elbow	20
45° Standard Elbow	16
Transition in Size	20
Standard Tee (flow through run)	20
Standard Tee (flow through branch)	60

The total equivalent length of pipe in a system, or segment of a system, is the sum of the actual pipe length and the total equivalent length of the fittings.

Other Considerations

There are often other components in the system that must be accounted for in the calculations. For example, inlet filters can create pressure drops that affect the inlet density and the necessary blower pressure ratio. The pressure loss across a given filter varies with flowrate and also varies with time as the filter accumulates dust. These changes are not readily predictable. Consequently, a fixed value is usually assumed for filter loss, typically corresponding to the Δp at max flow rate and with a dirty filter element. Typical values are 6" to 12" water (0.2 to 0.4 psig).

Valves are used at several locations in most systems. If they are used for isolation, they will be either fully open or completely closed. Valves, chiefly butterfly valves, are also used for throttling blowers and balancing air distribution between multiple processes. The pressure loss across a valve can be readily calculated if the position of the valve is known (See our article "The Basics of Aeration Control Valves-Part 1" for a deep dive on this). The designer has two choices: assume a valve position and calculate the pressure drop at the expected flowrate or assign an arbitrary value for the pressure drop. A common and conservative allowance for valve losses in aeration systems, for example, is 0.5 psi at the maximum flowrate.

Check valves are a special case. They are commonly employed to prevent flow backwards from the system through parallel blowers. Most air systems use a double disc design and not a swing check design. A spring assists the discs in closing to prevent backflow. A minimum pressure, the cracking pressure, is required to begin opening the discs and some pressure differential across the valve is necessary to hold the disc completely open. If better information is not available, the tabulated value may be used. However, it is recommended that the supplier be consulted for specific application guidance.

Silencers are often employed on the inlet and discharge blower piping. The pressure loss for a given airflow through them varies greatly depending on the design and manufacturer. The pressure drops through silencers, similar to losses through an orifice, is essentially proportional to the square of the air velocity.

Many blower applications include a fixed static pressure that must be included in calculating the required blower discharge. A common example of this is aeration. The blower discharge pressure must exceed the static head of water above the air release point before flow can occur.

Many systems include segments with different pipe diameters and air flows. These are handled by calculating the pressure drop in each segment in series and adding them.

It is usually desirable to develop a system curve, which shows the required pressure over a range of flows. To create a system curve, the pressure losses at several flows are added to the static pressure. For components where pressure loss is given at a single flow rate, for example silencers, the equivalent length of pipe can be back calculated and used for additional data points.

Example

Consider the piping system in Figure 1. The pressure drop between the blower and the vendor-supplied equipment must be determined at maximum airflow rate. The supplier requires 8.5 psi at the connection to their equipment. Ambient conditions are given in the figure.

First, the equivalent length of pipe for the silencer must be calculated. The supplier specifies the pressure loss as 0.25 psi for a flow of 3,000 scfm at 14.7 psia and 68°F. The equivalent length of pipe can be calculated

