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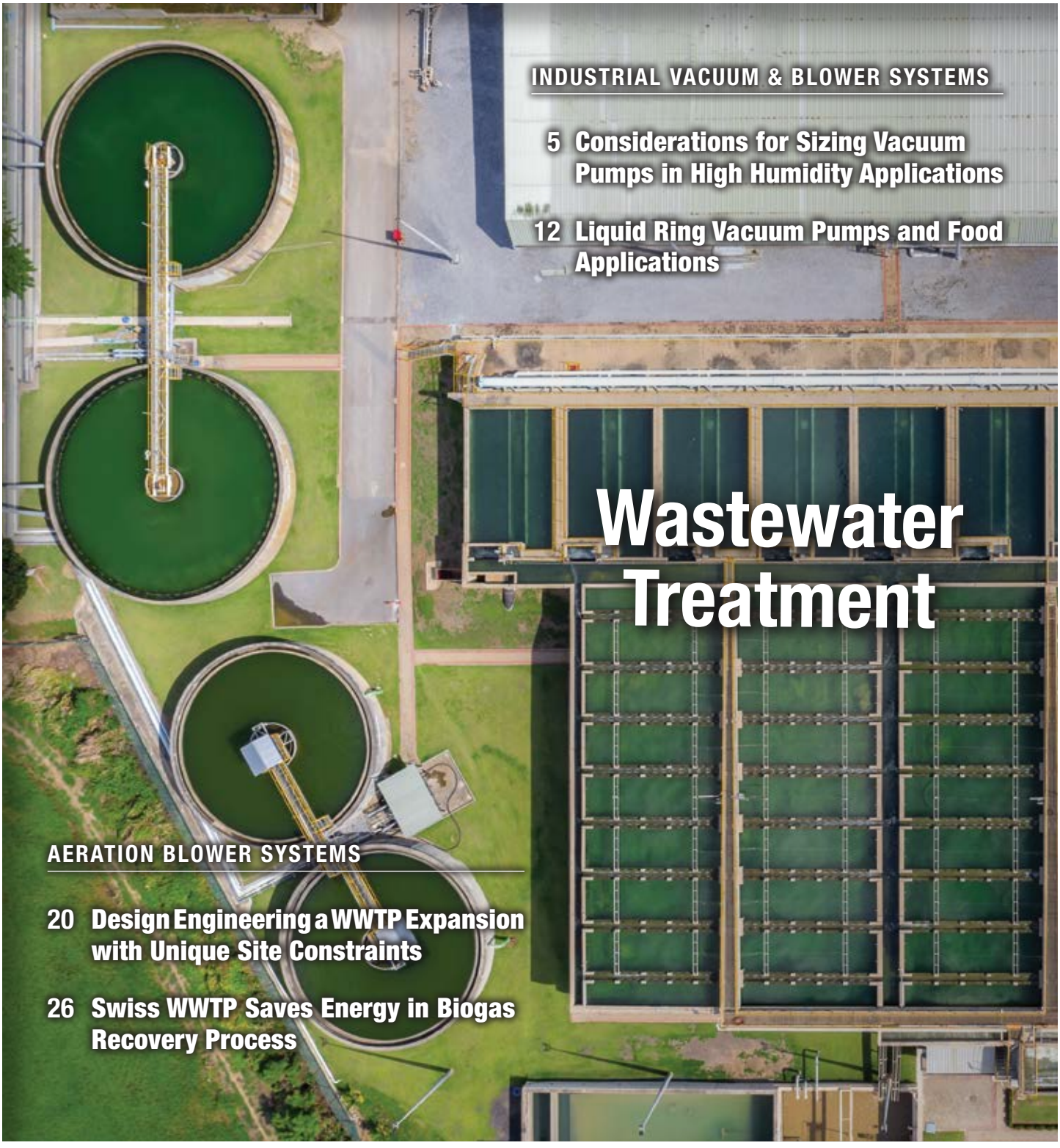

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EVERY ISSUE

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FROM THE EDITOR

Industrial Blower & Vacuum Systems

Reliability will always be the top priority for any piece of equipment. Critical to reliability is whether products are sized correctly. Thanks go to Antonio Mantilla, from Atlas Copco, for sending us the article, "Considerations for Sizing Vacuum Pumps in High Humidity Applications." For the many engineers who subscribe, this article has all the formulas you need!

Tie Duan, from E.W. Klein & Co., has sent us another excellent vacuum fundamentals article titled, "Liquid Ring Vacuum Pumps and Food Applications." It's a useful piece for every plant as it covers how and why they work while also providing five practical troubleshooting tips for maintenance.

Aeration Blower Systems

A regional Wastewater Treatment Plant (WWTP) needs to expand treatment capacity from 0.95 to 2.25 million gallons per day. Sam Werner and Jacob Valentien, from engineering firms Jones|Carter and Pacheco Koch, have sent us an insightful article on how they designed a two-phase expansion of the aeration and digester blower system required to support this project.

We also have an interesting story, from Switzerland, about how a small wastewater treatment plant has been generating power from the recovery of biogas. Uli Merkel, from Busch Vacuum Solutions, describes the process of circulating biogas through the sludge in the digester and then reviews why this plant upgraded from piston to claw compressors to provide a constant overpressure of 0.6 bar.

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

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Considerations for Sizing Vacuum Pumps in High Humidity Applications

By Antonio Mantilla, Product & Applications Marketing Manager, Atlas Copco

A centralized vacuum system with Atlas Copco LRP VSD+ Liquid Ring Pumps.

Many of us are familiar with sizing vacuum pumps based on throughput, process pressure requirements, chamber size, pump down times, conductance and leakage. In a lot of cases, humidity becomes an afterthought and unexpected things happen. Some of these unexpected things we learn to live with, like emulsified oil. In other cases, the unexpected things prevent the pump from performing the job it was intended for.

I have never been a fan of articles written by manufacturers in which whatever is lacked in content is made up by being a brand commercial. On the other hand, I've always liked "how to" articles that teach a new skillset, so…here we go.

Vapor Pressure

To understand what humidity does to a process, let's begin with the concept of vapor pressure. As its name indicates, it's the pressure of the vapor that is in the surface of a liquid at a specific temperature. The higher the temperature, the more energy the molecules have in that liquid, so the more eager they are to escape the boring land of liquids.

We are pretty used to water, so examples referencing it are often useful. Water at 86°F (30°C) has a vapor pressure of 30Torr. One atmosphere is 760Torr, so if we have 760Torr pressing on the surface of water at 86°F (30°C), the water molecules will not have enough energy to escape because 760Torr completely outweighs its futile 30Torr attempt for freedom. If we add heat to the water to invigorate the molecules and raise the temperature to 212°F (100°C), then the vapor pressure will be 760Torr. That is the same as the pressure holding them in place and, at that point, water starts to boil. Once we start generating a vacuum around the water, the internal energy required for the molecules to escape will be lower; if we pull a 30Torr vacuum over 86°F (30°C), the water will boil.

Let's say I have a 1m^3 chamber containing 10 liters of water at 86°F (30°C). To make the math easy, let's assume that the process is temperature compensated at 86°F (30°C) so that evaporation is not cooling my 10 liters

Considerations for Sizing Vacuum Pumps in High Humidity Applications

A liquid ring vacuum pump suited for humid, dirty and high temperature applications.

of water, which will make the vapor pressure drop. If I were to pump down the chamber to 10Torr without the water in it with a 100m^3/hr pump, it will take roughly 2.5 minutes if we use the approximation:

$$S = V/t * \ln (Pi/Pf)$$

S is the pump's pumping speed, V is the volume of the chamber, t is time, Pi is the initial pressure and Pf is the final pressure. Now what happens when we put the 10 liters of water in the tank? Avogadro says that any 1 mol of ideal gas occupies 22.4Lts at normal conditions, and water is no exception. 1 mol of water weights 18 grams, so 10 liters (10,000grams) is equal to 555mol. At normal conditions, it would occupy 12,400Lts (12.4m^3). The problem is that water at 1 atmosphere and 32°F (0°C) is

not a vapor, so we need to correct for pressure and temperature. That means:

$$12.4m^3 * (760Torr/30Torr) * (303K/273K) = 348m^3$$

Those innocent 10 liters of water will generate $348m^3$ of water vapor at 30Torr and 86°F (30°C). Our $100m^3$/hr pump will have to pump that so it will take a bit longer – approximately 3.48 hours more. What took 2.5 minutes before, now will take approximately 2 minutes to reach 30Torr, then the water will boil at that pressure and temperature for 3.48 hours, and then the pressure will go from 30 Torr to 10 in around 40 seconds. This is a very rough approximation because air will start carrying out water before it boils, and temperature compensated processes are not as common as one may think. If the target was to reach 10Torr in ten minutes, we may have undersized the pump quite a bit.

Some of you may be thinking, "But if my pump is not reaching the vapor pressure of water, I will not be boiling anything, and I have nothing to worry about." While technically you are correct on the fact that you are not boiling the water, you may have a few things to worry about.

Saturation

To better understand what happens here, we invoke the concept of saturation. Air can carry a good amount of water. The ratio of water/air gets larger the hotter the air is, and the lower pressure is. This is the reason why when we spill a glass of water outside, we do not have to wait until the ambient temperature reaches 100°C and boils the water for the puddle to dry up. This fortunately does not happen as it would make for a very uncomfortable day at the park. What really happens is that the dryer air around the puddle decides to soak itself in water and operate like a sponge. If the "sponge" is pretty dry, it can hold a lot more water that if it was partly soaked or saturated.

The amount of water that air can carry can be estimated by the following formula:

$$\text{Mass flow of water} = \text{Mass flow of Air} * (MW(water)/MW(air)) * (Pv(water)/(P-Pv(water)))$$

Mass flow of water and air are in any units, MW is in gr/mol and Pv is the vapor pressure of water which can be in any unit as well. The

Considerations for Sizing Vacuum Pumps in High Humidity Applications

Installation of oil-sealed rotary screw vacuum pumps ideal for a range of applications in plastics, glass, bottling, canning, wood, packaging, printing and paper, meat packaging and many more.

ratio of water to air will be adimensional. This means that if I have a process in which I am pumping 1kg/hr of saturated air @ 86°F (30°C) and 50Torr, that 1 kg/hr of air is carrying roughly another kg/hr of water. We are not boiling the water because its vapor pressure at 86°F (30°C) is 30Torr. This equals roughly to 35 m^3/hr.

