White Paper

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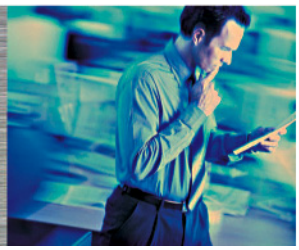
Honeywell Process Solutions



Improving Plant Safety and Reliability: Wireless Case Studies in the Process Industry

Introduction

Imagine being in charge of alcohol inventory at an ethanol plant, and one of the primary duties is monitoring tank levels. If those levels overflow and spill, many hazards arise: Cleanup could be costly, but more importantly, personnel are in danger and the plant could sustain significant asset losses. It's therefore critical to have a dynamic monitoring system in place.

Currently, in many older facilities, the only indication ethanol plant workers have when monitoring tank levels is eyesight – because the tanks have only visual-level indications. And that opens the opportunity for human error.

Operators at an Illinois ethanol plant found an easier way.

Using wireless pressure transmitters, they not only improved the safety level in a very volatile area of the plant, it netted savings of over $200,000 when compared to a wired solution.

This case is one example of the benefits delivered by wireless devices in the chemical processing industry. Many companies are turning to wireless systems to help them save money by eliminating wiring costs. But many also see a business value that is greater than just reduced installation costs. These devices are gaining recognition for improving operations in areas like:

- Critical, life-safety reporting needs
- Compliance with OSHA plant evacuation requirements
- Chemical spills and overflow
- Employee accident reporting
- Coded alarm signaling

Home on the "Tank Farm"

Finally, because every industrial environment is different, and may offer a unique set of obstacles to effective RF communication, a site survey is a recommended first step in determining which technology is most appropriate for any given application.

The plant's tank farm consists of several tanks, each about 20 feet high, used to store ethanol for alcoholic beverages. The facility was originally built in the late 1800s and was modernized after Prohibition. The tank farm has been in use since at least the 1920s.

The ethanol's chemistry is tailored per customer specification, and the tanks serve as a holding station before it's sent to distributors. While the tanks themselves are ventilated, the tank farm is an enclosed area. And the ethanol is nearly pure-grade alcohol that emanates intense vapors. Since the vapors always pose the risk of ignition, the tank farm is considered an explosive environment. When a tank (each tank holds 10,000 gallons) overflows, the area must be evacuated to protect workers from the heavy fumes and the increased ignition risk.

Their previous system for monitoring the tank levels relied on sight gauges on the sides of the tanks. These sight gauges were clear tubes that came out of the bottom of the tanks and ran up along the sides. Every inch was marked with a line on the tube. Every eight hours, workers inspected each tank and recorded the ethanol levels on clipboards.

This system was problematic for several reasons.

The clear ethanol was plainly visible at or below eye level, but with only a tight space to maneuver around the tanks (about 1-4 feet), employees couldn't always see the levels if it extended high above them. Employees sometimes would mistakenly record a tank as empty, when in reality, they simply couldn't see the clear line of liquid at the top of the tube. The result: more ethanol would be added to an already full tank and overflow.

As a secondary safeguard to the sight gauge, employees would sometimes climb to the top of the tanks and use a manual float gauge with banding hanging over the side to physically check the levels. But because they sometimes mistook the initial sight gauge, they wouldn't make it to the stage of using the float.

The manual recording system also made it easy for people to mistakenly confuse tank numbers and readings. As a result, they estimated the tanks would overflow about 50 times a year, on average.

It became clear that using digital transmitters would be a more accurate, not to mention faster, method of monitoring the tank levels. But they hit a roadblock when considering the use of traditional wired devices: Because the tank farm was considered an explosive hazard area, workers were precluded from using electrical devices and wiring that weren't labeled "explosion proof" or "intrinsically safe."

For regular wiring, it would have cost about $25-$40 per foot. For explosion-proof or intrinsically safe wiring, the cost could've been about $80-$100 per foot.

The most-commonly talked about benefit of wireless is the reduced installation costs. Without any wiring or conduit to install, the implementation is much easier for vendors and less expensive and intrusive for customers.

But taking it a step further, transmitters such as those used at this tank farm add value to the operation because they can allow the company to more easily keep track of their inventory.

The wireless pressure transmitters are based on open-vessel static pressure measurement – meaning the device can calculate how much ethanol is in a tank by analyzing the weight against the transmitter. The transmitter then sends that data to a distributed control system (DCS), and employees can constantly check the levels on a computer screen instead of physically making the rounds every eight hours.

In this case, the wireless solution gave the company multiple points of information for its control system and added dramatic savings to the business process. From the business perspective, it gave them the capability to monitor asset inventory for both sales and revenue. Since installing the wireless transmitters, the plant has not had a single spill in the tank farm.

Breaking the Routine

Like the ethanol plant, a nearby plasma-based pharmaceutical manufacturer was searching for a way to better monitor its alcohol tank levels and reduce safety risks to employees. But their tanks aren't located in an enclosed area – they sit outside, which brings environmental concern.

Virgin alcohol arrives at the facility via railroad and is unloaded into several storage tanks. For the next 5-7 days, the alcohol is used in the processing and refining of the end product. The process alcohol is then cleaned and redistilled before being put back onto another set of rail cars and shipped to distributors.

