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August 2022

Food & Beverage Packaging

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FROM THE EDITOR

Industrial Vacuum & Blower Systems

We begin this issue with two vacuum system optimization case studies; one on fresh food using chamber machines and the second on a clay extrusion system. Our thanks go to Uli Merkel and Jasmin Markanic from Busch Vacuum Solutions.

Plastic extrusion is one of the largest industrial vacuum system applications. We are grateful to Tie Duan, from E.W. Klein, for his article titled, "Vacuum in Plastic Extrusion." Please mark your calendars for the upcoming E.W. Klein-hosted Industrial Vacuum Workshop, taking place at the Best Practices 2022 EXPO & Conference this October in Atlanta (see page 24 for more information).

Our own Kimberly Vickman went to downtown Pittsburgh where she saw the latest technologies in iron- and steelmaking – and how onsite utilities support them – with her report titled, "Show Report: Vacuum Technology at 2022 AISTech."

Aeration Blower Systems

"Measuring Blower Airflow Rates with Calibrated Ammeters" is the title of our latest article from Tom Jenkins, of JenTech Inc. His formula-supported article reviews the basis of operation, automated control applications, compensating for temperature and limitations.

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

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Upcoming Webinars

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- **July 28, 2022:** ASME PTC 13 Wire-to-Air Performance Test Code for Blower Systems Part 2 – *Presenters Hiran DeMel, Senior Project Manager and Principal Technologist, Jacobs and Lloyd Slezak, Consulting Engineer (ret), Brown and Caldwell*
  Sponsored by Howden
- **August 18, 2022:** VFD Vacuum Pumps Do's and Don'ts – *Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting*
  Sponsored by Busch Vacuum Solutions
- **November 10, 2022:** ASME PTC 13 Wire-to-Air Performance Test Code for Blower Systems Part 3 – *Presenters John Conover, Consultant, Mark Addison, Senior Engineer, Artesian Water Company and Fred Constantino, S&C Project Engineering Advisor, ASME*
  Sponsored by APG-Neuros

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INDUSTRY & TECHNOLOGY NEWS

Busch Vacuum Solutions Announces New VP of U.S. Industrial Sales

Busch Vacuum Solutions, one of the largest vacuum pump and systems manufacturers in the world, announces Jennifer Ploskina as Vice President of Industrial Vacuum Sales in the U.S. In this role, Ploskina will direct strategic sales operations and business development in the industrial vacuum market. Busch's major industrial customers include companies in the food, packaging, chemical, pharmaceutical, metallurgy and plastics markets.

Ploskina brings 25 years of business leadership experience in both sales and marketing to this role. Before joining Busch, Ploskina held a collective 17 years with Eaton Corporation, with her recent role focusing on digital transformation in the energy transition markets (renewable energy, electrification of buildings and transportation), building businesses tied to systems, services and software.

Her diverse background will enhance Busch's ability to meet customer needs as they continue to provide quality, innovative products to the marketplace. "Busch has a bold commitment to providing excellent service and growth in the industrial vacuum technology market and I'm thrilled to be part of the team that is leading the way," said Ploskina.

Ploskina holds a Bachelor of Science degree in Electrical Engineering from the University of Pittsburgh and a Master of Business Administration from the Katz Graduate School of Business (University of Pittsburgh).

Jennifer Ploskina, Vice President of U.S. Industrial Sales, Busch Vacuum Solutions.

About Busch Vacuum Solutions

Busch Vacuum Solutions offers vacuum and pressure solutions for all industries 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 more than 45 countries. For more information, please contact Busch at info@buschusa.com or visit the Busch US website at www.buschusa.com.

Atlas Copco to Acquire National Vacuum Equipment

Atlas Copco has agreed to acquire National Vacuum Equipment Inc., a leading local US manufacturer of industrial vacuum pumps and packages for mobile use on tanker trucks. National Vacuum Equipment Inc. is headquartered in Traverse City, Michigan, USA and has around 100 employees.

"The acquisition will add to our vacuum solutions portfolio, allowing us to enter the currently untapped mobile vacuum market," said Geert Follens, Business Area President Vacuum Technique.

The purchase price is not disclosed. National Vacuum will become part of the Industrial Vacuum Division, within the Vacuum Technique business area. The acquisition is expected to close during Q3.

About Atlas Copco Group

Great ideas accelerate innovation. At Atlas Copco we have been turning industrial ideas into business-critical benefits since 1873. By listening to our customers and knowing their needs, we deliver value and innovate with the future in mind. In 2021, Atlas Copco had revenues of BSEK111 and at year end about 43,000 employees. For more information, visit www.atlascopcogroup.com.

Pfeiffer Vacuum Opens New Leak Detection and Vacuum Technology Facility

Pfeiffer Vacuum, one of the world's leading providers of vacuum and leak detection solutions for the semiconductor as well as the analytical, industrial and research & development markets, opened up a new 40,000 square foot facility. This state-of-the-art facility is located at 4037 Guion Lane, Indianapolis, Indiana.

The new facility serves North American customers in all technological questions around leak detection and high-vacuum technology, focusing on semiconductor

Industry & Technology News

Pfeiffer Vacuum's new 40,000 sq ft Leak Detection Center of Excellence and Custom Engineered Vacuum System manufacturing facility in Indianapolis, IN.

applications, medical devices, consumer electronics, pharmaceutical, automotive and industries. The new building includes a CNC machine shop and modular assembly bays to support air and helium leak detection as well as custom engineered vacuum systems.

A new application laboratory will be of great benefit to customers by offering in-person or interactive customer training and demonstrations. Customers will be able to have parts tested on all Pfeiffer Vacuum leak detection technologies such as air, helium and hydrogen test methods and determine which is the best for their application. Using the newly created multimedia production center, Pfeiffer Vacuum will document the optimal solution. The company can also offer remote, interactive training so that customers can conveniently become more proficient in using Pfeiffer Vacuum leak testing equipment.

In addition to the Leak Detection Center of Excellence, Pfeiffer Vacuum has established a Custom Engineered Vacuum Solutions team that provides engineering, designing, manufacturing and training. Pfeiffer Vacuum partners with customers to understand their vacuum needs and to provide them turnkey solutions. The custom vacuum systems utilize Pfeiffer Vacuum's extensive range of vacuum products. This includes pumps, pressure gauges, gas analyzers, leak detectors as well as a complete line of fittings, valves and custom chambers. To ensure system performance, vacuum training and field service are offered. This enables the customers to focus on their core competency and not have to worry about vacuum system design.

"The Pfeiffer Vacuum Indianapolis division has been building instruments and complete leak detection systems for over 25 years. This new state-of-the-art facility will allow us to support the growth of the automotive, pharmaceutical and semiconductor industry as well as other industries in North America. The central location of this new facility provides advantageous and cost-effective services and logistics throughout North America. With our expanded in-house design, engineering expertise and decades of experience, we are very well positioned to help customers with their next custom vacuum system," said Derek Izzi, General Manager of Pfeiffer Vacuum Indianapolis.

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, components as well as vacuum chambers and systems. Founded in 1890, Pfeiffer Vacuum is active throughout the world today. The company employs a workforce of more than 3,500 people and has more than 20 sales and service companies as well as 10 manufacturing sites worldwide. For more information, please visit www.pfeiffer-vacuum.com.

Atlas Copco's New Range of GHS VSD+ Vacuum Pumps

Building on the revolutionary GHS VSD+ range of variable speed-driven oil-injected screw vacuum pumps, Atlas Copco have taken a leap ahead with the new GHS 1402-2002 VSD+ series. These series of pumps have a new design for better performance, optimal oil separation, a smaller footprint and an innovative new controller which puts the customer in gear for Industry 4.0.

With the GHS 1402-2002 VSD+, vacuum manufacturer Atlas Copco is launching a new model of speed-driven screw pumps in three pumping speed classes. In rough vacuum applications, the oil-injected pumps deliver a continuously high pumping speed – from atmospheric pressure to ultimate pressure. Commenting on the first of many new features, Product Manager Yuri Vanderveken said, "The GHS 1402-2002 VSD+ features the new Atlas Copco oil-injected screw element. It's innovative compression optimization valves allow for high pumping speeds at rough vacuum." This makes them ideal for use in central vacuum systems, for vacuum cooling, to produce food packaging and thermoformed plastic components as well as for vacuum chambers for altitude simulation.

"This is also a forward-looking pump. It is equipped with HEX@TM, Atlas Copco's revolutionary new vacuum controller, making this pump ready for industry 4.0. With a new control system, users of the speed-driven pump type are also well equipped for the comprehensive digitalization of industrial processes," said Vanderveken.

Compared to the previous models, the innovative design of the three models GHS 1402, GHS 1602 and GHS 2002 VSD+ results in better vacuum performance, a 15 percent smaller footprint and longer maintenance intervals. "The footprint of the GHS 1402-2002 VSD+ is smaller than 2 square meters. The design is compact due to the vertical drive train design," said Vanderveken.

The new GHS VSD+ screw pump also contributes significantly to saving energy costs. This is based on the one hand, on the combination of the Neos inverter with a setpoint control. This means that the GHS 1402-2002 VSD+ deliver exactly the pumping speed required for the respective process. Moreover, an energy recovery system helps recover up to 80 percent of the power in the form of hot water. In addition to saving costs and water, this also results in lower CO_2 emissions.

Industry & Technology News

The increased efficiency is also due to the new permanent magnet motor. In its IE5 efficiency class, it has high efficiencies and produces an increase in efficiency of about two percent over the entire speed range. "This new technology ensures higher efficiency at all speeds when compared to classic motors. These new motors are oil-cooled, with oil lubricated bearings that provide optimal cooling at any speed," said Vanderveken.

