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Product Features

Vortex Flowmeter Measures Temperature

SPIRAX SARCO'S VLM10 inline vortex flowmeter combines an inline vortex meter, a built-in flow computer and an integral temperature sensor.

The flowmeter handles mass, volumetric and energy flow measurement on steam, liquid and gas applications of 1 inch to a foot. The VLM10 is capable of a steam or gas mass flow accuracy of ± 1.5% of range over a 20:1 flow range. The fully welded, gasket-free design, helps ensure safe steam measurements and allows the sensors and RTD to be removed without first having to shut down the line.

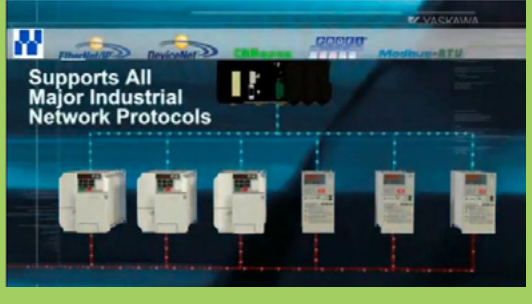
The built-in web server allows customers to monitor flow and meter health through the internet. Digital communications deliver information on demand using Modbus RTU, BACnet MS/TP, and Modbus TCP/IP technology with standard analog and pulse outputs.

The VLM10 is available in a range of connections and pressure ranges.

Ad Index

Variable Speed Drive Eases Commissioning

THE P1000 variable speed drive from Yaskawa delivers simple, reliable, cost-effective control for variable-torque loads through 500 hp. Specific application features, energy savings and network connectivity make the P1000 a great choice for industrial fans and pumps. The P1000 includes application presets for easy commissioning. A real-time clock (built into the keypad display) can be used for system control based on time of day, and also can provide time-stamped event information. Primary and secondary PI process control loops help regulate both drive-related and non-drive-related process variables.



Click the image above to watch a video about the P1000.

The P1000's dynamic noise control minimizes drive-related audible motor noise under light load conditions. It also has fast-acting current and voltage limiters for tripless operation, communication interfaces for all major industrial networks, and preventative maintenance monitors that provide alarms for scheduling work before problems occur.

An auxiliary control power unit keeps the drive communicating when main power is removed. In addition, a USB copy unit can help easily duplicate drive configuration and a removable terminal board with parameter storage provides automatic configuration backup.

Built-in DC reactors (30 HP and larger) provide input harmonics and protection from input disturbances. For low harmonics, a cost-effective integrated 12-pulse version (480V, 40 hp and larger) is available. A flange version provides cabinet mounting efficiency (heatsink external) with a high integrity dust-tight solution (NEMA 12). The P1000 is made with RoHS-compliant materials for environmental responsibility.

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Specify the Right Slurry Seal

Consider new dual-seal and water-management options

By Heinz P. Bloch, consultant, and Tom Grove, AESSEAL Inc.

IN THE 1990s, slurry-sealing trends moved strongly from braided packing toward single-type heavy-duty mechanical seals. Still, mechanical seals often are among the first components to fail; whenever fine abrasive slurries can migrate into the seal faces, the performance of mechanical seals becomes especially unpredictable. Yet, virtually all modern process plants place great importance on reliable mechanical seals. Facilities experiencing repeat failures may find that better slurry seals now available enable effective remedial action. For mild slurries, single-type heavy-duty mechanical seals with springs located away from the pumpage (as illustrated in Figure 1) often suffice. For more difficult slurry services, best-in-class companies typically specify dual seals (Figure 2).

SPECIFICATION STRATEGIES

Today, top reliability professionals select these dual seals by invoking and further amplifying the American National Standards Institute (ANSI)/Hydraulic Institute (HI) Rotodynamic (Centrifugal) Slurry Pump Standard ANSI/HI 12.1-12.6-2011 [1]. Section 12.3.8 of this standard describes general arrangement details for mechanical shaft seals. It states that dual pressurized seals have the advantage of providing enhanced lubrication to the faces with a pressurized barrier fluid. This arrangement prevents process fluid leakage to the atmosphere and so improves safety. The standard further notes that dual pressurized seals are used when the limits of heavy-duty single mechanical seals are exceeded, when air potentially can be entrained in the slurry, or when large volumes of air can be introduced into the pump. Experience shows that both the seal environment and seal face materials must be carefully selected for the service. Buffer fluid pressurization requirements and associated controls are important as well.

Figure 2 depicts a dual pressurized seal design. The inboard set of seal faces contains the process slurry or impure pumpage; a secondary barrier fluid (clean water) is pressurized higher than the process stream. An outboard set of seal faces confines the clean barrier fluid. The higher pressurization means the secondary barrier forms the inboard-seal-face fluid film. Seal face failure risks normally originating with micron-size-range particle contaminants are mitigated because the seal-face operating environment is clean water at a stable pressure.