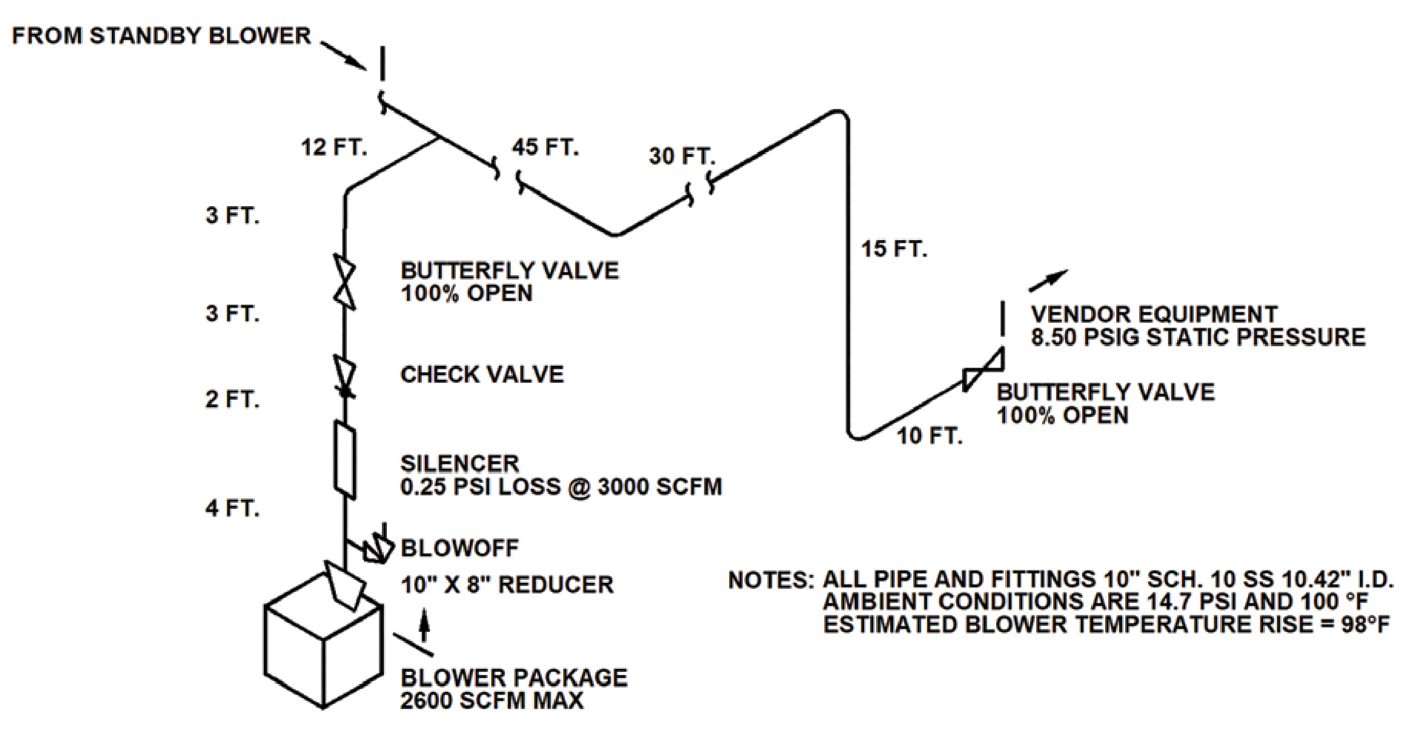


Figure 1: Example Blower Piping System

Calculating Aeration Piping Friction Loss

by rearranging the formula for pressure loss given above.

$$L_{equvalent} = \frac{100 \cdot 0.25}{0.07} \cdot \frac{10.42^5 \cdot 14.7}{3000^{1.85}} \cdot \frac{528}{528} = 238$$

Then the total equivalent length of pipe is calculated as shown in Table 1.

Table 1				
Fitting Type	Equivalent Length, L/D	Equivalent Length, feet, each	Number of Fittings	Equivalent Length, feet, total
Straight Pipe	n/a	n/a	n/a	124
90° Elbow	30	26	4	104
Check Valve	135	117	1	117
Silencer	n/a	238	1	238
Tee, flow thru branch	60	52	1	52
BFV 100% Open	20	17	2	35
Transition	20	17	1	17
Pipe ID = 10.42"			Total:	688

The first iteration of the pressure loss is calculated using an initial assumed value of 0.25 for the pressure loss.

$$p_{final} = 14.7 + 8.5 = 23.2$$

$$p_{m1} = 23.2 + \frac{0.25}{2} = 23.325$$

$$\Delta p_{estimate1} = 0.07 \cdot \frac{2600^{1.85}}{10.42^5 \cdot 23.325} \cdot \frac{460 + 100 + 98}{528} \cdot \frac{688}{100} = 0.437$$

The friction loss is recalculated using the value of Δp from the first estimate:

$$p_{m2} = 23.2 + \frac{0.437}{2} = 23.419$$

$$\Delta p_{estimate2} = 0.07 \cdot \frac{2600^{1.85}}{10.42^5 \cdot 23.419} \cdot \frac{460 + 100 + 98}{528} \cdot \frac{688}{100} = 0.434$$

The difference between the results of the first and second estimates is negligible, indicating the solution has achieved sufficient convergence.

$$\Delta p_f = \Delta p_{estimate2} = 0.434 psi$$

The required discharge pressure at the blower can be calculated:

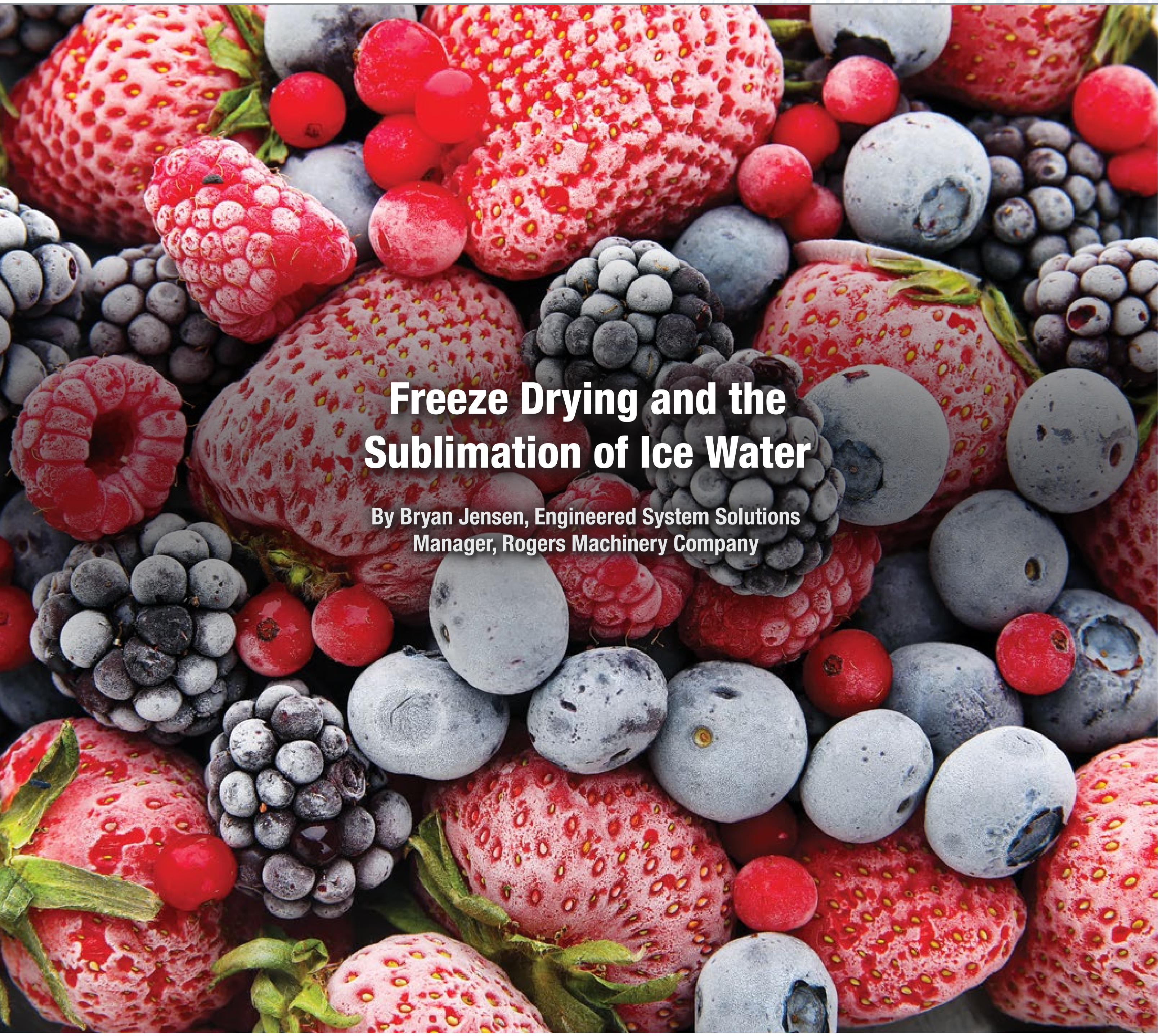
$$p_{discharge} = 8.5 + 0.43 = 8.93\ psig$$

