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*Wireless*HART®

User Case Studies

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Introduction

The first WirelessHART devices were deployed in 2009 and since then over 40,000 networks have been installed. Today, WirelessHART instruments represent more than 4% of all HART unit sales - hundreds of thousands of WirelessHART devices per year. In fact, WirelessHART has the single largest market share (>30%) of all process wireless communications. WirelessHART is providing significant benefits to the industry and improving the reliability and competitiveness of plants.

In a recent survey (2019) by Control Magazine, nearly 88% of users indicated they were interested in wireless technology application stories. This application guide summarizes a diverse set of existing applications / installations, illustrating some of the possibilities WirelessHART offers. Most importantly, all of this information serves to aid users in improving plant performance through access to actionable information.

Why Wireless?

WirelessHART offers 30%-60% lower installation costs than adding traditional wired instruments. This alone enables adding more points for measurement and optimization of existing plants previously considered unachievable. Since no additional instrument wiring is needed, deployment can be completed very quickly. In fact, one study featured in this document shows WirelessHART uses for mobile/temporary installations.

WirelessHART was developed for the process industry and the very high reliability it demands. Well-formed WirelessHART networks routinely exceed >99.99% reliability. WirelessHART are mesh networks. This means that all devices have multiple neighbors and multiple paths to communicate over. This redundancy ensures communication reliability. Since Radio Frequency (RF) conditions and interference patterns change over time, WirelessHART Network Managers are always grooming and improving the mesh network. WirelessHART's extreme reliability instills user confidence and encourages innovative applications like those summarized in this guide.

Getting started is simple. Most vendors who manufacture WirelessHART products offer a "starter kit", consisting of a WirelessHART gateway and 5 field devices. You should have at least 5 devices to ensure you have a solid, redundant mesh network. This small installation/network allows evaluation of WirelessHART in your plant. Adding instruments and growing your network actually enhances reliability. In fact, WirelessHART networks are easy to expand and deployment aligns with existing standard practices. As with HART 4-20mA devices, when a new instrument is received, normal bench-top commissioning is performed (like entering its Tag). In addition, WirelessHART devices only need a Network ID and Join Key. WirelessHART instruments work with the HART-enabled tools you already have. When the device is installed in the field, it automatically finds the WirelessHART network, joins it, and begins communicating.

WirelessHART gateways provide robust connectivity options to the instruments in the network. All gateways support HART-IP and often other protocols. This allows data integration over the local intranet or cloud applications via the internet. Supplemental protocols (like MODBUS) even allow the additional instrumentation to be integrated into existing, legacy systems.

WirelessHART saves significant time and money as opposed to traditional wired installations. Its high-reliability and easy setup removes barriers to deploying new instrumentation and making plant improvements. As a result, plant availability and competitiveness can be enhanced.

This guide provide many application stories to fire your imagination and encourage you to improve your business.

WirelessHART Gas Detectors Help Lower Emissions and Safety Risks for California Underground Natural Gas Storage Sites

Application: Gas Utility
Industry: Underground Natural Gas Storage
Location: USA

Overview

Central Valley Gas Storage LLC operates an underground natural gas storage facility in California. Once a natural gas field, the facility was successfully converted into a storage reservoir for gas reinjection. The conversion process involved drilling many new wells to enable rapid withdrawal of gas from the reservoir storage. With methane as a primary constituent of natural gas, these wells are a potential source of hazardous leakage.

Challenge

Reducing methane emissions has always been a challenge for the gas industry, along with compliance with emerging regulations. Enhancing safety is always paramount. Methane is highly combustible gas and if sufficiently accumulated, almost any ignition source can cause an explosion.

"We needed a way to detect small methane leaks around the wellhead. That way, the small leaks could be fixed in time before they developed into bigger ones," says Patrice Mbeukeu, Instrumentation and Controls Engineer. "When I first heard of a Wire-lessHART fixed gas detector, I did not think much of it because of some previous negative experience with gas detectors. Shortly after that, however, I got the idea of using multiple wireless monitors to create a gas detection envelope around a wellhead. Because we had a WirelessHART network already, adding a Vanguard WirelessHART combustible gas detector had great potential to solve the challenge we faced."