Oil cooling maintains the optimal motor temperature at all speeds. The motor bearings are also lubricated by oil, which eliminates the need for regular relubrication. "We have in fact have dispensed with an additional fan, which reduces energy consumption and the noise level," he continued. The motor is enclosed in a housing with IP66 protection. This makes it very resistant, especially in rough and dusty application environments.

One of the more exciting features of the GHS 1402-2002 VSD+ series is its intelligent functionalities. "For this purpose, we have integrated our new Atlas Copco HEX@

Atlas Copco's new GHS 1402-2002 VSD+ Vacuum Pump.

TM controller, which ensures high vacuum performance and user-friendliness," said Product Manager Yuri Vanderveken. "HEX@ has a configurable user interface. You can tailor the information you see to your own needs and priorities." Via the controller, users can visualize and set the parameters of the pumps from any smartphone, laptop, PC or 3 (4) tablet via a web browser, regardless of location. This allows the vacuum pumps to be configured even more specifically and sustainably for the respective applications. Other smart functionalities vary from intelligent scheduling over pump down optimization to leak detection.

Atlas Copco's new GHS 1402-2002 VSD+ delivers efficiency by design and combines the best of several technologies that ease of use, peace of mind and next-level innovation.

About Atlas Copco Vacuum Technique

Great ideas accelerate innovation. At Atlas Copco Vacuum Technique we collaborate with our customers to turn industrial ideas into leading edge technology in vacuum and abatement solutions. Our passionate people, expertise and service bring sustainable value to industries everywhere. Atlas Copco is based in Stockholm, Sweden with customers in more than 180 countries and about 41,000 employees. Revenues of MSEK 110/ 10,6 MEUR in 2021. For more information, visit www.atlascopco.com.

Pfeiffer Vacuum Expands the OktaLine® ATEX Series of Roots Pumps

Roots pumps from Pfeiffer Vacuum's OktaLine are ideal for use in processes in potentially explosive environments or for evacuating explosive gases. Designed in accordance with the ATEX Directive (2014/34/EU1 and/or 1999/92/EC) with pressure surge resistance of PN 16, they meet the very highest explosion protection requirements. Zone entrainment of explosive gases is ruled out as a result. Potential applications range from the chemical, biotechnology and pharmaceutical industries to industrial applications such as vacuum furnaces or heat treatment.

As a result of the expansion of the series, pumping speeds range from 280 to 8,100 m3/h. Depending on the application, there is a choice between equipment category 2G or 3G. All pumps are suitable for temperature class T3. Installation is possible without flame arresters. This means that, effectively, the full pumping speed of the pump is available.

The pumps are suitable for universal use due to their variable differential pressure and flexible rotational speed. All pumps can be used at ambient temperatures ranging from -20 °C to + 40 °C.

In view of their magnetic coupling, OktaLine pumps are hermetically sealed and achieve extremely low leak rates of 10-6 Pa m3 /s. The magnetic coupling eliminates the need for shaft seals, which are inherently weak points if it comes to pressure surges and are high-maintenance. OktaLine ATEX pumps are pressure surge resistant up to 1600 kPa. Due to their magnetic coupling, there is no risk of zone entrainment. The integrated temperature sensor protects against thermal overload and monitors the gas temperature in the outlet area.

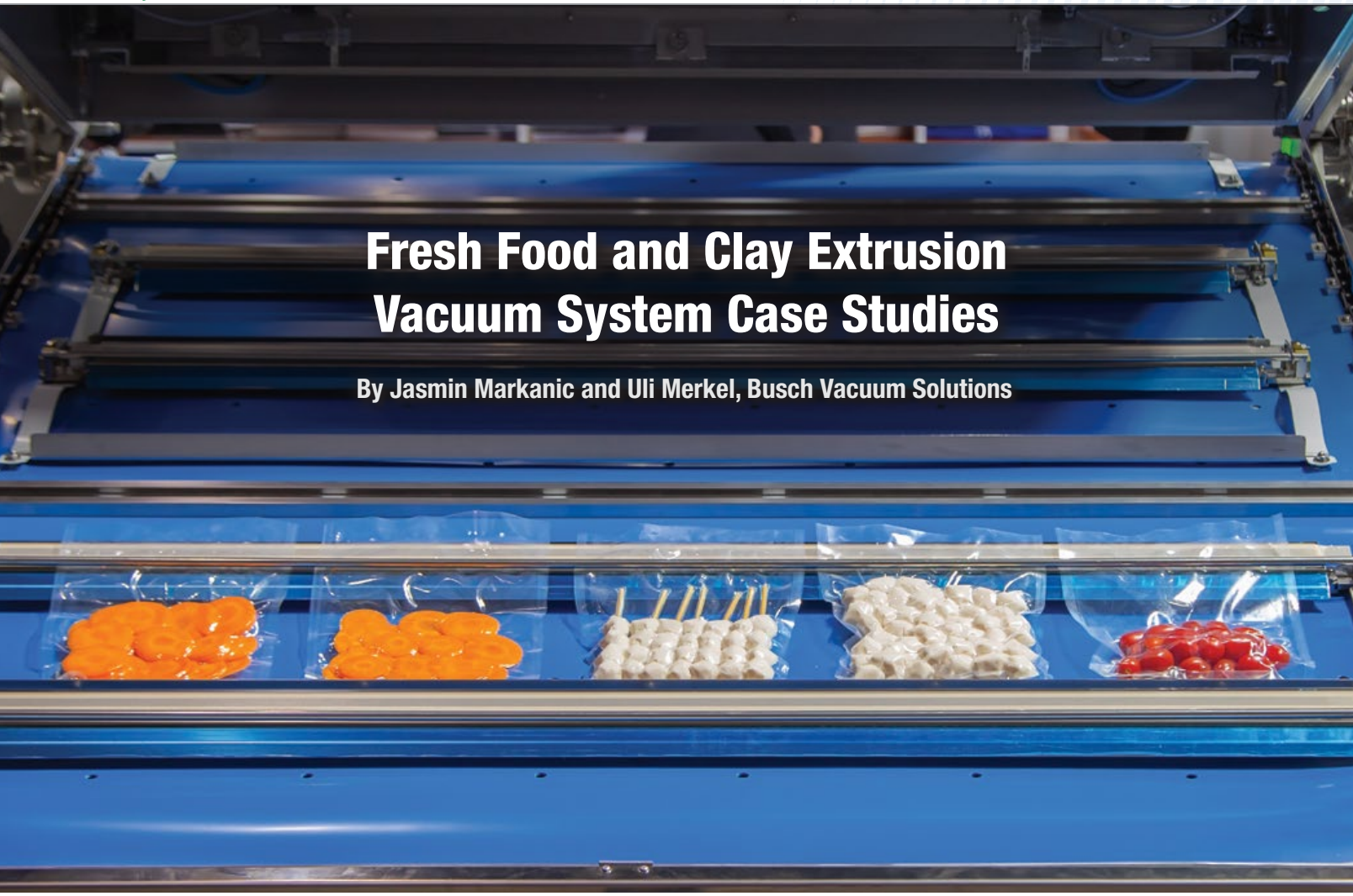
Compared to pumps with shaft seals, the OktaLine's magnetic coupling achieves up to

20% lower operating costs and considerably reduced maintenance costs. OktaLine Roots pumps can also be operated without a bypass, since ATEX protection is guaranteed even with passive rotation (windmilling). The use of ATEX IEC motors means that replacement on site is quick and easy.

Pfeiffer Vacuum expands the OktaLine ATEX Series of explosion-proof Roots pumps.

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, 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 more than 3,500 people and has more than 20 sales and service companies as well as 10 manufacturing sites worldwide. For more information, please visit www.pfeiffer-vacuum.com.



Fresh Food and Clay Extrusion Vacuum System Case Studies

By Jasmin Markanic and Uli Merkel, Busch Vacuum Solutions

➤ Case Study #1: Vacuuming of Fresh Food

Tips for correctly handling the vacuum pump in a chamber machine

Vacuuming fresh food using chamber machines is often a daily activity in butcher shops, at fresh food counters for meat, sausage, and cheese products, as well as in the food service industry. All fresh foods contain more or less unbound water, which partially evaporates during vacuum packaging. This can influence the quality of the product. Furthermore, if the packaging machine is not permanently in operation, the packaging result may deteriorate, or the packaging process may take too long. If the packaging process takes too long, the food to be packaged will lose weight. Below is an explanation of the physical operations

Figure 1. Functional model of a chamber packaging machine with visible rotary vane vacuum pump inside.

performed during the packaging process, as well as some practical advice to ensure trouble-free operation and a long service life for the vacuum pump in the packaging machine.

R5 oil-lubricated rotary vane vacuum pumps from Busch Vacuum Solutions are standard (Figure 1) in chamber machines and are used by all renowned manufacturers. They have been specially developed for packaging food and have proven themselves over decades. Through continuous advancement, these vacuum pumps have achieved the highest possible quality standard (Figure 2).

Figure 2. Typical R5 rotary vane vacuum pump from Busch for use in chamber packaging machines.

Fresh foods such as meat, sausage, fish, and cheese are usually vacuum packaged at a pressure of around five millibars. At this pressure, the oxygen content in the remaining residual air is so minimal that the activity of various microorganisms is prevented. This significantly increases the shelf life of the packaged products. However, such low pressures also cause water to start evaporating at low temperatures. While water at normal atmospheric pressure only evaporates or begins to boil at a temperature above 100 degrees Celsius, at a pressure of 30 millibar it starts to evaporate at room temperature. At a pressure of 8 millibar, water evaporates already at a temperature of 4 degrees Celsius – even in cooled rooms (Figure 3).