So far this doesn't seem to be a problem: we have a 35m^3/hr pump happily pumping 86°F (30°C) saturated air at 40Torr. What could go wrong?

The saturated air will enter the pump and must be compressed to atmospheric pressure to be exhausted. A reasonable exhaust temperature from an oil sealed vane pump will be around

158°F (70°C). At 760Torr and 158°F (70°C), the same 1kg/hr of air that was coming in can only carry 0.3kg/hr of water vapor. This means that the pump is able to pump water vapor in but not pump it out, so it eventually stays in the pump causing some problems. Water in oil will not lubricate very well, so the pump will suffer abnormal wear. Water inside of the pump will also evaporate, taking up some of its capacity so it will not pump as much and will not reach the pressures it used to.

So then, what can we do? There are a few options. The first question that needs to be answered is, "Does my process require me to boil the water?" In some cases it doesn't, but we do it anyway. Some applications like degassing and water deoxygenation tend to take the process into the boiling point accidentally in detriment of the process itself. The idea is to remove oxygen from the water, or remove the bubbles from the shampoo, not to boil the product.

Four Options to Consider

With that in mind, consider these four options.

1: Use a Liquid Ring Vacuum Pump

This has often been the traditional solution, and it works. A liquid ring vacuum pump is a vacuum pump, a water pump and a condenser, all in one. It is immune to water condensing inside because (in most cases) it is already being sealed with water, so a bit more water is not going to do any harm as long as the pump is able to move it and the amount is not large enough that it will heat up the ring to a point that induces cavitation at process pressures. There also needs to be enough non-condensable gas load to prevent cavitation. Pumping speed correction for vapor load is also an advantage because it will condense in the ring making the actual pumping speed of the unit larger than its nominal capacity. There are a few disadvantages that some companies can live with. Given that this is a vacuum pump plus a water pump and a condenser all in one, it consumes power and water like the sum of all three. Its operating pressure is restricted to the vapor pressure of the sealing liquid at the exhaust temperature, so they often can't go lower than 25Torr with 59°F (15°C) cooling water before they start sounding like someone dropped marbles inside. The process may contaminate the seal water so sealant recovery may not be an option, and then water consumption and treating could add a few expenses.

2: Run a Hotter Pump

If the inside of the pump is close to 212°F (100°C), then there is the need for very little air to pump the water out in vapor phase. This is an option we offer on our lubricated screw line. A "humid" version can pump 100% water vapor given that it is programmed to operate with the gas ballast open, running controlled temperatures close to 212°F (100°C) and executing air purges in between cycles. That way the oil is always clean. Running a hot pump is also possible with other technologies, like dry claw, dry screw and vane, depending on the process pressure requirements and the budget.

3: Dilute

A gas ballast valve helps considerably but sometimes it is not enough. In some cases, purging with dry clean air and oversizing the pump to meet the process pressure with the higher gas load is an option. Going up to the next size pump and allowing air to leak into

Considerations for Sizing Vacuum Pumps in High Humidity Applications

An Atlas Copco GHS VSD+ with a ZRS Mechanical Booster Pump. These booster pumps are suitable for use with high differential pressures which allow the booster pump to be started at the same time as the backing pump, reducing total pump down times.

the inlet may maintain all the water in vapor phase. We can help calculate how much is needed and determine if this option is viable.

4: Run at the Correct Pressure

If the process needs to run at 24" Hg, why run it at 25" Hg? Running at deeper vacuum is not always a bad thing, but every so often it is. The deeper you go unnecessarily, the higher the ratio of water/air, so you are more prone to condensing water in the pump. This is most critical when the process does not require you to boil the water in the first place. A VFD driven pump with a pressure setpoint is usually a great solution because it will not allow the pressure to be deeper than what is needed, and it will save energy in the meantime. This can be taken a step further with pump programming and a temperature sensor. There are versions of our lubricated screw pumps that measure the pressure and temperature at the inlet of the pump (or any other point in the process) and vary the setpoint pressure based on the vapor pressure curve of water. That way if it measures, for example, the temperature being 86°F (30°C) and the pressure being 30Torr, it will ramp down to not touch the boiling point and unnecessarily dry up the product.

Options like these are available as an off-the-shelf standard product. There are many considerations to take into account when selecting a pump, we hope this guide helps. Please don't hesitate to contact us with any questions. BP

For more information contact Antonio Mantilla, Products & Applications, Atlas Copco, email: Antonio.mantilla@atlascopco.com, https://www.atlascopco.com/vacuum

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Liquid Ring Vacuum Pumps and Food Applications

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

➤ The food industries can have many messy processes, whether it is poultry evisceration, deboned waste conveying, bottling, or sugar cake filtration. Liquid ring vacuum pumps (LRVP's) are often utilized as the backbone of these processes because they can handle the soft solids, debris, and particles that can easily get sucked into the vacuum pump. So how does a LRVP work, why does it work in these processes, and how to make sure they keep working?

How Does a Liquid Ring Vacuum Pump Work?

Over the years, some call the liquid ring a "water piston pump", because it acts as a liquid piston under the centrifugal force from the rotor assembly. How it accomplishes this is shown in Figures 1-5. In this cross-sectional view of a Nash conical LRVP, note the rotor assembly (white outlined circle) sits off-centered from the pump body (red outlined circle).

Why do LRVP's Work?

The LRVP Just "Eats It"

Unlike rotary vane pumps, where vanes slide against the interior of the body, a LRVP's rotor blades do not contact the body, a liquid ring vacuum pump's rotor makes no contact with its body. Instead, the water seals the clearance between rotor blade and body to create vacuum and prevent slippage. This operating principle allows the pump to ingest various gas, liquid, soft solids, and

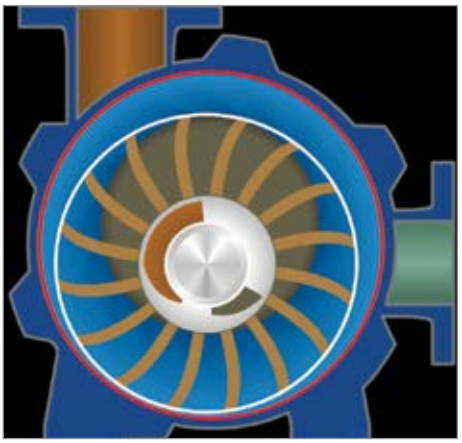

Figure 1. The blue ring between the housing and rotor is a ring of liquid, typically water, that is created from the spinning rotor. The space between two rotor blades is called a bucket.

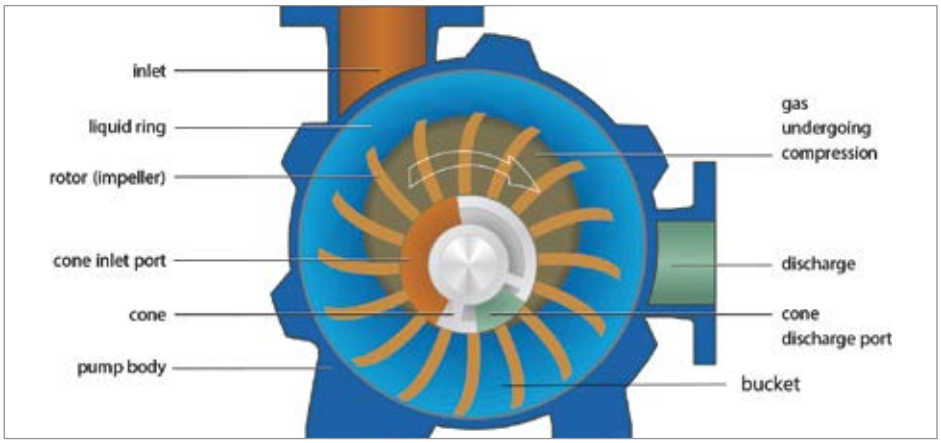

Figure 2. During operation, when a bucket (the space between the two highlighted rotor blades) is at the bottom of the rotation, it is filled with water.

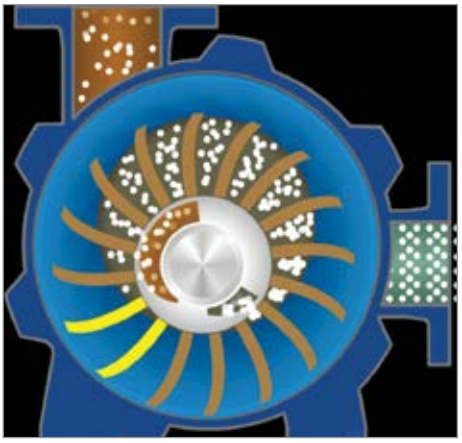

Figure 3. As the bucket moves toward the top of the rotation, water retreats away from the center of the rotor due to the centrifugal force of the spinning rotor. This pulls gas into the bucket through the inlet port.

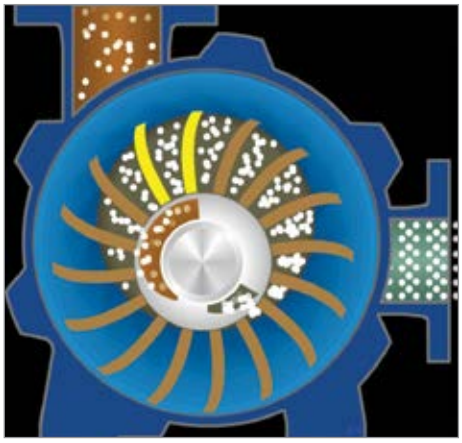

Figure 4. As the bucket returns to the bottom of the rotation, water is forced back into the bucket, the gas is pushed out of the pump through the discharge port in a gas and water mixture.