Application

With the help of optical imaging technology, Mbeukeu positioned multiple Vanguard units optimally around the wellhead for effective monitoring of a controlled release of a methane plume. Deploying multiple units ensured that even if the wind blew in different directions, at least one Vanguard

would detect fugitive gas emissions and transmit the concentration data to the SCADA system through the WirelessHART gateway.

Results

"I am very satisfied with the performance of the Vanguard units. The Vanguard could detect methane concentrations as low as 1% LEL or 500ppm" says Mbeukeu. "With its wireless capability, there was no need to run any power and signal wires onsite, saving us labor, time and material costs. In terms of data reporting, the Vanguard units transmitted data reliably and accurately over the recent months and there are no connectivity issues with the gateway. The Vanguard units were also interoperable with other WirelessHART devices. One of my favorite things about the Vanguard is its ease of use and calibration. Calibration is simple with the touch of one button."

> "I am very satisfied with the performance of the Vanguard units. The Vanguard could detect methane concentrations as low as 1% LEL or 500ppm."

To date, several hundred Vanguard Methane Gas Detectors have been commissioned to provide 24/7 monitoring of well heads at underground natural gas storage facilities. With residential populations often close to these storage locations, operators are able provide reassurance that even small leaks won't go undetected for any material length of time.

Global Tire Manufacturer Reduces Waste and Increases Safety via WirelessHART

Armstrong®

Application: Tire Manufacturing
Industry: Steam and Temperature Monitoring
Location: Unreleased

Application

A global tire manufacturer was having issues of obtaining the temperature in their tire press creating scrap product while increasing the chance of a safety event. During operation, the steam system had failed steam traps periodically backing up condensate resulting in low temperature alarms in the tire press and creating a water hammer. The steam traps in question are in hard to reach locations that cannot be checked by technicians while the machine is running in a safe or timely manner. Monitoring various steam traps on the tire presses while integrating real time alarms it into local HMI's allowed operators to ensure the steam system was operating properly eliminating the risk of running scrap.

Goal

The customer had no option to run wired instrumentation to the tire presses due to the high temperatures of the equipment and space requirements in and around the tire press. The customer wanted to give the ability to an operator to safely watch the operation of the steam traps while the system was running on the HMI for each press, if there was an issue they could bypass the steam traps during press operation, allowing the tire press to get up to temperature and create good product.

Solution

Installing 1 WirelessHART gateway and 30 non-intrusive transmitters, the customer was able to span the entire tire press while monitoring all critical steam traps and air vents. Utilizing a WirelessHART gateway allowed the customer to implement a monitoring system quickly while the tire presses were shut down during a 1-day turn around. The customer then integrated the WirelessHART gateway into the HMI allowing operators to receive real time alerts while the press was running ensuring there were no issues with the process. Additionally, the system extended the lifetime of components on the tire press by not allowing condensate to sit in the steam system at

various times of operation, lowering the total cost of maintenance by 5% per year while decreasing scrap runs by 20%.