Summary

There are many ways to estimate the pressure losses from friction for air flowing through pipes. The method presented here provides accuracy comparable to other methods with less effort. The method has the further advantage of eliminating the need for graphical information such as the Moody diagram. This enables it to be implemented in spreadsheets or similar software. BP

About the Author

Tom Jenkins has over forty years' experience in blowers and blower applications. As an inventor and entrepreneur, he has pioneered many innovations in aeration and blower control. He is an Adjunct Professor at the University of Wisconsin, Madison and a WEF Fellow. Tom is the current Chair of the ASME PTC 13 Committee. For more information, visit www.jentechinc.com.



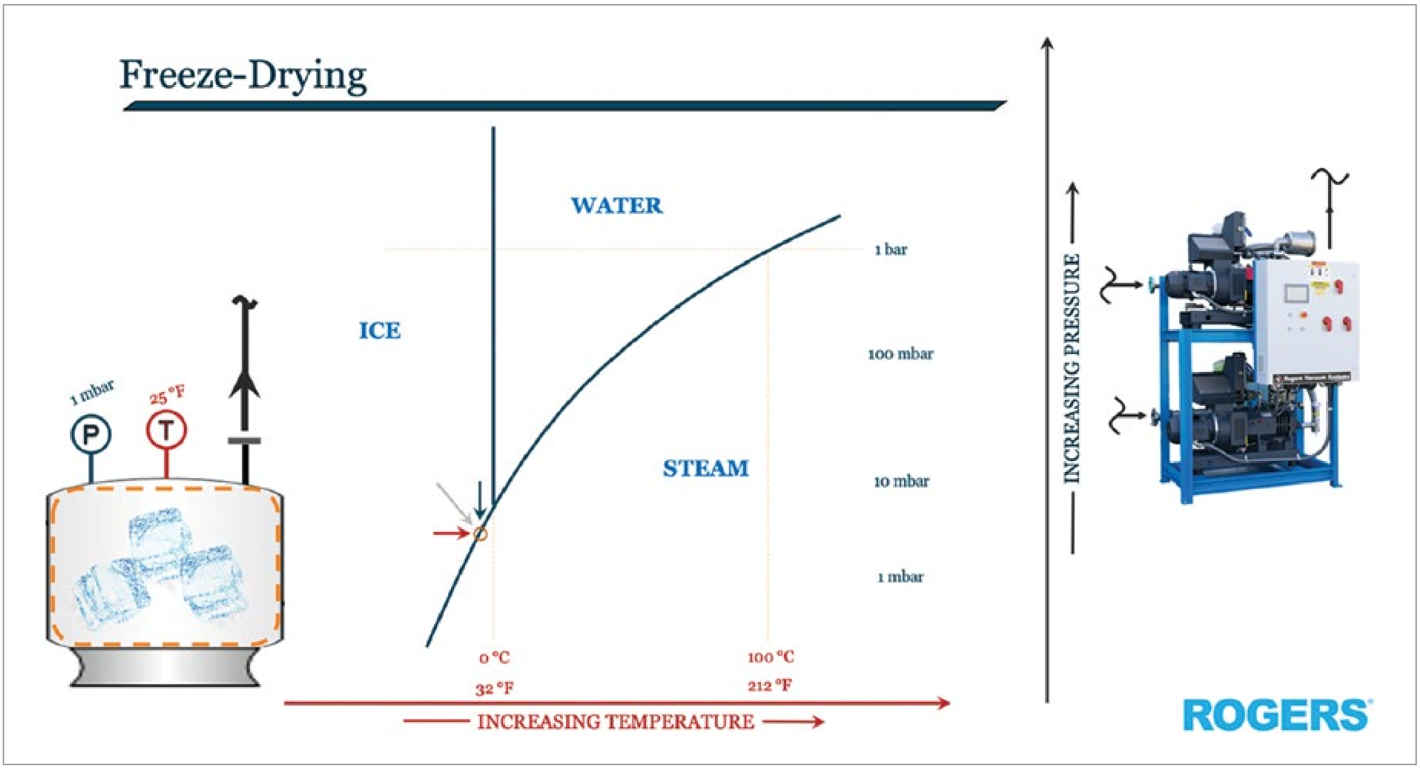
Freeze Drying and the Sublimation of Ice Water