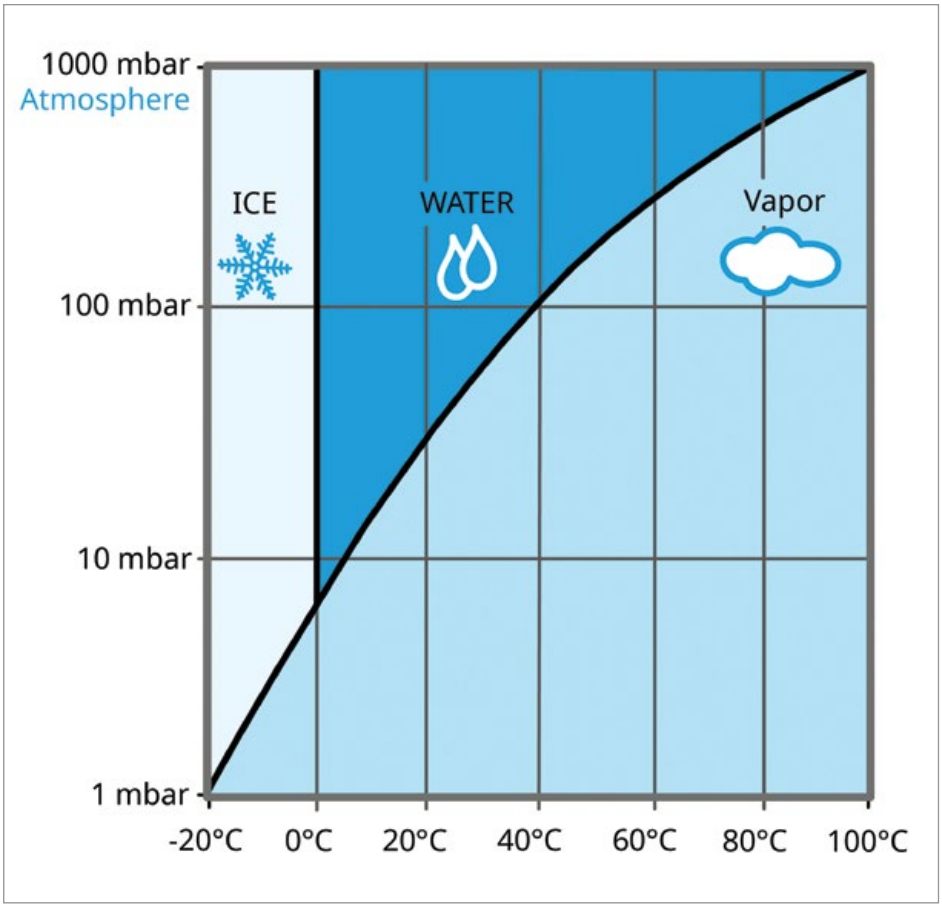


Figure 3. Change in the aggregate states of water as a function of temperature and pressure.

For this reason, fresh foods always generate water vapor during the packaging process, and this water needs to be extracted by the vacuum pump together with the air from the packaging chamber. If the vacuum pump rarely or never reaches the operating temperature due to very short runtimes, the water vapor condenses almost completely inside the pump. This leads to an accumulation of water in the

Fresh Food and Clay Extrusion Vacuum System Case Studies

interior and in the oil of the vacuum pump. This causes the oil to lose its lubricating and sealing function, which can have a negative effect on the performance and service life of the vacuum pump.

Recommendation for Operation

In order to ensure the reliable and trouble-free operation of chamber machines, the following should be observed:

1. **Let the vacuum pump warm-up before packaging**
   To do this, simply run the packaging machine five to ten times without any product and packaging bag. Make sure that the chamber is dry for this.

2. **Use the service program regularly**
   Nowadays, most chamber machines have a service program. This program ensures that condensed water vapor that has mixed with the oil is removed from the vacuum pump. This program should be started at least once a week. Depending on the packaging machine, it takes between 10 and 20 minutes. The vacuum pump is brought to operating temperature so that the water in the vacuum pump evaporates again and is discharged.

3. **Check oil level and oil quality weekly**
   A visual inspection should be carried out once a week to check that the oil quantity and quality are correct. This can be done quickly and easily through the oil sight glass. The oil in the vacuum pump should be colorless to yellowish and clear. If the level falls below the MIN mark on the oil sight glass, the oil must be topped up. If the oil is milky and cloudy, this is a sign that water has mixed with the oil and formed an emulsion. The service program then needs to be run. If this has no effect on the visual condition of the oil, an oil change needs to be performed. Darkening of the oil is a sign that some substances, for example spices, have been deposited in the oil or that it has aged too much. An oil change also needs to be performed if this is the case.

4. **Use suitable vacuum pump oils**
   The quality of the oil in vacuum pumps and the correct quantity play an important role in the packaging process and in protecting the pump. It is therefore essential to choose the correct oil to ensure the vacuum pump and thus the packaging machine function properly. Busch Vacuum Solutions has developed special oils for vacuum pumps in packaging machines. The VSA vacuum pump oil is suitable for packaging very moist products since it has been designed for the extraction of air with a high-water vapor level. For less moist food, the VSL vacuum pump oil can also be used. Both oils are food-grade synthetic oils with H1 approval. They also have a service life of up to four times longer than mineral oils. Busch also offers suitable oils for packaging with oxygen as a modified atmosphere.

5. **Service your vacuum pump regularly**
   The vacuum pump in a chamber machine should be serviced regularly. The service intervals depend on the

operating conditions, the number of packaging cycles, and the type of goods to be packaged.

A reliable indicator of when an oil change needs to be performed is the visual condition of the oil, as described under point 3.

When changing oil, the exhaust filter in the oil separator should always be replaced as well. For vacuum pumps with a pumping speed of 25 cubic meters per hour or more, the oil filter also needs to be changed. The sealing rings on the service openings should also be replaced in order to prevent leaks. For your convenience, Busch offers service kits for all R5 vacuum pumps, which contain all the necessary parts. Busch Vacuum Solutions offers worldwide maintenance service so that this work can also be carried out by a service technician directly at the customer's premises. Different types of service contracts are available.

Observing these instructions will help to ensure trouble-free operation and a long service life for the vacuum pump, as well as optimum packaging results.

Case Study #2: High-Quality Roof Tiles Thanks to State-of-the-Art Vacuum Technology

At the Wienerberger GmbH brick factory in Bad Neustadt, vacuum technology is used for degassing the clay mixture in the extrusion press. A vacuum system with a dry COBRA NX screw vacuum pump as the core element is being used for generating the necessary vacuum. This vacuum pump generates

Poroton backing bricks are manufactured at the Wienerberger brick factory in Bad Neustadt, Germany.

COBRA NX vacuum system for degassing clay bricks at Wienerberger.

Fresh Food and Clay Extrusion Vacuum System Case Studies

the vacuum needed without any oil and is completely contact-free. The variable speed drive enables demand-driven control and ensures that the desired vacuum can be precisely maintained independently of how much moisture the material contains. The modern vacuum system has provided Wienerberger with significant benefits when it comes to efficiency, quality, and operational safety.

The brick and tile factory in Bad Neustadt was founded in 1951 and was sold by the family company Gessner to Wienerberger Ziegelindustrie GmbH in 2001 to ensure the long-term success of the enterprise. In addition to Poroton backing bricks, the factory also produces highly efficient thermal insulation bricks in line with the requirements of new energy-saving regulations. Wienerberger Ziegelindustrie GmbH, headquartered in Hanover, Germany, is part of Wienerberger AG, an internationally active group with its head office in Vienna, Austria.

An extrusion press is used to manufacture various Poroton backing bricks. The material is degassed as it passes through the vacuum chamber between the twin-shaft mixer and the extrusion press. This prevents air pockets during extrusion and thus guarantees pore-free castings. This also significantly increases their stability, preventing them from deforming before they dry and ensuring dimensional accuracy of the finished brick. The porosity necessary for good thermal insulation properties after they are fired is ensured using supplemental materials such as sawdust, paper pulp, and polystyrene. These burn away during the firing process, leaving pores in the material.

Previously used vacuum supply required high maintenance effort

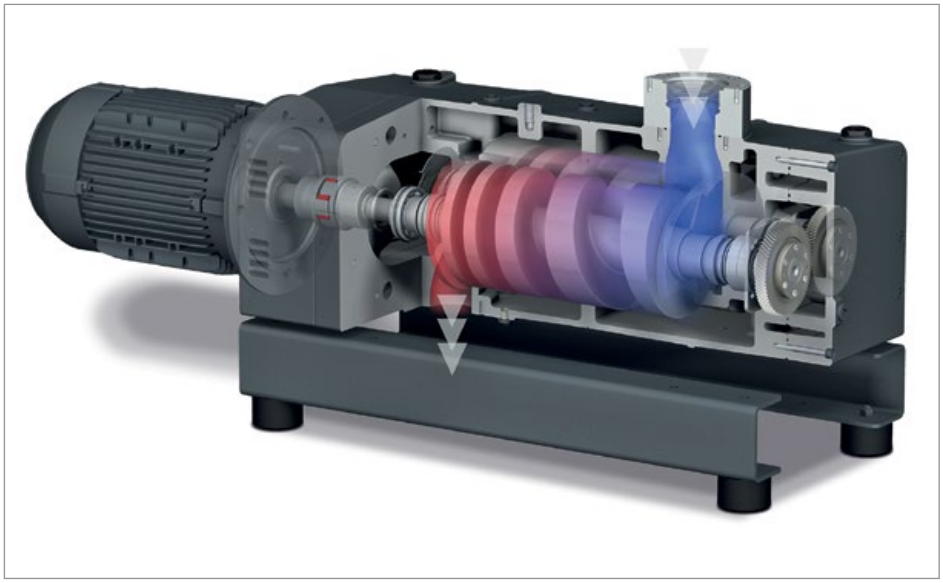
In earlier years, the Wienerberger brick factory in Bad Neustadt used a once-through oil-lubricated rotary vane vacuum pump. When the previously used vacuum pump needed a general overhaul, plant manager Wolfram Tittel began to search for ways to optimize his vacuum supply. His primary goal was to minimize oil consumption, the accumulation of oil emulsion, and maintenance efforts. So he spoke with

the vacuum specialists from Busch Vacuum Solutions, who performed a detailed analysis of this application and then suggested a completely new overall solution for vacuum generation.