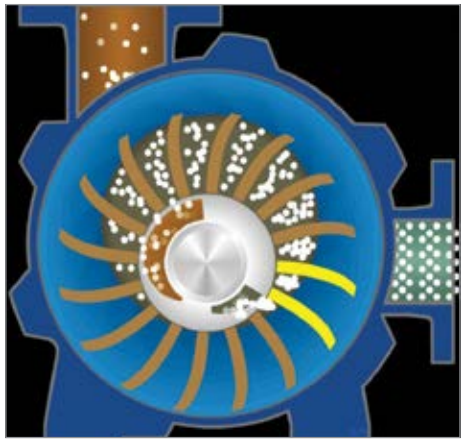

Figure 5. The water in each bucket acts as the mechanical piston in a cylinder, constantly pulling in gas and pushing out gas and water mixture.

All images used with permission from Gardner Denver.

particles from the process without damaging the pump. In poultry evisceration or waste transportation applications, chicken skin, tissues, blood, even bones are often sucked into the pump but are simply discharged out of it into the plant's water treatment facility, and the pump just keeps on running.

In beverage bottling applications, a LRVP is used to evacuate the air from bottles just before they are filled. This reduces the time required to fill the bottle and increase throughput. Additionally, it removes oxygen from the bottle, preventing reaction with the product and preserving the product's taste and aroma. This process often introduces liquid carryover into the vacuum pump. Because liquid is an intrinsic part of a liquid ring vacuum pump, any carryover from the filling system is easily handled with reduction in performance or production.

Bound vs. Unbound Moisture

In dewatering applications like the washing and drying of cake in sugar production, the concept of bound and unbound moisture becomes critical.

As shown in Figure 7, bound moisture is the water retained in small capillaries at solid surfaces as solutions in cells or fibers. It has lower vapor pressure than water at the

Liquid Ring Vacuum Pumps and Food Applications

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.

same temperature. Unbound moisture is any moisture other than the bound moisture and has the same vapor pressure as water. Imagine wringing a soaking wet towel. You can remove a lot of water from the towel, but no matter how hard you wring it or how long you leave it in the washer's spin cycle, it will always remain damp. The water you remove from wringing is the unbound moisture, but fibers of the towel still trap some unbound moisture and all the bound moisture, keeping it damp. Further drying is needed to remove all moisture.

Drum filters are used at sugar refinery and other food applications to mechanically strip unbound water using high air velocity generated from vacuum pumps. Removing unbound moisture using high air speed generated from vacuum is limited by the sonic velocity of air. Deeper vacuum does not always equal better drying. As vacuum level gets deeper, air velocity entering the pump increases as well. However, air velocity will approach up to 720 mph but not increase any further. This plateau would

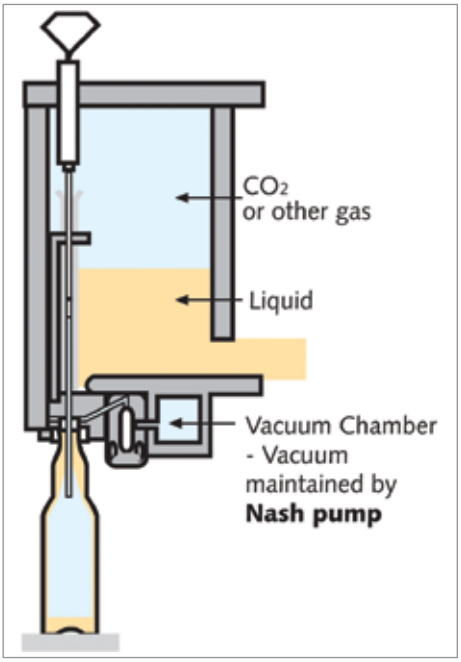

Figure 6. Typical bottle filling under vacuum. Image used with permission from Gardner Denver.

occur at around 16 in-Hg gauge vacuum depth. An earlier study done by E.W. Klein illustrated this phenomenon in Figure 7.

It is important to note, however, the drum filters used in this type of application can run up to 20 in-Hg in normal operation. Even though at this vacuum level air velocity plateaus at around 720 mph, the increased pressure applied by the top layer of the cake onto the lower layer will help remove more unbound moisture than air velocity can along.

Other Food Processes

Many other food processes also utilize LRVP's because of its robust design and reliability in handling process liquid, vapor, and soft solid carryovers. Here are some examples of these processes:

- **Humidification of tobacco.** LRVP's are used to extract air from tobacco packed in bales and replaces it with steam, to prevent the product from getting too brittle.
- **Evaporators, cookers, and vacuum pans.** LRVP's are used to lower the boiling temperature to improve appearance and taste, reduce the cooking time, and reduce energy cost.
- **Milking system.** LRVP's excel in this application over other oil-lubricated pumps because they use no oil, are tolerant of carryover, and require very little maintenance.
- **Sterilization of teas and spices.** Like the tobacco humidification process, LRVP's are used to replace air in the package bales with sterilized gas to destroy pests, insects, fungi, and bacteria, as well as add the proper humidity.

How to Keep LRVP's Working – 5 Troubleshooting Tips

This pandemic has been tough on a lot of operations. Many maintenance teams have been reduced to skeletal crews, with the directive to run to failure rather than follow normal PM schedules. We have compiled a comprehensive list of troubleshooting tips that can help maximize liquid ring vacuum pumps'

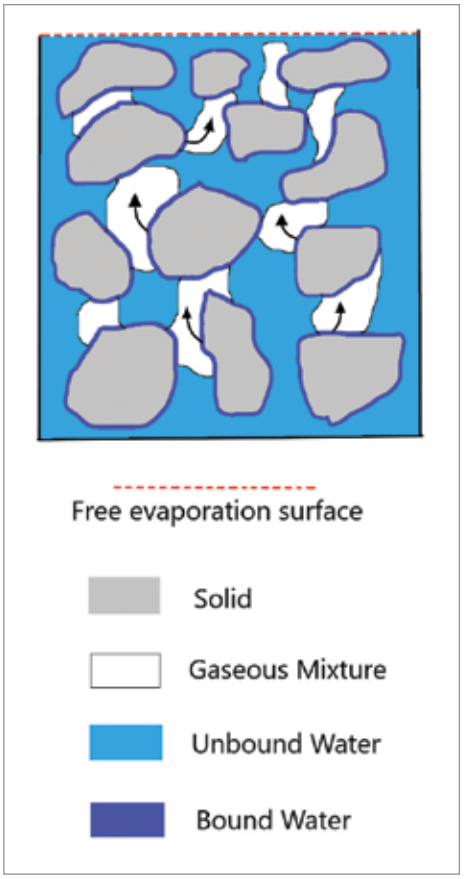

Figure 7. Bound vs. Unbound Moisture. Image provided by E.W. Klein & Co.

Liquid Ring Vacuum Pumps and Food Applications

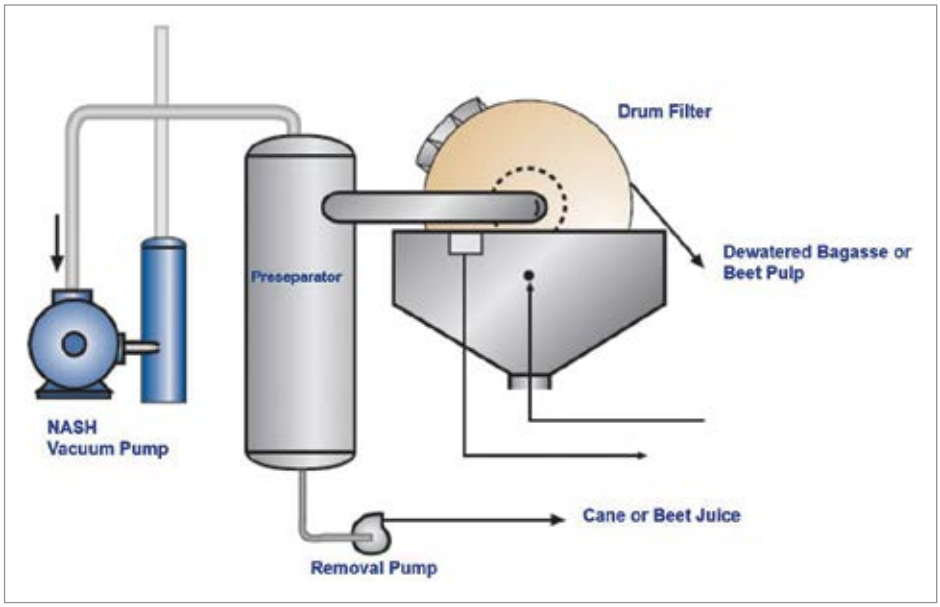

Figure 8. Removing sucrose from clarifiers using vacuum drum filter. Image used with permission from Gardner Denver.

longevity and performance. Here are a few quick actionable tips:

Tip #1: Excess Seal Water

Running the pump with too much water, flooding the pump, is not normally recommended. However, in some situations, seal water flow rate can be increased to lower pump temperature and restore vacuum performance. Some liquid ring vacuum pump models are designed to handle up to 150% to 200% of rated seal liquid flow. Some smaller pumps have a design variation called Water Handler, which can handle 10 times more water than regular models, but at the compromise of ultimate vacuum depth.

Tip #2: Vacuum Gauges

We normally recommend having two vacuum gauges on a vacuum system. One at the pump's inlet, and one at the process.

- If the gauge on the vacuum pump's inlet is reading more vacuum than at the process, then there is probably a clog in the line.
- If the gauge on the vacuum pump's inlet is reading the same as at the process, but both are not as much vacuum as expected, then there is probably a leak. You can use a $200 Seek thermal camera from Amazon to look for a cold spot on your metal vacuum line. Due to energy loss during volumetric expansion of air under vacuum, a leak will appear to be a cold spot.
- If the gauge on the vacuum pump inlet is reading less vacuum than at the process, then it is probably a bad gauge. Vacuum gauges have a notoriously short life expectancy.

