OleumTech®

CASE STUDY

A Large Utilities Organization Benefited from OleumTech Wireless Tank Level Monitoring System at Quick Recovery Peak Load Substation

THE CHALLENGE

Background

Electric utility companies can be faced with challenges during events when spikes in power usage result in significant disruption to their customers. Their customers, especially commercial businesses, cannot afford an interruption in power service since some of them have factory machines, refrigeration systems, pumping and process systems that must be kept fully operational. When any of these systems go offline, the costs are much more than simply lost production, although those costs alone can be crippling.

Process Conditions

To mitigate power outages, this large utilities organization utilized peak load stations, which are power generating facilities that supply added power coverage during peak usage situations.

This one particular peak station created wastewater during the power production process which was collected in a nearby storage tank. At the time, the tank level and pumps were manually monitored and controlled by dedicated service operators.

Desired Outcome

To reduce the burden of labor and improve the quality of data collection while implementing instant safety controls, the operator desired to commission a fully automated system that could accurately monitor tank level data on a consistent timed interval.

In an effort to improve their efficiencies, they were seeking to get a better insight into their operation. They wanted the ability to detect high level conditions that could automatically and instantly trigger, shutting down the pump to prevent spillage of hazardous wastewater. The level signal needed to be provided in the form of an analog 4-20 mA signal to tie into their Station Control Programmable Logic Controller (PLC). A digital I/O signal was required to operate the pump control system based on high level conditions.

They considered two general options to solve their wastewater level monitoring and control challenges:

1. **Deploying a traditional hardwired system** which would require permitting, trenching, running conduit and wire
2. **Deploying a wireless system** to reduce commissioning time and the cost of a hardwire system

THE SOLUTION

After evaluating their options, the operator chose a system that integrated both wireless and hardwired I/O connectivity.

They chose a wireless solution for connecting the tank level sensor and high level switch to the control panel to avoid breaking any ground to lay wire. Then, once the signals were brought into the panel, the Modbus value for the analog tank level was converted to a 4-20 mA analog signal while the high level alarm was converted to a digital output.

To commission such a system, it required the use of the OleumTech OTC Wireless I/O Sensor Network that has both wireless connectivity and raw process signal output capabilities.

Here is a quick composition of the system:

1. **OTC Wireless Resistive Level Transmitter** with a Discrete Input that can connect to both a level sensor and a high level switch
    a. OTC Patented Resistive Level Sensor (316 stainless steel)
    b. High Level Switch (316 stainless steel)
2. **DH2 Wireless Gateway** that is responsible for collecting the data from the wireless transmitter and providing a RS485 serial output to the WIO® Expansion System
3. **WIO® RS485 Expansion System** with 4-20 mA (Blue) and Digital I/O Module (Red) for accepting the RS485 serial output from the DH2 Gateway and converting the data to analog and digital signals

1

Wireless Connectivity from the Level Transmitter

The Level Transmitter wirelessly sends the tank level data to the DH2 Gateway.

The transmitter is also equipped with a Discrete Input to bring in a High Level Switch for instant alarm reporting.

2

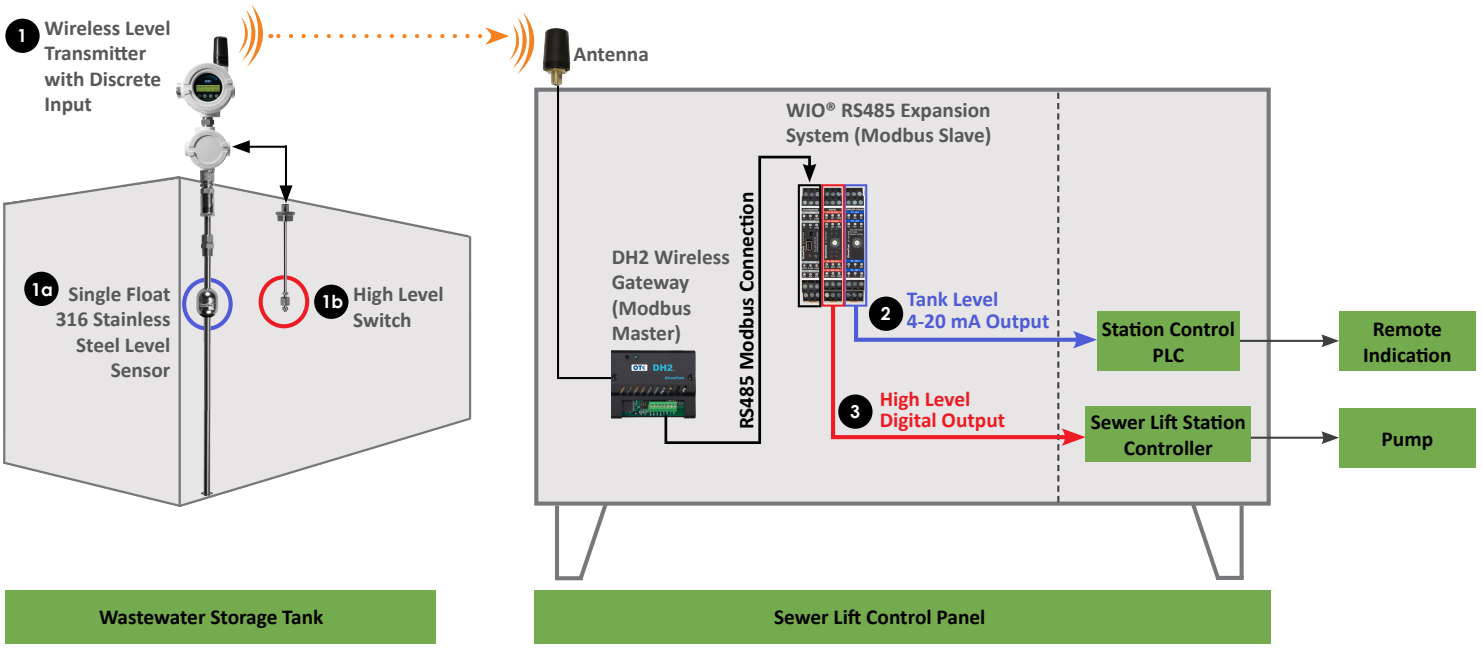
Level Data is Converted to a 4-20 mA Output

