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CASE STUDY: SYLVAN LAKE

How Sylvan Lake, Canada Transformed its Water and Wastewater Operation to Achieve Real-Time Monitoring and Control

BY CRAYTON WHITE

Situated on the southeast edge of Sylvan Lake, a 15-kilometre-long (9.3 mi) lake, the town of Sylvan Lake in Alberta, Canada is home to nearly 15,000 citizens and attracts more than 1.5 million tourists from around Alberta each year.

The town, which is roughly nine square miles in size, has 19 field stations that comprise its core water infrastructure operations; seven water stations and 12 wastewater pumping stations. Half of the town sits at the lake level. As a result, wastewater must be pumped from lower elevations to higher elevations. Water reservoirs require continuous monitoring to ensure chemical injections stay in check and the water supply is safe. As the town and demand have grown, so has the need to automate this critical infrastructure and to upgrade the communications network.

For the last four years, Contact Automation Inc., a system integrator located in Western Canada, has provided maintenance and network management services for the town's existing water infrastructure, SCADA, and communications system. Regularly, they troubleshoot hardware communications and sensor failures and have managed network footprint expansions as new water and wastewater facilities online. The challenge was the limitations and daily operational challenges caused by the city's aging system.

Sylvan's SCADA network was originally designed as a serial radio network. With legacy equipment almost 20 years old and numerous configurations, the system was inflexible and did not permit users to communicate reliably with remote stations.

Because of the system's limitations, town workers had to physically drive to each field location to monitor and report on the system repeatedly throughout the day. Town officials recognized its



requirements for the existing system exceeded what was possible and needed to find a new, cost-effective, solution that integrated Smart Utility Technology to keep their entire operation safe, compliant, and accommodate for future growth. They ended up using a solution from FreeWave Technologies.

Needs and Pain Points

Sylvan Lake's existing communications system posed a number of ongoing challenges. Over the last five years, the communications network had become increasingly unreliable. It was plagued with system-wide errors due to hardware failures.

Since all station inspection reporting had to be done manually, historical operational data was not easily searchable or accessible. While each station had alarms, they were limited in growth and expandability and town officials knew they could not continue to manage the system effectively via remote call outs.



FreeWave's ZumLink IQ integrated with Inductive Automation's Ignition Edge MQTT installed at one of Sylvan Lake's field stations.

If a pump went down – even for minutes – it could result in an environmental disaster.

Despite the best efforts to keep up with its maintenance, the current system was showing every bit of its age. The city's growing need for automated reporting, real-time monitoring, and centralized control of this critical water infrastructure kicked off a two-year effort to modernize its communications infrastructure to not only meet current needs but also allow the scalability to handle future requirements. The town no longer trusted the communications system, in place, to monitor and manage their critical utility infrastructure.

Sylvan Lake also wanted an asset management, ERP system and other outside resources as part of their overall network upgrade. After years of planning and securing the approval for funding, the

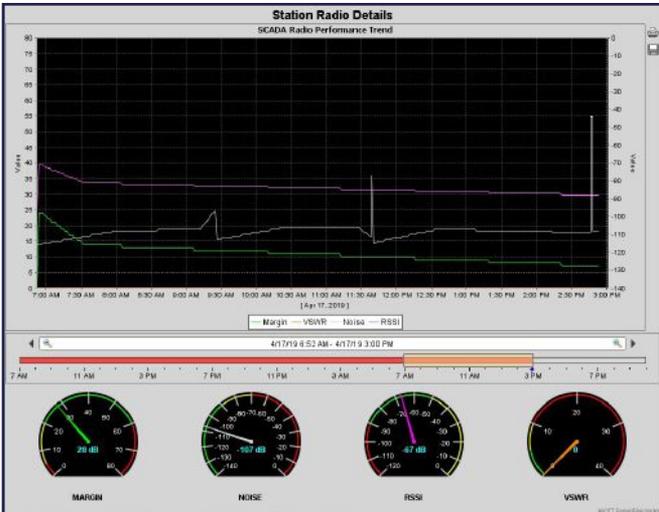
initiative to transform the town's water management communications system began in March of 2018.

Sylvan Lake initially considered a SCADA software upgrade to drive the functionality officials wanted, the plan quickly evolved to a complete rebuild of the entire system. After evaluating numerous technology solutions, the final choice was FreeWave's ZumLink IQ Industrial.