Busch develops a clay degassing system for the highest level of operational safety

Busch developed a clay degassing system specifically for this purpose. At its core is a COBRA NX screw vacuum pump, which is used to extract air and water vapor, and compress and expel them again completely dry, i.e. without the use of oil or any other operating fluids. The standing filter upstream of the vacuum pump has been optimized for dust and particles from clay and loam masses. The frequency-controlled motor of the vacuum pump and the integrated demand-driven control unit make it possible to precisely maintain the defined vacuum level in the vacuum chamber. Due to its design, this vacuum pump can consistently maintain the prescribed vacuum levels between one millibar and atmospheric pressure throughout the whole process.

Depending on the level of moisture in the clay mixture, there are varying levels of water vapor that need to be extracted from the vacuum chamber. This means that the pumping speed of the vacuum pump has to be increased via a higher motor frequency for very moist material because, in addition to the actual evacuation of air, higher amounts of water vapor also need to be suctioned out. If the material contains less moisture, the pumping speed can be reduced again. As a result, the vacuum level in the vacuum chamber remains constant at all times. In addition, the desired moisture level between 19.5% and 21.5% can be precisely maintained when the material is pressed into the nose piece during extrusion. This ensures a high level of operational safety during the clay degassing process while maintaining flexible process conditions.



Operating principle of a COBRA NX screw vacuum pump.

The vacuum specialists from Busch dismantled the COBRA vacuum pump used after one year of running time in the manufacturing plant and examined it thoroughly. They did not find any damage or signs of wear and tear from dust or particles penetrating the vacuum pump. The maintenance work is significantly less than that required for an oil-lubricated vacuum pump. Thanks to the contact-free operating principle of the COBRA screw vacuum pump, there is no wear, thus no wearing parts need to be replaced. The oil-free operation also eliminates the previous necessary oil filter changes. In addition, all work and costs for procuring the oil and disposing of the oil emulsion have also become unnecessary.

Enormous energy and water savings

As a brick factory whose energy management complies with the DIN 50001 standard, the possibility of reducing energy consumption for vacuum generation was of great significance. The newly deployed vacuum pump usually operates in a range from 30 to 35 Hertz and only operates at full load when the water vapor level is very high. 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.

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Measuring Blower Airflow Rates with Calibrated Ammeters

By Tom Jenkins, JenTech Inc.

One definition of "calibrate" is "to determine, rectify, or mark the graduations of something". An ammeter is an instrument for measuring electric current. Therefore the simple definition of a calibrated ammeter is a current measuring device marked with units of measure, presumably amperes.

In the blower industry, however, the term has developed a specific meaning. A calibrated ammeter is an instrument that measures a blower motor's current draw and converts the measurement to a display of blower airflow rate. (Figure 1)

This simple device has been in use for decades. In many installations the calibrated ammeter with an integral low current switch is the primary surge prevention device. Surprisingly, despite its long history, the calibrated ammeter's operating principles and limitations are not well understood by end users.

Basis of Operation

The basic ammeter has been used for measuring current since the nineteenth century. Used in conjunction with the current transformer (Figure 2) it can measure the current draw for motors from fractional to thousands of horsepower. This provides a simple and robust measurement system.

Converting amperage to airflow rate is based on the fundamental operating principles of constant speed centrifugal (dynamic) blowers: the pressure ratio and head have a direct, one to one correlation with volumetric airflow rate.

Head, expressed as ft·lb$_f$/lb$_m$, is a measure of the work done on the gas.

$$W_s = \frac{\kappa}{\kappa - 1} \cdot \frac{\overline{R}}{MW} \cdot T_i \cdot \left(\left(\frac{p_d}{p_i} \right)^{\frac{\kappa - 1}{\kappa}} - 1 \right)$$

W_s = isentropic head, ft·lbf/lbm
κ = ratio of specific heats, dimensionless
$\overline{R}$ = universal gas constant, ft·lb$_f$/lbmol·°R
MW = molecular weight, lb$_m$/lbmol
T_i = inlet temperature, °R
p_d, p_i = discharge and inlet pressure, psia

Head and flow rate in turn have a direct relationship with power.

$$P = \frac{\rho \cdot q_v \cdot W_s}{\eta_s}$$

P = blower shaft power, bhp
ρ = air density, lb$_m$/ft^3
ηs = bare blower isentropic efficiency, decimal

These thermodynamic calculations can be omitted in developing data points for the calibrated ammeter. The starting point for calibration data is the blower performance curve, which shows discharge pressure and

Figure 1: Example of a Calibrated Ammeter

power vs. flow rate at specific inlet and barometric conditions.(Figure 3) The power corresponding to a given ICFM or SCFM can be read directly from the curve.

For an electric motor at constant voltage, power has a direct relationship with current. The nominal motor efficiency and power factor can be obtained from the motor nameplate or motor data sheet. That permits calculating the current draw from the shaft power.

$$I = \frac{P \cdot 746}{V \cdot \sqrt{ph} \cdot \eta_m \cdot PF}$$

I = motor current, A
P = blower shaft power from performance curve, bhp
V = system voltage, V
ph = number of phases (typically 3), dimensionless
η_m = motor efficiency, decimal
PF = motor power factor, decimal

The current has a direct correlation to a specific airflow rate at specific inlet conditions.

The calculation can be repeated for any number of points needed. The relationship is essentially linear and intermediate points may also be obtained by interpolation.

Performance curves are often provided using ICFM for the x-axis. The process demand is generally given as SCFM, defining the oxygen content of a cubic foot of air at 14.7 psia, 68 °F, and 36% relative humidity. Most calibrated ammeters show the correlation between SCFM and current.

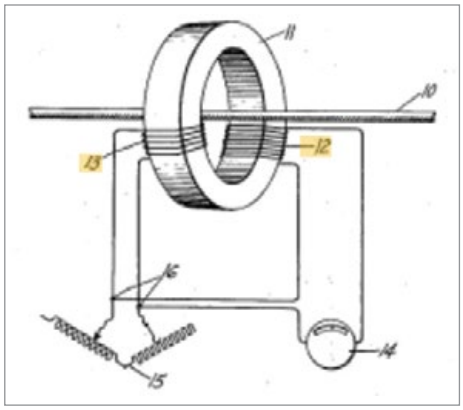

Figure 2: Drawing from a 1928 Patent for a Current Transformer

Measuring Blower Airflow Rates with Calibrated Ammeters

Ignoring relative humidity, the conversion from inlet volumetric flowrate to SCFM is straight forward:

$$SCFM = ICFM \cdot \frac{35.92 \cdot psia}{°R}$$

Note that these relationships ignore the effect of voltage fluctuations and variations in motor properties as well as changes in relative humidity. This obviously results in some inaccuracies, and if precise measurement is needed alternate technology should be investigated. However, the calibrated ammeter has proven to be adequate for aeration process control and blower surge protection in most applications.

Automated Control Applications

The calibrated ammeter is a useful monitoring device for manually throttled blowers. Mounted next to the blower it can be used to modulate the SCFM delivered to the process and more importantly prevent inadvertent operation in surge or overload regions. Most new applications, though, involve a programmable logic controller (PLC) modulating an electrically operated inlet valve to maintain an operator entered flow or pressure setpoint.

Using a PLC to measure motor current can be accomplished simply and easily. Many starters provide an analog signal for motor current as a standard or optional feature. Current transmitters also provide an analog signal. Monitoring one phase provides adequate accuracy, making the instrumentation inexpensive.

The correlation for current and SCFM obtained above can be converted to a linear equation in slope-intercept form, y = mx + b, for PLC programming. One way to accomplish this is to plot several data points in an Excel chart and add a trendline. (Figure 4)

It is possible to manually determine the linear equation from only two points. The points can come from the performance curve or values taken from an existing calibrated ammeter.

$$m = \frac{q_2 - q_1}{I_2 - I_1}$$

$$b = q_1 - m \cdot I_1$$

$$q = m \cdot I + b$$

q = air flow, SCFM
I = motor current, A
m = slope, SCFM/A
b = y intercept, SCFM

It is important to note that the equation derived is most accurate for the specific ambient conditions used to establish the original performance curve or to determine the calibrated meter data under consideration.