Delivery of the water barrier fluid is important to application success. Traditional piping configurations are API Plan 53-A and API Plan 54. Plan 53-A is limited by a fixed volume of barrier fluid; a fluid-containing vessel or "seal pot" is externally pressurized by air or nitrogen. During process upset conditions, the pressurized volume of fluid crosses the inboard seal face, and the seal pot must be recharged during operation. This recharging process is not operator-friendly — so there's high likelihood the seal will run dry. Plan 54 is a centralized water-barrier distribution

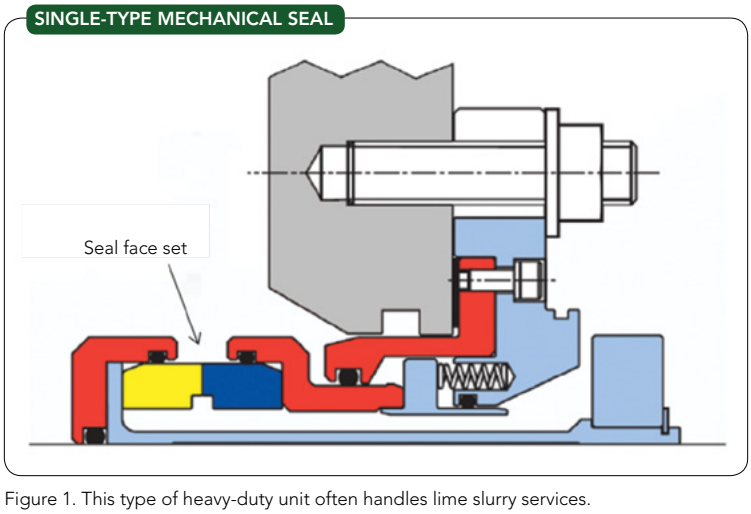

Figure 1. This type of heavy-duty unit often handles lime slurry services.

system, usually through multiple pumps. This means the circulating system always must be pressurized 15 to 30 psig above any seal chamber pressures to avoid cross contamination of the barrier fluid.

Leading processors have had success with hybrid solutions whereby Plans 53 and 54 are combined and water comes from a self-contained water-management system (Figure 3). The system is designed to control pressure and cool the seal faces; it uses a regulator and a backflow preventer to set the correct water-barrier pressure for the seal faces. The water is recirculated, reducing actual consumption to just a few gallons per year. An inline filter connected to the continuous source of water filters the barrier fluid to 1 micron absolute. A three-way valve in the line returning from the seal to the reservoir enables the operator to inspect the condition of the barrier fluid in the seal without compromising seal performance. Should any particles cross the inboard seal face, the three-way valve is activated to flush the seal. An internal standpipe on the supply line to the seal protects the seal from contaminants. By connecting a valve and drain line to the bottom of the tank, an operator can purge contaminants from the reservoir while the connected water source automatically replenishes the system with clean water. If process air bubbles accumulate at the seal face, the secondary liquid provides sufficient cooling to ensure consistent seal performance. The size of the seal pot and the positioning of the inlet and outlet ports determine the level of heat dissipation by the support system. Independent control of the seal environment broadens the success margin for the seal.

A recent U.S. Environmental Protection Agency rule tightened the caps on sulfur and nitrogen oxide emissions. As a consequence (although appeals are pending), processors are giving ever-closer attention to equipment reliability and efficient use of existing pollution-control technologies. In late 2011, the U.S. Department of Energy outlined "near-term compliance pathways," highlighting the need for increased utilization and reliable performance of wet and dry flue-gas desulfurization (FGD) units [2]. Of course, selecting reliable mechanical seals is of critical importance, not only in FGD, but also in the majority of other slurry applications. New dual-seal and flush-

A DUAL MECHANICAL SEAL

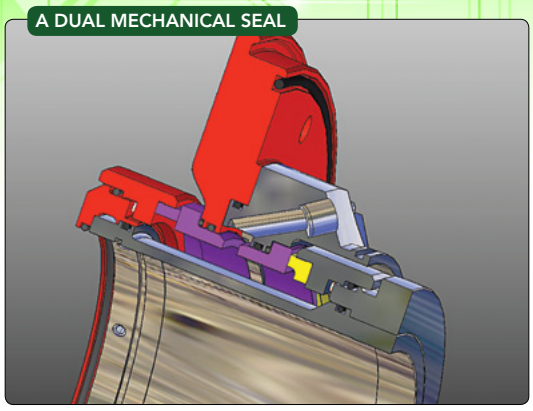

Figure 2: The space between the sleeve and the inside diameter of the two sets of seal faces is filled with a pressurized barrier fluid — usually clean water.

water management options allow users to upgrade from maintenance-intensive packing to highly reliable mechanical seal alternatives. Moreover, in large pump sizes, designs that allow seal installation from the wet end of the pump, which will minimize the cost of overhaul, deserve to be considered.

