The Magazine for ENERGY EFFICIENCY in Blower and Vacuum Systems

BLOWER & VACUUM BEST PRACTICES

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Packaging

INDUSTRIAL BLOWER & VACUUM SYSTEMS

AERATION BLOWER SYSTEMS

Dare to Compare.

The isentropic efficiency for variable speed screw and turbo blowers is 20-35% better than multi-stage blowers

Picking the Right Blower Technology

Blowers are critical assets for wastewater treatment plants, and they are often the biggest energy consumers in the plant. Choosing the best blower is vital for plant operational success; however, too often engineers and operators, stick to blower technology they know best, rather than taking the time to compare blower technologies.

Multistage blowers have been a popular choice for many years, but did you know rotary screw and turbo blowers have better isentropic efficiencies than multistage blowers?

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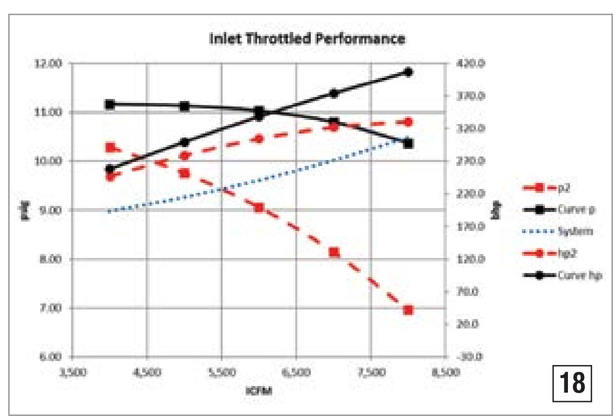
EVERY ISSUE



FROM THE EDITOR

Industrial Blower & Vacuum Systems

Modern paper machines carefully remove water from the paper sheet by using vacuum created by either liquid ring vacuum pumps or turbo blowers. Andrew Smitneek has a long career's worth of knowledge (his biography says he's retired four times!) on this topic. I hope you enjoy his article reviewing the pros and cons of using these technologies.

Tie Duan, from E.W. Klein & Co., has sent us his third excellent vacuum fundamentals article this year. This one is titled, "Case Studies in Dry vs. Wet Vacuum Pumps." It's a useful piece for every plant and every vacuum sales engineer trying to optimize vacuum systems.

Vacuum conveying has long been used in the food industry. Automating the movement of food, in the plant, can never come at the expense of food quality. Nora Ashmen, from VAC-U-MAX, has sent us an interesting case study about how a tea manufacturer resolved a quality control issue related to their vacuum conveying system.

Aeration Blower Systems

"Aeration Blower Control Strategies" is the title of our latest article from Tom Jenkins, from JenTech Inc. If you "get technical" with positive displacement and centrifugal (turbo) blowers, the calculations and graphs will challenge you! You can also hear Mr. Jenkins make a presentation on this topic by visiting our Webinar Archive pages at https://www.blowervacuumbestpractices.com/magazine/webinars

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

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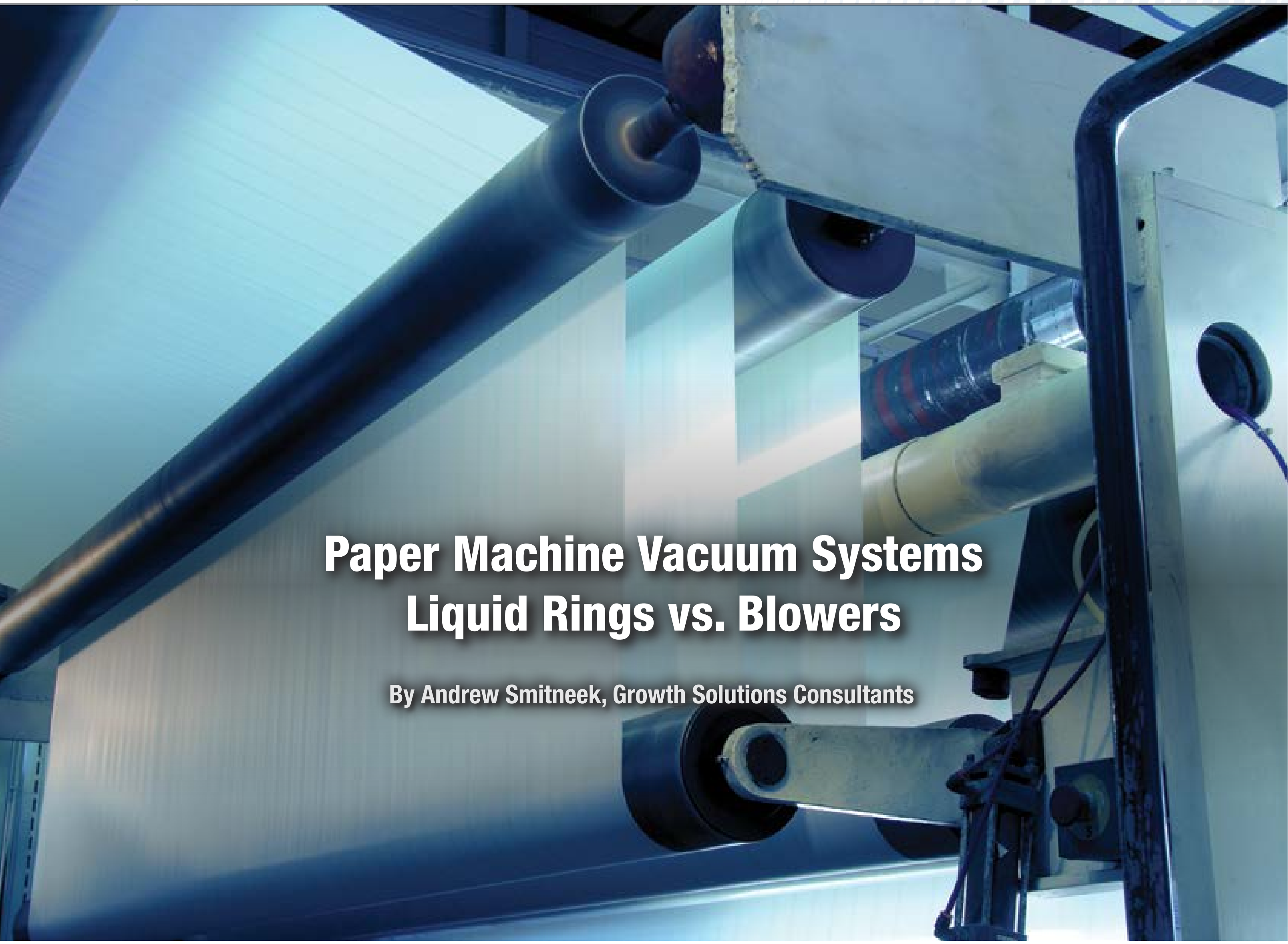

Paper Machine Vacuum Systems Liquid Rings vs. Blowers

By Andrew Smitneek, Growth Solutions Consultants

Introduction

So you need a vacuum system for your paper making machine. Take a deep breath and read on. Blowers versus liquid ring vacuum pumps, the short list:

- If you need less than 3" Hg vacuum (90 kPa) you want a fan.
- If you need more than 18" Hg (40kPa) you will need a liquid ring vacuum pump.
- If you want a machine that will run for a very long time with little or no attention, you will want a liquid ring pump.
- If you want to run without measuring or controlling anything, you want a liquid ring pump.
- If you want to save energy, you will want a turbo blower.
- If you want to use a blower, you will have to measure, understand and control the blower speed to the process parameters.

The approximate energy comparison of the best turbo blower versus the best very large liquid ring pump is on this chart; note that the liquid ring pump is running at a constant speed, the turbo blower would have to be variable speed to meet the curve shown in Figure 1.

Blowers vs. Liquid Ring Vacuum Pumps – How they Work

Any air pressure, lower than local atmospheric, is called a vacuum. This is the definition. A machine that can remove air from a chamber, faster than it can leak in, is called a vacuum pump. The vacuum pump gathers air at a low pressure and discharges it to a higher pressure (the atmosphere). It is by definition a compressor.

A paper machine carefully removes water from the paper sheet. Some of this water removal is done by passing air through the sheet, thus moving the water from the sheet to the wire. Air is moved by creating a pressure differential across the sheet. This is normally done by putting the sheet on a wire and then putting a box under the wire and then evacuating the air from the box. The resistance of the air movement through the sheet and wire causes the pressure drop from the machine room to the box.

Two different devices are commonly used to create a vacuum, the liquid ring pump and the turbo blower. Within practical bounds of operation, they work as follows:

The liquid ring pump is a positive displacement isothermal compressor. In thermo dynamic terms, isothermal compression is the most efficient. It is also a constant volume device if it is run at a constant speed. Unfortunately, the liquid ring pump uses water as the piston, and moving the water in the largest most efficient liquid ring pumps consumes one third of the power put into the pump. In smaller, more commonly used pumps, this number is closer to half of the power.

The turbo blower is a constant pressure adiabatic compressor. In thermodynamic terms it is less efficient than the isothermal compressor. However, the enormous energy drain of moving the water in the liquid ring pump makes the turbo compressor more efficient. Also, because the compression is adiabatic (without exchange of heat), the air coming out of the blower is typically 392°F (200°C), there is energy there that can be reclaimed.

In a liquid ring system, the vacuum in the box is created by the resistance to the air flow through the sheet and carrier because the pump is constant volume. As a felt fills and compacts the resistance to flow increases

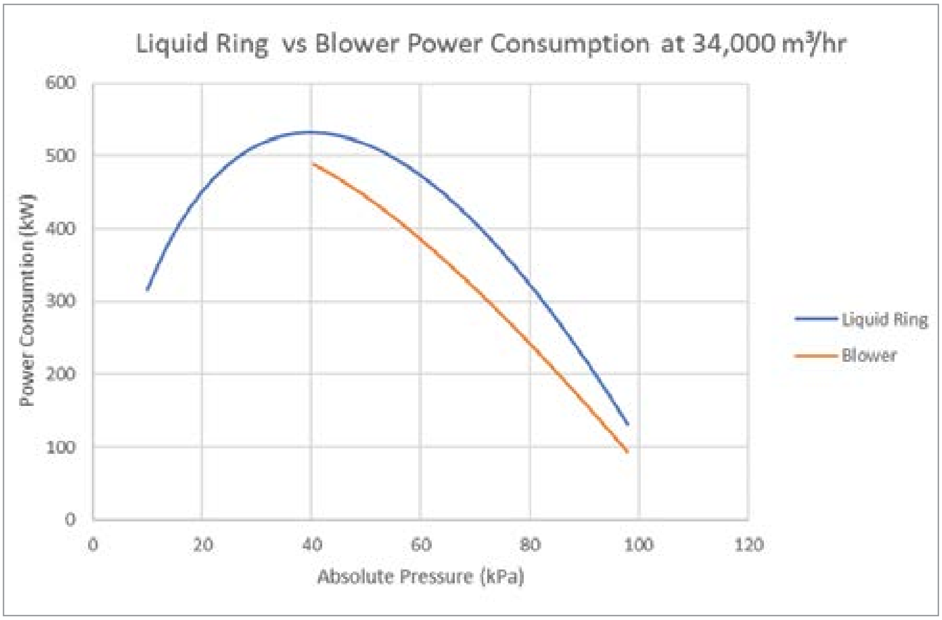

Figure 1.