Compensating for Temperature

Temperature shifts the correlation between current and SCFM because of the impact on inlet density. Lower inlet temperature increases the density, increasing the head and power draw at a given flowrate. The new

Figure 3: Example Blower Performance Curve

correlation can be calculated from the temperature ratio and the linear equation for SCFM vs. current.

$$q_{newT} = m \cdot I + b \cdot \frac{^{\circ}R_{original}}{^{\circ}R_{new}}$$

Although it may be counter-intuitive, throttling the blower inlet doesn't affect the correlation between SCFM and motor current. (Figure 4) The inlet throttling valve creates a pressure drop, which decreases air density. Both the volumetric flow rate and the correlating head and pressure ratio remain the same. Some of the pressure difference across the blower is taken across the inlet valve instead of at the discharge. Because the inlet density is reduced the mass flow rate is reduced. The net result is that the blower shaft power and the motor current are reduced, maintaining the correlation between SCFM and current.

Limitations

Calibrated ammeters aren't suitable for positive displacement (PD) blowers or for centrifugal blowers with variable speed or guide vane controls. The correlations behind the calibrated ammeter only apply to constant speed centrifugal blowers.

The head of a PD blower is not a function of flow rate. The discharge pressure and pressure ratio will rise until they are high enough to overcome the resistance to flow. The power demand and motor current are functions of the pressure ratio, and therefore do not correlate with flowrate alone.

The centrifugal blower's relationship between head and flowrate can be disrupted by the control method. If variable speed is used to modulate blower capacity the performance is governed by the affinity laws. The flowrate is proportional to speed, and the head is proportional to speed squared. Further complication results if a variable frequency drive (VFD) is used to change speed. The VFD output voltage is typically proportional to frequency, which affects the motor current.

Guide vanes also modify the relationship between flow and head. Inlet guide vanes (IGV) and variable diffuser vanes (VDF) change the conversion of kinetic energy produced by the impeller to potential energy. The resulting change in pressure ratio creates a change in head.

Measuring Blower Airflow Rates with Calibrated Ammeters

It would be possible to correlate speed or guide vane position to current and develop a correlation with flow. Doing so would be complex, however, and the inherent simplicity of the calibrated ammeter would be lost. It is generally preferable to measure airflow by other means for these applications.

The primary sensing element of the system is often a current transformer (C/T). C/Ts are sized based on a 5 A output on the secondary terminals, matching the 5 A input range of most ammeters. For example a 300:5 C/T will output 5 A when motor current is 300 A. Every C/T has a maximum burden rating identifying the maximum secondary volt-amperes (VA). This can be converted to equivalent resistance:

$$R_{max} = \frac{B_{max}}{I^2}$$

R_{max} = maximum allowable total current loop resistance, Ω

B_{max} = maximum allowable C/T burden rating, V·A

I = secondary max current, A, usually = 5 A

Low ratio C/Ts generally have a low maximum burden, and the total loop resistance of the wire from the C/T to the ammeter and back can be exceed the maximum rated VA. This can be overcome by using a higher ratio C/T and multiple turns of the motor wiring through the C/T window, which will change the effective C/T ratio. (Figure 5)

Summary

The calibrated ammeter is a well-established and robust device for monitoring the air flow rate of throttled centrifugal blowers. The correlation between motor current draw and airflow rate can be readily adapted to PLC or microprocessor based automated control. The system's accuracy is sufficient for all but the most stringent process control applications. BP

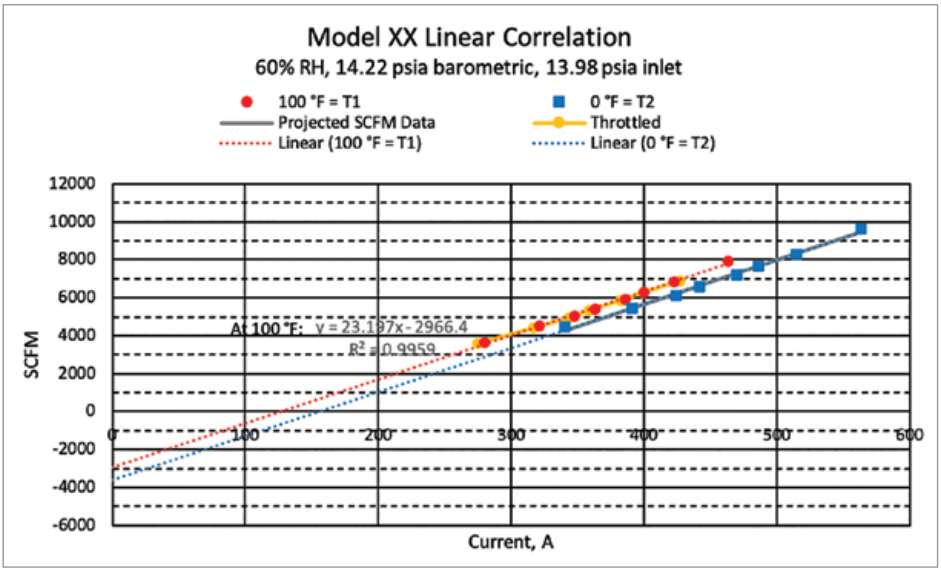

Figure 4: Linear Correlation of Blower Current to SCFM

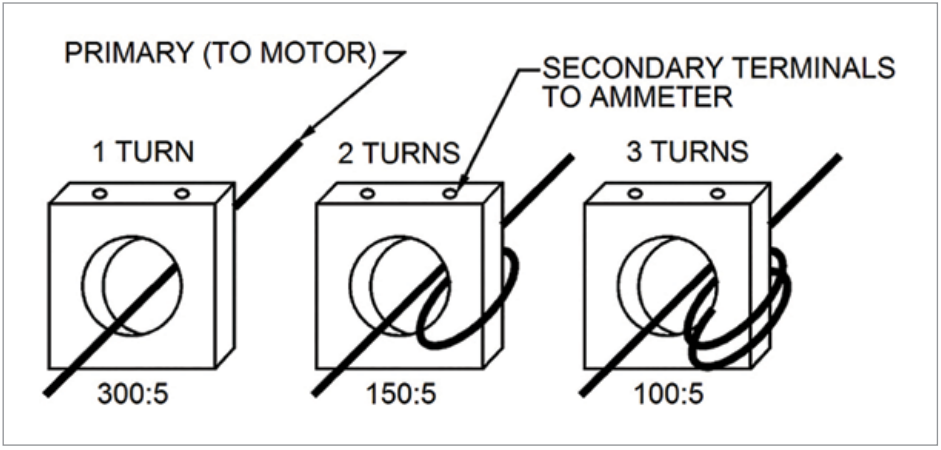

Figure 5: C/T with Multiple Primary Turns

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. Tom is the current Chair of the ASME PTC 13 Committee. For more information, visit www.jentechinc.com

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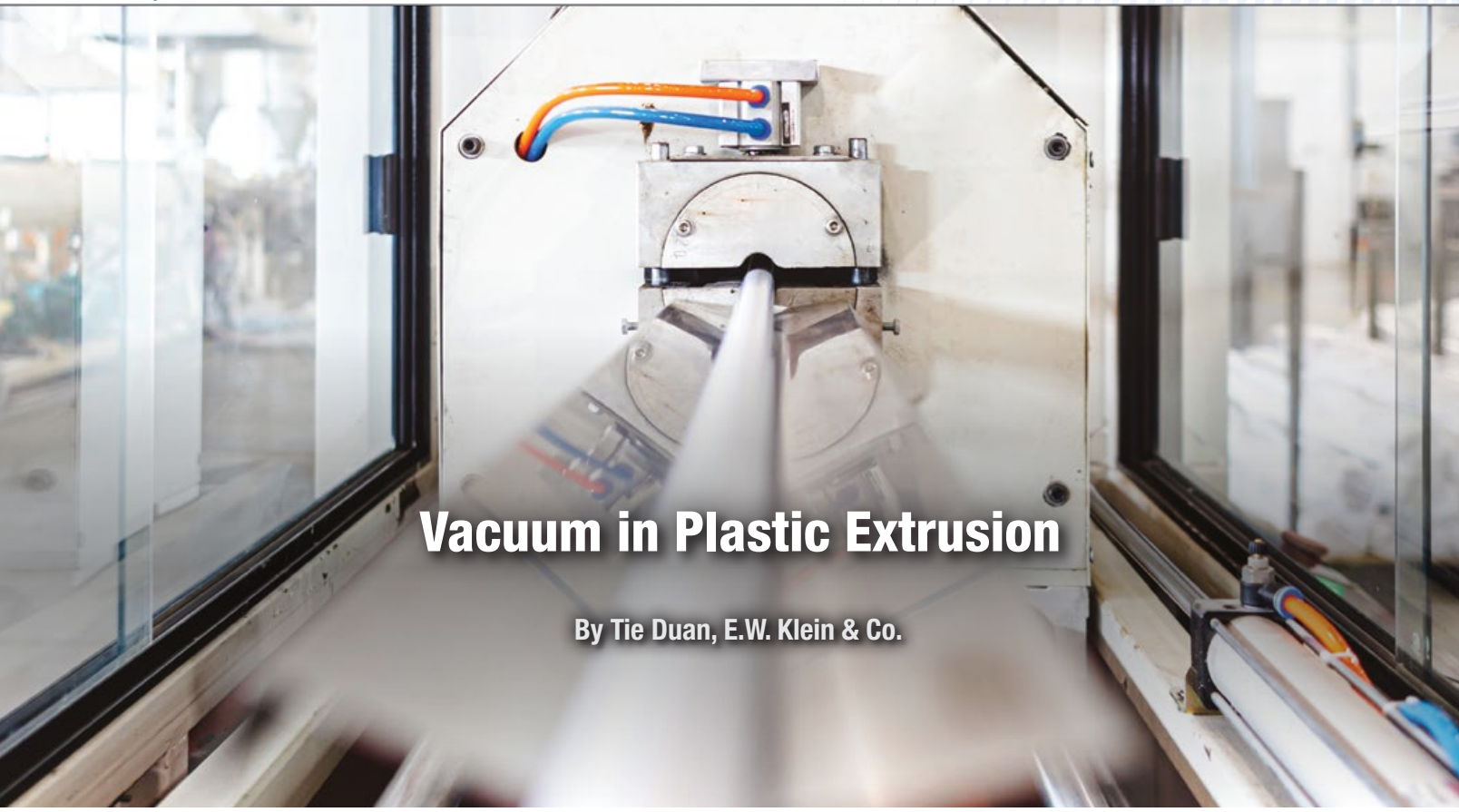