The DH2 Wireless Gateway provides the continuous level of the wastewater storage tank via its serial port to the WIO® RS485 Expansion System where the continuous level is converted to a 4-20mA signal (Blue).

3

High Level Detection Triggers Station Controller's Digital Output

If the high level switch is activated, the alarm is immediately sent to the DH2 Wireless Gateway where it is provided serially to the WIO® RS485 Expansion System and converted to a digital output (Red) which is used to shut down the pump.



At the Wastewater Storage Tank

1. Resistive Level Transmitter with Discrete Input (LL3-D)

Key product features:

- 4-in-1 monitoring by providing connection to both the Resistive Level Sensor and High Level Switch (Discrete Input)
- Up to a 10-year battery life before needing a replacement[1]
- Advanced local LCD display interface for viewing data instantly and device programming capabilities
- Self-contained, rugged design, CID1 Intrinsically Safe, IP66, -40 ˚C to 70 ˚C
- Robust RF range with secure AES encryption

1a. Rigid Resistive Level Sensor

Key product features:

- 3-in-1 level monitoring capabilities (product, interface, and temperature)
- Patented design using reliable and accurate reed switch technology
- 316 SS rigid or PTFE flex options
- -40 °C to 120 °C / -40 °F to 248 °F
- Installs in minutes: Quick Connect eliminates sensor wiring error and hassle

1b. High Level Switch is an 18” Top Mount Switch with the trigger point set at 16” (2” from the bottom of the switch). The switch is connected to the discrete input of the transmitter and is triggered as water levels raises the float. An actuation of the float will signal to the Sewer Lift Station Controller the level has reached a preset depth. The high level status is written to the RS485 digital output (Red) module to shut down the pumps.

Key product features:

- Instant high level alarm
- Single or dual actuation options available (high / high-high)

At the Sewer Lift Control Panel

2. DH2 Wireless Gateway acts as the Modbus Master device, wirelessly gathering the tank level data and high level status from the LL3-D Wireless Transmitter. The DH2 sends the tank level data and high level state to the WIO® RS485 Expansion System.

Key product features

- Primary data collection point for wireless sensor data
- High scalability, supports up to 63 transmitters
- Modbus Master/Slave functionality
- Robust RF and secure AES encryption
- 9-30 Vdc input

At the Sewer Lift Control Panel

3. **WIO® RS485 Expansion System (PM1K)** enables I/O capabilities to any Modbus Master device using serial RS485 connectivity, in this application, the DH2 Gateway. The 4-20 mA I/O Module (Blue) converts tank level data to a 4-20 mA signal that is sent to the Station Control PLC. The Digital I/O Module (Red) is used as the output for pump shut down based on high level detection.

   Key product features

   - Serial RS485 Modbus Interface
   - Fully customizable modular I/O solution
   - Option to add 0-10 Vdc, 4-20 mA, and or Digital I/O
   - No software, no programming involved
   - Only requires a single 9-30 Vdc power source

SUCCESS

As a result of deploying the OleumTech OTC Wireless Sensor & I/O Network system, level monitoring tasks that were previously time consuming, prone to human error, and had greater safety risks were transformed to a fully automated level monitoring solution. The operator gained remote access to accurate and reliable tank level data and was able to achieve their goals of improving operational efficiencies and safety with a cost-effective approach.

BENEFITS/ADVANTAGES

- Deploying the OTC Wireless Sensor & I/O Network solution eliminated manual level monitoring and high level detection tasks
- The OleumTech Liquid Level Sensor provided precise, repeatable liquid level measurement
- Automating routine tasks helped improve worker safety by reducing hazardous work
- OTC Gateways provide an incredible level of scalability with up to 63 transmitters that can be added - typically more than any such peak load substation will require
- Expansion Modules can be added to the WIO® RS485 Expansion System in a modular fashion to extend the I/O count and serve a range of specific application requirements and budgets

For more information or for help solving automation challenges, please contact an OleumTech representative today by phone at 1.949.305.9009 or by emailing sales@oleumtech.com

[1]Ambient temperature and one transmission per 1 min interval without any retries were used to calculate battery life. Actual battery life may vary depending on environmental factors, application, and usage. Use data shown above only as general point of reference. See OleumTech Battery Life Expectancy Chart for predicted battery life based on reporting interval.

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