A WIRELESS APPROACH TO TANK LEVEL MONITORING

Tank level monitoring is a critical operation within the oil and gas, chemical, and refinery markets. It addresses the need to maintain inventory levels, protect against overflow, and ensure accurate process operations. In the past, obtaining tank level data was a manual and laborious task, often prone to error. Today, automated systems transmit tank level and temperature data from sensors to a remote control center.

While wired tank level monitoring systems have been around for some time, the unique attributes of oil and gas operations, especially in hazardous areas, prove challenging to them. Cabling requirements, environmental conditions, multiple sensing requirements, costs, distance, and topography can all present problems. Wireless remote sensing systems are becoming more prevalent in tank level applications as they offer substantial operating and cost advantages over wired systems.

WIRELESS SYSTEMS REDUCE INSTALLATION AND MAINTENANCE COSTS

Wired tank level monitoring solutions can be expensive to implement and maintain, especially when covering large areas. As the distance between monitored assets can range from a modest 20-50 yards or extend to 1,000+ yards, installed cable costs can run $10 to $20 per feet (and more if trenching is required).

A comparable wireless system can cost just a few hundred dollars per measured point, depending on vendor and application specifications. Powered by battery, solar, local power, or a power-scavenging device, wireless systems have no conduit requirements, eliminating the need for trenching.

In addition, a wireless tank level monitoring system can be configured and tested in the shop, not on the back of a pickup truck in the field as with a wired system. Travel time for installers can be significant. It is not unusual for an electrician to travel more than two hours to reach a work site and for an installation to take several days to weeks. Typically, the installation of a wireless tank level monitoring system requires 50% to 75% less on-site labour.

If a wired sensor control system needs to be reconfigured or repaired, it can require new cable, involving trenching, hardware and labour. When removing sensors for periodic maintenance, wires connecting the units can be damaged. Should a wired system fail due to cut wires or another adverse condition, repair can take a long time to find and fix, resulting in sub-par operations or failures until the instrumentation is back online.

A wireless telemetry system is scalable without adding new hardware. After initial installation, wireless systems can easily be retrofit by adding new wireless instruments to meet changing and expanding requirements. After removing sensors for maintenance, they easily reattach without interference with wires.

OPERATE IN DIFFERENT TERRAINS

Wired sensor control systems often can't, realistically, be run on property not owned by the production company. Roads, cemeteries, rivers, buildings, or other structures all limit the feasibility of wired connectivity. The industrial transceiver nodes of a wireless remote monitoring system (see graph 1) provide robust transmission of data up to three miles in the unlicensed ISM bands that sustain signal strength through terrain, structures, or weather. Even when operating in hostile and dangerous environments, a wireless remote sensing system can operate unattended for years without being affected by environmental conditions such as snow, rain, dust storms and ice.

A secondary benefit, particularly in outdoor applications, is the reduced risk of lightning damage. While nothing survives a direct hit, wireless monitoring systems are relatively compact and can better withstand the rapid changes in electric fields when lightning strikes. In addition, since there are no wires, a worst case scenario is the loss of a single asset, not an entire wired system.

SENSOR AGNOSTIC

In tank level monitoring, the contained materials as well as monitoring requirements indicate the best sensing technology for the application. In some applications, various parameters such as level, temperature, pressure, and flow are monitored. Sensor selection is, ultimately, driven by the environment, desired accuracy, cost and the process parameter being monitored.

In using multiple sensors to monitor various parameters, a wired sensor control system must wire each sensor back to the controller and connect it via an interface port. Large wired systems require a significant interface panel with different interface types.

Wireless remote monitoring systems with an open architecture allow users to integrate many types of sensors to monitor assets. As a result, a variety of sensors can be added or subtracted as needed to measure parameters such as pressure, temperature, level, and

Graph 1: SignalFire's remote sensing system consists of remote nodes that wirelessly power and extract data from sensors for transmission to a gateway that links to the internet and back-end servers in bringing tank level data to a control center or PC

flow. Users can choose the best sensor for each application and bring all that data from different sensors to a single point with a single data interface (often Modbus).

Wireless connectivity, if used correctly, will solve the issue of mixing multiple sensor interface types and allow the different data formats to work with each other. Operators rarely want to use sensors for all required measurements from a single sensor manufacturer. Consequently, the network connecting all these sensors will need to interface with a variety of sensor types with various sensor interfaces. Standard sensor interfaces include 4-20mA, 1-5 Volt, Modbus, HART, digital, pulse, thermocouple, and SDI-12. Depending on a vendor, a wireless sensor control system can connect different sensor types with different interfaces together, allowing you to choose the sensor that best solves your application problem.

A SignalFire Sentinel HART wireless node connected to a guided wave radar sensor for tank level monitoring

More cost effective and versatile than traditional manual gauges and wired instrumentation, wireless remote sensing systems meet different challenges that wired monitoring systems just can't address. For ultimate effectiveness in tank level monitoring applications, wireless systems must meet stringent safety standards. Off-the-shelf wireless solutions are not feasible due to the need to adhere to strict safety standards. Wireless remote sensing systems operating in hazardous areas require specialised circuit design or specialised enclosures. Even with the added cost and complexity of meeting these requirements, the economic advantages of these wireless tank level monitoring systems can be compelling.

FOR MORE INFORMATION

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