

Small PLC with GSM modem improves SCADA reliability

Summary

- A water treatment plant used a SCADA software program that would frequently drop communication with the SCADA/HMI software
- The operators were not notified when this happened, setting up the possibility of serious problems should an overflow occur
- ICTech, a SCADA designer and integrator, designed a new system based on Phoenix Contact's Nanoline PLC and GSM modem
- The Nanoline controller has increased stability and reduced the possibility of errors, simplified programming and added security to the operation

Customer Profile

Innovative Control Technologies, Inc. is an independent SCADA (Supervisory Control and Data Acquisition) designer and integrator. ICTech's services include a turnkey design and implementation of brand new SCADA systems as well as optimization and expansion of the existing ones. The company has strong practical knowledge of automation and control system design including telemetry, PLC applications and SCADA systems. ICTech, Inc. is experienced in a multitude of HMI (human-machine interface) and hardware platforms.



ICTech installed the Nanoline at about 20 remote locations. The Nanoline provides accurate and timely alarms, improving the system's stability.

Challenge

ICTech designed the SCADA control system of a water/wastewater facility in Utah. Originally, a SCADA alarm software would communicate with SCADA/HMI software on an industrial PC at the control center. When an overflow occurred, the alarm program would send the alarm back to the SCADA PC.

Occasionally, the computer would drop communication between the HMI and the alarm software. Unfortunately, there was no notification when this happened, so the operator would not know that communication was down. According to Igor Kovalenko, electrical controls engineer at ICTech, this set up the potential for serious issues.

"If we have overflow problems and don't receive notification, this could lead to major problems. If it's bad enough, it could end up being a story on the evening news," he said.

Kovalenko explained, “After installing the SCADA software on the computer, you have to run copper analog line. On top of that, this software was complicated and required a lot of programming.”

A typical alarm dialer system requires a copper phone line, also known as Plain Old Telephone System (POTS). Most software manufacturers don’t have the resources to support all of the various Voice over Internet Protocol (VOIP) software, so they usually choose not to support any. This is cheaper for the software company, but the cost of running the copper analog line is time-consuming and expensive for the end user.

Solution

ICTech worked with Phoenix Contact to design and install a SCADA system based around Phoenix Contact’s Nanoline programmable logic controller (PLC) and its optional GSM modem.

The Nanoline is a small, flexible controller for simple applications. It uses free Nanonavigator software for easy programming and hardware configuration. Several I/O and communication modules (including the GSM modem) are available for easy expansion. Kovalenko says that the modem’s advanced I/O and alarm capability were key factors in the decision. “The Nanoline GSM modem could handle up to 60 alarms, and offered the possibility to increase this number in the future,” Kovalenko said. “I couldn’t find another modem that could handle more than eight or ten alarms. This would mean installing additional analog and digital, which would add more wiring and labor costs. Analog PLC is the most expensive option, but by using the Phoenix Contact modems, we were able to bypass this process.”

ICTech installed the PLC inside panels at about 20 remote locations. All of the remote locations communicate to the master PLC back at the plant. The master PLC then communicates to the Nanoline PLC using an RS-485 serial connection to send and acknowledge alarms. The Nanoline does not communicate directly with the HMI. Because the alarm dialer and the HMI are separate, the Nanoline communicates directly with the master PLC. This creates a more robust system that doesn’t have to rely on a computer to send alarms.

More recently, Robert Simons, ICTech’s programmer, has created an Android application that can automatically send a pre-set text



The GSM modem is one of several expansion modules available to make the Nanoline even more flexible.

message to the Nanoline with the simple click of a button. The app also displays all of the messages received from the Nanoline.

Results

Since it’s been in operation, the system has run as planned. Kovalenko says the new system has increased stability and reduced the possibility of errors. The Nanoline ensures accurate and timely communications, including the critical alarms.

“Having both alarms is the system’s most important feature,” said Kovalenko. “This is exactly what I was looking for. If you flood a pump station, that can potentially lead to millions of dollars in loss. But if you can react in time, there will be fewer problems.” He said the Nanoline’s output has proven more robust than the computer SCADA system they used to rely on.

“If the wires on the POTS line go down, it doesn’t affect our HMI, because we’re connected directly to the PLC via the modem,” he stated. An added benefit was that they did not need to hardwire anything. “We can install the new system anywhere that there is cell service. We no longer have to worry about running additional POTS copper lines.”

Kovalenko noted that the original solution provided unlimited alarms. The Phoenix Contact solution can only provide up to 60 alarms and 64 messages, but he says, “That is more than enough.” Another advantage was the modem’s built-in security features, including password access, caller ID blocking, messaging aging and watchdog timer security. “We didn’t have secure communication with the old system,” Kovalenko stated. “Phoenix Contact

installed security, so that only people with access can make notifications and changes.”

Not only did the system work well, but Kovalenko said it was more cost-effective than the old alarm software. The original software cost about \$1,500. Adding in the required hardware, the total cost for that system came to about \$3,000.

“We spent about \$800 for the Phoenix Contact solution. We do have a monthly charge for cell phone service, but it costs only \$5 or \$10 a month. The monthly charge for a POTS line would be much higher, so there is significant savings,” said Kovalenko. The Nanoline’s easy programming reduced labor costs even further. Unlike the labor-intensive alarm software, the nanoNavigator software supports two simple programming language options. ICTech used the Nanoline’s traditional Relay Ladder Logic (RLL) to program the system.

Kovalenko said that his Phoenix Contact sales team was very helpful, and he hopes to build upon the system’s solid base. “In the future, I’d like to add more alarms. I’m also hoping that we can go without the logic inside, and have direct communication from the modem to the process PLC.”