

CONTROL SIGNAL

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Improving Wastewater Treatment with Air Flow Instrumentation

In wastewater treatment plants, a variety of processes are employed to eliminate organic pollutants from water to ensure its safety and release for future uses. One of the most common processes is the activated sludge method, which biologically treats the wastewater through the use of large aeration basins. This process requires the pumping of compressed air into the aeration basins where a diffuser system ensures the air is distributed evenly for optimum treatment.

Tiny micro-organisms in the aeration basins decompose biologically



degradable organics in the wastewater. These microorganisms require air to survive and depend on the aeration system to provide the right amount of air necessary for them to thrive and consume the organics in the wastewater. Eventually, over a period of time,

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Hot New Products

Simple Solution for Chemical Feed

Sea Metrics' M-Series Pulse Meters offer a simple solution for monitoring flow for metering pump pacing in water treatment control. A simple cast bronze body in ¾", 1", 1 ½" and 2" sizes contains a single impeller with inlet jets on one level, and outlet jets on another. A gear train drives register totalizer dials in the same fashion as a house water meter. All the internals are wetted, including the dials, behind a clear polycarbonate lens that is tested to 2000psi, the same material used for bulletproof glass and aircraft windows.

Three models are available. Simple flow total is obtained with the model MDT, while two other models offer pulsing incremental outputs by replacing the scaled pointer dial of choice

with a magnet. Simple rotation of the rugged lens places the pickup cavity over the installed magnet. The model MDR offers a dry contact reed switch output, while the MDE provides a solid-state output for each selected increment of flow volume. SeaMetrics offers a convenient optional connector on the end of the pickup leads that will mate directly to the very popular LMI metering pumps.

All M-Series meters include a vent port on the body to allow venting of entrapped air after installation, as well as union style end couplings to allow easy connection to existing pip-

(Continued on page 6)



M-series pulse meter

Pump Protection via Back Pressure Regulator

A common factor among positive displacement pumps is continually increasing head pressure and brake horsepower when these pumps operate at low flows or against a closed discharge. A bypass valve should be installed in these systems to prevent serious over-pressure or over temperature conditions from occurring.

Back pressure regulators, also called pump relief valves, or bypass valves, are not safety devices. Rather, they are valves used to impose a pressure limit within a system. This is done by relieving excess pressure into a lower pressure vessel or directly to atmosphere.

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Jordan MK50 back pressure regulator

Inside This Issue

What sets Gilson Apart (p.2)

Quick Disconnect fittings in Div 2 Areas (p.3)

Employee Profile

Samuel Warren Jr. joined Gilson Engineering in June of this year after serving 22 years in the Air Force, leading and managing personnel in various leadership positions. From ICBMs to satellite processing to test launch, Sam had a breadth of experience within his career. He attained the rank of Senior Master Sergeant and only two percent of the enlisted force is able to reach this rank. Sam has an electro-mechanical background within the nuclear weapons arena.

In his 22 years of experience, there are two accomplishments that he's most proud of. The first is being in charge of a \$750 million National Reconnaissance Office Satellite program at Cape Canaveral Air Force Station. Sam said, "There is no greater satisfaction than seeing your hard work and dedication go into space, and to know that satellite was going directly to benefit the warfighter." The second and most important is being people oriented, looking after and taking care of your people. Sam took great pride in the fact that his troops came first. To see them succeed was reward enough.



Having reached his long term goals, it was time to step out into the real world and put his experience to use. Sam is looking forward to working with his brother John, who has been with Gilson Engineering for almost 16 years. He's excited about helping customers with their application needs. When he is not learning the instrumentation business, Sam enjoys watching NASCAR and wood working. Sam's territory is Washington and Greene counties in Pennsylvania, portions of the panhandle of West Virginia and portions of Eastern Ohio.

What sets Gilson Engineering Apart

At Gilson Engineering, we pride ourselves on being one of the top representative agencies in the country. Here are a few reasons why:

1. A Live Voice. Incoming calls are routed to real people, not voice attendants. 80% of the time you can reach the team that covers your account on the first try.
2. 24/7 support. Home and cell phone numbers given on business cards. Instruction manuals are available on the website. Emergency recording list all sales people and the president's home phone numbers and cell phone numbers.
3. Timely Quotes. Most quotes will be generated in a matter of minutes. You will receive complete part numbers, technical specifications, and literature attached with your quotes.
4. Inside Sales and Technical Support. For every outside salesperson there are 2 inside people plus 2 application engineers.
5. Product Synergies and Technologies. Gilson offers virtually all technologies for Flow and level. Over 20 technologies for both Level and Flow. Different technologies exist as each technology has both economical and technological advantages and disadvantages for different applications. Gilson's advantage to our customers is to provide them the best economical technology for their applications.

