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Sheboygan Regional Wastewater Facility Prevents Energy Waste With Eaton's New Motor Insight

Location:
Sheboygan, WI

Problem:
Need for real-time monitoring of pump motor status at remote lift pumping stations

Solution:
Eaton's Motor Insight Overload Relay

Results:
Real-time monitoring of pump motor load results in maintenance personnel being dispatched on an as-needed basis

Contact Information
Readers who may have similar application challenges and would like to discuss this success are invited to call Adam Krug at 414-339-8235.

To ensure real-time monitoring of pump motor status at its five lift pumping stations, Sheboygan Regional Wastewater Treatment Facility, Sheboygan, WI, replaced its bi-metallic overload relays with Eaton's Motor Insight™ overload and monitoring relays. During the first month of operation, the Motor Insight overload and monitoring relays detected conditions that could have resulted in motor or pump failure and energy waste had the conditions not been addressed promptly.

With the Motor Insight's advanced monitoring and communications capabilities, ground fault detection and motor protection, Sheboygan Regional Wastewater is not only preventing energy waste and dispatching maintenance personnel on an as-needed basis, it is also minimizing the potential for sewer system backups.

Need For Real-Time Monitoring

Sheboygan Regional Wastewater has five remote wastewater pumping stations throughout the city. The wastewater pumping stations are monitored remotely with a SCADA system, which does not monitor motor load conditions. Maintenance personnel routinely go 30 feet below ground to check the pumps and motors' health. If a pump was partially restrained, the pump and motor would still run (inefficiently) until the bi-metallic overloads would eventually trip if current draw was sustained at a level above 115 percent full load amperage (FLA) for a period of time.

Sheboygan Regional Wastewater Superintendent Dale Doerr explains, "Since we are vigilant about finding technological tools to enable us to operate efficiently and cost effectively, we turned to Eaton for suggestions on how we could implement real-time monitoring of our pump motors to prevent energy waste."

"The average daily flow at the facility is about 11 million gallons. If we have a rain event or substantial snow melt, we can reach peak flows of 64 million gallons. It is essential that all our pumps operate at capacity to ensure that we can manage the increased flow levels and avoid adverse sewer problems for the 68,000 people we serve."

Lift Station Retrofit

Eaton explained that its new Motor Insight overload relay would allow Sheboygan Regional to monitor its entire system, including line/load and motor from a headquarters location. With real-time data, maintenance personnel would only need to be sent to a location when data suggested there was a problem.

Sheboygan Regional agreed to be a BETA site and retrofit its Indiana Avenue lift station with Motor Insight overload relays, remote displays and Modbus communication modules on three 60 hp pump motors.



Powering Business Worldwide

After Eaton delivered the units, Sheboygan Regional WWTP retrofitted the motor disconnect panels for the Motor Insight overload and monitoring relays.

Sheboygan Regional Wastewater Controls Engineer Steve Meifert reports, "I was impressed by how easy it was to learn the Motor Insight's capabilities as well as how quickly it can be programmed. The unit is very user friendly. It was easy for me to interface the modules with our SCADA system. I plugged them in, wired them up and they were talking."

Impact of Early Detection

Soon after installing the devices, maintenance personnel noticed a problem with one of the pumps. While two pumps were drawing around 60 amps, when flow was at its maximum level, the third pump was drawing closer to 90 amps. Sheboygan Wastewater's maintenance supervisor immediately noticed this higher current level and dispatched a maintenance technician, who then found a foreign object wrapped around the impeller of the third pump.