Paper Machine Vacuum Systems: Liquid Rings vs. Blowers

Two of twelve medium-sized liquid ring vacuum pumps on a fine paper machine.

and the air velocity through the felt increases thus increasing the velocity of the air through the felt. This is an automatic compensation for felt filling as the increased air velocity will increase the water removal.

In a turbo blower system the pressure in the box is created by the blower, and the air flow is dictated by this pressure. As the felt fills the resistance to air flow increase however the pressure remains constant and the air flow decreases. The power used by the blower also decreases as it is dependent upon the air flow. In modern systems, the water removal by the vacuum system is measured and the blower speed increased to optimize the water removal. In this sense it mimics the liquid ring without controls.

The liquid ring pump is robust, runs slowly and can handle an enormous amount of excess water and junk running through it. The turbo blower is finicky to control, runs very fast and cannot tolerate any contamination. Failure of a liquid ring pump is usually very slow and predictable. Failure of a turbo blower is usually rapid and catastrophic.

Paper Machine Vacuum System Surveys

Measurement of the water removed and careful experimentation with your product versus water removal is a very good idea, as it will remove variability from your process (remember 6 sigma?). Either the turbo blower or the liquid ring pump can and should be speed controlled for optimum energy performance.

Most paper machine have too many vacuum pumps and also have uncontrolled vacuum systems. The very large energy gains reported by going from a liquid ring system to a turbo blower system are partially caused by elimination of vacuum capacity from the system. In many cases this vacuum elimination can be done without replacing the pumps. A vacuum survey, experimentation, performance measurement and controlling the speeds of the liquid ring pumps will often get good enough results to avoid the higher capital of a complete system rebuild.

For a new paper machine, a hybrid system with fans, blowers and liquid ring pumps is desirable.

The vacuum system must be measured and controlled. I worked on one such system in Europe where after the machine was built with 4 liquid ring pumps with 3000 kW connected and after two years two of the pumps were shut down wit the other two running faster, for a savings of 1000 kW over the original design. Without the experimentation, measurement and controls this would not have happened.

The design of the vacuum system and the troubleshooting of an existing system is complicated but not impossible. Before you undertake this activity, you should study and consult with independent people who have done this before.

So take a deep breath and understand that your lungs work like a liquid ring pump. If you could breathe 250 times per minute you would move about 1800 m³/hr. This is what a liquid ring pump with your lung capacity would do. Call me for the calculation. BP

About the Author

Andy Smiltneek is an independent consultant and president of Growth Solutions Consultants LLC in the U.S.. Andy has lived and worked in the U.S. and China and has retired 4 times. He will consult anywhere in the world. Visit www.growthsolutionconsultants.com

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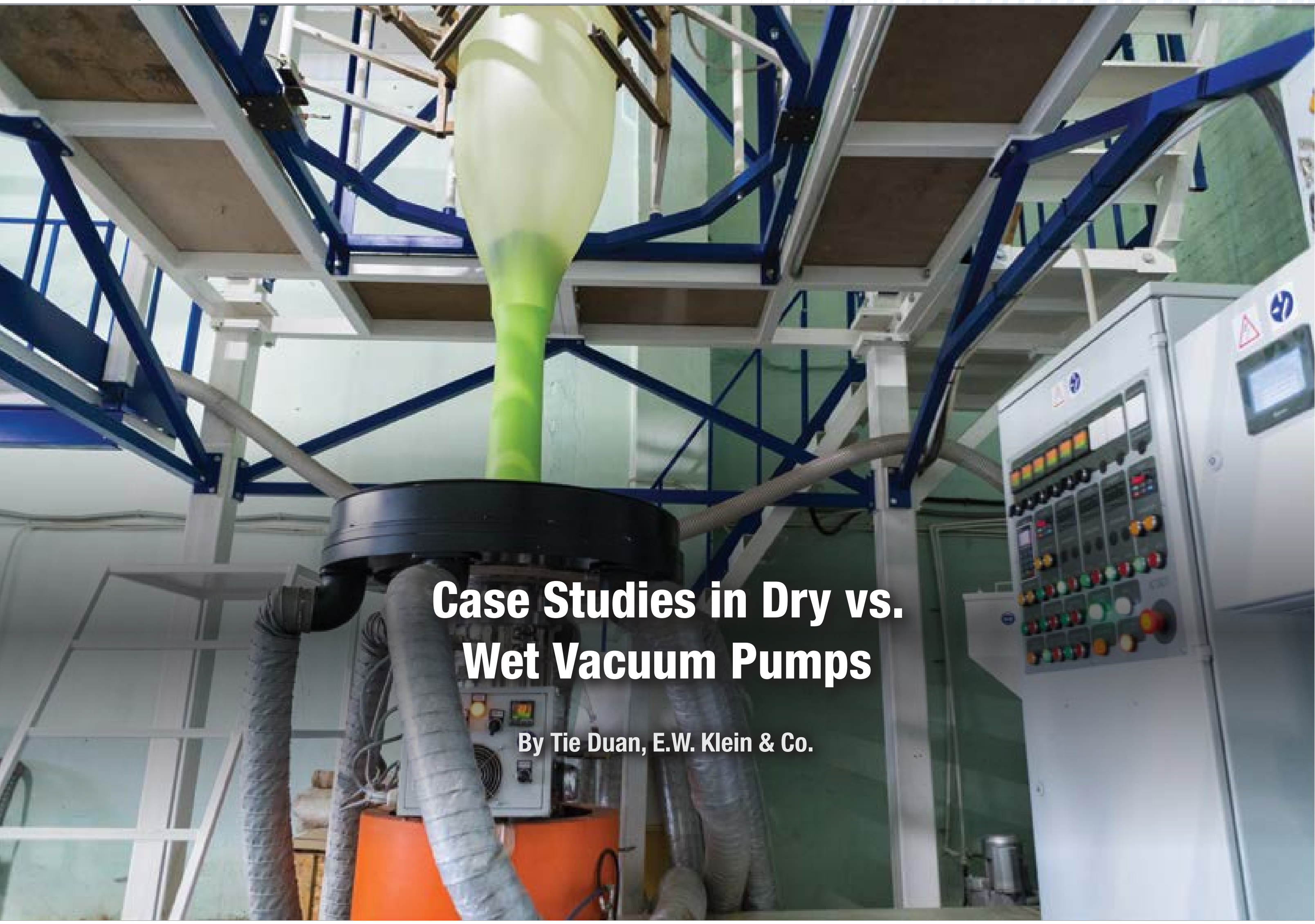
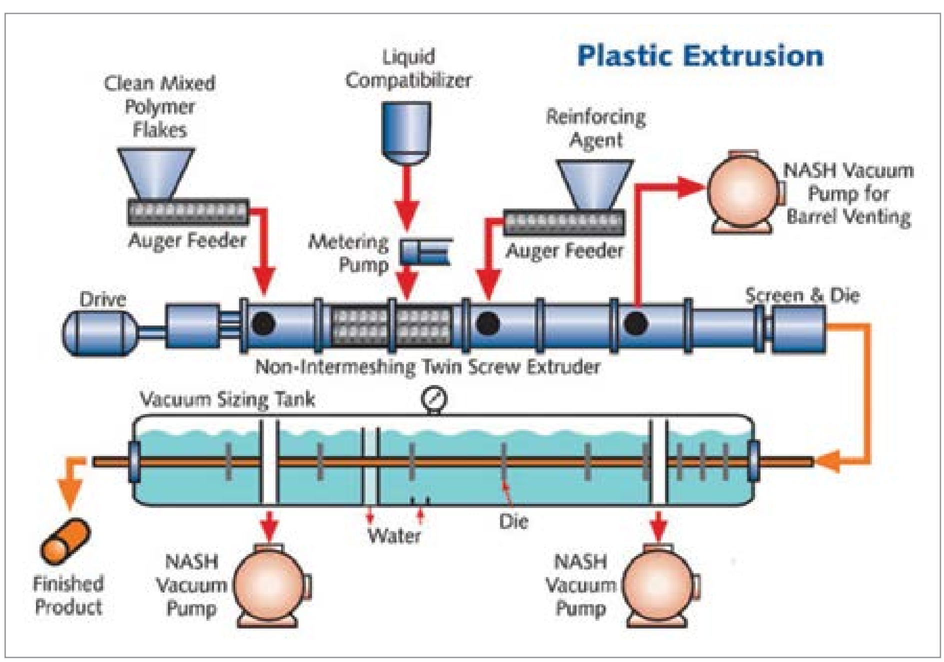


Case Studies in Dry vs. Wet Vacuum Pumps

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

Why is my vacuum pump failing? Do I continue replacing/repairing my pumps or try a new vacuum technology? What is the learning curve for a new pump technology? How will a change in vacuum pump affect my plant utilities?

Many of our customers have grappled with these questions. In our recent travels, we have seen more and more exploration and experimentation with different vacuum technologies on existing processes. Liquid ring vacuum pumps being replaced by claw pumps, rotary vane pumps being replaced by liquid ring vacuum pumps, claw pumps being replaced by screw pumps, etc. Although the results have yielded many success stories and some unexpected challenges, we still believe these trials are not only healthy challenges



Typical vacuum applications in plastics extrusion process.

to status quo, but also necessary to push the boundaries of vacuum applications, and drive innovations in different industries.

Typically, when our engineers evaluate the suitable vacuum technology for an application, we take these areas into consideration:

- Process vacuum level
- Capacity demand
- Process carry-over's interaction with pump's internal seal liquid, coating, metal, seals, etc.
- Discharge gas/vapor/liquid/particle disposal regulation
- Environmental constraints (floor drain location, heat dissipation, noise level, etc.)
- Utility availability
- Cost of ownership
- Motor efficiency

As one can see, these above dynamic parameters go beyond just a vacuum technology's vacuum level and CFM capacity. To summarize this decision-making process into a simplified one-size-fits-all flow chart would effectively force any complex real-world scenario into a sterilized thought exercise. Instead, we present a few case studies derived on real-world application examples, where various vacuum technologies may be suitable solutions. These examples do not contain company names or extensive process details, so to protect proprietary information. Each case is generalized enough that the knowledge is applicable across multiple specific applications.