Benefits

While wired instrumentation was not an option, wireless allowed the customer to provide process information in a short time frame and in a cost-effective manner. Utilizing a WirelessHART system the customer could then monitor other critical process information without running wires to the same area resulting in more asset monitoring such as pressure and temperature on various parts of the equipment.
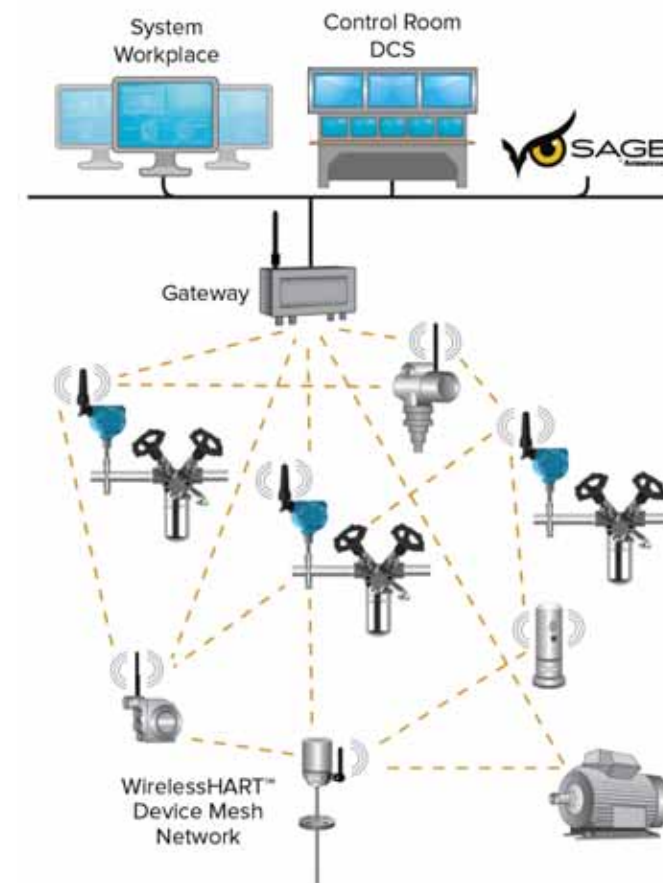
Potato Chip Manufacturer Reduces Energy Costs with Online Steam Trap Monitoring

Application: Food & Beverage
Industry: Steam Trap Monitoring
Location: North America

Challenge

Steam quality is a critical component in the making of many of the foods and beverages we enjoy. In a recent energy reduction project, a potato chip manufacturer installed three rooftop heat recovery steam generator units that recycle heat from the ovens that toast chips. Heat-recovery boilers convert the exhaust into steam that is used throughout the plant.

To further reduce energy costs, the plant wanted to collect data from each of the three lines and determine the BTUs used per ton of product. Reports would be sent to each of the unit leaders, who would take ownership of the energy costs. The reports would indicate what units were the largest energy users, which were most inefficient (per ton of product) and even which lines were becoming inefficient over time.

Plans to manage steam quality and availability included:

- Improved boiler efficiency
- Maximized return of condensate
- Maintenance of steam heat exchangers
- Insulation of all sections of pipe
- Reduced pressure losses before steam turbine
- Reduced header upsets – venting through PRVs
- Proper maintenance of steam traps

The key to optimize these steam system management methods is data collection and analysis. Unfortunately, the plant did not have timely information for the steam traps. An audit was performed annually for each of the 400 traps, where technicians would compare actual parameters with ideal parameters. This provided only a brief view of the health of the trap.

These analyses required significant work hours, could be inconsistent and inaccurate, and left the plant vulnerable to the impact of failed traps between audits. Increased manual surveys were not possible

because of the resources required and the safety considerations. A new, innovative solution was required.

Solution

The Rosemount™ 708 Wireless Acoustic Transmitter provided the customer with a cost-effective way to continuously monitor traps online. Fifty devices were installed on 50 of the highest priority steam traps in the plant, with priority based on:

- Capacity (potential loss of energy)
- Process control impact
- Access (difficulty to inspect using conventional methods)

Installation was non-intrusive and easily done using stainless steel bands to clamp each device to the pipe, with no cutting required and no process downtime. "The installation is easy but important," says the facilities manager. "The bulk of our time was spent getting to the traps, since many of them were in hard-to-reach places." He adds a warning, "We

discovered that proper installation is crucial; we had to ensure proper pipe contact with each device to prevent false cold readings."