Plant reliability professionals should consider bridging the distinct operating parameters of numerous slurry-containing processes with existing industry standards for slurry sealing. To incorporate the options outlined above requires important amendments to current equipment standards. The add-on wording should state:

- The mechanical seal must be a heavy-duty dual-cartridge mechanical seal suitable for slurry duty and designed to operate at all times at a higher pressure than the process pressure.
- Seal internal cross-sections must have large radial clearances; the inboard face set must be hydraulically balanced to the barrier fluid.
- Tungsten carbide (TC) and/or silicon carbide (SiC) faces matched with solid TC faces must be used when the pH is greater than 5; solid SiC must be used when the pH is 5 or less. Pin drives must be designed to minimize face fracturing.
- Wetted alloys must be super duplex for abrasion resistance.
- Mechanical seals must perform equally with or without impeller back-vanes; the user requests that back-vanes be incorporated in the equipment impellers.

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- The seal chamber must be an open-frame plate liner with vortex breakers or a closed-frame plate liner designed to prevent excessive erosion.
- A mechanical seal support system must be provided as a pre-engineered turnkey system; it must include all instrumentation and fittings necessary for site installation.
- The tank must have a minimum capacity of 25 liters (6.6 U.S. gallons) and be self-filling. Inboard seal face integrity must be visually confirmable at the support system with a flow indicator.
- The distance between the seal supply and return port should be a minimum of 15 inches to maximize residency time for barrier-fluid heat dissipation.
- The system at all times must deliver barrier fluid at pressure differentials 15 psig (minimum) above the process pressure in the pump stuffing box.
- The seal system must include inline filtration of plant seal water to 1 micron. An internal standpipe on the supply leg, a three-way valve on the return leg, and a blowoff valve at the bottom of the tank must be included to allow clearing the system of any contamination after the initial installation and during its service life.
- As part of the initial supply package, documentation must include a heat generation report for each installation. The report must refer to the operating conditions for the intended shaft diameter, speed, process/barrier pressure, temperature and induced flow. The data must provide the input for a thermal equilibrium estimation and result in a calculation of the heat generated by the specific seal supplied in each case.

PRE-ENGINEERED WATER-MANAGEMENT SYSTEM

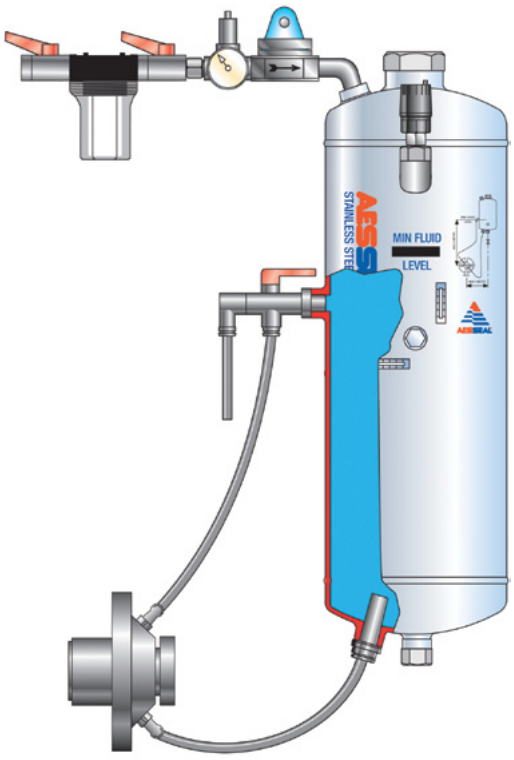

Figure 3: A self-contained system can supply water for dual mechanical seals while minimizing makeup water.

As regulatory legislation issues persist, a thoughtful compliance strategy will drive sealing solutions that truly optimize reliability of slurry pumps in virtually all industries.

HEINZ P. BLOCH, P.E., is a Westminster, Colo.-based process machinery consultant. **TOM GROVE** is executive vice president of AESSEAL, Inc., Rockford, Tenn. E-mail them at heinzpbloch@gmail.com and tom.grove@aesseal.com.

Federal Equipment Acquires McQuay Process Chillers

CLEVELAND-BASED FEDERAL Equipment Company has acquired two 800-ton McQuay PEH126 centrifugal chillers that are now available for purchase.