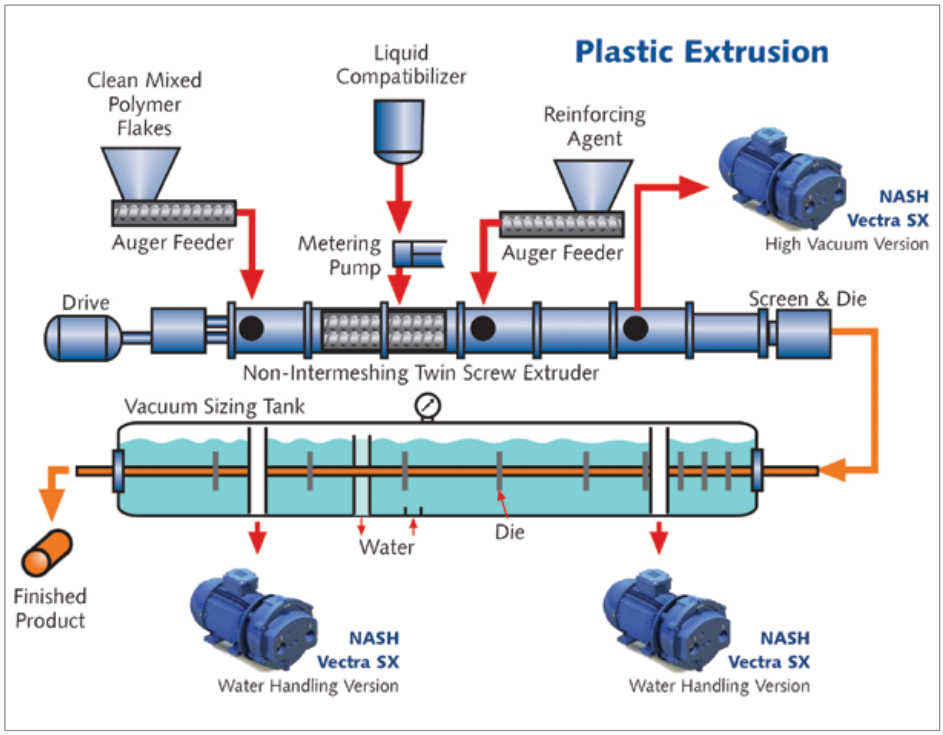
Vacuum in Plastic Extrusion

By Tie Duan, E.W. Klein & Co.

The basic function of vacuum degassing is to remove the vaporized gas and moisture from the extruded material. During the extrusion process, as raw materials melt under heat and pressure inside the extruder. The polymer chains and chemical compositions are going through changes, and a variety of gases are released.

While most of the vapor removed from an extrusion process under vacuum is water, in certain situations some harmful chemicals are also released. For example, vinyl chloride monomer can be a damaging monomer released from PVC extrusion, and if mixed with water it can become a corrosive agent. Hydrogen cyanide can be released from nylon extrusion, which is a carcinogen. When designing a vacuum system for an extrusion process, it is important to consider the effect of process off-gassing on the pump's material of construction, as well as the disposal of the removed gases and vapors.

If insufficient vacuum is applied in a process, gas and vapor can be trapped in pockets in the plastic melt as it's being pushed through the final compression zone of the extruder, resulting in visual defects of the finished plastic parts. These can be air bubbles in injection-



Vacuum degassing in a twin-screw extrusion and vacuum sizing tank. Image credit: Gardner Denver Nash

molded parts, voids in plastic pellets, and a host of visual defects in plastic sheets or films.

Another damaging effect of not sufficiently removing moisture by vacuum is advanced polymer degradation through hydrolysis. Although plastic products appear to be solid pieces to our naked eyes, on the microscopic level they can be visualized as a mess of entangled and crosslinked spaghetti noodles, or polymer chains. These entangled and crosslinked polymer chains is what gives a plastic product its physical properties: rigidity, ductility, impact resistance, flexibility, etc.

Hydrolysis is the process in which polymers are broken down into monomers when water molecule is introduced. It essentially breaks a long polymer chain to smaller chains, therefore reducing its ability to entangle and crosslink with other polymer chains. This phenomenon reduces a plastic product's physical properties, makes it more brittle, less flexible, or less impact resistant.

Hydrolysis can happen to certain thermoplastics during the extrusion process. Polyester, for example, is vulnerable to hydrolysis, which is why PET film extrusion operations would normally require large pre-drying systems to remove moisture from resin pellets before extrusion. There have been some innovations in Europe and Asia where vacuum is applied to the extruder to remove moisture without pre-drying the raw material. These innovations have also made their way into the U.S. market in recent years.

Vacuum Solutions Able to Manage Process Carry-Over

Because of their incredible tolerance of process carry-overs, liquid ring vacuum pumps have been the predominate technology used in this application. These pumps' internal design and operating principle allows reasonable amount of particulate, liquid, and vapor to pass through without causing pump failure. However, with aggressive filtration, separation, and condensation, dry vacuum technologies, such as claw pumps, can also be used in this application. While claw pumps have the advantage of not producing contaminated water that requires proper disposal, it is critical that process carry-overs are sufficiently removed before the pump, or the risk of pump failure can be high. This can also translate to higher maintenance cost and reduced reliability compared to liquid ring vacuum pump.

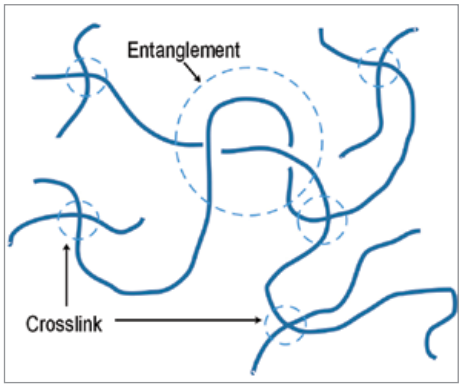
The most common issue with this vacuum application is process carry-over clogging up the pump.

Solution: use vacuum filters to remove particulates and liquids, or vapor condensing separators to remove vapors. In certain situations, we have recommended using both as a two-stage system to remove as much process carry-over as possible.

Vapor condensing separators are a double-walled variant of the simple vacuum inlet filter. Cooling fluid is circulating in between the double walls, condensing incoming vapors, and dropping them out of the air stream. Manual discharging of condensed liquid is needed to prevent overflow and slugging liquid into the pump. For condensed liquid that flows easily, an automatic draining kit can be installed to replace manual discharging.

Plastic Profile Calibration

In profile extrusion, plastic melt is extruded into a set of profile calibrators where cooling water and vacuum are applied simultaneously to the plastic to cool and form it into desired product shape. In this application, liquid ring vacuum pumps are the preferred choice in vacuum technologies. The large amount of water that gets sucked into the vacuum pump presents a significant challenge for any dry or oil lubricated vacuum pumps.



The entanglement and crosslink of polymer chains.

The typical vacuum issue one would see in profile extrusion is early pump failure due to flooded pump at startup. Vacuum pumps are frequently installed at the bottom of the profile calibrator's water bath, where the pumps are discharging upwards into the tank or the calibrators. When the extrusion line shuts down, water can rush back into the pumps, flooding it for the next start up. When the pump starts up again, it will try to compress the incompressible fluid until extra water is discharged. This will cause excess stress on the pump's rotor blades and early failure.

Solution: Add a check valve at the discharge and a drain line with a solenoid at the centerline of the pump so when the pump shuts down, excess water can be drained out.

Another option we recommend is a liquid ring vacuum pump variant that can easily handle

Vacuum in Plastic Extrusion

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E.W. Klein Industrial Vacuum Workshop at Best Practices 2022 EXPO & Conference

E.W. Klein & Co., a vacuum, heat transfer and industrial equipment supplier with over 101 years of expertise serving the Southeastern U.S., will conduct an industrial vacuum workshop at the Best Practices 2022 EXPO & Conference, taking place October 4-6, 2022 at the Cobb Galleria Centre in Atlanta, GA.

Led by the E.W. Klein team of vacuum application specialists, the workshop is exclusively available to manufacturing plant and engineering firm personnel involved with maintenance, production and engineering. Various major vacuum technologies will be covered in-depth including operating principles, design conditions, maintenance, and troubleshooting. Tailored to interest and sign-ups, industry-specific sessions will take place including: plastics, paper, carpet, chemical and poultry.

The Best Practices 2022 EXPO & Conference is devoted exclusively to optimizing and maintaining on-site utilities powering modern plant automation including chilled water, vacuum, compressed air, blowers, pneumatics, motors, and instrumentation. The EXPO features over 70 exhibitors (and counting), eight brand neutral conference session hours (certificates for 12 PDH), product training, Compressed Air Challenge Level 1 Fundamentals of Compressed Air Systems Training, and the Certified Compressed Air System Specialist exams from the Compressed Air & Gas Institute.

To reserve your seat in the workshop, please first register for an EXPO or conference pass at https://cabpexpo.com/registration/, then contact Tie Duan with E.W. Klein at tie@ewklein.com with credentials.