By Bryan Jensen, Engineered System Solutions Manager, Rogers Machinery Company

The phrase pairing the two words freeze and dry is one of the more straightforward and clear descriptions of a process in industry. To freeze dry a blueberry, an ice cream sandwich, the latest-greatest-pharmaceutical or a formaldehyde-infused complex carbon chain; one must first freeze the liquid water (or other liquid compound) into solid ice that is integrally bound within the food or other moist substance.

Next, the material must be dried. That is, the constituent part of the thing must have all the moisture removed from it, just as if blow drying a freshly showered mane. The tricky part is, of course, that the moisture is now embedded within the substrate as a frozen ice brick, and it must remain coldly solid even while it is being dried away from the remaining core stuff in order to preserve the molecular pith of the desired final product.

It turns out that freeze drying anything at all, despite the straightforward word pairing, is pretty darn difficult to pull off.



We view the molecular compound which combines two parts hydrogen to one part oxygen (H_2O) as either solid or liquid since those are the two states in which our eyeballs allow us to see ice or water, respectively. Though it is, rarely do we consider transparent and ethereal steam, the vapor phase of H_2O, as being equally prevalent in our lives.

The key to freeze drying is sublimation (sub-lah-MAY-shun). And the key to sublimation, that is the phase change of a solid directly into a gas vapor without going through the liquid phase, is pressure; or more aptly, the lack of pressure. In the case of H_2O, it takes a low pressure, or at least what we humans here on Earth think of as low pressure, somewhere on the order of a one-thousandth of an atmosphere (~1 mbar) or lower, to sublimate ice directly into steam.

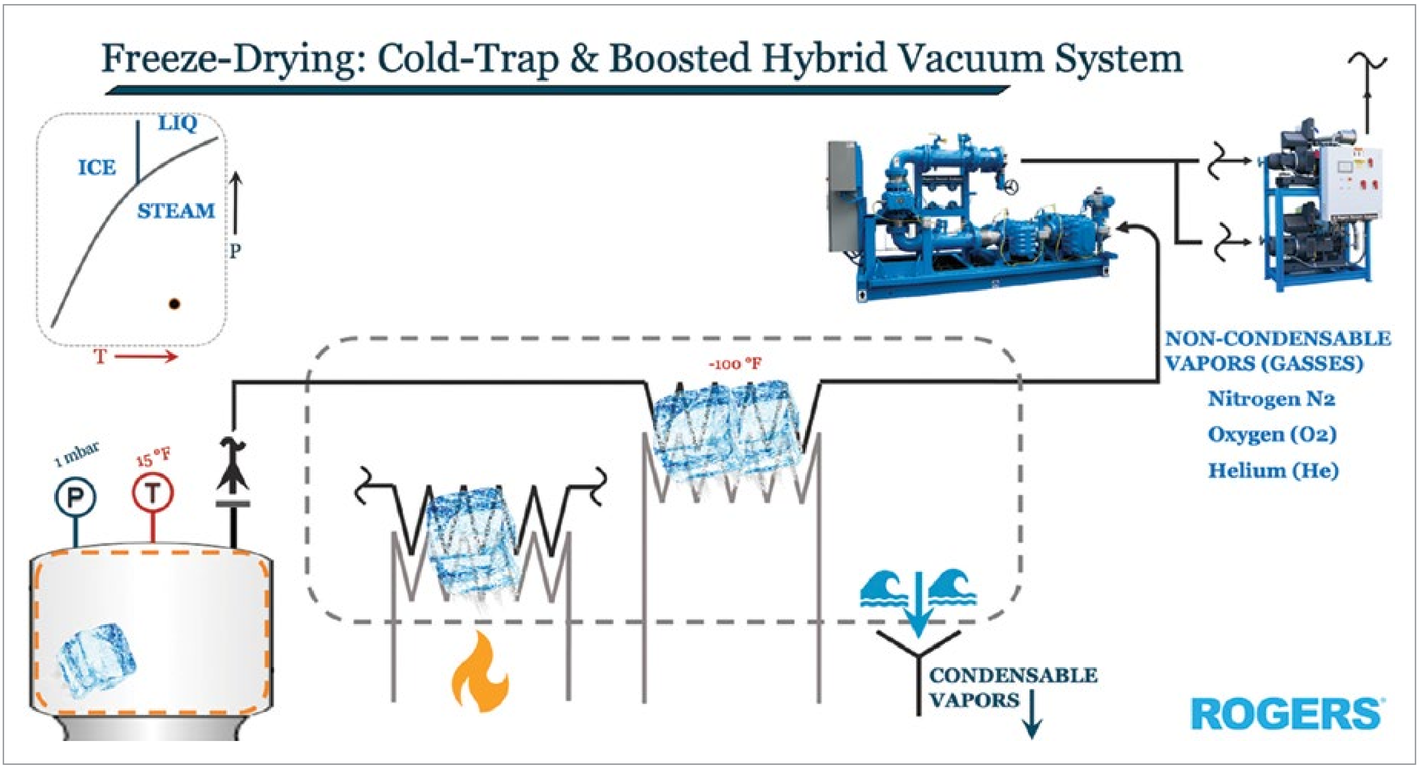
Vacuum Chamber to Pump: Decreasing Pressure with Undulating Temperature

Let's put some frozen strawberries on a tray and place them in a vacuum chamber. Once the embedded ice starts to sublimate when we bring down the chamber pressure to 1 mbar; the solid water will begin to get even colder than frozen. This is because, just like a pot of water boiling on the stovetop, it takes sustained heat energy to drive the sublimating phase change. So, our freeze-drying vacuum chamber also needs some heaters to sustain the temperatures in order to maintain sublimation.