6. Seven Outside Sales Offices. By locating our offices close to our customers, we can respond quicker and more effectively than companies with one office covering multiple states.

7. Overall experience within the Company. Average age is 42, with 18 years of experience in the instrumentation and control field. Two Professional Engineers in Controls for Both Ohio and PA.

8. Very low turnover. Average number of years of our sales people calling on the same accounts is 12 years. Also, inside contact average with the company is 10 years.

9. Packaged Solutions. Measurement and Control loops usually require multiple components. We offer the complete instrument package from primary sensor, to the final control element directly from the manufacturer and not as a marked-up buy out item

10. Gilson has a backup unit for virtually every major product they sell. In addition to this, Gilson also is the only rep in the country to have the Siemens Verificator (\$14,000) that enables us to test magmeters inline to verify accuracy.

Test your Tech Knowledge

We upgraded to new HART smart field transmitters but are still using our original field mounted isolators. Now we can't access the HART transmitters from the control room. Is there a solution?

See answer on page 3

General News, Schedule of Events

PA, OH, WV Sam Warren promoted to outside sales in SW Pennsylvania, panhandle of West Virginia, and portions of Eastern Ohio

www.gilsoneng.com

Time is Money: Quick Disconnect Fittings Speed Up Instrumentation Work

There's a breakdown in the middle of the night on a Friday before a holiday weekend. There's a one-day shutdown requiring three days worth of work. There's a new instrument tech who doesn't always get things right the first time. And by the way, it's going to rain all night.

Ever been there?

If so, you might appreciate the Turck line of process wiring products which clean up and speed up routine procedures like unwiring and re-installing instruments.

Consider the problem of a DP transmitter on a nasty process line that requires frequent removal. How can we outfit this electrical installation to minimize the time required for removal and re-installation, while at the same time maximize the chances that the device will be rewired *exactly the same way it was before*?

The solution requires just a few standard parts:

1) A 1/2" or 3/4" NPT male receptacle installed in the transmitter con-



Standard method of wiring, vs QD fitting

duit port. The leads are hardwired to the terminal block of the instrument; this will be the last time those terminal screws in the transmitter get turned.

2) A mating cordset, shown below with Turck's patented Armor-Fast™ flexible steel armor and molded PVC jacket, is used in place of the standard flexible conduit, or "flex", for short runs, usually less than three feet. Once the connection is made to the fitting, it's IP67 (minifast, shown) or IP68 (eurofast, slightly smaller)

3) The other end of the mating cordset can go a variety of different ways. The first, and most common, is to use a fitting designed for flex-armor cable which grounds the armor to the terminal enclosure (ie, Crouse Hinds or OZ Gedney). The second, in extreme cases, is to make the other end a quick disconnect also. If that's the case, it can be plugged into a special conduit adapter for a rigid conduit cable home run, or into one of our multiport junction boxes, which marshal the wiring from several nearby devices into a common home run cable.

4) For Division 2 hazardous area classifications, Turck offers explosion-proof feedthru as well as their Lokfast™ locking device, which clips around the receptacle and cordset nuts, preventing someone from accidentally

unscrewing the coupling nut and breaking the electrical connection. A small screwdriver is used to pry open the guard for authorized disconnection.

We've now minimized the amount of time needed to unwire and rewire a two-wire transmitter; however, this solution could also work for a level probe on a tank wagon, a control valve on a pitch line, or any process instrument that might require removal. With a parts cost of around \$80 (for a receptacle, a 3-foot cord-

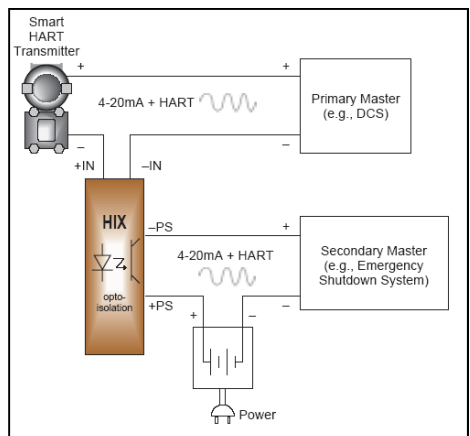
set, and the locking mechanism) users can afford to use it in a variety of places in a plant. Many variations are available.