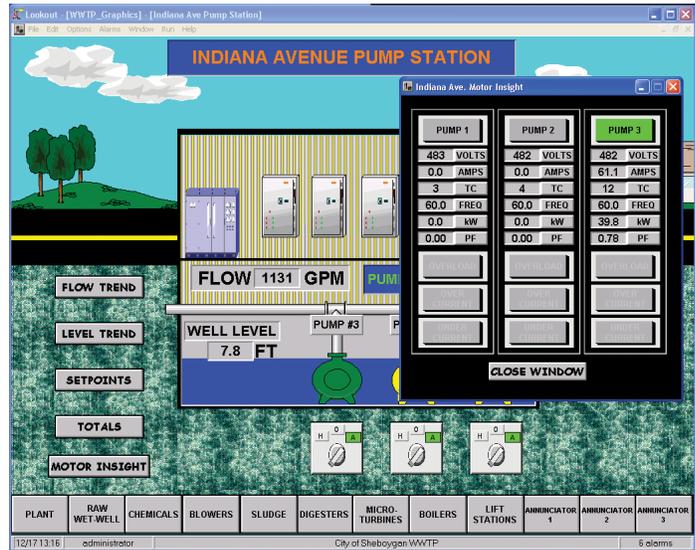
Meifert states, "Prior to the Motor Insight installation, the issue may have never been noticed because the facility only looked at its flow meter, which reports gallons per minute. He noted that the flow was still the same for all three pumps and without the Motor Insight's monitoring capability, the situation would have gone unnoticed. In addition, he said that the increase in current caused by the obstruction may not have been large enough to trip the previously used bi-metallic overloads, thus, the extra power draw could have gone on for an extended period of time without being detected, leading to large energy losses.

"From a cost standpoint, this equates to: 30 amps x 480V = 14,400 Watt-hours or 14.4 kW-hrs x \$0.104/kw-hr or to \$1.50/per hour of unnoticed run time. If this condition had gone unnoticed for an extended period of time, this could amount to \$252 in wasted energy for one week (\$1.50 x 24 x 7 = \$252), \$1096 of wasted energy for one month and \$13,154 in wasted energy for an entire year."

In this instance, it was one of the numerous monitoring features that allowed Sheboygan Regional Wastewater to look into its pump and motor system in real-time, and dispatch a service technician in a timely manner to correct the problem. The facility is currently monitoring volts, amps, thermal capacity, frequency, power and power factor. It has set alarm levels for over current and under current and a displayed fault for an overload condition. If the situation had been a more severe deviation from the normal operating conditions, the Motor Insight's load, line, or motor protection settings would have created a fault to protect the system.

Preventing Equipment Failure

In another instance, the Motor Insight paged out an alarm of an undercurrent on a weekend. Maintenance personnel investigated, found and removed a blockage in the check valve. Without the Motor Insight, this issue would not have been detected until the next week when staff looked at the flow charts and realized that when the pump was running, there was either no flow or only a partial flow.



Doerr notes, "If the problem was not detected until Monday or Tuesday, you could possibly have a second pump come on to compensate, which would mean additional energy costs. Although pumps can run with a valve closed, they can heat up and damage mechanical seals, which rely on water as a cooling agent. The water heats up because there is nowhere for it to go, it cannot cool the unit. The mechanical seal can be damaged and lead to about \$1,000 in repair cost, in addition to the cost of wasted energy."

Meifert states, "The Motor Insight provides far more protection than the bi-metallic overload relays. We now have the ability to find and resolve a situation before it becomes a failure. For a bi-metallic to trip, an object like a piece of wood or chunk of asphalt would have to wedge between the sidewall of the pump. Since the motor

would not be able to turn, it would overload. To fix the problem, you cannot just go to the location and remove an inspection cover and remove the obstruction. You have to disassemble the motor and impeller, remove the foreign object and then reassemble the entire unit. The Motor Insight enables us to address situations before they cause unnecessary energy and maintenance expenditures."

Doerr adds, "With Motor Insight's ability to monitor the pump motors and loads in our hard to access areas, Sheboygan now has the ability to trend in real-time motor conditions that could have gone unnoticed for days and even weeks. The Motor Insight overload and monitoring relay allows us to send out maintenance personnel when a problem occurs, potentially saving us thousands of dollars annually."

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