Extrusion Degassing

In plastic extrusion processes, moisture and volatile gas are often removed from the molten plastic by vacuum pumps. Insufficient off-gas removal can result in visual defects or poor physical properties in the final products.

The set-up: Company A has a twin-screw extruder running XYZ polymer with various powder additives. A claw vacuum pump is used for extruder barrel degassing.

The problem: Not enough moisture and volatile gas is pulled out of the extrusion process causing product defects. The claw pump requires constant rebuild as powder additives pulled out of the extruder get into the claw pump.

Our approach: Proper extruder barrel venting can be critical to the final product's physical and visual quality. Generally, the deeper the vacuum, the better the degassing. A single-stage claw pump's ultimate vacuum level is limited to 25 in-Hg gauge. For some extrusion applications, effectively removing all volatile gas from raw materials with high moisture content (e.g., un-dried regrind) requires a vacuum technology with deeper ultimate vacuum level than 25 in-Hg.

When dealing with process carry-overs in a vacuum application, the basic philosophy we follow is to either prevent it from getting into the pump or let it pass through without damaging the pump. In general, the claw pump is easy to install and operate. However, any process carry-over must be addressed. If not filtered or separated prior to entering the pump, the claw pump's internals can see severe abrasion, corrosion, and clogging. The gas and vapor pulled out of the extrusion process can become a very complex chemical mixture, presenting significant challenges to claw pump's reliable performance. This is

Cutaway view of inlet vapor condenser.

Add-on auto-drain kit to the vapor condenser.

Case Studies in Dry vs. Wet Vacuum Pumps

E.W. Klein & Co. Celebrates 100 Year Anniversary

Only a handful of companies last 100 years, and E.W. Klein is beginning the celebration of its 100th anniversary thanks to you and the great companies we represent, such as Gardner Denver, Alfa-Laval heat exchangers and other equipment. Founded in 1921, E.W. Klein & Co. is a leading manufacturer's representative of engineered vacuum and heat transfer equipment to the chemical, paper, power, and general industrial markets.

Our Roots: Based in Atlanta, E.W. Klein was selected as Nash Engineering Co's first representative in 1921. Nash's original focus was on steam heating systems common in buildings of that time. Later, Nash developed their world-famous line of Nash Hytor vacuum pumps. Still a leader in vacuum today, Nash is now part of the Gardner Denver product line recently merged with Ingersoll-Rand.

2020 was a challenging year for us all. Since the founding of the company back in 1921, E.W. Klein & Co has come through all kinds of difficulties: wars, depression, recessions, natural disasters, stock market crashes, a pandemic, and everything in between. Through it all, it has been the people of E.W. Klein – our employees, great customers, and the equipment we represent – who have made the difference. COVID has taught us that we can make it through the tough times and make sure we celebrate the good ones too, now and for the next 100 years. Looking forward to 2021 and past COVID: A part of our overall growth plan was moving to a new location that has allowed us to stock and repair pumps and other equipment that we represent. We are excited about our new capabilities that will allow us to service the customer better than ever.

The keys to our success have always been our dedicated technical-focused staff, developing strong relationships with our diverse customer base, and capitalizing on new opportunities. For more information about E.W. Klein and the great companies we represent, please visit www.ewklein.com.

especially true as the production raw material recipe changes (e.g. adding talc powder, calcium carbonate powder, liquid colorant, UV stabilizer, fire retardants, recycled flakes, etc.).

Our solution: For this application, we converted it to a liquid ring vacuum pump in recirculation setup, which can reach deeper vacuum level of 28 in-Hg. We decided to put in an inlet vapor condenser separator between the extruder vent port and vacuum pump inlet. This device uses chilled water/cooling tower water to condense the incoming gas and vapor then collect the condensable for manual discharge and cleaning. The vapor condenser prevented majority of the volatile gas and vapor from reaching the liquid ring vacuum pump. A secondary knock-out pot was placed between the vapor condenser and the pump inlet to drop out any liquid and particles. The residual amount of carry-over that makes it into the liquid ring vacuum pumps can easily be handled by the pump. As a result, the high cost of frequent claw pump rebuild is eliminated by periodic flushing of the liquid ring vacuum pump recirculation system.

The X-factor: This vapor condenser was so effective it requires constant manual discharging and cleaning. To reduce the dependency on manual intervention, an auto-drain system was put in to discharge the condensed liquid based on level sensors inside a drain pot at the bottom of the unit.

Because the recirculation system requires chilled water to cool down seal water, the customer was concerned with their chiller capacity as this solution is expanded to additional extrusion lines. Unlike a claw pump where heat generated from internal compression is dissipated into the surrounding atmosphere, a liquid ring vacuum pump's heat is almost completely removed by the seal water. In a recirculating seal water loop, the heat removed from the pump by seal water equals to the heat chilled water picks up through the heat exchanger. That heat transfer rate can be converted from the pump's brake horsepower using below equation.

Heat Transferred (Btu/hr) = Pump Brake Horsepower (bhp) × 2,544.43 Btu/hr

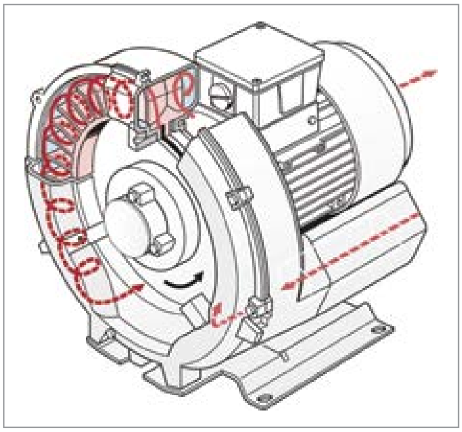
CNC Vacuum Hold Down

Various vacuum technologies are being used to hold down the product while a CNC router cuts it into shape. Many of these are selected by the OEMs of the CNC machines, which are often designed to cut a limited selection of materials. However, once these machines get into the real-world applications or the lively used equipment market, all kinds of materials can be cut on these machines. In many cases, the OEM supplied vacuum system might not be the best fit for these non-ideal application conditions.

The set-up: A liquid ring vacuum pump in an air-cooled self-contained recirculation package is used to perform hold down on CNC machines that cuts wood panels.

The problem: Fine dust gets into the recirculation system and causes clogging of the seal water lines, overheating the pump, resulting in poor hold down performance and frequent pump failure.

Our approach: For cutting substrate that are porous, like the MDF panels, a vacuum pump needs be to able to pull to the desired vacuum level to prevent the panel from moving while being cut. It also needs to have enough CFM capacity to handle the air being pulled through the panel without losing vacuum depth. While the existing liquid ring vacuum pump system has inlet filter, it is easily clogged by the large amount of routing dust produced from this process. Once the dust gets into the pump system, it tends to stay in the recirculation loop, causing abrasive wear on internal components and reduce heat transfer efficiency of the onboard air-water cooler.



Regenerative Blower, also called Side Channel Blower.

For this application, the vacuum depth needed was only 10 in-Hg gauge, so we decided to replace the liquid ring vacuum pump system with a regenerative blower, which can reach this vacuum level and provide high air flow

Gardner Denver Elmo Rietschle 2BL Air-Cooled Self-Contained "Pump-In-A-Box".

Case Studies in Dry vs. Wet Vacuum Pumps

capacity. A larger inlet filter with finer filter element was also installed, to improve process carry-over prevention. Due to the internal design of a regen blower, it can tolerate some fine dust being pulled into it. This regenerative blower was installed outdoors adjacent to the wall where the CNC machine is installed inside. This helped to keep the noise level at the production area low and allowed occasional exhaust of routing dust outdoors for easier housekeeping in the shop.

The X-factor: Some routing applications required higher vacuum level, such as water jet cutting of granite countertops. To ensure the heavy granite does not move while being cut and be able to handle the water introduced to the vacuum system, a water-sealed liquid ring vacuum system or a claw vacuum pump with extensive inlet liquid separation can be retrofitted to the cutting machine.

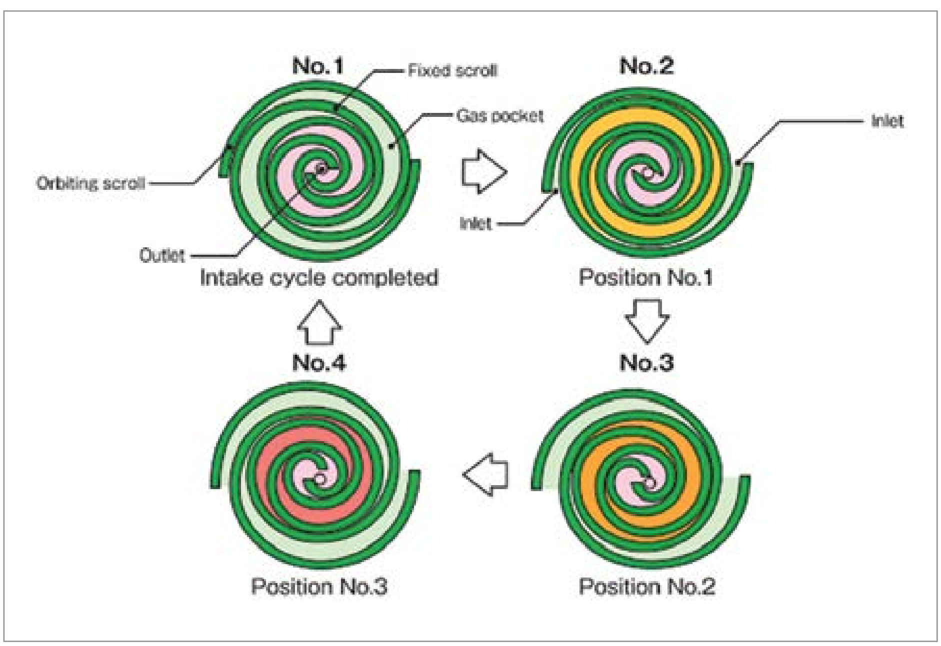
Pick-and-Place

Pick-and-place operations typically see oil-lubricated rotary vane pumps as the main source of vacuum, but the frequent maintenance and oil misting from these pumps can present some challenges to short-staffed maintenance teams and housekeeping.

The set-up: A customer uses a dozen robotic pick-and-place machines with oil-lubricated rotary vane vacuum pumps to package a certain product. This is a 24/7 operation with little appetite for equipment downtime, planned or unplanned.