About Best Practices 2022 EXPO & Conference and E.W. Klein

Best Practices 2022 EXPO & Conference is an event devoted exclusively to optimizing and maintaining on-site utilities powering modern plant automation. The event is produced for the important reader segments of the Best Practices Magazines – the engineering firms, manufacturing plants and equipment companies responsible for specifying, purchasing, operating, maintaining, selling and servicing industrial equipment. For more information on the Best Practices 2022 EXPO & Conference, please visit cabpexpo.com. For more information about E.W. Klein please visit www.ewklein.com.

the excess water. Internal modification to a Nash SX pump can turn a standard unit into a Water Handler variant, which can tolerate up to 10 times that of normal seal water flow while maintaining operating vacuum level.

Wire/Fiber Dewatering

In wire extrusion and some fiber extrusion, the insulated wires and extruded fibers need to have the surface water removed after they emerge from the water bath. This can be done using vacuum or positive pressure. In the case of using vacuum, liquid ring vacuum pumps are frequently used because of its tolerance of incoming process water. However, it can be susceptible to low water quality in the bath and slugging of water due to inconsistent flow of water from the process or incorrect piping configurations. Dry vacuum pumps have been used in this application with some success, but they require aggressive inlet filtration/separation and regimented filter/separator cleaning/draining schedule.

The key is to either ensure the water coming off the extruded wire or fiber is removed before the vacuum pump, or the vacuum system is designed to tolerate this water. This setup in the diagram below allows the water to be sucked into a liquid ring vacuum pump recirculation system after the front-end filter removes larger debris in the water. This setup would result in constant draining from the system's overflow because the water being pulled off the product ends up in the vacuum system.

Positive pressure solutions can also be applied. Air knives can be a cost-effective and low maintenance solution. However, it is important to consider the cost of compressed air usage

when evaluating an air knife. A common alternative to compressed air usage is a dedicated regenerative blower for the air knife.

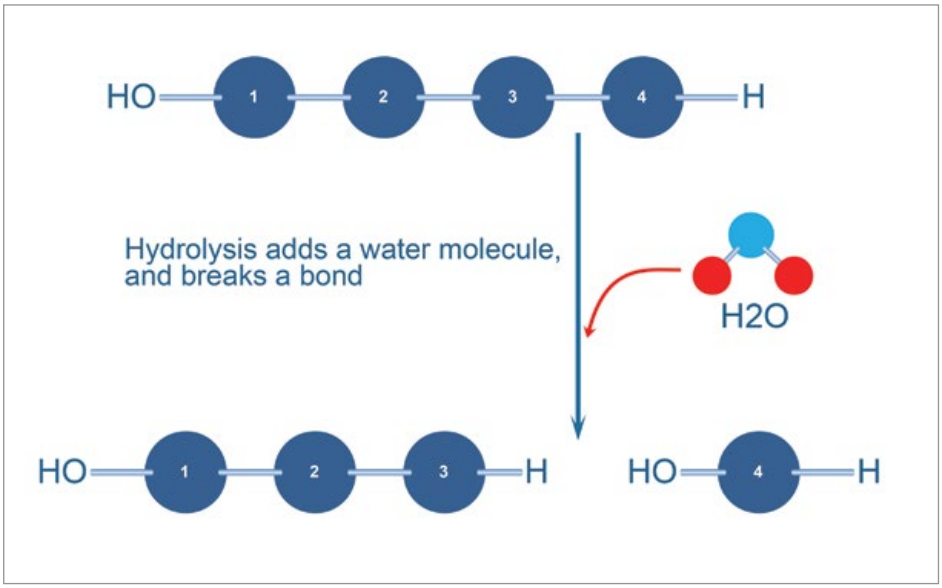
Thermoforming

In thermoforming operations, plastic sheet or film is first heated, then vacuum is used to force the softened plastic sheet/film into a mold, where it is cooled and formed into the shape of the mold. Unlike the previous applications, where the process carry-over can dictate the vacuum selection, in this application, many vacuum technologies can be used:

- Regenerative blower. These low-cost blowers can be used as vacuum for forming thin plastic films into products without deep vacuum draw. It is important to install inlet vacuum relief valves on these blowers to prevent operating at deeper vacuum level than designed. Running at deeper than designed max vacuum level can cause blower overheating and failure.

- Claw pump. This dry vacuum pump is a common choice for thermoforming. A single stage claw pump can easily reach 25 in-HgV, enough vacuum to form products such as clam shell or blister packs from PET sheet. These pumps are easy to maintain and provides a relatively clean operating environment. Vacuum relief valves to limit vacuum level are also recommended for this pump in thermoforming.

- Oil-less rotary vane pump. This type of pump is also commonly used for thermoforming. With similar vacuum performance as the claw pump, they tend to have higher cost of ownership due to frequent vane replacements.



Hydrolysis Breaks down a Polymer Chain

- Oil-lubricated rotary vane pump. These pumps are often used for forming products using thicker plastic sheets and/or have deeper draw, because these pumps can reach deeper vacuum level than single stage claw or oil-less rotary vane pumps. However, the constant misting of oil from its exhaust can cause a housekeeping nightmare. Frequent oil change and vane replacement can increase cost of ownership over time.

- Liquid ring vacuum pump. While LRVP can be used for thermoforming, as their ultimate vacuum can easily cover the operating levels needed for many product shapes, they are often recommended as a central vacuum system, because its installation requires utilities such as city water and chilled water.

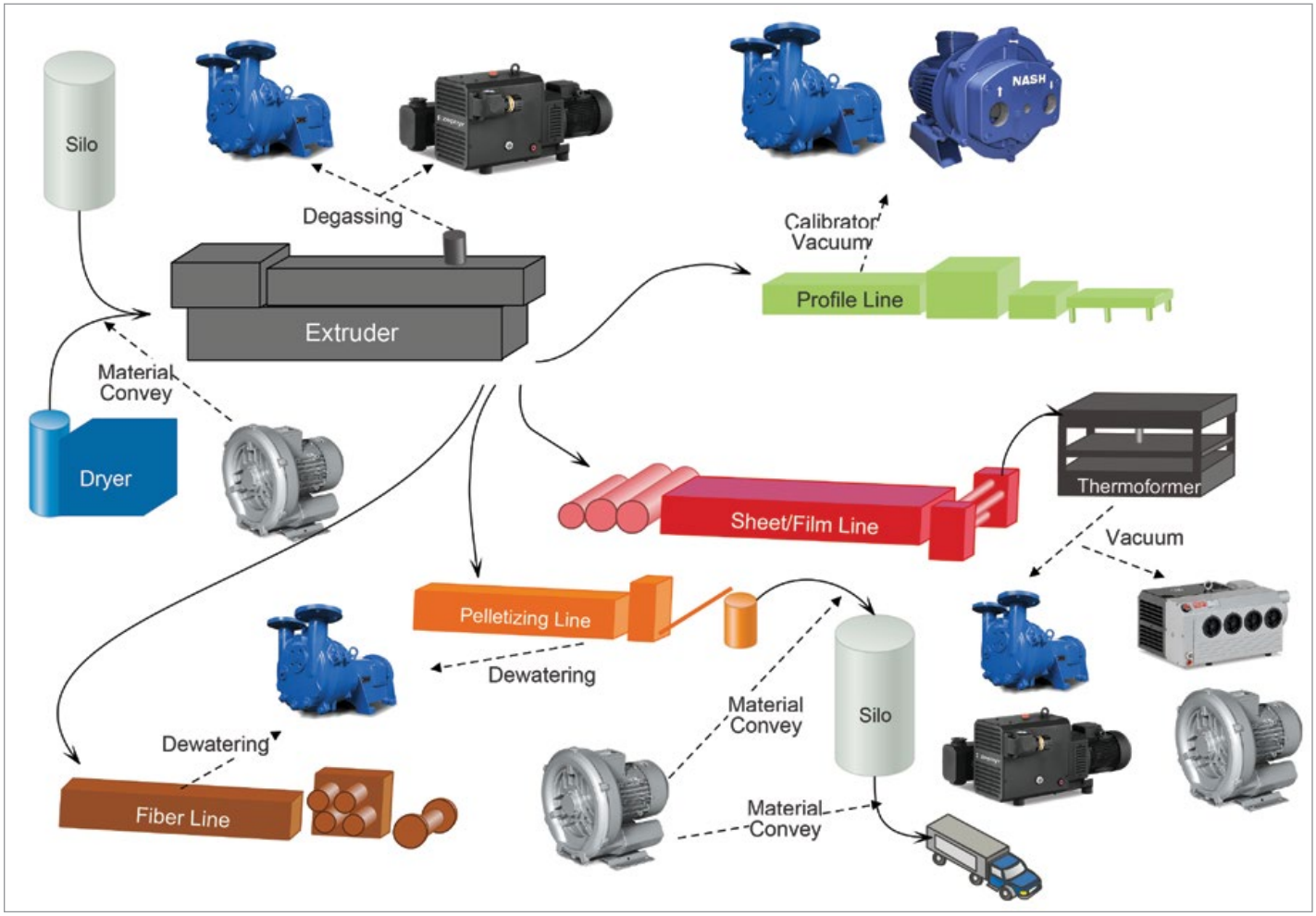
Material Conveying

Transferring large quantity of plastic pellets, flakes and powder are often done using pneumatic conveying. Pneumatic conveying can be done either using vacuum or positive pressure. In the case of using vacuum, it is typically no deeper than 10 to 15 in-Hg. The CFM sizing of the vacuum pump depends on a wide range of parameters, such as the type of material conveyed, size and shape of the particles, distance of conveying, piping sizing, number of elbows in piping, material transfer rate, etc. The pneumatic material conveying system design is a science and art of its own.