Tip #3: Maintaining the Bearings

A quick way to inspect your liquid ring vacuum pump's bearings is by measuring its' temperature using an IR thermometer gun. These temperature readings below would indicate an impending failure:

- Greater than 60°F (15.5°C) rise over discharge temperature
- Over 180°F (82°C) reading on the bearing itself for most applications

Some common causes of bearing issues are incorrect grease, mixing grease types, insufficient or excess grease, shaft misalignment, incorrect pump mounting, improper V-belt tensioning, excessive piping load.

Liquid Ring Vacuum Pumps and Food Applications

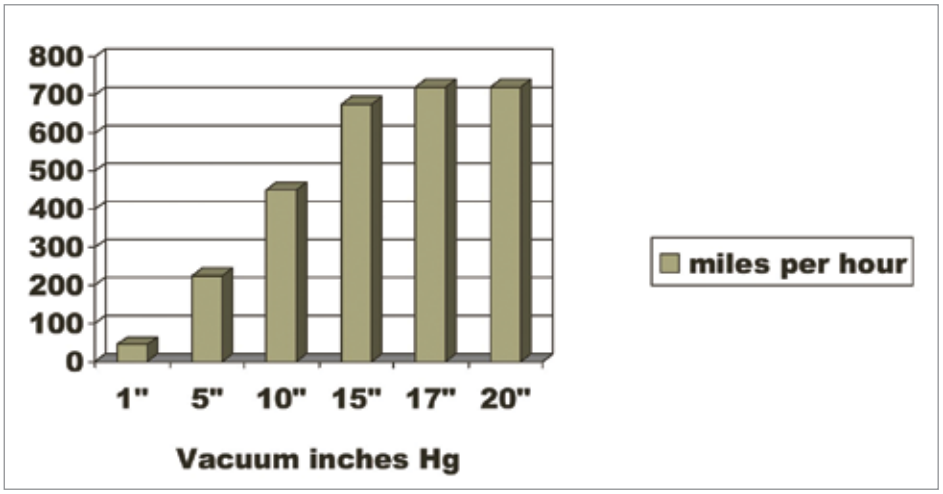

Figure 9. Air Velocity. Image provided by E.W. Klein & Co.

Tip #4: Maintaining the Packing

If your pump comes with packing, then you will probably notice it is leaking water. A trickling of water leak is normal for packing, but gushing water is not. You can adjust packing during operation, but be sure to follow these guidelines below:

- Adjust at operating vacuum depth.
- Turn gland nuts one flat at a time, on both sides of the shaft, and let it run for at least 20 minutes.
- Adjust evenly, do not allow the gland to contact the shaft, it can groove the shaft.
- If your packing stops dripping water, be sure to monitor pump temperature. If it is at 130°F (54°C) or below, the packing should be fine.

Tip #5: Trending Motor Current Draw

Motor horsepower and current draw can be a great indicator of the pump's performance. Measuring these datapoints either through your SCADA system or using a handheld amp meter periodically are both quick checks. If you see a higher-than-expected amp reading, this can be a sign of:

- Pump flooded with excess water
- Restrictions at pump inlet or discharge
- Internal scaling or debris build-up
- Pump wear
- Incorrect assembly/rebuild BP

About the Author

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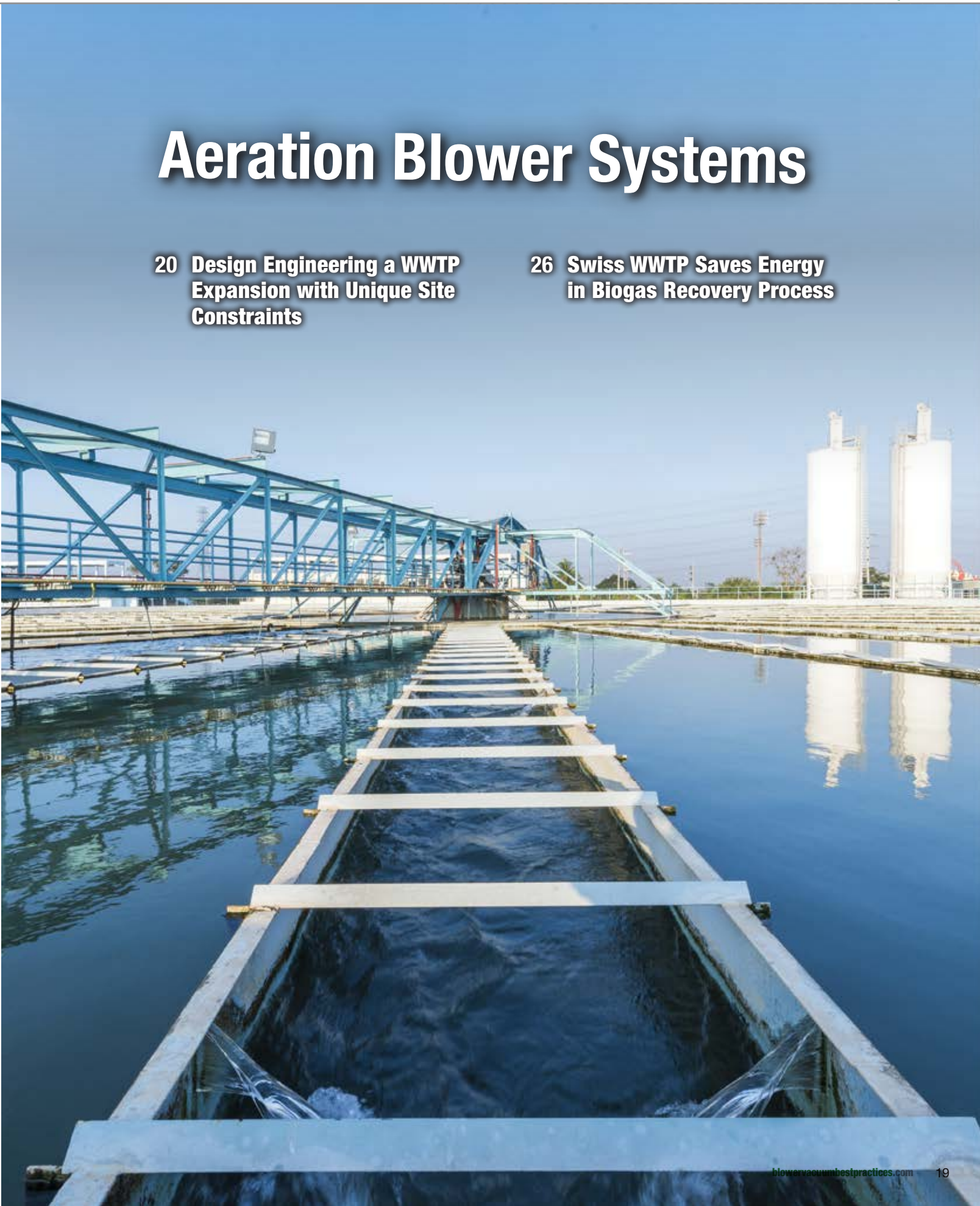


Design Engineering a WWTP Expansion with Unique Site Constraints

By Sam Werner P.E., JonesICarter and Jacob Valentien P.E., Pacheco Koch

Example installment of Aerzen positive displacement (PD) blowers with package mounted variable frequency drives (courtesy of Aerzen).

A small site located within a floodplain, prone to erosion, and currently occupied by an existing in-service wastewater treatment facility is not at the top of any engineer's list for a desirable site to expand a wastewater treatment plant or reclamation facility. However, these challenges created opportunity for specialized solutions during the design of the facility expansion; in particular, in designing the aeration and digester blower system.

A regional Wastewater Treatment Plant (WWTP) located in northeast Houston, TX was reaching treatment capacity due to ongoing growth in the municipalities and increase of organic strength. The existing WWTP is permitted for 0.95 million gallons per day (MGD), after factoring the current wastewater demand projection, the facility ultimately needs to expand to 2.25 MGD.

The WWTP expansion was split into two phases with a modular design to facilitate an incremental expansion paced by growing demand. The ultimate expansion of the WWTP had to account for multiple site constraints including buffer zone, floodplain and floodway regulations, future nutrient removal facilities, as well as an on-site detention and mitigation pond. Operator and client preferences led to the selection of a conventional complete mix activated sludge treatment process with single phase nitrification.

Two-Phase Expansion to 1.875 MGD

Phase I expansion will increase the overall treatment capacity of the facility to 1.875 MGD. New construction includes three (3) aeration basins, three (3) clarifiers, and two (2) chlorine contract basins as well as an elevated building to house all blowers and the motor

control center (MCC). The existing 0.95 MGD treatment module will be reconfigured to become a multi-stage aerobic digester upon completion and start-up of the proposed new treatment modules.

Phase II includes the construction of one additional treatment train (aeration basin, clarifier, chlorine contact basin) to increase treatment capacity to the ultimate flow of 2.25 MGD. Also factored into the ultimate site plan design were future anaerobic and anoxic biological nutrient removal (BNR) basins and tertiary filters in anticipation of stricter nutrient removal requirements being enforced in the future.

The overall expansion project also had goals of alleviating existing flood risks, automating operational components, and improving energy efficiency. Improving the aeration system's efficiency was the main method for achieving energy efficiency improvements. The proposed blower system design needed to supply all the process air needed for biological treatment and various mixing applications while accommodating future phases of expansion.

Engineering Around Site Constraints

The existing multi-stage centrifugal blowers and the motor control center were flooded during Tropical Storm Harvey, inundated by over four feet of water, and were repaired and put back into service without any mitigation measures being put into place. To minimize future flooding risk, a new elevated building to house the electrical equipment and centralized blower system was designed.

There was little space left over for new Blower/MCC building after accounting for the various site constraints. This limitation was addressed by locating all the aeration and digester blowers in the same room and installing the variable frequency drives (VFDs) directly on the blower packages thereby reducing the overall footprint of the building. The combination of these items into one central location also offers several operational and economic benefits including a reduction in the length of shielded instrumentation cables and shorter runs of electrical cables and conduit between the between equipment and the control panels. The graphic below is the process & instrumentation diagram (P&ID) for the blower system courtesy of the blower supplier on the project, Aerzen.