Once each device was placed properly, the transmitter was "joined" to one of the two Emerson wireless 1420 gateways, which were wired to a local workstation. Installation was complete once configuration with the software was done. "We had to enter the inlet/outlet pressures, trap style and whether it was indoors or outdoors," the manager states. "Steam trap state is then calculated using PlantWeb Insight software." This software works with all trap vendors; it applies algorithms to measured acoustic and temperature measurements, user-provided pressure and trap type inputs.

Continuous monitoring of steam traps provides an accurate analysis of trap health and enables plant personnel to replace failed traps before they impact the efficiency of the plant operation or worse, personnel safety. Cost benefits were realized early. "We monitor all of the steam traps on a daily basis," the facilities manager says. "We identified 12 failures in just the first two months. We were able to take action more quickly and have an annualized reduction in CO_2 of 205 metric tons. We estimated an annualized savings of $27,810 and a payback estimated at 20.3 months."

With the savings from the first project, the plant decided to double the number of traps being monitored. Another fifty 708 acoustic transmitters were installed on 50 of the next (priority) tier of traps. "Steam management is critical to us," the facilities manager states. "We use it to heat ovens, heat oil to fry the chips, for sterilization, and many other things. We now have 100 out of 400 traps being monitored and have plans to install another hundred in the near future. We expect to continue reducing our energy costs and improving our carbon footprint. The cumulative savings will help these projects pay for themselves."

> "Steam management is critical to us."

> "We now have 100 out of 400 traps being monitored and have plans to install another hundred in the near future."

WirelessHART Enables Flexibility in Pharmaceuticals with Mobile Mixing Tanks

Application: Mobile Mixing Tanks
Industry: Pharmaceutical
Location: Unreleased

Challenge

In state-of-the-art pharmaceutical applications, portable mixing tanks are a regular part of drug production and handle all relevant processing steps, from mixing to heating and cooling of the products. Thanks to their integrated agitator, these mixing tanks may serve as preparation containers, material buffers or as stores for dosed products.

Since the mixing tanks are frequently used in safeguarded procedures that have to match the highest standards, numerous measurements have to be taken: they are equipped with industrial sensors that control the drive speed of the agitator and detect the temperature, pressure, pH value, and fill level of the tank. Data generated by the sensors has to be submitted to the process control system while maintaining mobility of the mixing tanks.

Solution

As these sensors are 4-20 mA HART-compatible, the field device data can be transmitted wirelessly to the process control system using WirelessHART technology: for that, the mixing tank gets equipped with two BULLET WirelessHART adapters. The BULLETs communicate the field device data to a WirelessHART gateway which then passes it on to the process control system.

Both BULLET adapters and field devices can be powered directly from the existing energy source which drives the agitator. While one BULLET adapter transmits the 4-20 mA signal from the agitator, the HART signals, indicating the temperature, pressure, pH value, and fill level are transmitted to the control side by a second BULLET operating in multidrop mode.

As no conventional wiring is necessary to communicate the process data to the control system, mobile mixing tanks save money. Additionally, no batteries are needed which frees users from monitoring battery status and prevents costly downtimes. The tanks are ready to be moved quickly when a process changes or they are needed at a different location.

In the example above, two WirelessHART BULLETS are placed on the mixing tank. One of the BULLETS runs in multidrop mode, transferring four HART transmitter signals - level, PH, temperature, pressure, while the other one sends a 4-20 mA signal (motor speed controller) to the WirelessHART gateway which interacts with the control system.

The BULLET draws energy from the AC power supply of the agitator's motor, keeping the wireless data transmission independent from restrictions of batteries or extra power supplies. With its rugged housing, the BULLET also easily withstands the stress of typical Clean-in-Place (CIP) procedures.

WirelessHART Helps BASF Cut Manual Measurements Due to Wiring Constraints of Rotating Equipment

Application: Rotating Equipment Measurements
Industry: Chemical
Location: Europe

Challenge

BASF in De Meem, The Netherlands provides high-quality catalysts for the process industry that is used in chemical, petrochemical, food and pharmaceuticals. Their processes often involve a number of system components for which wireless communication would be a good solution. One such application is around rotating equipment.