(Tech knowledge, answer from page 2)

Moore Industries' HART® Isolators provide isolation, while allowing the HART signal to 'pass thru'. Signal isolators provide economical solutions to three common and costly problems that plague many of today's "smart" process loops.

Surge, spike, and transient safeguarding

protects I/O cards. Add the 1500Vrms isolating capability of a HART Isolator to a loop to break the common galvanic path that can pass dangerous overloads from DCS to transmitter to PLC or vice-versa— even when the equipment is sup-



posedly "isolated" already.

Area isolation allows for equipment maintenance without loop downtime. Placing current-driven or HART devices on isolated legs of a loop makes it possible to remove those instruments from the circuit without affecting other equipment.

"Sharing" the HART output of one transmitter—safely—with a secondary control or recording device allows for redundancy without further burden on, or risk to, a process loop.

(*WWTP airflow, continued from page 1*) they flocculate into a mass with the non-biodegradable solids that settle to the bottom of the basin. Large amounts of compressed air are required to ensure this process operates effectively to treat the water adequately before it can be moved along to clarifying basins, filtering, disinfection and other treatment processes. Controlling the proper amount of air that is released into the aeration basins is essential because the air flow controls the growth of microorganisms that treat the wastewater. Flow meters are typically installed in the aeration system piping to measure the amount of air flow and the meters' analog or digital outputs run to the control system.

In wastewater facilities, as well as industrial plants, air compressor operation is one of the largest energy expenses. The cost of energy to produce compressed air continues to rise along with fuel costs. So, optimizing the aeration process by measuring and controlling the aeration systems air flow with a suitable flow meter also reduces energy costs.

In most plants, each of several aeration basins is configured with numerous diffuser systems. Individual air flow monitoring and independent control is generally required for each diffuser system. The compressor system must run 24/7 to maintain the optimum amount of air flowing to the diffuser systems and the aeration basins, but demand for air changes throughout the day to accommodate a variety of climatic and other factors.

In evaluating and selecting flow meters for the aeration process or any other wastewater treatment air or gas flow measurement application, there are five important factors to consider:

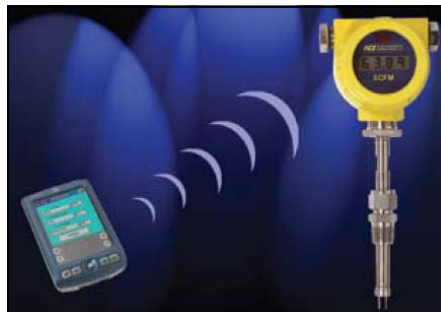
- Flow Sensor Technology
- Range and Accuracy
- Operating Environment
- Ease of Installation
- Maintenance and Life

Flow Sensor Technology

Three flow sensor technologies have typically been in use in aeration air flow monitoring applications in wastewater treatment plants:

- Differential pressure (orifice plates)
- Vortex shedding technologies
- Thermal dispersion (mass flow)

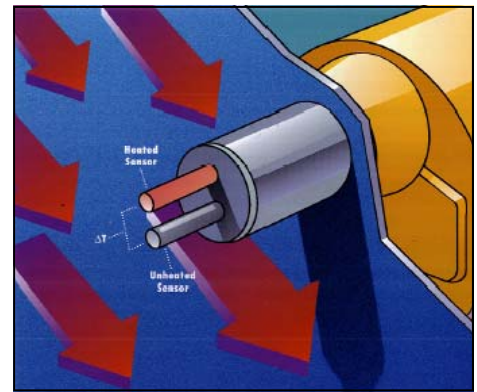
Differential pressure (orifice plates) and, to a limited degree, vortex shedding technologies have an installed base. While, orifice plates have been in use for many decades in water treatment plants and vortex shedding is recognized for its high accuracy, thermal dispersion flow measurement now has the largest installed base for this application for several important reasons. Thermal dispersion has grown in popularity because it offers direct mass flow measurement, offers a wider turndown ratio, has no holes or moving parts to foul or clog, is an insertion style meter that installs in a single tap and is the most cost effective technology applied for the pipe lines sizes commonly found in the aeration distribution system.