The chillers use the common R134A refrigerant. The refrigerant is suitable for continued use. These midsize industrial process chillers typically range between 200 and1,500 tons. They can handle many industrial applications including biopharmaceutical processing, pharmaceutical manufacturing, chemical processes and food and beverage production.

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Get the Most Out of Your Fans and Pumps

Variable frequency drives can help reduce energy costs and improve motor efficiency

By Christopher Jaszczolt

THE MAJORITY of fan and pump applications spend little to no time requiring the motor to run at rated speed. On average these motors can meet demand by running at 70% of shaft speed. The additional system capabilities are usually reserved to accommodate future expansions and/or infrequent increased load demands. Carious controllers can be utilized to run a motor at reduced speed. One such motor controller is a variable frequency drive (VFD).

A VFD is a reliable electronic device that efficiently operates a three-phase electric motor. It can be used to efficiently operate a fan or pump motor at any speed. Operating a fan or pump motor below base speed to meet the requested demand can show significant energy savings over the same motor run across the line. The energy saving benefits of utilizing VFDs in fan and pump applications have been well established and documented. The costs of a VFD and its installation for various pump and fan systems can usually be paid back in energy savings within a few years.

VFDs save energy in pump and fan applications by taking advantage of their variable torque load profiles. The variable torque load profiles present in these types of applications can be expressed through the affinity laws. The affinity laws convey the relationship between shaft speed, volumetric flow rate, and power.

Affinity Laws:

I. Flow is proportional to shaft speed:

$$\frac{Q_{Out}}{Q_{Rated}} = \left(\frac{N_{Out}}{N_{Rated}}\right)$$

II. Pressure or Head is proportional to the square of shaft speed:

$$\frac{H_{Out}}{H_{Rated}} = \left(\frac{N_{Out}}{N_{Rated}}\right)^2$$

III. Power is proportional to the cube of shaft speed:

$$\frac{P_{Out}}{P_{Rated}} = \left(\frac{N_{Out}}{N_{Rated}}\right)^3$$

Where:

Q – Volumetric flow rate (CFM, GPM, etc),

N – Shaft rotational speed (RPM),

H – Pressure of head developed by the fan/pump (feet, meters, etc.),

P – Shaft power (Watts, HP)

For example, running a motor at 70% of rated speed should only require approximately 34% of rated power to generate the 50% torque required to produce the 70% flow demand. Therefore, using a VFD will require 64% less energy to run a motor and meet the required load demand than the same motor running directly across the line (neglecting savings associated with inlet vane and/or output damper control).

• 70% motor speed provides → 70% rated flow → by using 50% of rated torque → at 34% of motor rated power.

As this scenario demonstrates, the energy savings is usually realized through the comparisons made between a motor run across the line and motor run by a VFD at reduced speed. Additional savings are realized though reductions in peak demand charges resulting from the VFDs soft-starting capabilities. A motor starting across the line will draw 6 to 7 times its rated current, while a VFD will draw current from its power source linearly with respect to the output power demand. The transformer feeding the VFD will never see the initial current surge required to start the motor. Furthermore, a VFD can be further configured for additional energy saving by improving motor efficiency.

Most VFDs are configured to output voltage to a motor based on a constant torque volts-per-hertz (V/f) pattern. Constant torque V/f patterns are required when the load torque is independent of speed. As

a result, a motor must be able to generate constant torque throughout a motor's speed range. This can be generated by creating constant flux, which is obtained by maintaining a constant voltage-to-speed relationship. This can usually be described by the relationship between base voltage and base speed.

A 460 volt, 60 Hz rated motor will require 7.67 volts-per-hertz to generate constant torque throughout the motors speed range. Therefore, constant torque V/f patterns generally have linear relationships between the amount of voltage provided to the motor and its running frequency. There may be a slight increase in voltage in the motor's low end speed region to help generate starting torque. A further voltage boost will be added to the output to offset the voltage drop associated with winding impedance.

On the other hand, we have already expressed that fan and pump applications are variable torque loads. Variable torque loads are applications where the load torque required to drive a motor is dependent on shaft speed. As we have already expressed through the affinity laws, torque is proportional to the square of shaft speed. Therefore, a constant torque V/f pattern is no longer necessary because the motor no longer needs to generate constant torque below rated speed.

In fact, running a motor applied to a variable torque load, with a VFD configured to output based on a constant torque V/f pattern, will reduce the motor's efficiency. In some instances, running a motor designed for a variable torque load profile, with a VFD configured for a constant volts-per-hertz output, can cause the motor to go into saturation and draw high current. The resulting current draw may sometimes exceed the motor's rated full load amps, which if not corrected can cause the motor to overheat.