Aeration Blowers Provide Efficiency Gains

Various blower technologies were evaluated but ultimately positive displacement (PD) blowers with twisted lobe/screw impellers were specified due to their favorable turn-down potential (nearly four to one) all the while maintaining constant pressure and a high level of

Design Engineering a WWTP Expansion with Unique Site Constraints

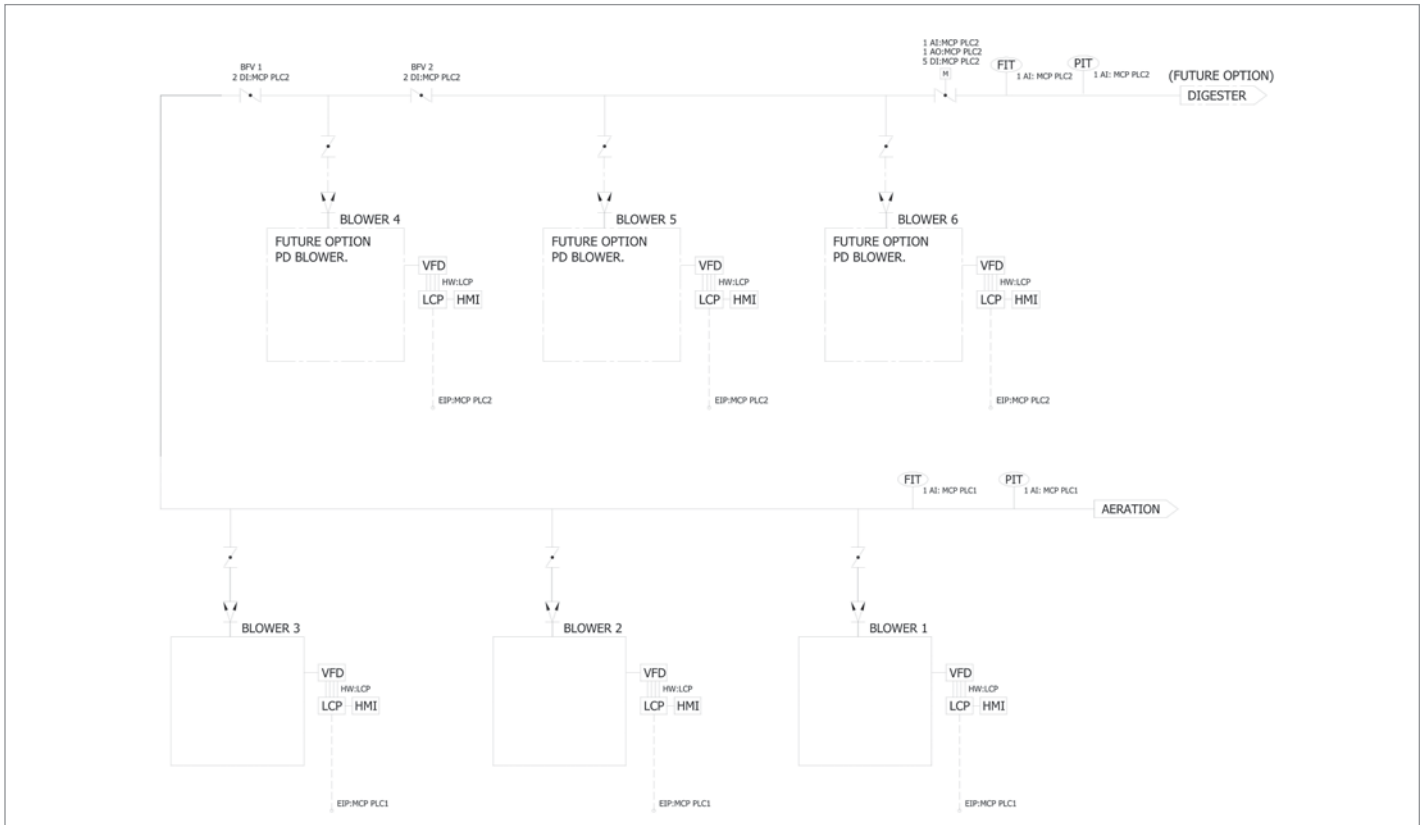
efficiency. A wide range of system turn-down was required to accommodate the diurnal and wet weather variations and increases in organic loading over time as well as Phase II expansion aeration demands.

A bifurcated blower header was designed to establish two separate banks (Bank No. 1 and Bank No. 2) of blowers accommodating a total of six equally sized blowers (1,575 SCFM @ 10.00 psig with 125 HP motors). There were several maintenance advantages of selecting equally sized blowers of the same technology including a reduction of required on-hand spare parts and simplified maintenance schedules.

Blower Bank No. 1 will service the aeration and chlorine contact basins accommodating four blowers (Blowers Nos. 1- 4). The second bank of blowers will service the aerobic digester basins and accommodate two blowers (Blowers Nos. 5-6). Firm capacity is achieved by installing butterfly valves on the discharge header on both sides of Blower No. 4, effectively bifurcating the header, so that it can be switched over to either bank. NEMA 3R blower enclosures were specified as the blowers will be housed in a three-sided building to protect against the elements but also aid in ventilation. Figure 1 is the P&ID for the aeration system, courtesy of Aerzen.

Deeper Aeration Accounts for Side Water Depth

The relatively high blower pressure, for the industry and region, was needed to account for to the 20-feet side water depth (SWD) of the proposed aeration basins. A 20-feet SWD



NARRATIVE SUMMARY:

MCP - AERPROCESS PLC1 SHALL ACT AS THE DO AND AERATION CONTROLLER OF THE AERATION SYSTEM AND ASSUME DEFAULT CONTROL OF BLOWERS 1, 2, AND 3, WITH OPTIONAL NH4 CONTROL

MCP - AERPROCESS PLC2 SHALL ACT AS THE DO AND AERATION CONTROLLER OF THE FUTURE OPTION AEROBIC DIGESTER SYSTEM AND ASSUME DEFAULT CONTROL OF BLOWERS 5, AND 6.

CONTROL OF FUTURE OPTION BLOWER 4 SHALL BE SHARED BETWEEN MCP - AERPROCESS PLC1 AND PLC2 DEPENDENT ON THE POSITION OF BFV 1 AND BFV 2.
- CONTROL STATE 1: BFV 1 IS CLOSED, BFV 2 IS OPEN - CONTROL SHALL BE ASSUMED BY PLC2.
- CONTROL STATE 2: BFV 1 IS OPEN, BFV 2 IS CLOSED - CONTROL SHALL BE ASSUMED BY PLC1
- CONTROL STATE 3: BFV 1 IS CLOSED, BFV 2 IS CLOSED - BLOWER IS UNAVAILABLE FOR CONTROL
- CONTROL STATE 4: BFV 1 IS OPEN, BFV 2 IS OPEN - AERATION AND DIGESTER CONTROL SYSTEMS SHALL ENTER MANUAL CONTROL MODE

LCP (AERTRONIC) SHALL RECEIVE COMMANDS FROM AERPROCESS VIA ETHERNET/IP. LCP SHALL CONTROL VFD VIA HARDWIRED IO.

Figure 1. Blower P&ID and control narrative summary (courtesy of Aerzen).

was chosen to decrease the footprint of the aeration basins to alleviate site constraint concerns. A sharp crested weir on the effluent side maintains the prescribed SWD with diffuser submergence depth staying relatively constant for all flows. The deeper aeration was also beneficial from an oxygen transfer perspective with the proposed fine bubble diffusers achieving upwards of 37% standard oxygen transfer efficiency (SOTE) at the designed SWD.

One potential drawback of deeper aeration basins is the disruption of the air flow split due to different pressures with other basins with lower SWD. In particular, the proposed chlorine contact basins are designed at a shallower (12-feet) depth. To address this issue, the proposed design calls for an air flow control valve, flow meter, and pressure transmitter at the chlorine contact basin air header to regulate pressure and air flow to meet the minimum mixing and dissolved oxygen requirements.

To accommodate the municipalities budgets for Phase I, only three (3) PD blowers will be installed to serve the new aeration and chlorine contact basins. The existing multi-stage centrifugal blowers serving the converted modular treatment unit into aerobic digester will remain. Although the existing multi-stage centrifugal blowers are at risk for inundation, in an extreme rain/flooding event, the repaired blowers are still in acceptable condition and can still service the treatment module. The additional three (3) blowers will be added when either the Phase II treatment capacity is needed or when until the existing multi-stage centrifugal blowers the reach the end of their useful life or damaged by further flooding.

One aeration design feature of note in the existing 0.95 MGD treatment module is the implementation of single drop coarse bubble diffusers within shear (draft) tubes (Ovivo Enviroquip®) to facilitate mixing and aeration of the deep (20-feet) aeration and digester basins. A shear tube functions essentially as an airlift pump creating differential pressure between the bottom of the tube and the aerated water surface at the top of the tube. Sludge or mixed liquor (ML) is drawn up inside the tube and discharged out the top producing a rolling pattern out from each tube, down the depth of the water, and back up the tube. Overall, the system has the potential to lower blower

Design Engineering a WWTP Expansion with Unique Site Constraints

horsepower compared to a floor mounted aeration system as the diffuser heads are mounted only a portion of the full depth of the tank requiring lower blower pressures due to a reduction in diffuser submergence.

Proposed Reduction of 40-60% in Electrical Costs

The proposed aeration blower design is anticipated to reduce the municipalities aeration electrical costs by 40-60% compared to a conventional coarse bubble aeration system with multi-stage centrifugal blowers with limited turn down. Energy savings are found in the high SOTE due to the increased aeration depth reducing biological treatment air demand along with the automated aeration control system coupled with strategic blower sizing. By selecting multiple with lower capacity blowers (six (6) blowers at 25% design capacity) allows turn-down capability to be maintained as capacity demands increases in the future (as opposed to two (2) blowers at 100% design capacity).

The automated aeration control system is designed to have two (2) dissolved oxygen probes and one (1) ammonium probe installed in each aeration train to send real-time operational data back to the control system. We specified "Most Open Valve" aeration control system for the biological treatment based upon the average dissolved oxygen concentration in the aeration basins. A minimum system air demand will be programmed to ensure the minimum air mixing requirements are met in order to keep solids suspended as ancillary mechanical mixing is not provided in the aeration basins in Phase I.