FCI model ST50 thermal dispersion flow meter

Accuracy and Flow Range

At a typical large urban municipal wastewater treatment plant, one of the more common specifications for the aeration flow meter is to measure over a wide flow range from 1.5 to 150 SFPS (0.46 to 46 NMPS) with an accuracy of +/-2% of reading, +0.5% of full scale, with a repeatability of +0.5% of reading. Most aeration systems will operate with excellent efficiency at this level of accuracy. Flow meter manufacturers can provide products for higher accuracy specifications, however these products typically include extra features and functions that are unused in aeration application and they carry a price premium. It is also critically im-



Thermal Dispersion sensor

portant to look at a flow meters repeatability specification, which tells the user how reliably the device will maintain its specified accuracy level.

Operating Environment

The amount of air required to maintain the treatment process varies throughout the day and is dependent on environmental and climate conditions. Flow meters for such applications must be able to tolerate significant drops in pressure throughout the system from 0.8 to 17.6 psig [0.6 to 1.2 bar (g)], which means the flow meter must have a wide turn-down range and this can be a problem for mechanical devices with moving parts that wear over time. Temperatures can vary widely from -68 to 150°F (-20 to +65° C). This is also a rugged, dirty environment that can be a maintenance issue with devices with holes that may plug or foul, and the device may require an approval rating matched for installation location.

Ease of Installation

When it comes to installation, some flow meters are more straightforward than others. Be sure to ask if the flow meter that you are considering can be inserted directly into the process pipe or if it requires an inline configuration that will require you to cut and splice your pipes in multiple places. To accurately measure flow, meters require some length of unobstructed pipe straight-run upstream and downstream from the meter to achieve their specified accuracy.

If your plant is short on real estate or if valves or elbows have to be

(Continued on page 5)

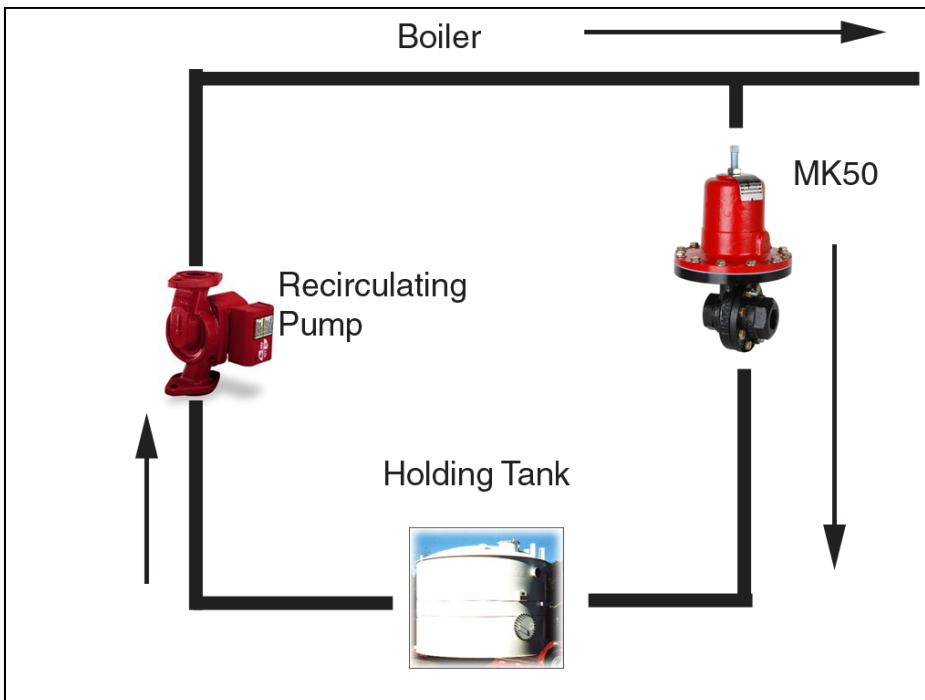
(Regulator, continued from page 1)

Reciprocating, Regenerative, and Rotary Turbine pumps are all positive displacement pumps.

Reciprocating Pumps are generally used for applications requiring low capacity with high head pressure. When the pump is operating under low-flow conditions, there is a continual build-up of head pressure and brake horsepower. If the discharge were closed and the pump was still running, pressure would continue to be applied to the system and

tive displacement pumps, will continue to build up pressure when the discharge is closed. Most rotary pumps have a built-in relief valve which passed excess pressure from the discharge side back to the supply side of the pump. However, internal relief valves have several disadvantages:

1. They may free gases that could interfere with the operation of the pump.
2. They can cause over-temperature



build up until a rupture occurred. The insertion of a properly sized relief valve, set to open at a pressure slightly in excess of the maximum working pressure required at the pump, is recommended because of the safety it affords the system.