Focusing just on the component level, the vacuum pump can have a couple of common causes of failure:

1. Lack of proper filtration before the pump allowing dust and particle get into the pump.

Vacuum in Plastic Extrusion



The different applications of vacuum in a plastics operation. Image credit: Gardner Denver Nash

2. Lack of properly set vacuum relief valve, causing pump to overheat running at deeper vacuum than designed.

3. Frequent start and stop of the pump motor based on vacuum conveying demand, resulting in burning up the motor. This can be solved by installing a vacuum breaker valve that toggles between atmosphere and process piping based on conveying demand, while keeping the pump motor running.

Vacuum can be found in many different applications in the extrusion process, but a firm understanding of the limitations of each vacuum technology and a good grasp of the principals of vacuum is required to make the best choice. BP

About the Author

Tie Duan is the Solutions Sales Engineer at E.W. Klein & Co. Email: tie@ewklein.com, tel: 478-508-2017. For more information about E.W. Klein and the great companies we represent, please visit www.ewklein.com.

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Show Report: Vacuum Technology at 2022 AISTech

By Kimberly Vickman, Blower & Vacuum Best Practices Magazine

The 2022 AISTech Conference and Exposition was held May 16-18 at the David L. Lawrence Convention Center in Pittsburgh, Pennsylvania. It was the conference and exposition's most successful year yet with more than 8,000 attendees. The event featured 300+ technical presentations and 500+ exhibitors, featuring the latest technologies in iron- and steelmaking from all over the world. AISTech 2022 also gave away a brand new, fully loaded, 2022 Chevy Silverado Truck to one lucky attendee. Both Blower & Vacuum Best Practices and Compressed Air Best Practices Magazines were pleased to be in the literature bins. A virtual experience was also available this year for those unable to travel and featured a technology conference, exhibitor connections and plenary events available to anyone with a computer.

Vacuum Technology Roundup

Busch Vacuum Solutions told me about their vacuum systems for steel degassing. Steel degassing is the process of removing all the impurity gases such as Nitrogen and Hydrogen out of the liquid steel. What makes Busch's solution unique from other manufacturers is that their Cobra vacuum pumps are set up on skids making them easy to transport from

place to place. The skids also save space in a plant because they can be placed side by side. Busch told me that they were no stranger to steel degassing in other parts of the world, but they are new to the process in the U.S. They were proud to tell me they received a significant order in the U.S for a big system to be installed in a large facility soon.

Pfeiffer provides both pumps and instruments to generate and measure vacuum in different steel applications. Brian Cox greeted me at the Pfeiffer Vacuum booth where they were showing a few pieces of equipment. He showed me Pfeiffer's leak detector, which is a small portable unit with a remote. The unit is designed with the service technician in mind in that it can be easily carried from place to place. What Brian was most proud to show me was their industrial gas mass spectrometer. Pfeiffer is taking a laboratory instrument and making it durable enough to withstand any industrial environment. Brian said, "it is the first of its kind and we expect full production in the beginning of 2023." Brian also mentioned their new lobe blower is the future of steel degassing, but it was too big to bring to the show.

Dave Morris showed me a 3D model of Leybold's standard module design at their booth since the real system was too big to show. The module included eight RUVAC vacuum boosters backed up by up to four DRYVAC dry screw pumps. The entire module is Atex certified and is a vacuum solution for modern melt shops. In fact, Leybold already has 11 installations in North American steel mills and melt shops. Dave Morris, Business Manager, Leybold said, "no one does it like us," when describing the module's redundancy to avoid downtime.

Sean Donnelly, Thomas Burke, Mike Krupitzer, Mike Norton (left to right) at the Busch booth.

Brian Cox next to Pfeiffer Vacuum's industrial gas mass spectrometer.

David Badaczewsk next to a 3D model of Leybold's standard module design.

Show Report: Vacuum Technology at 2022 AISTech

Anke Teeuwsen and Theron Everett (left to right) at the Edwards booth.

Stephen Williams and Sam Vacca (left to right) at the Howden booth.

Joel Hatfield and Siraj Boudighar (left to right) next to ABB's control system.

Edwards supplies mechanical vacuum pump systems for the secondary refining of steel. They have a proven track record and have been supplying the industry since 1998. Edwards has dry pumps that consume less electricity and no steam, minimizing the carbon footprint of the system. Anke Teeuwsen was proud to tell me that she authored a paper at the show this year, Diversified Mechanical Vacuum Pump Solutions for VD/VOD, highlighting Edwards' technologies.

Cooling Systems, Motors & Drives, and Fan Technology Roundup

Howden represented their aftermarket and OEM business at their booth. Their axial flow and centrifugal fan products are used in the steel making process. Their fans are used to remove and clean waste gases from the steel process. Their exhaust fans help with plant operation by drawing waste gases through the primary waste gas cooler.

ABB's booth featured their drive and control technologies. They supply a selection of AC and DC drives to the steel industry. Their booth featured crane control with their AC drive. The crane has special software and special controls so that it doesn't sway. The ABB booth also featured a drive control emulation. Siraj Boudighar showed me how changing the controls increased or decreased the speed of the demo motor. Their drives can be used for many applications. The ABB booth also had their cabinet DC drive on display. The design makes it simple to add more drives in a modular design as well as being simple to remove or replace if something were to go wrong. Siraj also told me that ABB can control the entire steel process. Their electromagnetic stirrer is used to stir molten metal into a

homogenous mixture. Their controls also operate hot rolling, cleaning and painting, among other processes.

Rockwell Automation featured their information software solutions at their booth. Adam Milazzotto, FIIX app and maintenance technician, told me that Rockwell Automation's solutions enable factory talk innovation by monitoring production and decreasing downtime. Rockwell Automation also had augmented reality at the booth where you could see their products put into a steel plant. What impressed me most about this booth was their Polytest Robot for cooling bed sampling. I was told that sampling in a steel plant typically takes 120 seconds and is a dangerous process that usually needs a plant shutdown. The Polytest Robot thrives in a dirty, demanding and dangerous environment and is able to sample in just 20 seconds. The booth also featured their latest edition drive (as of April 1st), the Powerflex 755TS. The drive monitors its own health and comes with ethernet built in. It is available with optional XT Technology that coats critical components to protect from hazardous gases.

Marco Maleki and Adam Milazzotto (left to right) next to Rockwell Automation's Polytest Robot.


Denis Balogh at the Motion booth.

Motion distributes a variety of bearings, hoses, hydraulics and safety equipment to the industrial sector and had a selection of items on display. In addition, they supply ABB Baldor motors and drives, vacuum pumps, centrifugal air-operated diaphragm pumps, automatic lubrication systems, pneumatics and electromechanical equipment. They manufacture their own fluid power equipment.

The steel industry requires cooling water for contact- and non-contact applications such

Paul Heston and Ron Lair at the Hydrothrift booth (left to right).

Show Report: Vacuum Technology at 2022 AISTech

Andrew Sickler and Kevin Deliman at the Baltimore Aircoil Company booth.

Mike Pires and Ted Lyons at the Air Products booth (left to right).

Scott Hill and Eric Cummings at the Ross Controls booth (left to right).

as roll cooling, cooling molds on casting machines, cooling electric arc and induction furnaces, heat treatment, hydraulic systems and more.

Hydrothrift Corporation was present discussing its complete line of thermal transfer systems and nationwide heat exchanger repair and remanufacturing services. While also offering open loop systems, its custom-engineered closed loop (dry type and evaporative) cooling systems offer reliable temperature control and efficient operation. Its Closed-Loop Evaporative-Type systems (20 – 2,000 gpm) are equipped with heavy-duty prime surface evaporator coils, close-coupled centrifugal pump, surge and vent tank and more in a packaged pump and control skid. After more than 40 years, Hydrothrift has completed more than 23,000 projects globally for organizations in the most demanding environments.

On display at the Baltimore Aircoil Company (BAC) booth was its Series 5000 Industrial Grade Modular Cooling Tower for contact water and dirty water applications. When steel is being rolled or cast, cooling water is introduced – collecting mill scale, oil and grease in the process. The Series 5000 from BAC is designed to withstand and shield off mill scale, oil and suspended solids with its proprietary splash fill bars. Other features of its crossflow, axial fan, induced draft design include superior maintenance and cleaning accessibility, ENDURADRIVE variable speed direct drive fan system, corrosion protection system, and flow rates up to 4,500 USGPM.

Air Products showcased its industrial gas solutions and technologies for all phases of iron and steel production. The Air Products

Foundation pledged to donate $100 to the AIST Foundation – up to $15,000 in all – for each registered attendee who visited the Air Products booth. The Air Products team also contributed to the Energy and Utilities sessions with a presentation on "Hydrogen Production and Supply Methods for Decarbonizing Iron and Steelmaking" as well as contributing to the panel discussion on "A Pathway to Making Your Reheat Furnaces Green while Improving Capacity and Reducing Energy Consumption."

Ross Controls is well-known as for its rugged directional control valves and air preparation units. The Ross Controls team was on site discussing how they've incorporated safety components into its turn-key packages of pneumatic components and valves for OEMs and suppliers. These safety panels include air relief valves in the event of emergency stops, air preparation, lockout mechanisms, safe pressure select valves, safe return dual pressure valves and more.

The 2023 AISTech Conference and Exhibition will be held May 8-11, 2023 at the Huntington Place Convention Center in Detroit, Michigan. For more information visit https://www.aist.org/home.aspx BP

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