The proposed ammonium probes are to be installed on the backend of the aeration train to function as a secondary check of the aeration control performance. The control system has the capability to be upgraded in the future to provide cascaded ammonia-based aeration control (ABAC). If biological nutrient removal goals become more stringent in the future, ABAC may represent a further energy savings opportunity over operating at constant user-defined DO set points. Having the ammonium probes report data to the blower PLC can also act as an amplification swing check for the DO control system. Occasionally with the MOV approach, the blowers will modify speed and air flow to accommodate an average DO reading but while the average is being met, the swings from high DO to low DO might cause treatment issues and the ammonium probe can be a trigger for concern that the DO amplitude swing is causing treatment performance issues.

Two aeration control PLCs were specified, one dedicated to aeration basin control and the other for aerobic digesters. The aeration control for the aerobic digester will be able to accommodate future controls based upon either digester water level or dissolved oxygen.

Specifying Responsibility for all Aeration Process Components

We specified the blower manufacturer to be responsible for all components of the

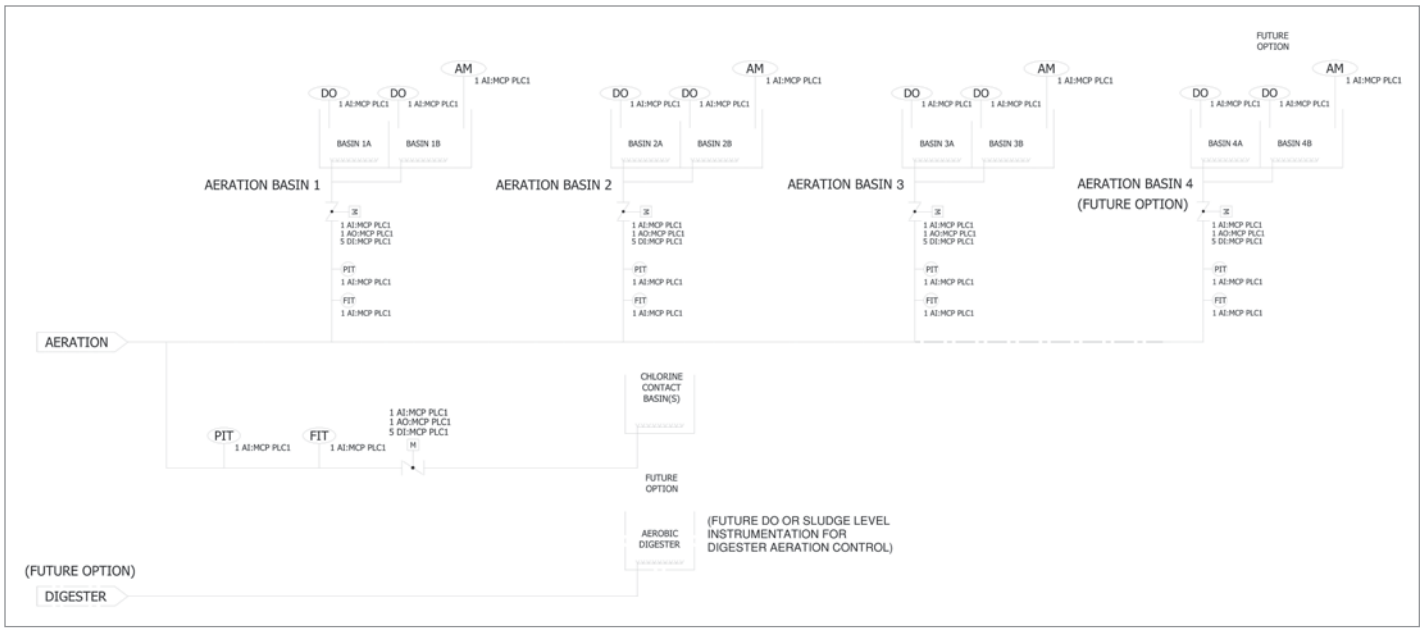


Figure 2. Aeration System Control P&ID (courtesy of Aerzen).

aeration process including, blowers, control valves, instrumentation, and programming in order to streamline both the installation and maintenance of the system and to allow for ownership responsibility to be held by the equipment experts. We also specified quarterly inspections of the aeration system by the blower manufacturer over the first two-years of operations to provide the facility operator ample training and support in operating and maintaining the system. This is even more important for this facility and client as the facility does not operate with full time staff.

Aerzen blowers were packaged as part of the winning public bid for the Phase I expansion work. Aerzen has local full-service center in the Houston area and is locally represented by Hartwell Environmental Corp. Aerzen's AERprocess supports both DO and ABAC based aeration control. In addition to biological and blower optimization, the AERprocess also provides both localized and optional remote support of the blower systems. Maintenance schedules and preventative measures are included in the overall control strategy. The customer is prompted to perform system maintenance based on run time or condition monitoring. Optional remote support is provided using a customer controlled 2048-bit encrypted LAN or cellular data connection.

Overall, the proposed design optimized the downsides of the site by providing deeper aeration basins to provide more efficient oxygen transfer which reduced blower sizing, combining aeration systems to reduce building sizing and costs, and design an intelligent aeration control system to capture energy efficiencies and provide operational assurances. A real-life engineering example of "when life gives you lemons…". BP

About the Authors

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Jones|Carter is an award-winning, full-service civil engineering, planning, surveying and consulting firm. With more than 500 employees in 10 office across Texas, our team is organized around 12 services that support nearly 20 public and private market sectors. Our mission is simple – enhance lives through engineering excellence. Learn more at www.jonescarter.com.

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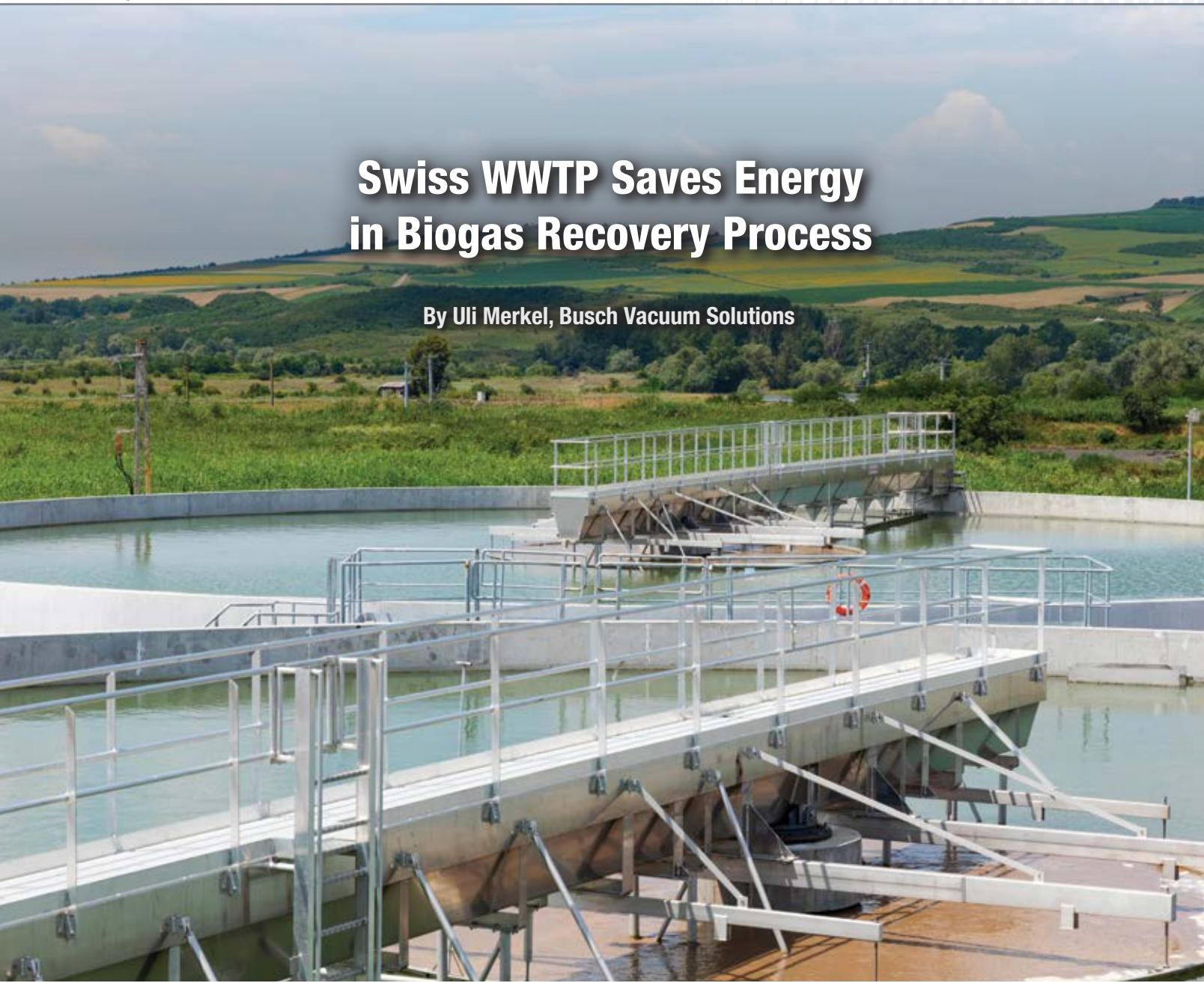

Swiss WWTP Saves Energy in Biogas Recovery Process

By Uli Merkel, Busch Vacuum Solutions

Ever since it was commissioned in 1974, the Echallens wastewater treatment plant in the Swiss canton of Vaud has been generating power from the recovery of biogas. In May 2020, two old oil-lubricated piston compressors used to mix the sludge in the digester were replaced by one MINK claw compressor from Busch Vacuum Solutions. This enabled the amount of power required for this process to be reduced by up to 40 percent. For the director of the treatment plant, this means he needs less energy to produce energy.