Regenerative turbine pumps are also positive displacement pumps. In steam generating boiler systems, these pumps are used as either boiler-feed pumps or condensate return pumps. Elaborate controls which occasionally shut off the flow between the pump and the boiler are sometimes installed in these systems. With the feedwater control valves closed and the pump operating, an over pressure condition could occur. A BPRV is needed in this application.

Rotary Pumps, like other posi-

problems by recirculating liquid through the pump housing where it picks up heat.

3. They do not always have enough capacity to handle a pumps full discharge.
4. They are usually very "rough cut" and offer poor control that is not always acceptable.

For these reasons, most larger rotary pump installations are furnished with external relief valves.

Jordan Valve manufactures a complete line of BPRV's and Feedwater Control Valves to meet the needs of most pumping systems.

(WWTP airflow, continued from page 4)

placed near your flow meter, a flow conditioner will reduce the straight-run needed to ensure the flow meter is measuring accurately. Tabbed type flow conditioners, such as those provided by the Vortab Company, have proved successful in these applications. Other flow conditioning technology choices including tube bundles, honeycombs, and perforated plates, may also be considered depending upon the specifics of the application and obstructions.

Maintenance and Life

Be sure to ask about the maintenance requirements for our flow meter. Some flow meters need more frequent recalibration, and/or cleaning which can be time-consuming or, worse, require you to remove the meter from service. For wastewater aeration applications, the ideal flow meter will have no moving parts to wear out and no routine cleaning requirements to minimize maintenance cost and provide many years of service. When calculating the cost of a new flow meter, be sure to look beyond the purchase price to determine what it will cost to maintain and how long it will provide service before you make a final decision.

Realizing Energy Savings

The cost of compressed air to support wastewater treatment operations is dependent on a number of major variables. These include the plant's physical climate, the layout, the volume of waste, the equipment in use (including the diffuser, compressor and control system), the piping configuration, the flow instrumentation and the energy supplier. In the perfect world, all of these variable factors would work together to promote the optimum micro-organism growth rate needed to treat the water in the shortest amount of time. While perfection is beyond most of us, improvement is possible and valuable. If your energy costs seem high, be sure to consider all the variables, including the type of the flow meters, where they are placed in the pipeline and their calibration for your application. Selecting the wrong type of flow meter or improper calibration or improper installation can all result in less than optimum compressor efficiency and higher energy costs.

(Continued on page 6)

(Chemical feed, Continued from page 1)
ing with threaded NPT ends, while the union can be broken for quick and easy removal of the meter.

The M-series offers a cost effective solution for direct reading of totalized flow, or two electrical options for pulsing outputs with a pre-engineered interface to metering pumps. The SeaMetrics line covers a wide range of cost effective solutions from simple mechanical meters to low flow magmeters for chemical addition of aggressive acids, to hot-tapped insertion turbine meters and magmeters .

(WWTP airflow, continued from page 5)

To determine the potential savings, consider the amount of compressed air consumed daily and then look at what a small percentage improvement in compressor efficiency is worth. Then ask your flow meter supplier to help you review the performance of the instrument in the actual application.



GILSON ENGINEERING SALES, INC. LOCATIONS:

PITTSBURGH, PA

535 Rochester Road
Pittsburgh, PA 15237-1747
412-369-0100 OR 800-860-4499
FAX 412-366-1728

COLUMBUS, OH

2697 Sawbury Boulevard
Columbus, OH 43235-4582
800-860-4499
FAX 614-889-6038

CLEVELAND, OH

2776 Berkshire Rd
Cleveland Heights, OH 44106
440-543-0300
FAX 440-543-1230

CHARLESTON, WV

505 Capitol Street
Charleston, WV 25301-1221
304-342-0012
FAX 304-342-0085

TOLEDO, OH

26953 Mingo Drive
Perrysburg, OH 43551-1071
419-874-1178 OR 800-860-4499
FAX 419-874-5333

ORLANDO, FL

144 Harston Court
Heathrow, FL 32746
800-860-4499
FAX 407-444-0335

TAMPA, FL

828 Walsingham Way
Valrico, FL 33594-4013
800-860-4499
FAX 813-655-3513

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