APPLICATION SOLUTION

Why Deployment Of A Wireless Remote Sensing System Makes the Most Sense To Monitor Water Tower Pressure and Water Supply Levels!

APPLICATION:

Water towers are used all over the world to provide a reliable water supply during peak usage hours and power outages. These elevated structures are deliberately tall to maintain sufficient pressure to deliver potable water by gravity through a pump distribution network that supplies water to homes. As residential water pressure ranges between 45 and 80 psi (pounds per square inch), the average height of a water tower must be around 165 ft. to deliver water at pressures between 50-60 psi. Water companies must monitor the overall water distribution system to ensure proper pressure and water levels. Pressure management is critical, as not having acceptable tank pressure/level could result in inefficient system operations, damage to pumps/pipes and more importantly insufficient pressure to meet the water demands of customers.

CHALLENGES:

• Typically, the water level of a water tank is measured by mounting a pressure sensor on top of the tank – at extreme heights.
• Pressure sensors are also placed on the suction and discharge pumps to monitor pressures.
• Other sensors may be deployed to monitor other pump parameters – start or stop, fuel/levels level, vibration, etc.
• Because of the height of the water towers, maintenance of hardwired sensors to this type of control system is costly, very time consuming and can present extreme safety risk to maintenance personnel that have to climb the tower.
• Powering wired sensors is also a big problem because normally only 120VAC is available at the tanks. Having to run power lines in conduit on water towers is very expensive, difficult and time consuming. And as wired sensors require that each sensor be wired back to a local controller (PLC/RTU), the entire local network is endangered by lighting strikes or ground faults that can
cascade along the cabled system and destroy all sensors and everything wired to it (pump and the controller).

**SOLUTION:**

_Fig. 1: Working configuration of a wireless remote sensor system in a water distribution system._

• A wireless remote monitoring and control system resembles the architecture of a wired system by using wireless instrumentation instead of cabling to measure and transmit the water pressure in the water tank and pumps.

• The wireless telemetry system consists of end nodes that include a radio that powers sensors, which conduct the pressure measurements for transmission to a gateway.

• Serving as the central hub for receiving measurements, the gateway stores recent sensor readings in Modbus format for accessibility by a PLC in a control center or through an Internet connection.

• The gateway can be physically wired via RS485 to a PLC/SCADA/DCS or wirelessly connected using cell modems.

• By using 900mHz instead of 2.4gHz, the wireless network provides for robust, highly secured data transmissions through different terrain, structures, and weather conditions and operates for years in harsh environmental conditions.

• Working in one wireless monitoring and control network, up to 240 integrated sensor nodes can provide feedback at various points to verify water levels and ensure the system has sufficient pressure to deliver water to users. Data is sent to a gateway that serves this information in various formats such as 4 to 20 mA or Modbus.

In figure 2 below, the Pressure Scout wireless pressure transmitter integrates a wireless radio, pressure sensor, and intrinsically-safe circuitry including a battery to serve as a cost-effective alternative to conduit, wired, and other pressure sensor solutions. This telemetry system offers overall ease-of-use and reliable pressure measurement for industrial applications without wire.
Adding a wireless pressure sensor on both the suction and discharge of the pumps in the water distribution system is easy as the system recognizes new devices and seamlessly integrates them into the system. When operating within a ½ mile range of a Gateway, pressure sensor automatically connects into the network. Working in one wireless monitoring and control network, multiple pressure sensors can provide feedback at various points to verify water levels and ensure the system is working in balance. The pressure sensor integrates with a Gateway that stores the most recent sensor readings in the network in Modbus format. An Ethernet interface module connects the Gateway to a local area network, a Wi-Fi network, or a cellular modem. Maintenance staff can monitor water levels on a smart phone or iPad from the convenience of their trucks while operators at the main dispatch can view status on laptops. This network supports a long-range data transmission that sustains signal strength through terrain, structures, or weather. As a result, the wireless system can operate unattended for years without being affected by environmental conditions such as snow, rain, dust storms and ice.

**Advantages:**

- **Lower cost of deployment/installation:**
  - As wireless instruments eliminated associate costs of cabling sensors to a PLC/RTU (labor and material), they provide a very high value to price ratio to a customer. At a minimum a wireless solution can save a customer >35% in deployment and installation costs - compared to a cabled solution.
  - Additionally, by eliminating the need to specify and purchase an expensive pressure sensor and wireless node separately, these integrated sensor nodes serve as low-cost alternative to conduit, wired and other pressure sensor solutions.
- **Lower cost of maintenance:**
  - A wireless network eliminates the costs associated with having to replace stolen or broken copper wires.
  - As customers can monitor sensors remotely, maintenance visits are dramatically reduced.
- **Increase safety to maintenance personnel:** A wireless system eliminates the need to wired sensors up a tower at extreme heights; thus, reducing the risk of an accident for maintenance personnel.
- **Easy and fast installation:** A wireless monitoring system can reduce installation time at each site by about 95%.
- **Battery operated devices:** The wireless pressure sensor is battery operated (expected life 5-10 years), which eliminates the costs associated with having to cable power to the sensor.
• IIoT capability:
  o By adding Ethernet connectivity using an interface module, the gateway becomes part of a local area network (LAN), a WI-FI network, or connects with a cellular modem to bring the information to laptops or smartphones.
  o Maintenance staff can monitor water levels on a smart phone, tablet or a command center while operators at the main dispatch can view status on business intelligence dashboards.

• Lighting strike protection: As nodes and other components are not physically wired to each other and/or to the controller, it eliminates the risk of entire network failure due to lightning strikes and ground faults that would normally destroy an entire wired systems.

For additional information contact our staff at sales@aiwts.com; call us at 800 326 9415 or visit our website at www.aiwts.com

Advance Industrial Wireless Technologies and Solutions is a certified solution provider of wireless solutions and represents SignalFire Telemetry products. With offices in the US and Latin America, we can provide technical support and help customers develop a customized solution in English and/or Spanish.