Making pump station call-outs a thing of the past

It’s 2:00 a.m. and a telephone rings in Eckville, Alberta. Rick McKinnon checks the display on his cell phone and sees it’s another high level call-out alarm, from one of the town’s new sewage lift stations. He knows, before he drives there, that the system will be running on floats, instead of the new ultrasonic level controller.

McKinnon is the Town’s public works supervisor and has to work out most of the problems that occur in the wastewater collection system. Level control call-outs in two new sewage lift stations were costly and straining his resources.

Serving a population of 1,100, the Town completed its upgrade project with two new lift stations and forcemains in 2011. Each control system included a non-contacting ultrasonic level controller with Hi/Lo floats as backups. The pumps are variable frequency drive, operated with relay connections to the level controllers for on/off pump control and 4-20mA speed control.

Soon after start-up, Eckville operators began receiving call-out alarms from the control systems in both pump stations. The cause of the echo loss problem was hard to figure out, because it was intermittent. The ultrasonic level controls would work perfectly for several weeks, but then call-out alarms would begin again.

They first suspected that condensate might be forming on the ultrasonic sensors and causing echo loss. Over several months, operators experimented with instrument settings, sensor positioning and then with baffles and stilling wells to reduce foam and grease build-up on the water surface. Improvements were made, but none of the modifications entirely stopped the call-outs.

This problem was not new to Greyline Instruments, who had seen similar echo loss conditions in sewage lift stations before. Their design engineers came up with the concept of a level instrument that operates with an ultrasonic as the primary sensor and any other 4-20mA level transmitter as a redundant or standby sensor. The new model PSL 5.0 Pump Station Level Controller was released at the same time Eckville was experiencing call-out alarms.

McKinnon contacted Carbon Controls of Calgary, to help solve the level control problems. Carbon Controls supplied two of the new Greyline level controllers, plus submersible pressure sensors to be connected to them as a hybrid system. They felt that using ultrasonic, along with pressure sensors, would result in a reliable level control system that would not be affected by foam or grease on the water surface.

How it works

Pump station level monitoring is a critical process, with catastrophic failure modes. In a standard collection system, sewage flows to local wet wells, or sumps, by gravity and is then pumped to a treatment facility. Water level in the wet well is monitored and pumps activate whenever the level exceeds set points. Monitoring instrument failure would allow the sewage level to rise and spill into the environment and/or back up into homes. High level alarm switches are typically installed as a backup.

Several methods exist to monitor liquid level. Airborne ultrasonic sonar has become the standard level monitoring technology. It offers easy transducer installation and maintenance as they are mounted above and away from the sewage. These sensors are highly reliable, due to modern manufacturing methods.

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The safe solution.

U.S.F. Fabrication’s Hatch Safety Grate System is available in a variety of configurations to meet virtually any application. The system allows for routine maintenance of pumps and equipment when closed and may act as an additional barrier when open. It allows people to move freely around the hatch openings without exposing themselves to dangerous fall-through.

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display shows the operator usage hours logged, for troubleshooting or maintenance.

PSL 5.0 uses a “hybrid” of transducer technologies to provide a redundant level measurement and insurance against level measurement failure. The 4-20mA secondary input, automatic calibration and signal monitoring, together with an easy field retrofit, are designed to solve a specific problem in the sewage treatment industry.

Non-contacting ultrasonic level sensors were installed about one meter above the high water level in Eckville’s wet wells. They were positioned with an unobstructed view of the water and where foam, grease and scum were least likely to form. Backup submersible pressure sensors were connected to the Greyline PSL 5.0’s 4-20mA hybrid sensor input and suspended in the sewage wet wells with ¾” PVC conduit. They were mounted a few centimeters below the low water level.

Once the ultrasonic and submersible pressure sensors were installed in the wet wells and the system was powered up, the PSL 5.0 automatically scaled the pressure sensor. After one or two on/off pump cycles, the pressure sensor was calibrated and ready to function. Now, if Eckville’s ultrasonic sensors lose signal from foam, or grease, on the water surface, the pressure sensor will take over reading instantly. As soon as the ultrasonic sensor receives new echoes, it resumes function as the primary sensor.

McKinnon checks the systems periodically by referring to the “run-time” reporting screen on each level controller. Pump run-times and alarms are logged automatically, as well as run-time for the redundant pressure sensors. Using the run-time reporting function, he can spot pump problems before they fail and plan maintenance. There has not been a call-out at either lift station since the PSL 5.0 Pump Station Level Controllers were installed.

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