Water expands by a factor of about 1600 times when it changes phases from a liquid or solid into a gas at standard atmospheric pressure. But we are not at atmospheric pressure inside this chamber. Instead, recall that we're at just 1/1000th of that. Therefore, the strawberry's embedded ice is expanding by a factor of at least 1.6 million, or even by a greater factor if the chamber is operating at a lower pressure such as one-half or one-tenth of a mbar, as many do.

This leads us to two realities. One, we must carefully control the rate of heating so that we don't sublimate too hard and explode the strawberry into bits. We are going for a gentle frozen simmer, as opposed to a rolling boil. Two, we need to re-deposit the sublimated ice

Freeze Drying and the Sublimation of Ice Water



back out of the gas stream prior to the inlet of the vacuum pumping system if we want its relatively limited volumetric pumping capacity to have a chance in keeping up with the onslaught of the expanded cold steam.

For this second reason, we must install a cold trap in our freeze dryer. Commonly supplied in pairs to allow for longer batch cycles, these ammonia-based refrigeration evaporators alternate back and forth, similar to the operation of a dual-tower desiccant compressed air dryer. While one cold trap is on-line depositing ice crystals out of the vapor stream, the other is offline and warmed at atmospheric pressure, ice melting to water to be drained away from the system.

In the context of the industrial vacuum system in its entirety, the cold trap can itself be considered a vacuum source, just one that uses thermodynamics in lieu of mechanical pumping. In fact, the collapsing vapor as frost deposits against the evaporator tubes is the single most important aspect regarding performance of the vacuum system at large. It also has huge ramifications on the maintenance requirements of the mechanical systems yet to come downstream. Not only does the cold trap reduce the volume of gas that the mechanical vacuum system must deal with by the same ~1.6MM:1 ratio, but it also eliminates a huge majority of what would become liquid water either inside or in the exhaust system of the vacuum pump.

The relative high pressure of <1 mbar in the cold trap's -100˚F pushes us along on our continuing journey to the lowest pressure we'll see in our vacuum system, that at the inlet throat of the mechanical vacuum pump. Or, in the case of a production operation, the first in, potentially, a series of rotary lobe vacuum boosters. Moving away from the cold trap, the temperature begins to naturally rise again just by the fact that the system piping is passing through a, relatively speaking, scorching +68˚F room temperature environment.

Vacuum Systems and Condensable Vapor Load: Temperature Control

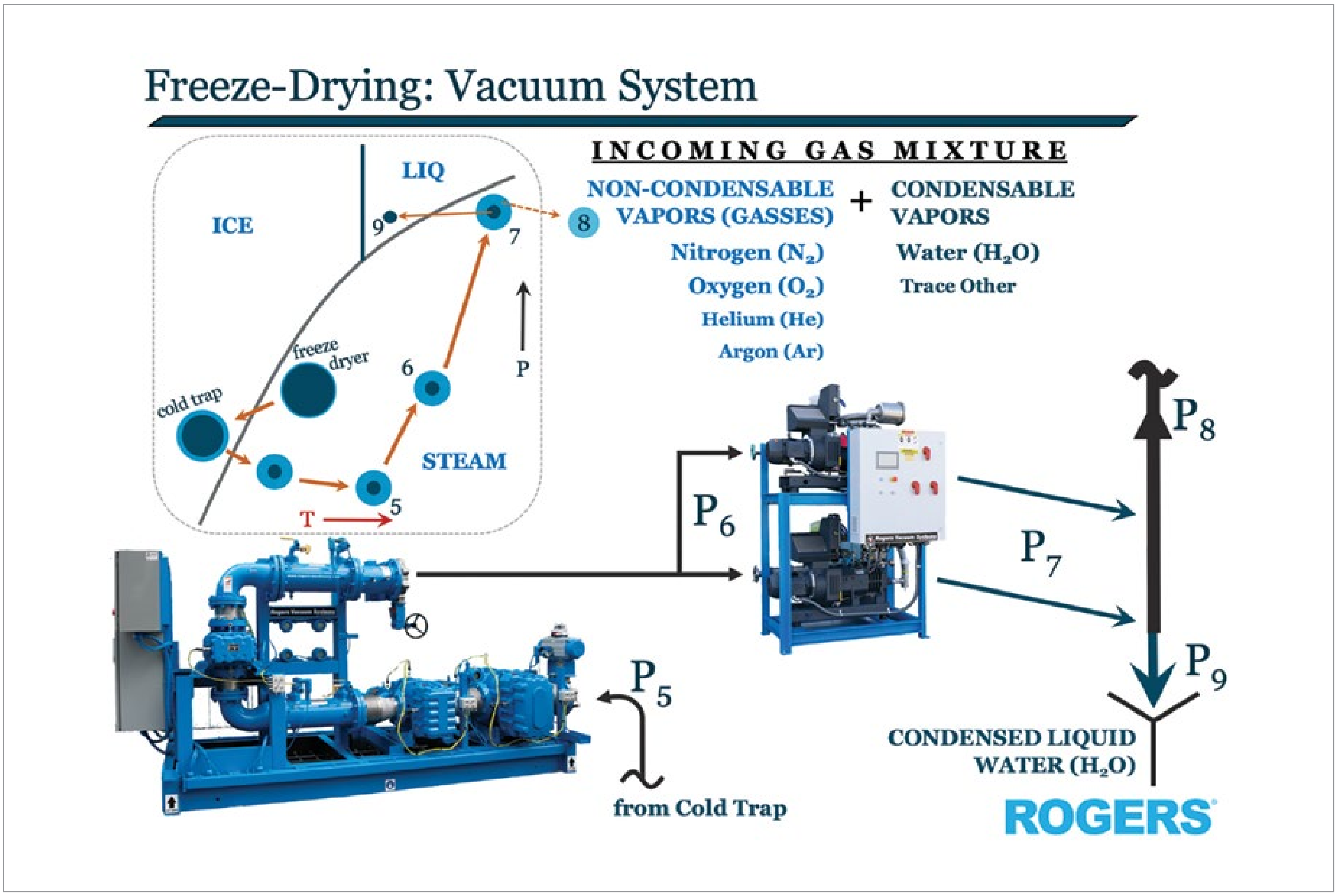
Our vacuum pumping system must now do the heavy lifting of compressing the sum total of the non-condensable nitrogen and oxygen which may have leaked in from the world, the helium or argon which may have been purposefully added for product quality and control, plus any of the condensable water vapor which flew by the cold trap (nothing is 100% efficient), to back up to just slightly above local atmospheric pressure.