As a result, VFD manufacturers have configured VFDs to incorporate pre-established V/f patterns specifically designed for variable torque loads. These V/f patterns have the output voltage strategically reduced to generate the typical torque requirements of variable torque loads throughout the motor's speed range. However, not every motor has the same design. As a result, these preset V/f patterns could still be oversaturating the motor, which reduces motor efficiency. This is where a VFDs automatic energy-savings function can be utilized.

By design, VFDs operate motors by varying their output voltage waveform's fundamental frequency in order to vary motor speed. The applied frequency is such that the motor operates within its normal full load slip rating, where rated slip is only applied at rated load. VFDs generate voltage waveforms with lower slip in order to meet the lower torque demands of the application. As slip decreases further and further away from rated slip, the motor becomes less and less efficient. Most AC induction motors are designed for maximum efficiency at rated slip. Therefore, a VFD will only run a motor near its optimum efficiency while running at rated load.

A VFD's automatic energy-savings feature is designed to be utilized whenever rated torque is not required. Since fan and pump applications are almost never run at rated load, a VFD's energy-savings feature will operate whenever the pump or fan is called to run.

Energy-savings control will regulate a VFD's output voltage such that the motor always runs at rated slip in order to continuously optimize motor efficiently, regardless of the load condition. A VFD's energy-savings function optimizes slip by first determining the amount of power being supplied to the motor. Then, the VFD calculates the amount of power that should be supplied to the motor based on the frequency range, tuned motor parameters, and power measurements. Once the VFD has calculated the right amount of slip to run the motor at its maximum theoretical efficiency, the output voltage is adjusted until the calculated amount of slip is achieved. Therefore, energy savings control improves motor efficiency by regulating the amount of slip through adjustments in the output voltage. The V/f pattern is specifically adjusted for each motor at every given load condition. Energy savings control will allow the end user to avoid configuring V/f patterns or using unreliable pre-determined V/f patterns that may decrease motor efficiency or perhaps place the motor in an over-saturated condition.

The VFD's energy-savings control is simple to

setup and use. The feature is generally initiated by enabling a parameter setting during the VFDs installation. Then a simple one-time auto-tune with the load uncoupled from the motor must be performed. The tune allows the VFD to ascertain key motor information for its energy savings calculations. With a VFDs capability to auto-tune motor data, the type of motor becomes irrelevant.

Figures 1 and 2 show the power required to run a motor applied to the same variable torque load with and without energy-savings control. The series in blue (V/f) designates a VFD running the load with a default constant torque V/f pattern. The red series (V/f + ES) has the VFD running the motor under the same load condition, with the VFD's energy-savings function enabled.

As we have previously stated, the V/f pattern using energy saving will have its output voltage continuously adjusted away from the default pattern to optimize slip. As the figures show, energy-saving control utilizes less power to run the same load by optimizing motor efficiency. The energy saving function will provide a larger reduction in power consumption the lighter the load becomes. As figure 2 shows, energy savings has a marginal effect on motor efficiency at higher speeds. As the motors draws nearer and nearer to rated speed, the motor will run nearer and nearer to rated load. Thus, the motor will run closer and closer to rated slip. Since the motor's optimal efficiency point is at rated slip, the VFD's energy savings control will not have to make any significant motor-efficiency improvements.

On the other hand, the torque requirement will be significantly lower in the mid- to low-speed range. As a result, the motor will not be running near its rated slip. Figure 1 shows a VFD's energy-savings control function can be used to substantially increase motor efficiency at lower speeds. For example, energy-savings control is able to reduce the power requirement to run this motor at 60% of shaft speed by nearly 10%.

Furthermore, the VFD can still generate a constant torque V/f pattern if the load demands reach or exceed the motor ratings. Therefore, energy savings control allows a VFD to seamlessly generate high starting torque without any adjustment to the V/f pattern, while still having the ability to back the voltage off automatically to run the motor near its optimum efficiency.