The problem: The rotary vane pumps emit fine oil mist from their discharge, resulting in housingkeeping issues. The customer tried putting in inlet filters, discharge oil demisters, and implementing rigorous separator filter change and oil change schedule. While these measures reduced the oil misting, they did not eliminate it, especially with a dozen machines in close proximity inside a poorly ventilated warehouse. As a result, these measures increased the cost of ownership without completely solving the housekeeping problem.

Our approach: To address the pain points of cost of ownership and housekeeping, we turned to a different version of dry vacuum pump. While oil-less rotary vane pump and



Operating principal of a scroll pump.

claw vacuum pump can both perform this pick-and-place function, oil-less rotary vane pump has internal vane wear which results in frequent maintenance downtime. The claw pump has higher initial capital investment and its larger footprint makes it difficult for drop-in replacement. Small vacuum generators were also evaluated but eliminated due to this facility's hyper-awareness of their compressed air usage.

ANEST IWATA Scroll Pump DVSL-500E.

Instead, we trialed a new air-cooled, oil-free vacuum technology: scroll pump. This type of vacuum pump utilizes the scroll mechanism for continuous process suction, compression, and exhaust with little change in torque. This pump eliminates the need for oil, has much longer service intervals than rotary vane pumps, has lower initial cost, and is compact in size for easy drop-in replacement. Below is a basic operating principal diagram.

The X-factor: The scroll pumps are suited for relatively clean vacuum applications. In other pick-and-place applications where dust is easily introduced into the vacuum pump (e.g. Cardboard packaging), centralized liquid ring vacuum pumps are the more preferred vacuum solution. For decentralized installations in these dirtier applications, claw pump with proper inlet filtration would be another suitable solution, especially in facilities with no process cooling capability.

Pharmaceutical Distillation

In vacuum distillation, a liquid or solution is removed from a mixture when the surrounding atmospheric pressure is reduced to below this liquid or solution's vapor pressure, so it boils off without excessive heat is applied. In pharmaceutical industries, this technique is often used to remove isopropyl alcohol or other type of solvent from the product mixture.

The set-up: A customer retrofitted claw vacuum pumps on a pharmaceutical distillation process to remove solvents from their product mixture.

Case Studies in Dry vs. Wet Vacuum Pumps

The problem: The claw pumps failed within weeks of operation. Upon inspection, the point of failure was isolated to internal seals. The seals were found to be incompatible with the solvent vapor pulled into the pump.

Our approach: Liquid ring vacuum pumps are often used for vacuum distillation process. However, it is limited in this application due to:

1. Pump discharge water is contaminated with harmful process vapor and residual product powder, requires investment in water treatment facility.

2. There is no chiller or cooling tower onsite, preventing the implementation of a recirculation system.

3. Process vapor will damage the internals of an air-cooled self-contained recirculation system.

4. Process vapor condensed in the seal water will also change seal liquid vapor pressure, reducing pump performance.

Gardner Denver Nash NDC Claw Vacuum Pump.

This limited our solution to either heavily modifying the claw pump with custom chemically resistant lip seal and compatible shaft sleeve or installing screw vacuum pump. Screw vacuum pumps are typically designed for processes that see vapor carry-over and most of the times it requires a customized solution to match the challenges. It takes the approach of "letting it pass through without damaging the pump". Screw pumps often require a period of warming up before it is opened to the process. This is to ensure the screws' geometric grows under heat to close off tolerance prevent slippage in operation. This warmup period also raises the pump internal temperature, so process vapor does not condense when entering the pump. At shut down, we typically recommend the pump run through a purge cycle with the inlet isolated from the process. This is to ensure all process vapor is fully evacuated from the pumping chamber, so no internal condensation occurs after the pump shuts down and cools down.

The X-factors: Due to the lack of any process cooling capability at this facility, a screw pump was not implemented. Screw pumps have high internal temperatures due to compression, requires water cooling of its jacket and have a higher initial cost compared to the claw. Chemical resistant seals and compatible internal components were custom built to retrofit the claw pumps instead.

Conclusion

When choosing the right vacuum solution for your application, it is important to look beyond just the vacuum level and air flow capacity. Consider these aspects as well:

- Process carry-over: dust, powder, liquid, gas, vapor, etc.? How to filter/separate/condense incoming process carry-over? How will ingested process carry-over interact with the pump's internal components or seal fluid?
- Environmental constraints: Regulatory restriction on discharge water, air, debris?
- Utility availability: Compressed air cost, chilled water/cooling tower capacity? Floor drain and water source location?
- Cost of ownership: service interval, cost of spare parts/consumables, maintenance labor cost, cost of equipment downtime, etc.
- Other X-factors: noise limitation, housekeeping, centralized vs. decentralized vacuum, PM scheduling, spare parts and consumables inventory management, etc. BP

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Aeration Blower Control Strategies

By Tom Jenkins, JenTech Inc.

Real world blower applications rarely operate at steady state design conditions. There are a variety of reasons for this. Designs usually include a margin of safety to accommodate unforeseen conditions. Typically, the process demand itself is variable, requiring a corresponding ability to modulate the blower flowrate.

Blower modulation can be provided by a variety of controls. The various blower designs have unique operating characteristics that must be considered in control selection. Some of these designs and control systems have a long history and some have been available for a comparatively short time. This article will describe the most frequent applications.

Basis of Process Demand

The process demand for air establishes the required performance. In almost all cases process performance depends on the blower supplying the appropriate airflow rate. Processes that depend directly on maintaining a specific pressure are rare. Most control systems that use a pressure setpoint use pressure indirectly to regulate airflow.

Airflow demand can be categorized as either volumetric or mass flow. Examples of processes that require specific volumetric flow rates include pneumatic conveying, air knives and agitation. In wastewater treatment, for example, the need to aerate channels and equalization tanks is satisfied by volumetric flow rate.

Processes based on mass flow rate are common. In most of these processes the mass flow rate of oxygen is critical. The predominant constituent of air, nitrogen, is important in cooling applications, but in combustion and biological processes it is oxygen content delivered to the process that determines performance.

Control Strategies

There are three blower performance parameters of interest. Airflow rate, volumetric

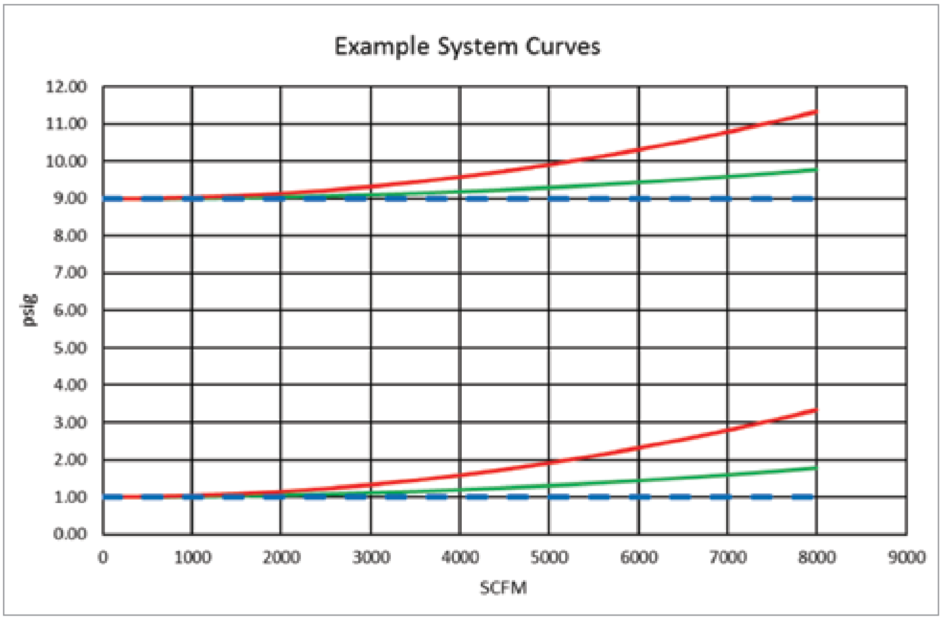

Figure 1: Examples of System Curves

or mass, is the controlled parameter. Pressure is required to overcome the resistance to airflow through distribution piping and into the process. The pressure consists of constant static pressure and variable friction losses. [See Figure 1.] The pressure and flow, in turn, establish the power needed to produce the desired airflow rate at the pressure necessitated by the system.

The blower performance curve identifies the pressure capability of a blower as a function of its flow rate. The system curve identifies the pressure created by the system as a function of the air flow through it. The intersection of the two curves will identify the actual operating point.

Control strategies are employed to modulate the airflow in response to changes in process demand or system resistance. This is usually accomplished by a feedback loop. The error between set and desired performance initiates a change in the airflow modulating device.

It is often necessary to predict the impact of control changes on system operation. An example would be pre-implementation analysis of Energy Conservation Measure (ECM) power cost.

There are multiple blower types and multiple control devices available for most applications. The most common combinations are shown in Table 1.

TABLE 1: BLOWER AND CONTROL TYPES

BLOWER TYPE	THROTTLING	VARIABLE SPEED (VFD)	GUIDE VANES
Lobe Type PD	Never	Only Practical Method	Never
Screw Type PD	Never	Only Practical Method	Never
Multistage Centrifugal	Very Common	Very Common	Uncommon
Geared Single Stage Centrifugal	Uncommon	Uncommon	Very Common
Gearless Single Stage Centrifugal (Turbo)	Uncommon	Always Provided	Never
NOTES:	Least Efficient	Most Efficient	Intermediate Efficiency

Aeration Blower Control Strategies

Positive Displacement (PD) Blowers

Both lobe and screw PD blowers are modulated by varying their speed. The PD blower curve is theoretically a vertical straight line, but actually internal leakage (slip) increases with higher pressure ratios. [See Figure 2.] Speed reduction reduces the flowrate, with the discharge pressure changing to match the system pressure at that flow. To avoid over pressure and damage to the system or blower a pressure relief valve should always be provided for PD blowers.

At constant discharge pressure blower flowrate change is linear with speed and blower power is linear with flowrate. [See Figure 3.] This simplifies calculating the response to speed changes. The slope and intercept can be calculated from tabular or graphical data.

$$m = \frac{cfm_2 - cfm_1}{rpm_2 - rpm_1} \text{ or } \frac{hp_2 - hp_1}{cfm_2 - cfm_1}$$

$$b = cfm_1 - m \cdot rpm_1 \text{ or } hp_1 - m \cdot cfm_1$$

$$cfm_{new} = m \cdot rpm_{new} + b$$

$$hp_{new} = m \cdot cfm_{new} + b$$

If the expected operating discharge pressure differs from the available data the performance can be evaluated at pressures above and below the anticipated value. Linear interpolation is then used to estimate performance at the anticipated pressure.