Echallens treatment plant is operated by the municipality of Echallens, located not far from Vaud's capital Lausanne, and treats the wastewater from the towns of Echallens, Montilliez and Villars-le-Terroir. It was designed to cater to a population equivalent of 10,000 – a capacity limit that has been largely exhausted. The canton's plans for the region of Echallens Haut-Talent include the consolidation of wastewater treatment by the year 2025 in an effort to make these operations more economically efficient in future. The plans also aim to improve the treatment of micro-pollutants. In the future, the plan is that Echallens treatment plant will replace all other local sewage treatment plants and then treat the wastewater from nine of the district's municipalities in total. To achieve this, Echallens is due to be expanded to a population equivalent of 26,000.

Recovering Biogas From the Digester

In 2019, a new cogeneration unit (Figure 1) was already built on the treatment plant's premises and generates an annual volume of 150,000 kilowatt-hours of power from the

biogas plant. The warm water recovered from the cogeneration unit is mainly used for the plant's own needs, for instance, to warm up the sludge in the digester or heat indoor areas. To make the process of recovering biogas (Figure 2) from the digester more economically efficient as well, a decision was made to optimize the circulation of biogas within the digester, which has a capacity of 350 cubic meters. A portion of the biogas generated in the digester is fed back into the sludge. To do this, the biogas is suctioned out of the top part of the digester, compressed with a compressor and fed back into the sludge at the bottom of the digester. The biogas flows through the sludge and then collects back up at the top of the digester, where it is fed through a line and into a gas tank as an interim reservoir. From the gas tank, the biogas then goes straight to the cogeneration unit. This currently runs for 20 hours a day and is only switched off for a few hours at night.

The process of circulating biogas has the following benefits:

1. The concentrated sludge is heated to 100°F (38°C) in the digester. Flooding the sludge with biogas helps to ensure that the heat is evenly distributed.
2. Mixing the sludge also helps to avoid deposits collecting and compacting at the bottom of the digester.

Figure 1. The new cogeneration unit at Echallens wastewater treatment plant is installed in a container. Using the biogas recovered from the sludge, it generates 150,000 kilowatt-hours of power per year.

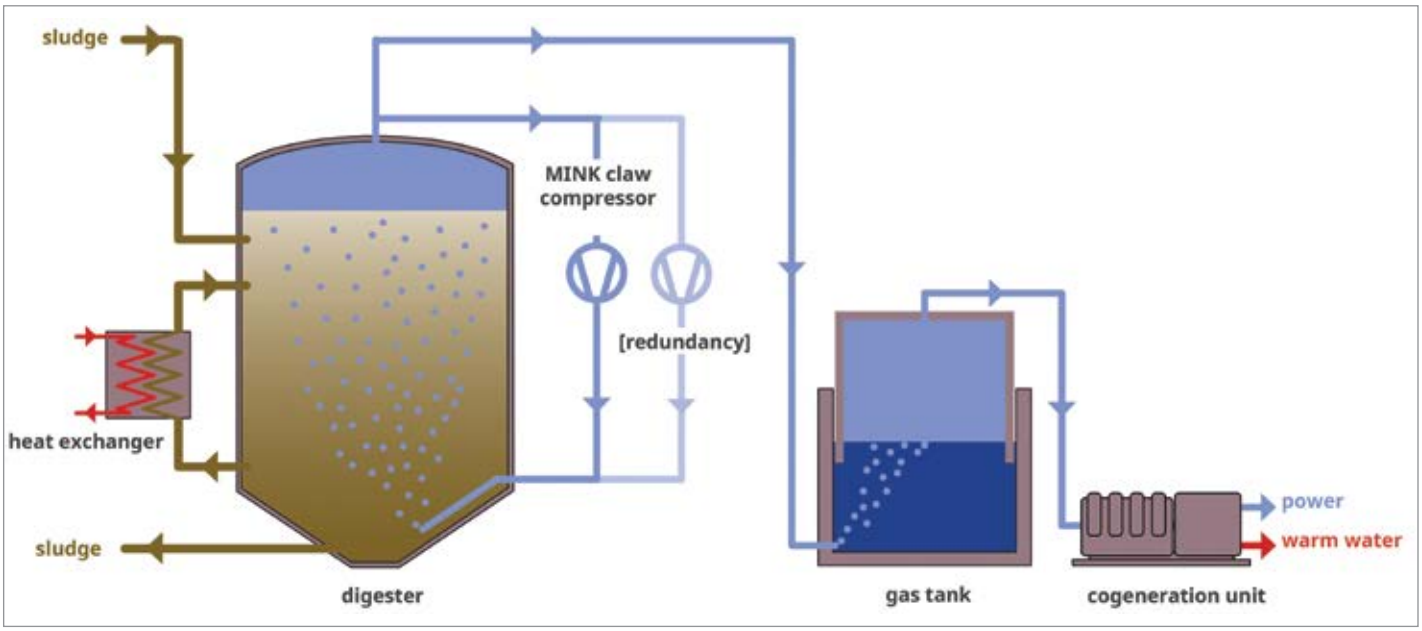

Figure 2. Process for generating power from biogas at the Echallens treatment plant.

Swiss WWTP Saves Energy in Biogas Recovery Process

3. The rising of the gas bubbles up through the sludge improves the microbiological degradation processes in the sludge, which ultimately leads to a higher gas yield.

4. Circulating biogas through the sludge also means that it does not have to be mixed mechanically.

Optimal Compression of Biogas

Two piston compressors were installed in 1974 to mix the biogas into the sludge, though one was designed to be redundant to allow the process to continue should the other compressor break down. In practice, however, it turned out that the capacity of one compressor was not enough, so both compressors ran all the time and there was no longer any redundancy. Both compressors were equipped with a motor with a rated current of 6.7 kilowatts.

After consulting a process engineer from the Swiss company Busch AG, a company belonging to the international group Busch Vacuum Solutions, the operator decided to purchase a MINK claw compressor (Figure 3) from Busch. This compressor is ATEX-certified (II 2G IIB3 T3 (i)/II 3G IIB3 T4(o)), which means that flame arresters are no longer required. Furthermore, it is equipped with a variable speed drive so that the volume flow can be adapted precisely to the requirements in the digester. The MINK claw compressor has been in operation since May 2020 and normally runs at full load with a power consumption of 4.5 kilowatts and a constant overpressure of 0.6 bar. Compared to the power consumption of the two older piston compressors, which had one 6.7-kilowatt motor each, this results in theoretical energy savings of more than 65 percent.

Figure 3. Up to 95 cubic meters of biogas per hour are transported by the MINK claw compressor at an overpressure of 0.6 bar.

MINK claw compressors compress biogas without using any oil at all. This is made possible by the compressors' contact-free operating principle, which means that the internal moving parts do not come in contact with each other or the housing. As a result, no oil changes are needed, unlike the oil-lubricated piston compressors which required two each year. As the 4.5 liters of oil from each compressor came into contact with the biogas, the old oil had to be disposed of accordingly. MINK claw compressors have an internal gearbox. This contains 0.85 liters of gearbox oil. Busch recommends an oil change after no more than 20,000 operating hours and an annual visual inspection to check the condition and oil quantity as a precaution.

The operator has also noticed yet another advantage during the first few months of operation: "The claw compressor is much quieter than even just one of the piston compressors we used before. Noise levels have more than halved." BP

About the Author

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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 photos courtesy of Busch Vacuum Pumps and Systems.

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— Uli Merkle, Busch Vacuum Pumps and Systems

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— Brendan Pankratz, Tuthill

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BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Busch Enables Cooling of Corona Vaccines

To cool this vaccine, conventional refrigerators, such as those used for flu vaccines, are not sufficient. The Corona vaccine must be stored and transported at -70°C. So that it retains its full effectiveness. In building the special refrigeration units, the Belgian company relies entirely on vacuum technology from Busch Vacuum Solutions. Vacuum is used to fill the cooling circuits of the refrigeration units with special gases. Due to the worldwide pandemic, the demand for these cooling units has risen sharply in recent months, and Busch was able to meet the expanded requirements by supplying additional vacuum pumps. These cooling units and transport equipment are sold worldwide and are used in the distribution of the vaccine around the globe. An essential product to ensure that the COVID-19 vaccine reaches vaccination centers intact and patients worldwide can receive the much-needed vaccination.

Busch Vacuum Solutions, www.buschusa.com

Howden New EasyAir Rotary Factory Package Blower

Howden kicks off 2021 with the launch of the new EasyAir Rotary. This factory package blower is under the Howden-owned product brand, Roots™. With its innovative features and easy-to-install plug-and-play design, the EasyAir Rotary is configurable to meet your unique requirements for both pressure and vacuum applications. The EasyAir Rotary is integrated with controls and has variable speed drive capability while maintaining easy maintenance and fully removable enclosure panels for 360º access. The small footprint and side-by-side installation allow for more efficient use of your available space, all while having limited free field noise levels to 80 dBA. Manufacturing of the EasyAir™ Rotary will be at Howden's 125,000 ft² facility located in Springfield, MO.

Howden, www.howden.com

Elmo Rietschle New VLR Claw Vacuum Pumps

Elmo Rietschle is pleased to introduce its new generation small capacity claw vacuum pumps. Our claw vacuum pumps offer reliable oil-less contact free vacuum performance for demanding applications operating with virtually no maintenance for long intervals. Decades of claw experience puts Elmo Rietschle at the forefront to offer the latest in claw vacuum technology. Our two new model sizes VLR-62 and VLR-122 are rated at 44 and 85 cfm with an ultimate vacuum level down to 27 inHg. We offer two different pump variants that allow you to select the right pump for the application. Our "passive" cooled version is a compact alternative to replace older style pumps such as rotary carbon vane, oil lubricated vane and liquid ring vacuum pumps in applications requiring a vacuum level down to 18 inHg.

Gardner Denver, www.gardnerdenver.com

Turbowin Releases WL Series Oil-Free Turbo Blower

Turbowin released one of the most efficient oil-free turbo blowers in the market with its upgraded design of air foil bearing. Paired with high efficiency up to 57.5%, the WL Series proves to be a reliable turbo blower ranging from 10 to 1,200 HP. Turbowin's core technologies include ultra-high efficient permanent magnet motor, supersonic impeller and a no bending, no welding air foil bearing. All parts are in house designed and manufactured with a complete turbo compressor lineup that is 100% oil-free.