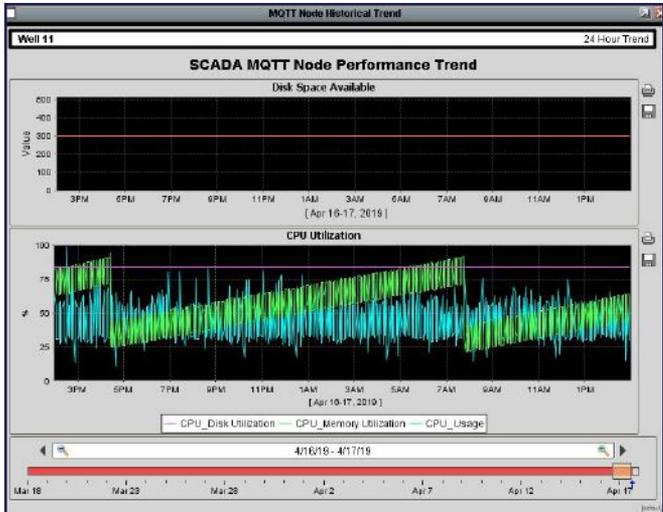
The town was running an antiquated poll/response serial SCADA system and over the last 20 years, each field station came in and was programmed by a different person, so the configuration differed from site to site. The goal was to standardize the entire system from the ground up.

The FreeWave system would immediately solve the town's alarming and reporting issues and create the standardization they needed across each field station. Ignition Edge MQTT, runs on FreeWave's Edge Intelligent Radio and performs edge-based data collection using various industrial protocols and data publishing via MQTT.

This publish/subscribe, or Pub/Sub, architecture provides granular data to anyone on the network and the proven ruggedness of the Zum platform provides a reliable home for applications that place analytics and intelligence alongside remote assets. As a result, the ZumLink IQ is an all-in-one solution that provides both secure wireless data transmission over long distances and application deployment.



Data from the ZumLink IQ Modbus registers are pulled to integrate network data into the Ignition SCADA system.



Java and IE automatically control memory usage. This edge computing information can also be pulled into the Ignition SCADA system.

Adding MQTT at the edge makes the field stations smarter while keeping the system's overall footprint and bandwidth requirements small. Typically, the more hardware you put in, the costs to purchase and maintain the system go up. This solution offered the ability to migrate and upgrade each station to achieve IoT at the edge by simply replacing the radio hardware. No other hardware had to be deployed to the field. To monitor pressure on a water line, all that is required is to use a sensor with the radio. The field system has been greatly simplified, communications and data accuracy has improved and infrastructure costs were lowered by making the edge smarter.

Results and ROI

To date, all seven freshwater pumping stations have been upgraded, as well as a new remote monitoring station. A new centralized control center was established at the main reservoir on the south edge of town.

Thanks to the upgraded network, Sylvan Lake went from having only one monitoring station in a remote location to managing the entire network in real-time from multiple locations, and, via mobile, all at the same time. The primary maintenance office is located downtown and remains the heart of its core operations. From this location, they can easily view the entire system on multiple screens.

The old system required round-robin poll/response requests to each station to report system data, which could take five minutes to accomplish — longer if a communications issue occurred. This delay was limiting their ability to see live data and remotely monitor the entire system effectively. In some cases, they were missing data spikes that could indicate an issue before it became an active alarm. The old system limited them to just responding to alarms, versus being able to take a more proactive approach to station maintenance.

Today, all field stations operate independently. If one site has an issue, the rest of the system will not be taken down with it. System-wide updates and alarm data are now available in seconds. SQL historical database development has now allowed for simple data reporting and analysis. Year-end compliance reporting has also been transformed, eliminating time-consuming manual analysis and achieving significant efficiency and time-management gains.

Sylvan Lake can now trust that the system they use to manage their water operations and the data it generates is reliable. They can communicate with their entire team from a central location, have reduced the points of failure and eliminated the need to physically drive from station to station to check and monitor their infrastructure multiple times a day. The communications reliability of field radios is nearly 100 percent.

Work will continue through the end of 2019 to bring the town's 12 wastewater operations online. But even then, the network will have the capacity to grow and expand as needs require.

Key Learnings

Much was learned throughout this process and significant improvements made along the way — including the ability to drag and drop Ignition Edge software onto the radios — it is now simple and seamless. This solution allows customers to modernize their networks without having to rip and replace everything in the field. Simply replace the radios and the IoT is established. The most satisfying part of the town's communications network transformation? It is possible to, now, accommodate any request made to the new system, when previously the answer was no. As an integrator, that is important.



Crayton White is an Automation Integrator and control system programmer for Contact Automation Inc. providing automation control solutions for clients in Western Canada. He has been providing contract services within various industries such as Oil & Gas and Municipal Water for over 15 years. Crayton enjoys working closely with clients to provide control and automated solutions. It is important to be in your client's corner and work with them to achieve a common goal. Crayton holds an Instrumentation Engineering Technology Diploma from the Northern Alberta Institute of Technology. He lives in Alberta, with his wife and three children.