Mechanical vacuum boosters and pumps are happiest compressing vapor only, as opposed to liquids and especially (duh) solids. Once we compress our resulting gas mixture to around 1,013+ mbar, any of the condensable vapors will want to do just that – condense – unless we keep them nice and hot. At a pressure of around 0.5 mbar at the vacuum inlet throat, the required compression ratio across the vacuum pumping system will be around 2000:1. If just 3-tenths of a mbar less at 0.2 mbar, then the compression ratio more than doubles to 5000:1. Thankfully, if there's one byproduct that these magnitudes of compression ratios translate to, it is heat energy.

In the case of typical operating pressures and cold trap deposition efficiencies combined with a fully dry-running vacuum system, there should be ample heat-of-compression energy available to temper the vacuum pump cooling such that the targeted exhaust temperatures remain high enough to maintain the vapor phase throughout the pump, into the exhaust system and down and away from the vacuum pump's discharge port.

Lubricant or water-sealed mechanical backing pump technologies may also be used, though each presents unique application challenges, since its operating temperatures must be maintained significantly lower than its dry counterparts. The addition of inert sweep gas or ambient ballast air may be necessary to clear the pump internals and exhaust system of condensing liquids. In any case, to maximize pump life and minimize maintenance

Freeze Drying and the Sublimation of Ice Water



costs it is likely desirable to add such gas packages for proper start-up, control and/or shutdown procedures.

Freeze dry systems are some of the more thermodynamically active vacuum applications around, with operating pressure requirements firmly categorized in the medium vacuum realm. The thermodynamic lessons learned from the principles and subsystems in play can and should be applied broadly to your own industrial vacuum system whether it's freeze-drying or some other process. BP

About the Author

Bryan Jensen is a mechanical and aeronautical engineer with over 20 years of application engineer with over 20 years of application experience in a wide variety of industrial manufacturing processes focusing on the compressed air and gas industry. He grew up in Alaska, trained in the Midwest and started his career as a NASA materials research engineer in the Deep South before returning to the Pacific Northwest. He currently heads the Engineered System Solutions team for Rogers Machinery Company, based in Portland, Oregon.

For more information or any questions, call the Rogers Machinery Company at (503)-639-0808 or visit the custom engineered solutions page at www.rogers-machinery.com.

For similar articles on ***Industrial Vacuum in Food Applications,*** visit https://www.blowervacuumbestpractices.com/industries/food.

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

Need More Vacuum Tips and Tutorials?

Learn Industrial Vacuum Best Practices - View Our FREE* On-Demand Webinars

Our Extensive Library of Webinars Includes These Titles

- Vacuum Specification Fundamentals: Flow vs. Pressure
- How to Correctly Size Vacuum Pumps
- 5 Tips on Optimizing VSD Vacuum Pumps
- Pros & Cons of Centralized Vacuum Systems

*Included with your free magazine subscription

Get FREE Instant Access* at **blowervacuumbestpractices**.com/magazine/webinars

Blower & Vacuum Technology News

Edwards Introduces nEDC300 Dry Claw Vacuum Pump

The nEDC300 from EDWARDS VACUUM is the latest iteration of mono claw vacuum pumps which boasts a range of inventive attributes that not only boost performance but also minimize noise levels, improve reliability, and facilitate on-site maintenance. This means that it can be used in a wide range of applications, such as water and wastewater treatment, thermoforming, vacuum conveying, food processing or even in medical systems. In these processes, the dry claw pump guarantees its users a reliable, cost-effective operation with easy maintenance options.

nEDC300 by EDWARDS VACUUM is the latest generation dry claw vacuum pump.