There are limitations in applying Variable Frequency Drives (VFDs) for controlling PD blowers. At constant discharge pressure the

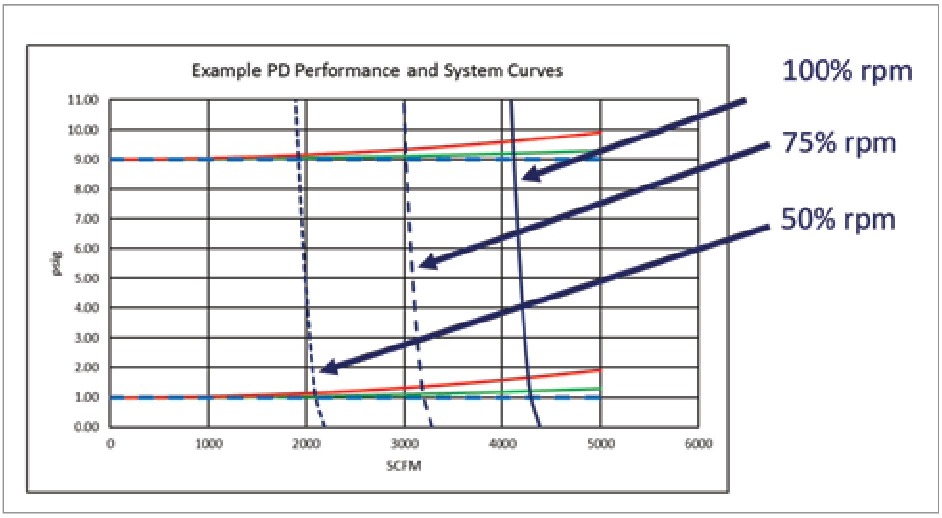

Figure 2: Example PD Variable Speed Performance

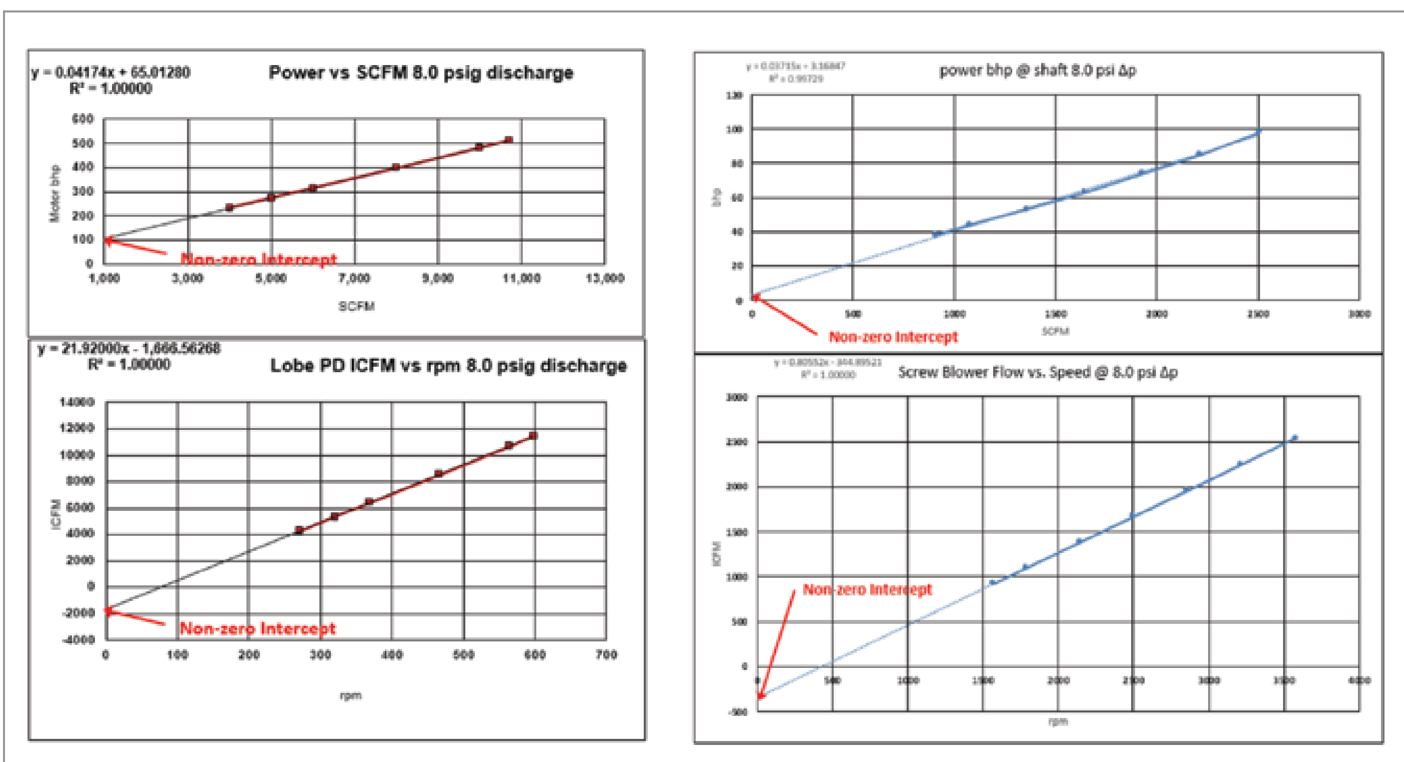

Figure 3: Examples of PD Blower Performance

blower demands constant torque from the motor, which in turn demands constant output current from the VFD. The horsepower rating of most VFDs is based on variable torque loading, so the VFD for a PD blower must be oversized to accommodate the high current load at reduced speed.

At reduced speed blower efficiency decreases, which increases discharge air temperature. Excessive temperature causes distortion and failure of mechanical components. This limits minimum blower speed. For fan cooled motors reduced cooling at low speed is also a concern. Either temperature sensing or the manufacturer's suggested minimum speed should be included in the control strategy to prevent damage.

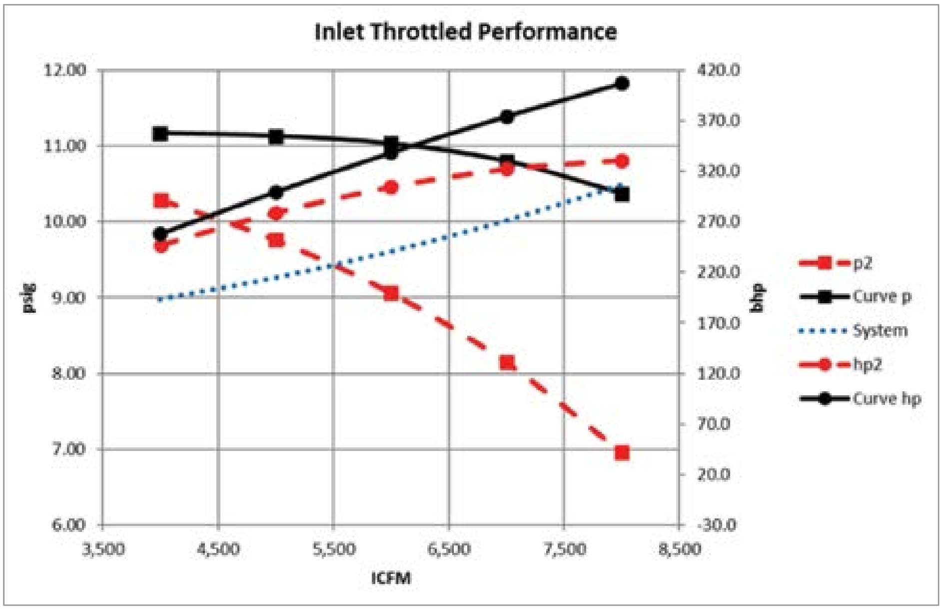

Figure 4: Example of Inlet Throttling Control

Aeration Blower Control Strategies

Centrifugal (Dynamic) Blowers

Centrifugal blowers have variations in design, but all share common operating characteristics. All centrifugal blowers use impellers to transfer kinetic energy to air. The volute or diffuser section at the periphery of the case converts some of the kinetic energy in the airflow to potential energy, i.e. pressure. The flow vs. discharge pressure and flow vs. power characteristics for a given set of inlet conditions are shown in the blower curves.

There are a variety of control methods available. [See Table 1.] All of them modify the blower curve to control the airflow.

Throttling at the blower inlet shifts the curve downward and makes it steeper. Throttling is the least efficient control method, but it has also the lowest equipment cost. It functions by creating a pressure drop at the blower inlet. The total head and the volumetric flow at the impeller eye are unchanged, but the available pressure and mass flow at the discharge are reduced. The intersection of the reduced blower curve and the system curve identifies the actual operating airflow.

Creating throttled performance curves is a two-step process. The pressure drop through the inlet valve is calculated in the first step.

$$\Delta psi_{valve} = \left(\frac{scfm}{22.66 \cdot C_v}\right)^2 \cdot \frac{°R_{upstream}}{psia_{upstream}}$$

If the Δp at a given flow is known a simplified analysis may be used:

$$\Delta psi_{inlet\ new} = \Delta p_{known} \cdot \left(\frac{q_{new}}{q_{known}}\right)^2$$

In the second step the impact of reduced density and inlet pressure for multiple points is calculated to create a new performance curve. [See Figure 4.]

$$psia_{inlet\ new} = psia_{barometric} - \Delta psi_{valve}$$

$$psia_{disch\ new} = psia_{inlet\ new} \cdot \frac{psia_{disch\ origina}}{psia_{inlet\ origina}}$$

$$icfm_{new} = icfm_{original\ curve}$$

$$bhp_{new} = \frac{icfm_{new} \cdot psia_{inlet\ new} \cdot \left[\left(\frac{psia_{disch\ new}}{psia_{inlet\ new}}\right)^{0.285} - 1\right]}{64.85 \cdot efficiency_{blower}}$$

The most efficient method of controlling airflow for all types of centrifugal blowers is variable speed, usually using a VFD. In the past the high cost of medium voltage VFDs (>600 Volts) made their use on large blowers uneconomical. Increased competitiveness in the VFD market and high energy costs now make them attractive for medium voltage applications.

Creating the new performance curve for variable speed uses the affinity laws.