Turbowin, www.turbowin.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Pfeiffer Vacuum New HiPace Turbopumps

With the HiPace 350 and 450, Pfeiffer Vacuum presents a turbopump especially dedicated for applications like mass spectrometry, electron-microscopy, metrology tools, particle accelerators and plasma physics. In addition to analytical, vacuum-process and semiconductor technology, their broad range of applications also includes coating, research & development, and industrial applications. HiPace 350 and 450 provide high performance combined with low weight and a small footprint. Based on a hybrid bearing, a combination of ceramic ball bearings on the fore-vacuum side and permanently magnetic radial bearings on the high vacuum side, these HiPace turbopumps have a particularly robust bearing design and guarantee reliability. The sophisticated rotor design of the turbopumps results in a high pumping speed for light gases.

Pfeiffer Vacuum, www.pfeiffer-vacuum.com

Edwards New Facility for Cryogenic Pumps

Edwards completed the acquisition of the cryogenic product lines from Brooks' Automation, Inc., in July 2019. The acquisition expanded Edward's technology offering to customers in the semiconductor and general vacuum industries. Edwards will now invest in a new building in Haverhill, Massachusetts, expected to be completed during the second quarter 2022. All functions currently within Chelmsford related to new product design, and manufacturing operations will be relocated to the new facility. Edwards will now invest in a new building in Haverhill, Massachusetts, expected to be completed during the second quarter 2022. All functions currently within Chelmsford related to new product design, and manufacturing operations will be relocated to the new facility. The Cryogenic Service operations activities, supporting the US market, will be relocated from the current Chelmsford facility to Nogales, Arizona and to Nogales, Mexico.

Edwards, www.edwardsvacuum.com

Republic Manufacturing Acquires Joost Industrial

Republic Manufacturing, a leader in the pump and blower manufacturing and metal fabrication industries, acquired Joost Industrial, LLC. Joost Industrial has been a successful distributor of Republic Manufacturing's blowers, pumps, and air knives for decades. Its rich heritage of service and product support provides a market leading proposition. "Joost offers an exciting opportunity for Republic to strengthen its product and service offering in the Rocky Mountain and Western Regions of the United States," said Zach Goff, CEO of Republic Manufacturing. Jeff Joost began working at Republic MFG in 1993. Three years later he moved to Colorado, started Joost Industrial and the two companies have worked closely together for the past twenty-five years. Jeff will join Republic Manufacturing as General Manager of the Colorado and Utah branches.

Republic Manufacturing, www.republic-mfg.com

Sulzer Boosts Efficiency at Vienna WWTP

The E_OS project on the edge of Vienna is a pioneering facility designed to transform the Austrian capital's wastewater treatment plant from a major energy consumer into a net producer. Important parts of the project therefore include maximizing energy efficiency and optimizing power generation, both of which were supported by Sulzer's expertise. Under construction since 2015, the project replaces the original primary sedimentation and aeration basins with a more compact but higher volume system. The new anaerobic digesters and a combined heat and power plant have been built on the space that has been vacated. The facility now produces around 78 GWh of electricity and 82 GWh of heat, meaning the plant will be able to generate all the energy it requires for wastewater treatment, with energy to spare while reducing Vienna's annual carbon emissions by 40,000 tons.

Sulzer, www.sulzer.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Piab MX Suction Cup Family

The MX suction cup can work across an array of applications such as bin picking, order fulfillment, box depalletizing, and parcel sorting. Gone are the days where you need to change gripper or suction cup for each individual product in the application. This multi-purpose, energy efficient suction cup boasts extreme gripping capabilities on many surfaces and materials. The MX suction cup has the ability to create a hard seal when using a low-vacuum flow, which contributes to a more sustainable energy output. The MX suction cups are available in five sizes: 35, 42, 50, 57, and 65 mm in diameter and are compatible with our extensive piGRIP® fitting program, allowing for fitting options tailored to your needs. For extra safety and robustness, opt for the aluminum clamp fittings.

Piab, www.piab.com

WELTEC BIOPOWER Member of the American Biogas Council

In January 2021, the German biogas plant manufacturer WELTEC BIOPOWER has joined of the American Biogas Council (ABC). The Washington-based association has been campaigning for the interests of the American biogas industry since 2010. The ABC represents biogas and biomethane plant operators, research institutions, municipal suppliers and manufacturers along the biogas supply chain. International Sales Manager Dr. Kevin Monson will represent WELTEC BIOPOWER in the US market. "We look forward to our commitment in the USA and are convinced that we can contribute to the growth of the biogas industry. Our tried and tested technology delivered under one turnkey contract and handed over at full output will be particularly attractive to developers looking for proven quality high-uptime plants with short lead-in times."

WELTEC, www.weltec-biopower.de

Leybold New VARODRY HD/O_2 Screw Pump

In 2018, vacuum specialist Leybold designed the 100% dry screw pump VARODRY for demanding industrial applications. This compact all-rounder is easy to install and, thanks to its compact design, easy to integrate into systems. Now Leybold has extended its VARODRY platform by the robust "Heavy Duty" and Oxygen VD HD/O_2 version. These features predestine the VD HD/O_2 versions particularly well for rough coating, drying and regeneration applications. In these areas, where extra robustness is required, and the exhaust gases are usually discharged via piping. The VD HD/O_2, which is available in pumping speed sizes 65, 100, 160 and 200 m³/h has been specially equipped with a stainless-steel exhaust and a built-in purge module. In comparison to competitive screw vacuum pumps, VARODRY is completely oil-free, which is a special feature.

Leybold, www.leybold.com

Brown and Caldwell Hires New VP in New York

Leading environmental engineering and construction firm Brown and Caldwell announced Sachin Gajwani has joined the company as vice president and client service director. The hire builds on the firm's strategy to grow its share of New York's municipal and private water market. With a water and wastewater engineering background spanning 24 years, Gajwani has positioned for, captured, and successfully delivered numerous high-profile, multi-million-dollar projects and programs in New York and throughout the U.S. Notable projects have included major wastewater treatment plant upgrades, construction of large-scale water conveyance systems, and resiliency preparedness and planning improvements at water and wastewater facilities. As client service director, Gajwani will pursue and lead the quality delivery of utility projects for the water, wastewater, and stormwater sector that positively impact clients' long-term goals.

Brown and Caldwell, www.brownandcaldwell.com

BLOWER & VACUUM INDUSTRY & TECHNOLOGY NEWS

Busch New Series of VACTEST Measurement Equipment

The exact observance of pressures or pressure curves in vacuum-assisted processes in process engineering is an important parameter for ensuring optimum efficiency and the best product quality. Busch Vacuum Solutions has now launched the new series of VACTEST vacuum measurement equipment. Designed to combine the latest advances in vacuum metrology with exceptional manufacturing quality, it provides an innovative and comprehensive portfolio of active vacuum gauges and controllers. Robust construction, reliability and measurement accuracy are key features of these devices, making them the ideal choice to monitor and control vacuum processes. State-of-the-art technologies allow for a wide measuring range from 1,600 to 5 · 10-10 mbar covering all vacuum levels with accuracy. All sensors comply with international standards and regulations such as CE and RoHS.

Busch Vacuum Solutions, www.buschusa.com

SPE Appoints Yi-Chieh Huang to Expand Seal Products

SPE appointed its COO, Yi-Chieh Huang, to oversee expanding mechanical seals products for the US industrial blower and vacuum markets. With 14 years of experience in machinery manufacturing, Huang led cross-functional teams to create over 30 sealing systems patents. Huang's inventions include a cartridge seal with multi-segment rings installed in industrial blowers for both low and high-temperature processes. Huang also led a R&D team to upgrade a manufacturing process to develop a next-generation non-contacting seal with a unique spiral pattern to lower Nitrogen consumption. Huang strives to provide high-performance seal products to lower rotating equipment energy consumption, and she advocates VOC emission solutions in response to government environmental policies. "It is my honor to lead an outstanding team to provide technical support for our clients and make better solutions for the industrial environment. I believe that every useful innovation always comes from customers' needs," Huang said.

SPE, www.scenic-seals.com

Pfeiffer Vacuum at Sirius Brazilian Synchrotron Light Source

Heading the project, with the expertise of more than 23 years in synchrotron light, The Brazilian Synchrotron Light Laboratory, associated to CNPEM, has been leading this successful project since 2008. "The high quality of Pfeiffer Vacuum products combined with the excellent support of the representative in Brazil, guarantees us the reliability for building the beamlines without any hitches, regarding the generation of vacuum, which is the crucial point for carrying out the experiments," said Mr. Gustavo Lorencini M. P. Rodrigues, the Scientific Instrumentation Supervisor. Pfeiffer Vacuum, with the support of representative in Brazil, Avaco Tecnologia em Vácuo, is proud to supply several ACP multi-stage Roots pumps, HiPace turbomolecular pumps, helium leak detectors and customized vacuum chambers. One of the key points of a high-end particle accelerator is the vacuum.

Pfeiffer Vacuum, www.pfeiffer-vacuum.com

Max-IR Labs Grant to Develop Nitrogen Sensor

Max-IR Labs, an infrared sensor technology company based in Dallas, Texas, announced it has been awarded a Phase II Small Business Innovation Research grant of $750,000 by the National Science Foundation to continue development of its patented ISMIRTM sensor for real-time monitoring of nitrogen pollutants including nitrate, nitrite, and ammonia in municipal wastewater. This grant will enable Max-IR Labs to develop a prototype that is based on novel quantum-cascade laser technology and initiate field-tests of the ISMIRTM sensor at municipal wastewater treatment facilities. An integral part of any wastewater treatment process is aeration – the process of adding air into wastewater to allow aerobic biodegradation of the nitrogen-based pollutants by naturally occurring bio-organisms.

Max-IR Labs, www.max-ir-labs.com

THE MARKETPLACE

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