"All in all, with the nEDC300 we have developed an uncomplicated vacuum solution that is closely oriented to the standards and quality requirements of the target markets," said Megha Ajmal, Product Manager at EDWARDS VACUUM. "This claw pump features stainless steel rotors as well as a durable stator coating safeguarding its process wetted parts which ensures robustness in effective contaminant handling. The nEDC series of mono claw vacuum pumps stand out as the intelligent option in many rough applications," said Megha Ajmal.

This has been achieved mainly through the modular design of the EDWARDS dry claw pumps. A separate, insulated pump element also makes the inside of the pump easily accessible to users for maintenance, repairs and cleaning. This means that the nEDC claw pump can be cleaned quickly and easily by the customer and then put back into operation meaning lower cost of ownership and less downtime for the customers.

Along with offering you higher pumping speed, the silencer has undergone a redesign to guarantee reduced noise levels, fostering a more comfortable workplace, all the while preserving optimal vacuum performance. The nEDC300 offers the best-in-class noise level compared to some of the other competitors in the market.

The new silencer also helps with improved airflow thus helping in lowering the internal pump temperature. This extends the service life of the lip seal and prevents any risks of oil leaks, giving customers a reliable long-term solution.

About Edwards

Edwards is a leading developer and manufacturer of sophisticated vacuum products, exhaust management systems and related value-added services. These are integral to manufacturing processes for semiconductors, flat panel displays, LEDs and solar cells; are used within an increasingly diverse range of industrial processes including power, glass and other coating applications, steel and other metallurgy, pharmaceutical and chemical; and for both scientific instruments and a wide range of R&D applications. Edwards has over 7,000 employees worldwide engaged in the design, manufacture and support of high technology vacuum and exhaust management equipment and has state-of-the-art manufacturing facilities in Europe, Asia and North America. Edwards is part of the Atlas Copco Group. Atlas Copco is based in Stockholm, Sweden with customers in more than 180 countries and about 49,000 employees. Revenues of BSEK 141 in 2021. For more information, visit www.edwardsvacuum.com.

Pfeiffer Vacuum Introduces SpeedAir 3050 Leak Tester

Pfeiffer Vacuum, a leading provider of vacuum technology, introduces the new leak tester SpeedAir 3050, an all-in-one solution for nonporous pharmaceutical containers. SpeedAir offers a CCIT solution for a wide range of products: Whether the products are flexible or rigid, liquid, or solid, SpeedAir can swiftly and accurately test them all. Typically requiring only 30 – 45 seconds, this mass extraction instrument quickly and efficiently delivers results.

With testing times as short as 30 – 45 seconds, it delivers reliable results, ensuring the integrity of pharmaceutical containers. Unlike alternative methods that focus on specific areas or access points, SpeedAir provides a comprehensive global Non-Destructive Testing (NDT) approach for containers. It adheres to ASTM Standard F3287-17, demonstrating the capability in independent third-party labs to 1 micron using an air-based technology.

SpeedAir 3050 from Pfeiffer Vacuum.

When it comes to liquid products, the SpeedAir stands out as the most sensitive air-based technology available today. Results are repeatable and reliable – eliminating risks associated with false negatives and positives.

SpeedAir is fully compliant with industry standards. It utilizes the USP recognized Mass Extraction technology and operates with FDA 21 CFR Part 11 compliant software, ensuring the testing processes meet the highest regulatory standards.

About Pfeiffer Vacuum

Pfeiffer Vacuum is one of the world's leading providers of vacuum solutions. In addition to a full range of hybrid and magnetically levitated turbopumps, the product portfolio comprises backing pumps, leak detectors, measurement and analysis devices, vacuum components as well as vacuum chambers and systems. Ever since the invention of the turbopump by Pfeiffer Vacuum, the company has stood for innovative solutions and high-tech products in the analytical, industrial, research & development, semiconductor and future technologies markets. Founded in 1890, Pfeiffer Vacuum is active throughout the world today. The company employs a workforce of some 4,000 people and has more than 20 sales and service companies as well as 10 manufacturing sites worldwide. For more information, visit www.pfeiffer-vacuum.com.

Blower & Vacuum Technology News

Piab Now Offers piCOBOT® for FANUC CRX Cobots

Piab's clever end-of-arm-tool piCOBOT® has so far had almost a decade of prosperity on the market for cobot equipment. Parts of the success relate to the unit itself – Its compact yet user-friendly design and unparalleled precision. And of course, its capacity. Despite its limited weight, only 1.5 lbs [720 g], this EOAT can lift objects of up to 15.4; bs [7 kg]. In 2022, the success was followed by the even more powerful model piCOBOT®L, with a lifting capacity of up to 135 lbs [6 kg]. Since their respective premieres, piCOBOT® and piCOBOT®L have been suited to fit several different cobot manufacturers specifically, one of which being FANUC - partner from some previous adaptations.

"Following our certified piCOBOT® and piCOBOT®L adaptations for FANUC's CR4/CR7 and LR Mate 200 robots, it was natural to apply the same matched setup on their CRX range. And it's exactly where we have landed today – true plug and play," said Madeleine Sheikh, Product Manager of Piab Vacuum Automation division.

The new Fanuc CRX configuration is a full package including a software plug-in, mechanical interface, specified cabling and compressed-air hosing, which will support safe and easy-to-use cobot interaction for the end customer. Naturally, when it comes to Piab solutions, the setup is accompanied by our ever-expanding range of suction cups and accessories, ensuring tailor-made applications for any context.