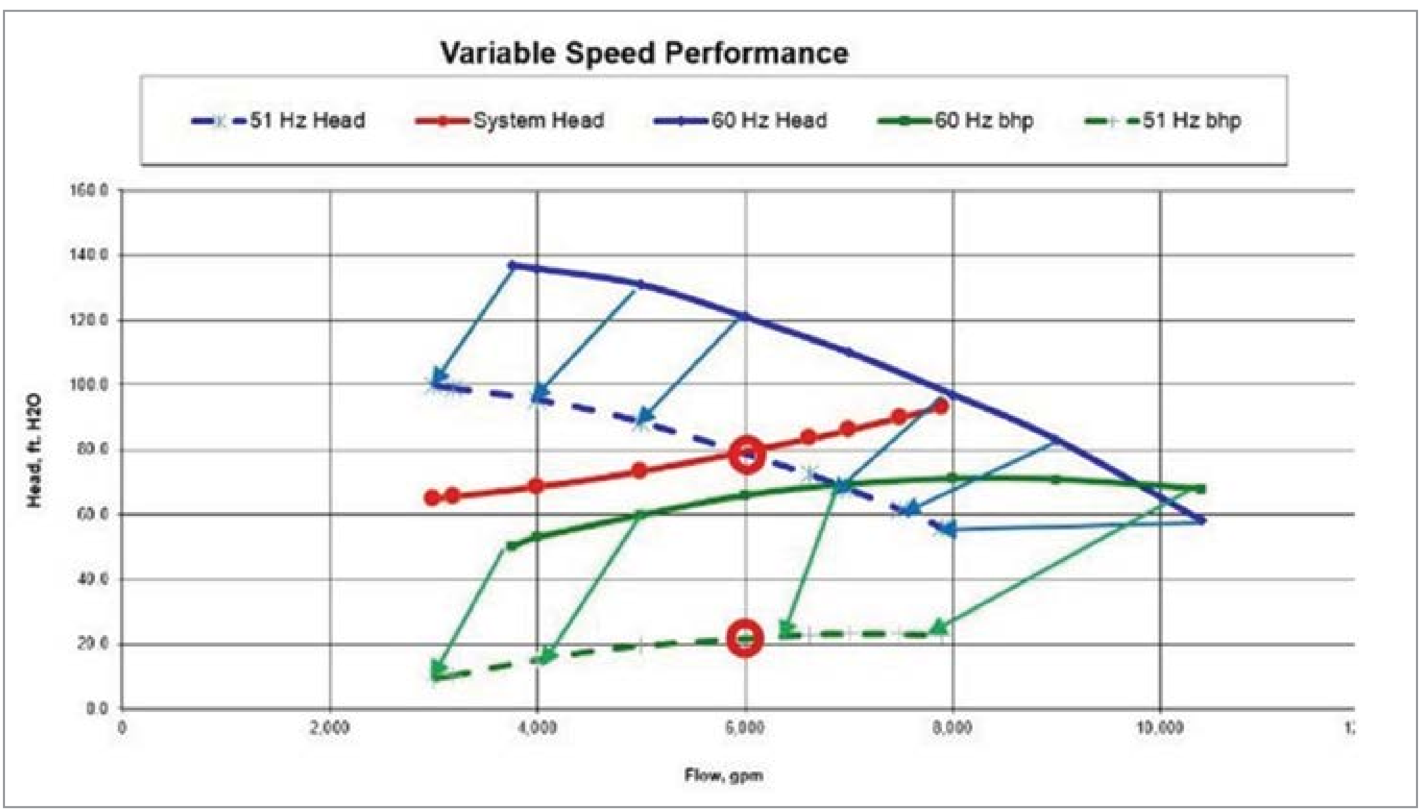

Figure 5: Example of Variable Speed Control

They define the relationship between the performance curve at the original and new speeds. The calculations are performed on several points to construct the new curves. [See Figure 5.]

$$icfm_{new} = \frac{rpm_{new}}{rpm_{original}} \cdot icfm_{original}$$

$$psia_{disch\ new} = psia_{inlet\ original} \cdot \left(\left[\left(\frac{rpm_{new}}{rpm_{original}}\right)^2 \cdot \left[\left(\frac{psia_{disch\ original}}{psia_{inlet\ original}}\right)^{0.285} - 1\right]\right] + 1\right)^{3.513}$$

$$bhp_{new} = \left(\frac{rpm_{new}}{rpm_{original}}\right)^3 \cdot bhp_{original}$$

A common error in evaluating performance with variable speed is to take an existing operating point, apply the affinity laws to it, and assume the result will be the new operating point. [See Figure 6.] This is not correct! The proper procedure is to construct a new performance curve and determine its intersection with the system curve.

Most existing applications of geared single stage centrifugal blowers use guide vanes for control. These may be inlet guide vanes (IGV) or variable discharge diffuser vanes (VDV). In many cases a combination of both is used to optimize performance. The efficiency of controlling blower airflow with vanes is better than throttling, but worse than using a VFD. The design and control algorithms for guide vanes are manufacturer specific and usually proprietary. Projecting performance for control changes should be made using manufacturer supplied data. [See Figure 7.]

Providing effective surge control is a concern for all centrifugal blowers. Surge is a pulsating flow condition occurring at low flow and high pressure. It can cause blower failure in a short time. Surge control consists of monitoring flow and taking corrective action. That may mean modulating the blower control device to increase flow to a safe operating point or opening a blow-off valve to increase flow and reduce discharge pressure. In other cases the blower is simply stopped to prevent damage.

Common Protection Features

There are many protection methods commonly employed to prevent premature failure of blowers and motors. These may be implemented with simple switches or may employ sophisticated analog transmitters connected to advanced programmable controls. The complexity varies with blower type and size. Employing advanced methods may not be economically justified on small blowers.