When catalysts are being produced, the product goes through a drying process which takes place in a large vacuum dryer. The product, a powder, can be fed in from the top through the tip of the cone in which a manual valve is mounted. On the other side, the tip of the other cone, there is an access point for taking samples. The vessel rotates ensuring that the product is mixed well with a special liquid injected through one of the rotation points. The product must then be thoroughly vacuum-dried to an exact specification. Samples must be taken regularly during the process

to assess how dry the product is. For this purpose, the rotating drum is stopped and the operator takes a sample through the special access valve. The sample is then analyzed in the lab. This operation takes between 30 to 45 minutes. Sometimes as many as three samples are taken. When the product is sufficiently dry, the process can be stopped, and the product tipped out. The total drying process takes approximately eight hours. For certain types of product, it can take 10 to 12 hours. This resource intensive manual process is costly and reduces the effectiveness of plant personnel.

Solution

BASF went to its partner Endress+Hauser for a solution. With a few simple HART devices, WirelessHART adapters and a WirelessHART Gateway, BASF was able to reduce drying time of their catalyst dramatically by automating much of the manual tasks and measurements. The temperature course is the primary variable for determining the moisture content of the product.
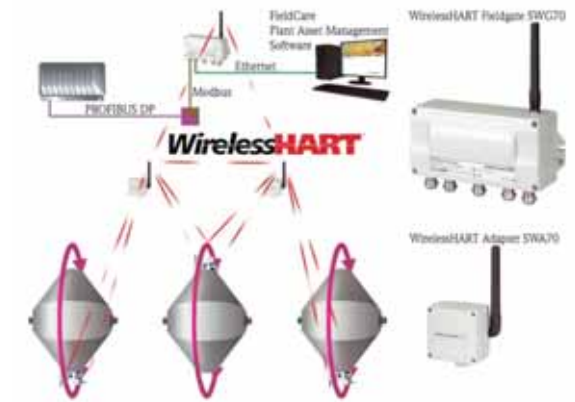
The WirelessHART adapters, which also supply power, are mounted directly on the transmitters. Two additional adapters transmit the HART information from the instruments on the continuously rotating drum to the gateway. Current results show cost savings in the following ways:

- Installation and assembly
- Energy reduction and laboratory costs via increased efficiency
- Improved process control and product quality
- Improved availability through condition-based maintenance strategy and centralized device performance monitoring

The expectation is that, before long, the process can be fully automated, which would result in an impressive time saving and improvement in product quality. At that point, two other drums will also be fitted with the new wireless measuring stations.

Mining Operation Reduces Wiring & Maintenance Costs in Difficult Terrain

Coke Manufacturer Uses WirelessHART to Easily Add Hydrogen Sulfide Detectors in Brownfield Application

Challenge

Located in mountainous western Colorado, Natural Soda is the second largest producer of natural sodium bicarbonate in North America. The company's product is used domestically and worldwide in the food and baking, personal care and pharmaceutical, animal nutrition and agriculture, pool and water treatment, and industrial markets.

The original Natural Soda facility was built in 1990 with the capacity to produce 60,000 tons per annum (tpa) of feed-grade product to be sold domestically. Expansion in 1996 increased capacity to 125,000 tpa. In March 2013, Natural Soda completed construction of an additional production train, increasing annual production from 125,000 tpa to 250,000 tpa. The production site has grown in multiple ways: increasing production has meant adding new well pairs and the requirements for the amount of data collected has also increased. This has meant more instrumentation at each well.

Solution

Given the high cost of wiring across vast rugged terrain for the additional instruments and reaching new injection wells progressively farther from the central facility, Natural Soda adopted WirelessHART for all of its wellheads. With the most recent expansions, the company has now deployed 60 wireless instruments across 10 wellheads. Additionally, to help handle the distance on some legs in its WirelessHART network, which can be as long as

one-mile, Natural Soda added eight Rosemount 702 transmitters as repeaters.