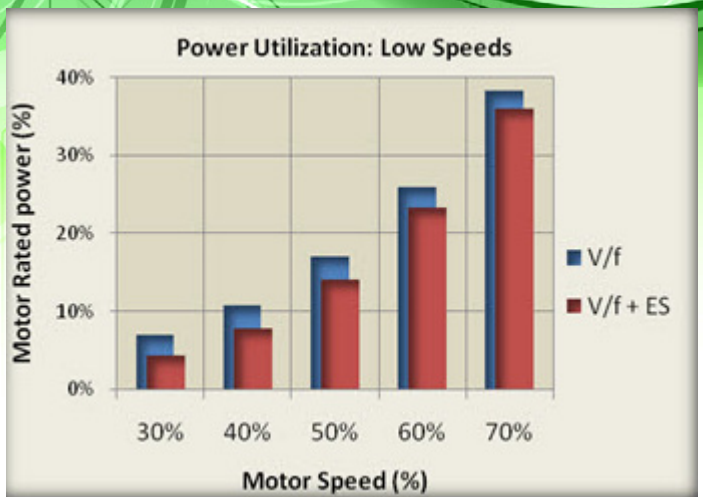

Figure 1

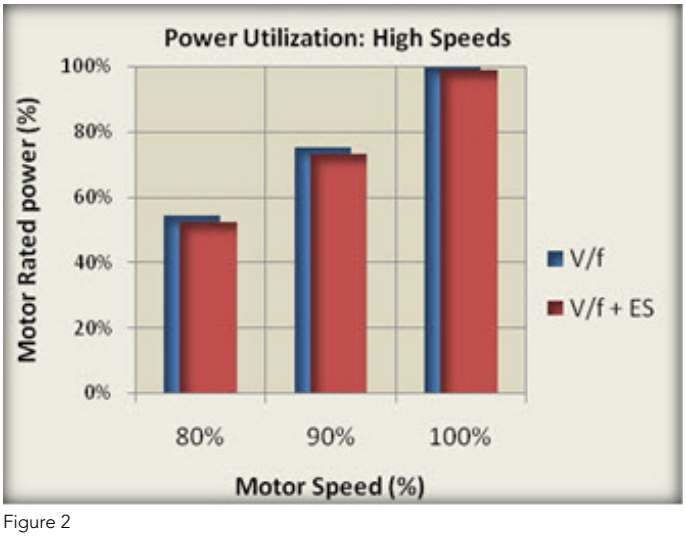

Figure 2

Additionally, energy-savings control allows for real-time adjustments. By making real-time power measurements, the VFD can accommodate for motor parameter changes that may have been affected due to motor temperature changes. Therefore, any unexpected load or motor characteristic changes will be automatically compensated for by the VFD.

Energy-savings control is a feature that may already be imbedded into your VFD. The benefits described using a VFD's energy-savings control isn't limited to fan and pump applications. Any application where there are long periods of light loading can benefit from a VFD's energy-savings control.

Ground EMFs with Virtual Reference

New grounding method eases electromagnetic flowmeter installation and minimizes costs.

By Ralf Haut, Krohne, Inc.

ELECTROMAGNETIC FLOWMETERS (EMFs) are one of the leading choices for recording the volume flow of electrically conductive liquids in a wide range of industries, including chemical, pharmaceutical, water/wastewater and food. Like all electrical equipment, EMFs must be grounded for safety reasons. Grounding is typically done using conductive non-lined pipe flange, grounding rings, or occasionally, grounding electrodes.

However, in some applications these standard grounding methods can pose problems. For example, in lines with cathodic corrosion protection or in galvanization plants, voltage is generated between the electrodes and the earth. Or, when using aggressive media in the application, the grounding rings often must be manufactured from special materials that are very expensive, which adds significantly to costs when dealing with large nominal widths.

With a new method called virtual reference, also known as virtual grounding, EMFs can be installed in any type of pipeline, without grounding rings or electrodes. The method facilitates the use of less-expensive plastic nonconductive piping, which would otherwise require grounding rings or disks that can be quite expensive, reducing the cost savings inherent in plastic piping. It's also ideal for use in chlorine alkali electrolysis plants, where very low voltages and strong currents cause stray currents on liquids flowing through pipes, which can disturb measurements. Finally, it can be used in circumstances where fatty substances like emulsions may coat surfaces inside pipes, reducing the conductive connection needed for proper grounding.

ENSURES ELECTRICAL ISOLATION

The EMF's basic measuring principle relies on Faraday's Law of Induction, which requires that the inner wall of the measuring tube be electrically isolated. That's why most EMF measuring tubes for chemical applications are lined with polytetrafluoroethylene (PTFE), perfluoroalkoxy (PFA) or polypropylene (PP), or made entirely of ceramic.

EMFs must be grounded in accordance with safety regulations to ensure protection against contact and prevent electric shock. This guarantees that in the event of an error there's no hazardous voltage to the conductive parts of the device. In addition, grounding provides a fixed reference potential to the EMF signal voltage.

This EMF signal voltage is typically about a millivolt or less. The converter can only process such small signals without interference and with maximum resolu-

Figure 1. Electromagnetic flowmeters typically require grounding using either conductive non-lined pipe flange, grounding rings or grounding electrodes.