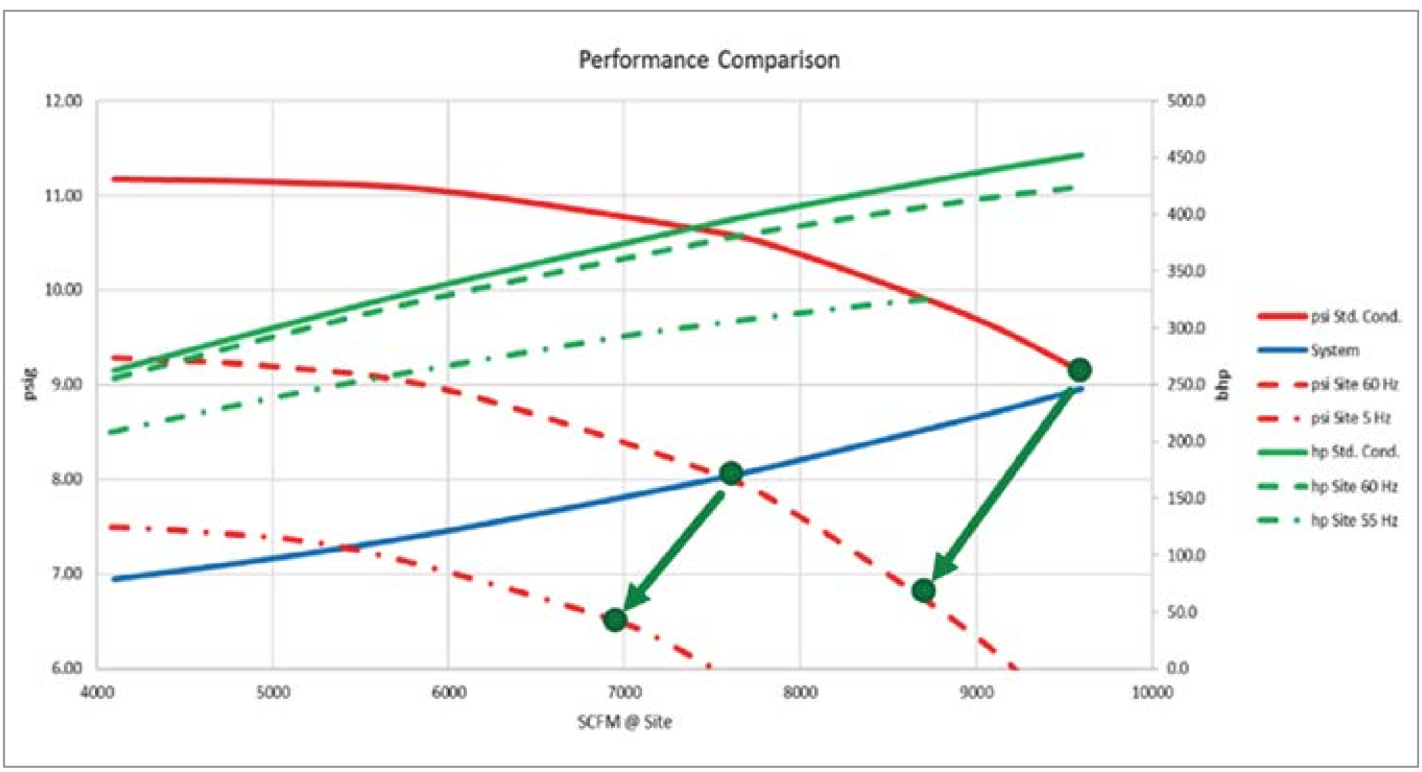

Figure 6: Incorrect Application of Affinity Laws

Aeration Blower Control Strategies

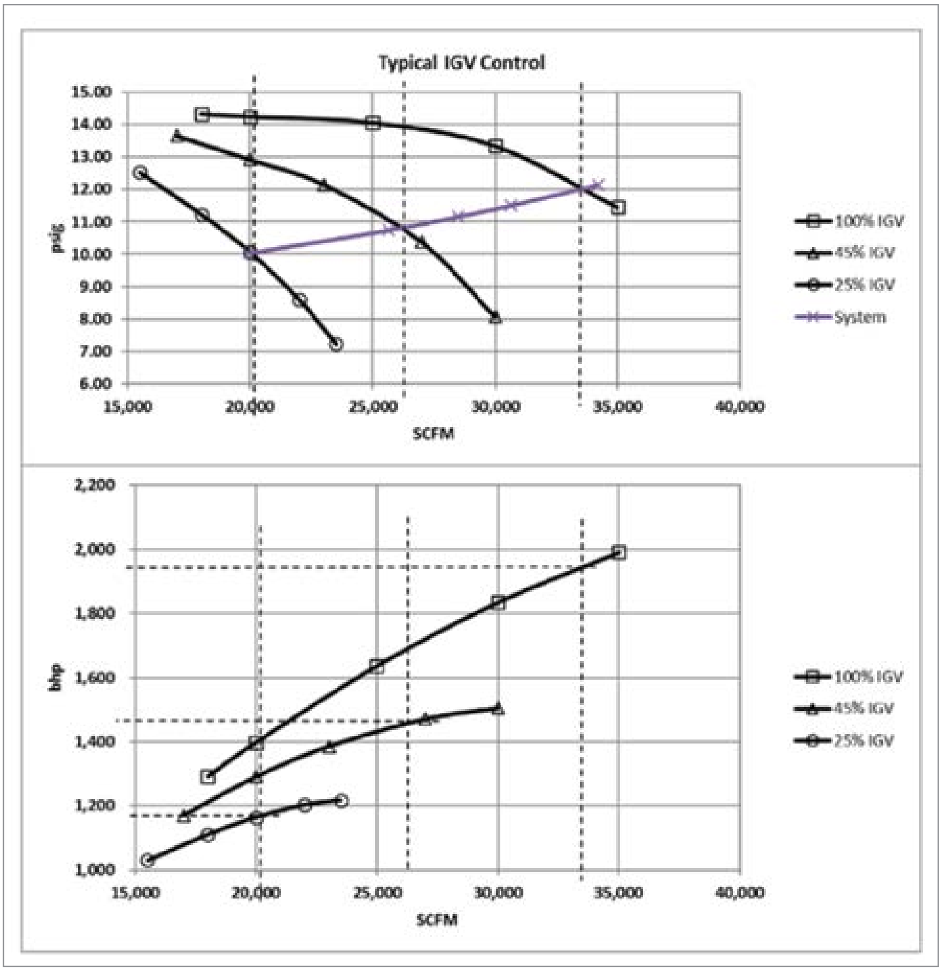

Figure 7: Example of IGV Control

TABLE 2: BLOWER PROTECTION SYSTEMS		
PROTECTION METHOD	**POSITIVE DISPLACEMENT BLOWER**	**CENTRIFUGAL BLOWER**
Surge Protection	Not applicable	Always
Motor Overload Protection[1]	Always	Always
Phase Loss / Phase Imbalance[1]	Larger Units	Larger Units and All Turbos
Blower and Motor Bearing Temperature	Larger Units	Usually
Blower Case Vibration	Larger Units	Larger Units Without Bearing Vibration Protection
Blower and Motor Bearing Vibration	Seldom	Larger Multistage and Most Geared Single Stage Units Mag Bearing Turbos
Discharge Air Temperature	Larger Units (May Use Differential Temperature)	Usually
Discharge Air Pressure	Larger Units	Usually (May Use Differential Pressure)
Lube Oil Temperature and Pressure	Larger Units	Geared Single Stage Only
Lube Oil Level	Larger Units	Geared Single Stage and Larger Multistage[2]

Notes: 1) Overload and phase monitoring is generally a standard feature of VFDs and solid-state starters.
2) Not applicable to grease lubricated bearings on multistage blowers.

Trends In Control

Blower control is rapidly changing as new technology in instrumentation and control is combined with new blower configurations. Better economics and the rapid implementation of complete blower packages have accelerated the rate of change.

Blower controls have developed increased communications capabilities to integrate their functions and operating data into SCADA systems. Many packages include advanced capabilities such as employing virtual machines, cloud data storage, and the Internet of Things (IoT).

Energy optimization is an increasingly important goal for blower control systems. This includes incorporation of advanced VFD designs. Initially applied exclusively to turbo blowers, permanent magnet synchronous motors are being applied to other blower types and at higher power. Advanced control algorithms like floating control and direct process flow control are becoming more common. These trends will continue to shape and improve blower control technology in the future. 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. For more information, visit www.jentechinc.com.

To read similar articles on ***Aeration Blower Technology,*** please visit https://blowervacuumbestpractices.com/technology/aeration-blowers.

Tea Packaging Quality Improved with Vacuum Conveying Upgrades

By Nora Ashmen, VAC-U-MAX

➤ Vacuum conveying is common in the food industry and while most suppliers say they can move product from point A to point B, there are some applications that require deeper knowledge to thoroughly assess and meet all requirements for ergonomics, safety, efficiency, and quality control.

Vacuum Conveyer for a Global Tea Manufacturer

In an ongoing project to improve processes whenever and wherever it can, a global manufacturer of private label retail, food service and specialty brand teas, purchased an extension conveyor system to improve efficiency and ergonomics. Prior to implementing the extension conveyor, a vacuum conveyor system transferred raw materials into portable silos that workers rolled from one production machine to the next. Finished product was then transferred from silos to packaging machines using a VAC-U-MAX packaging vacuum conveyor.

The new extension conveyor system, from another vendor, transported raw materials from large bags that workers cut and introduced into the conveying line. Once in the conveying line, material moved through the production process and the finished product conveyed to mobile silos. The packaging conveyor, in use for 10 years, then transported the final product from mobile silos to packaging machines.

A Quality Control Issue Arises

The tea manufacturer produces multiple grades of teas and the new extension conveyor system generated a higher volume of fine particles in the final product of its high-grade whole leaf tea products, resulting in a quality control issue.

Although the extension system vendor appropriately sized the system to gently move the whole leaf tea through the system, smaller particles (introduced into the system as result of breakage during transportation of raw materials from suppliers) further degraded while traveling through the extension system, creating a fine dust.

In addition, purging filters in vacuum conveying systems, force some dust back into the receivers and therefore the product, which in most industries isn't an issue.

The fine tea dust, up to 200 microns in size, is very receptive to static charge and was clinging to the inside of the cellophane packaging wrapped around the boxes – resulting in quality control issues and increased costs through lost product, cleaning times and wasted production time.

The dust is just part of the product, but the company did not want to introduce it to the packaging machine because it makes cleaning and sanitation difficult. The inherent nature of fully enclosed vacuum conveying systems prevents loose powder and dust from becoming airborne contributing to a cleaner and safer environment all around.

After unsuccessful attempts to remedy the problem, with the vendor of the extension conveyor system, the tea producer contacted VAC-U-MAX for a solution. After consultation, it was clear the existing system wasn't pulling off the fine dust the process was creating, so all entrained dust remained in the product and carried along the entire process.

5 Basic Parts of a Vacuum Conveying System

Vacuum conveying systems are fairly simple, consisting of five basic parts, a pick-point where material enters into the conveying system, convey tubing which transfers material between equipment, a vacuum receiver (typically equipped with a filter, and therefore often referred to as a filter receiver) which is an intermediate holding vessel for materials, a vacuum source that powers the system, and a control panel that tells the system how to operate.

In essence, larger more sophisticated vacuum conveyor systems that connect multiple processes consist of several conveying systems

Tea Packaging Quality Improved with Vacuum Conveying Upgrades

Filter receivers (filter separators) ready to be shipped to the tea manufacturer.

(without the need for multiple power sources or control systems), and therefore require multiple vacuum receivers.

Vacuum receivers are the second most modified component in a conveying system, after pick-up points, and are integral part of conveyor performance. When dealing with dust, system design requires interpretive consideration of multiple factors to reduce exposure and those factors change with each material, application, and process.

In industries where equipment is taken apart and cleaned on an hourly, daily or weekly basis, like food and pharmaceutical processing, the use of filterless receivers, or cyclones (a specific design of filterless receiver that operates in a different manner), in combination with a filter separator can reduce housekeeping times, improve product quality, reduce the possibility of cross-contamination and help with allergen control.

The most common reason for including filterless cyclones in conjunction with filter separators is to eliminate the need to clean, maintain and replace six or eight filters from receivers that sit above equipment. Filter separator is located remotely on the ground for easy cleaning and located away from areas where dust can pose problems.

In those type of situations there is an extra unit sitting on the ground and each of the units on the silos have airlocks instead of filters. It can be done without the expense of additional equipment but there is still dust in the product, which for many industries is not an issue.

In fact, most companies want to minimize the amount of carry-over of materials, but this application required maximizing the amount of dust captured. Carryover is the amount of product collected in the filter separator to separate the air from solids (dust) inside a vessel to prevent solids from reaching the vacuum pump.

The retrofit to the other vendors extension system included design principles similar to the 10-year-old packaging system that uses two filterless receivers that share a common filter separator to pull off the fines--except for the magnitude of scale.

Quality Testing for the Retrofit

During the testing phase for the retrofit, the raw samples looked clean before going through the system and the veteran conveyor experts knew that only full-scale testing could prove the reduction in fine particle dust. A visual inspection of the raw samples before conveying and the after samples showed a marked difference in how much nicer the end-product looked.

After factory acceptance testing, a pre-engineered system arrived at the tea manufacturer with several retrofitted filter separators to integrate with the extension system to remotely maximize the amount of carry-over of tea dust drawn away from the extension system.

The retrofit eliminated 70-80 percent of the fine dust from the product and the customer gained throughput because there is better product going to the packaging machines, less clean up needed, and no wasted production time. BP

To learn more about how VAC-U-MAX's pneumatic conveyors for food applications can improve efficiency, ergonomics, preserve product integrity, or reduce costs, write to them at 69 William Street, Belleville, NJ 07109; call 1-800-VAC-U-MAX (800) 822-8629 or (973) 759-4600; e-mail info@vac-u-max.com; or visit their website www.vac-u-max.com.

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BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Busch Exchange PLUS Vacuum Pump Service Program

Busch Vacuum Solutions USA, one of the largest manufacturers of vacuum pumps, blowers, compressors, and systems, announced the launch of their new Exchange PLUS vacuum pump service program. The PLUS program features a new module equipped inside every rapidly exchanged vacuum pump. The customer receives a practically new vacuum pump with every exchange increasing their production efficiency and uptime. This is a unique upgrade to the basic Exchange program currently offered by Busch. Once Busch picks-up a vacuum pump for repair, the customer receives a vacuum pump with a new module, 100% factory remanufactured components, painted in as-new condition and delivered all at a flat rate price. There is no wait time for the pump to be repaired putting production on hold.

Busch Vacuum Solutions, www.buschusa.com

Hoffman & Lamson PD Blower Packages

Hoffman & Lamson has added positive displacement lobe and screw blower packages to their North American portfolio of wastewater treatment solutions. Bringing together the most recognized wastewater treatment blower brands in the Americas and Europe, Hoffman PD blower packages feature "Robuschi inside." "As North America's preeminent blower provider for over 150 years, Hoffman & Lamson has long concentrated on being a center of excellence for the growing and ever-changing wastewater treatment industry. PD complements our existing high-speed turbo and multistage centrifugal blower technologies. Together with our blower controls and sequencing capabilities, Hoffman & Lamson provide competitive, turnkey, energy-saving solutions for virtually any wastewater treatment aeration need," Scott Hurlbut, Director of Sales for Nash North America, said.