"Our fresh piCOBOT® and piCOBOT®L packages are fully tested, approved and certified by FANUC as CRX devices and will be sold as such," said Madeleine Sheikh.

Apart from being cobot equipment marketed by FANUC, piCOBOT® and piCOBOT®L are

New piCOBOT® plug & play configuration for FANUC CRX cobots.

available on piab.com, fully configurable with the CRX package as a complement to previous adaptations.

About Piab

Piab is evolving automation through progressive gripping, lifting, and moving solutions and has done so since 1951. We believe in an automated world, where no resources are wasted, and no humans are injured. With annual sales of ~ 175 million USD, 650 employees and a global presence in more than 100 countries, we help our customers improve their operations for the better daily. Since 2018, Piab is owned by Patricia Industries, part of Investor AB. For more information, visit www.piab.com.

UCA to Install Blower System for Waste Services Provider

In a strategic move to enhance environmental sustainability and operational efficiency, Universal Compressed Air (UCA) proudly announces it will install a brand new, state-of-the-art Blower System for a major waste services provider in the Southeast. UCA will own, operate, and maintain the modularized Blower System which will contain all equipment and instruments under a 5-year contract term.

The system will be capable of producing between 15,000 and 25,000 scfm of low-pressure air for wastewater pond aeration.

UCA will install a brand new, state-of-the-art Blower System for a major waste services provider in the Southeast.

The new blowers will be installed in place of the existing units one-by-one in order for production to continue during the construction

Blower & Vacuum Technology News

and commissioning period. A redundancy philosophy is applied such that no one instrument or piece of equipment can cause a system shutdown. This installation work will be coordinated with the customer to avoid production interruptions.

"UCA is grateful to have the opportunity to work on this project," said Rick Kowey, Executive Vice President and COO. "The new system's advanced capabilities will not only enhance wastewater pond aeration but also contribute to substantial cost savings over the contract term. UCA continues to develop innovative solutions that benefit both our operations and the future of the environment."

The new system will provide estimated savings of over $1 million over the 5-year contract term.

About UCA

UCA engineers, designs, builds, owns, operates, and maintains complete systems for the worry-free supply of high-quality compressed air as a utility to a variety of industries, and provides for financially guaranteed performance & reliability, energy savings, capital preservation, and reduced environmental impact – all with a predictable, guaranteed monthly fee over a long-term agreement. This allows Customers to focus on what they do best. For more information, visit https://ucaair.com.

APG-Neuros Selected for Toronto Blower Replacement Project

APG-Neuros is proud to announce its selection for the blower replacement project at Humber Treatment Plant in the City of Toronto, Ontario. This collaboration with the design engineer team at GHD marks APG-Neuros' third project with the City of Toronto.

Their equipment is already operational and performing well at two other wastewater treatment facilities: North Toronto Wastewater Treatment Plant in partnership with CIMA+ and Highland Creek Wastewater Treatment Plant alongside AECOM design engineers.

For the Humber project, APG-Neuros will provide 10 of its largest model Blowers from the NX Series Turbo Blowers line.

About APG-Neuros

Founded in 2005, APG-Neuros participated in the successful introduction of the high-speed turbo blower technology in the wastewater treatment markets in North America, Western Europe and the Middle East. APG-Neuros turbo blowers are used in a variety of industrial applications and wastewater treatment processes, with over 1,700 units installed in North America and Europe, and more than 7,500 units worldwide. APG-Neuros is a market leader due to constantly driving and propelling innovation forward through the most technologically advanced products and aeration solutions to achieve maximum energy efficiency and operational flexibility for our customers. APG-Neuros' headquarters are located in Quebec, Canada, and its manufacturing and testing facility in Plattsburgh, NY, USA. For more information, visit https://apg-neuros.com/.

APG-Neuros was selected for the blower replacement project at Humber Treatment Plant in the City of Toronto, Ontario.

THE MARKETPLACE

BLOWER & VACUUM BEST PRACTICES
www.blowervacuumbestpractices.com

ADVERTISER INDEX

Company	Page	Web Site
Best Practices Webinars	Inside Front Cover, 15, 17, 27, 31	www.airbestpractices.com/webinars
Best Practices 2024 EXPO	6, 11, 21, 29, Inside Back Cover	www.cabpexpo.com
Kaeser Compressors	Outside Back Cover	https://us.kaeser.com
Aerzen USA	7	www.aerzen.com
Eurus Blower	9	www.eurusblower.com
Busch Vacuum Solutions	13	www.buschvacuum.com
WCVC Networking Group	25	https://cabpexpo.com/womens-group/

TECHNOLOGY & JOBS

Job & Product Marketplace Advertising Information

Reach 16,200+ readers of Compressed Air Best Practices® Magazine with Marketplace Ads every month! Job Marketplace ads are also placed for one month on www.airbestpractices.com and promoted in our three monthly e-newsletters.

Ad dimensions are 2.36" wide x 3.91" tall. We can help you design the ads. Send us your logo, product photo, and text to rod@airbestpractices.com. We recommend 20-50 total words of text.

Prices are $625 per Job or Product Marketplace Ad ($440 if 6 or more ads are placed). Contact Rod Smith at rod@airbestpractices.com to schedule your Marketplace Ads.

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®.


KAESER


KAESER
HBS 1600 M