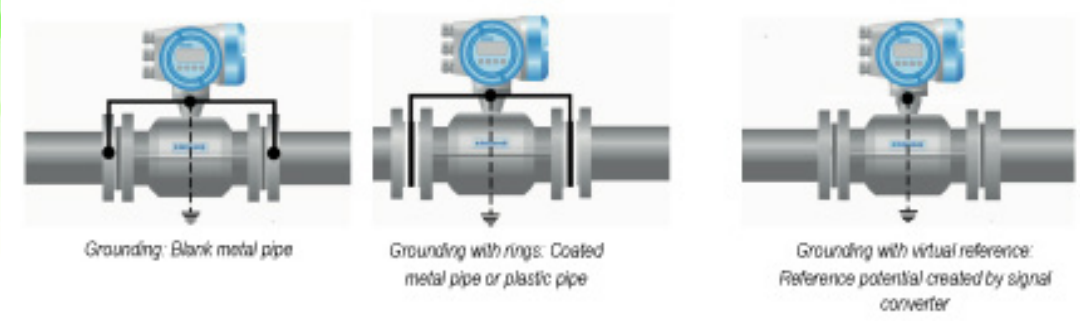

Figure 2. This diagram compares standard grounding methods with virtual reference.

tion provided there's not a great difference between the potential (the voltage) of the medium and the reference potential of the signal processing in the converter.

GROUNDING METHODS

There are several grounding methods available. Standard grounding methods include conductive non-lined pipe flange, grounding rings or grounding electrodes. In addition, there's the virtual reference method, which is done without separate grounding of the medium.

Conductive non-lined pipe flange: This is the simplest grounding method, used in pipelines that are electrically conductive on the inside (for example, blank steel or stainless steel). The liquid in the pipe has the same potential as the grounded pipe. The signal voltage on the electrodes thus has a fixed reference potential.

Grounding ring or discs: For ceramic, plastic or concrete pipelines and for lines isolated on the inside, the product is brought to a known fixed potential, usually by the use of metal grounding rings (grounding discs). The ring is in conductive contact with the product and usually jointly grounded with the sensor.

When assembling the pipeline and the EMF flanges, two additional gaskets are usually necessary. Groundings rings and gaskets must not disturb the flow profile at the measuring point. Careful selection and assembly of grounding rings and gaskets will prevent leaks.

This method is technically reliable and has been proven for many decades. Disadvantages include higher costs when special materials are needed for aggressive media or in the case of large pipe sizes. There are some instances in which the cost of the grounding rings exceeds that of the EMF itself.

In addition, when there are electrical potential differences, stray currents will occur between the product and the earth via the grounding rings and the grounding cable. The grounding rings can be destroyed as a result of electrochemical reactions with the product. Since they can be expensive, this solution has significant cost implications.

Grounding with grounding electrodes: With this method, the grounding electrode is situated at the invert of the pipe and is in direct contact with the housing that's connected to functional earth (FE) of the EMF sensor. Often, the cost of this additional grounding electrode is less than grounding rings. In the event of electrical potential differences in the plant, these grounding electrodes can be destroyed by electrolytic action, resulting in leakage or destruction of the whole EMF.

Abrasive solids in horizontal pipelines can also quickly destroy these grounding electrodes. In some cases, deposits on the grounding electrode can prevent the proper function of the product grounding, thus inhibiting correct measuring results.

In the case of large EMFs with grounding electrodes, significant deviations also occur when — as is often the case — the EMF was calibrated in an electrically conductive pipeline and then used in an isolated pipeline.

Virtual reference: Using this method, the EMF sensor can be installed in any type of pipeline without grounding rings or electrodes. The converter's input amplifier records the potentials of the measuring electrodes and a patented method is used to create a voltage that corresponds to the ungrounded liquid's potential. This voltage is used as the reference potential for signal processing. Thus, there are no interfering

potential differences between the reference potential and the voltage on the measurement electrodes.

This method has several advantages: For one, method has no need to come in contact with the product. The elimination of grounding rings and simpler EMF installation results in lower costs. This advantage shouldn't be underestimated, as faulty grounding is the most common cause of error when commissioning an EMF. There's no risk of electrolytic destruction when there are potential differences in the system, such as when using grounding electrodes. In addition, no stray currents flow over the product or grounding lines. Ungrounded use is also possible where voltage and current are applied to the pipeline, such as with electrolytic and galvanic treatment. The virtual reference method can be used on pipes with a diameter (nominal width) from DN10 (⅜-inch) and conductivity of ≥ 200 micro Siemens per centimeter (µS/cm).

Figure 3. An Andritz facility opted to use electromagnetic flowmeters with virtual reference grounding in an extremely corrosive process that normally would require expensive corrosion-resistant rings.