Hoffman & Lamson, www.gardnerdenver.com/en-us/hoffmanandlamson

Leybold DRYVAC DV 500 and DV 800

The new screw vacuum pumps DRYVAC DV 500 and DV 800 were presented by Leybold. These vacuum pumps compress completely dry, i.e., without operating lubricant in the compression chamber and are therefore ideally suited as backing pumps in food packaging or in pumping sets in heat treatment or coating systems, as they have significant advantages over oil-lubricated piston or rotary vane vacuum pumps. Thanks to their screw design with a specially adapted variable pitch, they work extremely efficiently due to their low power consumption, require minimal maintenance compared to oil-lubricated vacuum pumps and thus minimize operating costs. The robust screw vacuum pump is also characterized by high particle and condensate compatibility. As a pioneer in dry vacuum technology, Leybold has several different screw vacuum pumps in its product portfolio.

Leybold, www.leybold.com

Sulzer HST Turbocompressors

Resolving the through-life issues for customers was a key driver for Sulzer when developing the High Speed Turbocompressor. To that end, the HST uses a single main moving part: the electrical motor rotor that spins at very high speed on magnetic bearings. This design means there is no moving metal-to-metal contact within the compressor, and hence no mechanical wear. As a further benefit, the high rotational speed allows a smaller motor for a given output. Since their introduction, the HSTs have logged an admirable record for performance and reliability in water industry applications world-wide. Take the example of Anglian Water's Basildon Sewage Treatment Works in Essex, UK. As part of an upgrade of its aeration lanes, the facility installed three HSTs in 2007, and added a fourth in 2012.

Sulzer, www.sulzer.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Pfeiffer Vacuum MVP 030-3 C DC Diaphragm Pumps

Diaphragm pumps work entirely without oil. This makes them ideal for all tasks and numerous applications where a clean, dry vacuum is needed. These include laboratories, analytical systems, leak detection and research & development. With the MVP 030-3 C DC, Pfeiffer Vacuum has now introduced a new corrosive gas version of the diaphragm pump. This version features a gas ballast valve and excellent chemical and condensate compatibility. The special choice of materials ensures significantly increased robustness in a wide range of processes. The diaphragm pumps not only do their job reliably, but also quietly and with low vibration. The noise level is below 45 dB(A). Due to their compact design and low weight, they fit very easily into small analytical systems, mass spectrometers and turbo pumping stations.

Pfeiffer Vacuum, www.pfeiffer-vacuum.com

Kice Industries GR Filter

Kice Industries announced it has introduced a new baghouse filter to its product line, the Kice GR Filter. "We are excited for this new and improved design which will result in lower energy consumption and extended filter bag life," said Drew Kice, President and CEO, Kice Industries. "It will provide a more reliable cleaning mechanism for filtering. The cleaning mechanism will solve some long-standing challenges in this market." The new filter contains a patented method for controlling and activating the reverse air cleaning system. It has a standard temp rating of 150 °F with a max temp option up to 300 °F. The filter also has low energy requirements with a 7.5hp reverse air cleaning blower. "We've been testing for two to three years and think our customers will appreciate the user-friendliness of the design," said Kice.

Kice Industries, www.kice.com

Edwards nXRi Compact Dry Pump Models

Edwards has launched three new models of the nXRi high performance compact dry pump, the perfect vacuum solution across a spectrum of applications due to its compact size and low power, reliable performance, and reduced costs. These new models extend the range and will provide pumping speeds from 30 to 120 m^3h^{-1}, six times more pumping speed than a similarly sized dry pump. Designed with size in mind, the compact footprint and height allow the Edwards nXRi dry pump to fit easily under a benchtop saving valuable space in the laboratory; and at under 30kg offers a highly mobile vacuum pump for changing workflows and environments. The pump is maintenance-free for up to five years, with no tip-seal or oil change, for maximum uptime and reduced maintenance costs.

Edwards, www.edwardsvacuum.com

Brown and Caldwell Partners with Seeq

Leading environmental engineering and construction firm Brown and Caldwell has entered into a unique partnership agreement with advanced analytics solutions provider Seeq to bring significant advancements in operational analytics to the water industry. Founded in 2013, Seeq publishes software applications for manufacturing organizations to rapidly find and share data insights to improve production outcomes, including yield, margins, quality, and safety. Utilities collect vast amounts of indiscernible data via supervisory control and data acquisition systems and highly instrumented facilities. Bringing Seeq's solutions to the water sector, Brown and Caldwell will help utilities better leverage SCADA data, lab analyses, asset databases, and metering data in real-time to accelerate digital transformation and positively impact the bottom line. The partnership will harness diagnostic and predictive analytics, enabling greater efficiency and deeper understanding across departments.

Brown and Caldwell, www.brownandcaldwell.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Atlas Copco Acquires Arpuma

Atlas Copco has agreed to acquire ARPUMA regelund fördertechnische Geräte GmbH, known as Arpuma. The company is a highly specialized vacuum systems and solutions provider for the chemical and pharmaceutical industry. Arpuma is based in Kerpen, near Cologne in Germany, and has 14 employees. The customer base is in Germany, and the company serves big chemical process customers. Arpuma's systems are installed globally. "This acquisition will enable us to grow our systems and solutions business within the chemical and pharmaceutical industry," said Geert Follens, Business Area President Vacuum Technique. "The company's core competence is in customer consulting, application knowledge and system integration." The purchase price is not material relative to Atlas Copco's market capitalization and is not disclosed. The acquired business will operationally become part of the Industrial Vacuum Division within the Vacuum Technique Business Area.

Atlas Copco Group, www.atlascopcogroup.com

Piab piSAFE program

Piab's new piSAFE program enables new benefits in applications where safety, flexibility, speed and performance are key. The solutions in the piSAFE program are developed to provide configurable and low weight products that can be adapted to your specific needs. While maintaining market leading vacuum performance thorough Piab's patented COAX technology the flexible design and ease of maintenance makes it a perfect choice for challenging robotic applications and ergonomic handling devices where safety is a key concern. Whether you want a centralized or decentralized vacuum gripping system, interfaces towards common EOAT systems or stand-alone mounting, the piSAFE program provides a high vacuum safety and high performing configuration specified for you.

Piab, www.piab.com

Nash NRV Rotary Vane & NDC Dry Claw Technologies

A pioneer in vacuum pump manufacturing, Nash is making impressive strides to expand its historic product portfolio. The latest additions to Nash's product portfolio include the new NDC dry claw and NRV rotary vane series. These products extend Nash's pledge to operate as a full spectrum vacuum solutions provider. "Honoring that pledge requires a commitment to innovation. The development and support of these new products is just one way that Nash is honoring that commitment in 2021," Dave Robbins, Vertical Market Manager – GIP & Power, Nash North America, said. Nash's most recent portfolio expansion for the General Industrial vacuum market, combined with our renowned liquid ring vacuum pumps, provides a one-stop-shop for industrial vacuum needs, regardless of application or process conditions.

Nash, www.gardnerdenver.com/en-us/nash

AECOM Toronto Operations Manager

AECOM, the world's premier infrastructure consulting firm, has announced the appointment of Gianpiero Vancheri as operations manager for the Greater Toronto Area's Water business unit. Reporting to the Water Director of Operations, Mr. Vancheri's main responsibilities will be to provide day-to-day business leadership, oversight and direction for water projects and programs across the GTA. As a Professional Engineer and Chairman of the Ontario Regional Group of the Institution of Structural Engineers, Mr. Vancheri is a well-respected and recognized leader in the water sector. "JP's extensive experience in successfully managing budgets and schedules on complex projects and addressing stakeholder concerns will help advance our growth strategies in the GTA," said Ian Dyck, AECOM Water business line leader for Canada. "He brings innovative solutions and forward-thinking approaches that will shape the future of infrastructure for cities, towns and industries we serve."

AECOM, www.aecom.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Coval GVMAX HD

Vacuum handling systems in industry must respond to diverse requirements, gripping parts of different weight or material, integration on machines and robots, high speed operation. COVAL's GVMAX HD series of heavy-duty vacuum pumps combine robustness, power, modularity, and communication, allowing them to adapt to multiple applications. And thanks to IO-Link technology, they are fully plugged-in to the Industry of the Future. The IO-Link communication interface of the Coval GVMAX HD vacuum pumps makes installation fast and economical, supports continuous diagnostics, centralized parametrization, and efficient communication with higher level protocols. In addition, thanks to the NFC technology integrated in the GVMAX HD vacuum pumps, all parametrization and diagnostic functions are accessible and can be modified in the dedicated COVAL Vacuum Manager app on an Android or IOS mobile device.

Coval, www.coval-international.com

WELTEC BIOPOWER Biogas Plants to Japan

WELTEC BIOPOWER is currently setting up two agricultural 250-kW biogas plants for one of Japan's major milk producers. One of the plants is being set up in Urahoro on Japan's island of Hokkaido. The second plant is being built in Sakata in the prefecture of Yamagato on Honshu, the largest island. The structural design of the two biogas plants takes the earthquake risk in these regions into consideration. The generated power and heat will be used directly on site to enable energy autonomy. The commissioning will take place in summer 2021 in Urahoro and in autumn 2021 in Sakata. Following the Fukushima nuclear disaster in March 2011 and thanks to the support of renewable energies, biogas enjoys a good reputation in Japan.

WELTEC BIOPOWER, www.weltec-biopower.de

Busch Vacuum Solutions Nominated for Rudolf Diesel Medal

The Rudolf Diesel Medal has been awarded every year since 1953 and is based on the innovative and inventive lifetime achievement of the engineer Rudolf Diesel. This year, Busch Vacuum Solutions was nominated in the "Most Successful Innovation Achievement" category. From small beginnings Dr.-Ing. Karl Busch, together with his wife Ayhan, has shaped a globally operating company for vacuum pumps, blowers and compressors. Today, Busch products are used worldwide in the food, chemical, medical and semiconductor industries, among others. With the HUCKEPACK, Dr.-Ing. Karl Busch developed the first oil-lubricated rotary vane vacuum pump specially designed for packaging foodstuffs. A milestone in the history of vacuum. Compact, robust, with integrated additional functionality ideally suited to the market, and at the same time designed for mass production with a minimum number of components, the pump was superior to competing products in many respects.

Busch Vacuum Solutions, www.buschvacuum.com

Leybold Offers Online Sound Checks for Vacuum Pumps

Leybold is taking a big step toward the digitalization of its product line and has an innovative online sound check for vacuum pumps on its website. With this free tool, users receive immediate feedback regarding the condition of their vacuum pumps. Simply record a sequence of your pump's sound with your smartphone or tablet directly at sound.leybold.com or upload the sound file. The sound analysis is then used to determine whether the pump is running properly or if service is due. This feature initially applies to the Leybold VARODRY and NOVADRY oil-free screw vacuum pumps but will be extended to other pumps in the future. Using an intelligent test algorithm, Leybold draws upon its extensive vacuum expertise.

Leybold, www.leybold.com

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www.blowervacuumbestpractices.com

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