While the company depends on the cycle for its operations, the company recently decided to eliminate one of the cycle's most routine tasks: manual alcohol tank monitoring.

Each day, employees would walk up narrow stairways to the tops of the 50-year-old, 10,000-gallon storage tanks, which stand about 15-feet high. Then, they would open a 6-inch portal and lower in wooden sticks with lines marking every quarter inch to measure the alcohol levels.

The intense alcohol concentration within the tanks posed the risk of explosion and a potential safety risk for employees who would manually check the alcohol levels. Additionally – because the 12 tanks at the facility were outdoors – the company needed to comply with Environmental Protection Agency mandates that regulated how much vapor it released into the air.

The problem was three-fold: the company was searching for a system that would lessen the safety risk to employees, remain compliant with EPA regulations and help the company keep better track of its inventory.

They began examining options for a wireless system in 2004 and completed its implementation a year later.

The wireless base now sits about 300 yards away from the storage tanks next to a cooling tower on the facility campus. Pressure transmitters that can sense the weight of the alcohol in the tanks send the data to the wireless base, which then transmits the numbers to a programmable logic controller (PLC). Employees can then view the data at any time on a computer screen versus having to manually check the levels.

The transmitters were basically the same costs, but the cost of the wiring, running 300 feet or 400 feet of cable or conduit would have been cost prohibitive.

And it also keeps it safe. The new system reduces the safety risk by eliminating the need for human interaction at the tanks. Additionally, the wireless transmitters enable the company to emit even less alcoholic vapors into the air because workers no longer have to physically open the tanks to take measurements.

This company is considering options for introducing wireless technologies into the plant's actual processes. Wireless applications would eliminate clutter – which would reduce the amount of time employees spend maintaining the area. There's also the issue of keeping the area extremely clean; dirt and dust will have fewer places to collect without cables or conduit.

Rolling on the Rio

Stretching about 620 miles, the Rio Colorado starts in the eastern slopes of the Andes Mountains in Argentina and winds its way east-southeast into the Atlantic Ocean. The path it travels takes it directly through the Puesto Molina production area, and a sector owned by a top oil company in Argentina and Spain.

This oil company manages mature oil fields where the extraction is done through secondary recovery. The Puesta Molina production area contains 1,147 producing wells, of which 70 percent are the mechanical pumping (AIB) type. There are 787 water injection wells.

All these production activities are in line with the company's policy of giving priority to safety and preservation of the environment; they have long maintained a firm belief in innovative, yet environmentally friendly, technology. The company – which operates in more than 30 countries and produces more than 1.2 million barrels per day – needed to get a little creative, though, when it completed a major project in 2004.

That year, an underwater pipeline crossing of the Rio Colorado was completed in the Puesto Molina production area. One oil pipeline, two gas pipelines and a 585-meter aqueduct were installed under the river to connect the oil fields on either side.

Security and environmental standards required an accurate monitoring of the pipelines to avoid possible spills into the river in the event of a pipe breakage. To solve the problem, they implemented continuous monitoring of pipeline pressure and integration into a SCADA reporting system as part of the control system.

The company examined two options for the pressure monitoring on the pipelines: traditional wired, and wireless.

At the one area, they used pressure transmitters with 4-20 mA outputs to sense the pressure, and it also installed a new remote terminal unit (RTU) to send the data to the SCADA system. Meanwhile, at another area, the company used the same type of transmitters, but used wiring and cable to connect them to an existing RTU located in a water-injection well 50 meters away.

After completing the engineering design concepts for both options, they chose the wireless implementation because of its lower installed cost versus the traditional wired implementation. In this case, the mounting and startup costs were reduced from $17,840 to $11,300 – a 36.7 percent savings. They used an existing RTU near the area to mount a radio base and use wireless pressure transmitters in both heads.

The wireless option also had greater data reliability: It eliminated data transmission faults caused by wiring, marshalling panels and junction boxes, and measurement reliability was greatly enhanced.

Additionally, the high-reliability wireless solution had an approximately 50-percent reduction in maintenance costs, considering there weren't any wires, panels or boxes to maintain. The transmitters also feature auto-diagnose capability, as well as easy configuration.

For its equipment, they chose a variety of Honeywell products including a DCS, wireless pressure transmitters and other transmitters with 4-20mA output in order to accurately maintain the pipeline monitoring. The centerpiece of the project was the XYR 5000 wireless pressure transmitter, which are specifically designed for applications with no access to power, as well as hazardous and remote locations where instrumentation changes are frequent or where manual readings are usually taken. These transmitters securely transmit up to 2000 feet on a 3-5 year battery life with high accuracy.

More Than Just A Convenience

Wireless technology is becoming more than just a convenience; it has become a business tool that offers savings beyond maintenance and installation costs.

Wireless technology has helped lessen the financial blow of lost production and cleanup and helps ensure workers' safety. Many companies are finding that wireless is an effective method for staying environmentally friendly and compliant.

How widespread the use of wireless devices becomes in the chemical processing industry will be determined by companies' willingness to view the technology not as tactical, but strategic.

More Information

For more information on Honeywell's wireless solutions, visit our website, www.honeywell.com/ps/wireless, or contact your Honeywell account manager.

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