VIRTUAL REFERENCE IN PRACTICE

Andritz AG, headquartered in Austria, uses EMFs for pickling steel, an acid treatment used to clean off the surface and remove coatings resulting from the production process, giving the raw metal parts a better surface finish. The flow of mixed acids, consisting of hydrofluoric acid, nitric acid and water, is measured. At 90°C and a pressure of 3 bars (194°F, 43 psi), the acid flows at a speed of approximately 1.5 meters/second (5 ft/second).The extremely corrosive fluid would ordinarily have required corrosion-resistant rings made of tantalum. These rings are exceptionally expensive, costing about 1.5 times more than the price of the EMF instrument itself, so the company was interested in using another, less expensive, grounding method.

Andritz opted to use Optiflux 4300 EMFs, in sizes of DN10 to 300 (⅜ inch to 12 inch), manufactured by Duisburg, Germany-based measuring instrument manufacturer Krohne. The Optiflux 4300 uses Krohne's patented virtual reference method.

According to automation engineer Helmut Platzer, there are many advantages to using virtual reference. "Without this virtual reference electrode, grounding rings would have to be used. The rings must be made of different materials for different media, which would make it easy to confuse them during installation." He expressed concern that this could result in problems, because the chemical resistance is uncertain. He adds, "Also, these grounding rings can be very expensive, so not using them results in a significant reduction of cost."

Switching from a built-in reference electrode to a virtual electrode was technically easy. Another factor in favor of virtual reference is that Andritz is using small-sized pipes, where an external reference electrode could not be mounted. "Virtual reference performed well in every instrument in which we've installed it. There have not even been problems with difficult applications, such as the mixture of two acids with different temperatures right before the EMF," says Platzer. The use of Optiflux EMFs with virtual reference made device installation faster and reduces costs in many ways.

Virtual reference performs reliably, even in the harshest conditions. If pipe diameter and product conductivity conditions are satisfied, the EMFs can be installed in all systems in which classical grounding is a challenge.

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Determine Boiler Size Using a Flowmeter

An inline vortex meter reveals the proper steam usage, resulting in significant savings and improved energy efficiency.

WHEN IT comes to making big decisions involving capital purchases, it's best to do so with accurate information. Having the right information requires having the right data, and sometimes having the right data requires making accurate measurements. Such is the case with one company that sought to make changes in the way it generates steam for its manufacturing facilities.

Garlock Sealing Technologies, LLC (GST), a company that manufactures fluid sealing components such as compression packing, gaskets, expansion joints and dynamic seals, uses steam to operate some of its manufacturing equipment. Their operation encompasses several buildings. Therefore, the central boiler that supplies each of them must produce superheated steam to accommodate the steam temperature requirements of each machine.

It takes a lot of extra energy to superheat steam just to compensate the temperature drop that occurs as steam travels to where the equipment is located. For this reason, GST plans to decentralize steam generation at this location by installing a boiler for each product line.

Although a project of this magnitude is a significant commitment requiring a considerable investment, there are measurable benefits. Decentralizing steam generation will allow GST to accommodate the equipment at each site without having to superheat the steam. It will also allow them to save energy and lower maintenance costs.

MEASURING COMES FIRST

For a company to measure benefits or savings, it must first understand the benchmark to which it must compare. Initially, GST estimated the steam flow required for one of their product lines. Based on assumptions — instead of actual measurements — they thought they needed a 25,000-lb boiler.

Fortunately, GST has a close working relationship with its regional Spirax Sarco sales engineer. Because they rely heavily on this engineer, they trust his judgment and occasionally seek his advice.

The Spirax Sarco sales engineer convinced GST to install an inline vortex meter into the main steam line for the building to determine the steam usage for the selected product line. The sales engineer worked with GST's personnel to ensure the meter was properly sized and using less steam in this building than it had originally. Based on the sales engineer's calculations and information from the company, it was recommended to reduce the line size from 6 inches to 2 inches to accommodate a 2-inch inline vortex meter.

RESULTS SPEAK FOR THEMSELVES

With the line size reduced to accommodate the appropriate meter size for the application, the inline vortex was able to accurately capture the steam flow over the entire flow range.

With the inline vortex, GST was able to trend the actual steam going through the pipes, which resulted in the need for a 15,000-lb boiler instead of a 25,000-lb boiler for the specific product line. Vortex meters require no maintenance and therefore, GST didn't have to worry about wear or recalibration.

Now that the GST is able to quantify steam usage accurately, they can potentially use the inline vortex to understand the characteristics of their system to find leaks and other potential problems. If GST decides to move forward with other opportunities that can help them save energy, the inline vortex will give them the information needed to enable capturing those savings in the form of less steam usage.

This meter application was successful because the Spirax Sarco sales engineer took time to calculate steam usage and advised the customer regarding the proper meter size to capture the entire flow range.

The customer is impressed with the performance of the inline vortex flowmeter and the information it provides. Because of their satisfaction with this meter, they intend to purchase and install another vortex meter for a different product line.

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