Wireless transmitters make it possible to monitor remote injection wells to protect the environment, increase efficiency, and improve productivity. Natural Soda's operating permits with the U.S. Bureau of Land Management (BLM) requires continuous monitoring and recording of fluid temperature, pressure, and flow rate in both the recovery and injection wells. Operators must also keep these parameters within specified ranges as detailed in a BLM-approved mine plan.

Natural Soda estimates the use of WirelessHART technology has saved more than $80,000 in wiring costs for each of 10 well pads, for a total savings of $800,000. The costs of maintaining wired infrastructure in northwestern Colorado are also significant given the elevation, elements, rugged terrain and damage caused by local wildlife. WirelessHART status and diagnostic information indicates if any transmitter has a problem, and the system alerts operators accordingly. If a problem does occur with any transmitter, technicians can go right to the device and troubleshoot with a HART communicator.

Performance of the WirelessHART network has been flawless, and over five years, Natural Soda has only had to replace the power module on three wireless devices, even when running with 4- to 8-second update rates. In addition to performing required control and monitoring at a much lower cost, Natural Soda is able to provide reports to the BLM and show it is working within the required parameters.

Overview

Arcelor Mittal is a world leading producer of steel. This particular facility manufactures coke which is used as a fuel in the steel making process. The coke manufacturing process results in numerous by-products such as hydrogen sulfide (H_2S). H_2S levels in a facility needs to be monitored closely for personnel protection.

Challenge

Adding new gas measurement points in a brownfield facility is inconvenient and very costly. Inconveniences and costs include obtaining 'hot' work permits and running conduits for signal and power wires around assets. Some of these assets are located in hard-to-reach elevated positions.

"We were previously using wired gas detectors to monitor for H_2S. Power and signal wires to these detectors were getting damaged over time and needed to be replaced," says Don Shulock, Process Manager (I&E) Arcelor Mittal. "Since we already had an existing WirelessHART infrastructure in place, the UE Vanguard gas detector was dropped into the mesh network to provide an accurate monitoring point instantly. Deploying multiple Vanguard units around the facility was easy and completed in days and the Vanguard units augmented our gas detection coverage without the hassle of running and maintaining wires."

Application

Scrubbers are equipment used to remove byproducts (e.g. H_2S) from gas streams. With its drop-in-network mobility, the placement of UE Vanguard Wireless HART gas detectors was not constrained and the devices were deployed right next to scrubbers and other H_2S containing assets. That way, a leak could be detected immediately before it permeates through the Arcelor Mittal facility. Many units were deployed throughout the plant to increase monitoring density and provide a robust gas detection envelop against H_2S leaks.

Results

"The Vanguard units connected to the WirelessHART gateway seamlessly after it was configured onsite. Interoperability with the other WirelessHART pressure, temperature and level devices worked great and data was transmitted back to the control room accurately and reliably," says Shulock.

"We like the simplicity of the device. Bump testing and calibration was straightforward with the push of the side button. It was also very easy to mount the Vanguard to a beam or wall with its integral mounting bracket. We definitely saved significant installation cost and time by migrating to wireless gas detection technology."

American Steel Stays Competitive with WirelessHART

EMERSON

Challenge

A 2014 FieldComm Group Plant of the Year winner, NUCOR Steel in Tuscaloosa, Alabama illustrates a great use of WirelessHART and is found in a rather unique application. The present Tuscaloosa facility was built in 1985 on the site of what was once a paper mill. In 2004, Nucor Steel bought the mill and all of its assets from Corus, formerly British Steel. The Tuscaloosa mill presently has about 430 employees, which Nucor calls "teammates", and operates 365 days a year. They convert scrap metal into 5.25-in. slab steel, which is then rolled out into 1/8-in. to 2-in. thick temper plate steel. They can also coil steel up to 1 in. thick. Steel from the mill is used for pipelines, building plate, tug boats, barges, and pressure vessels. Ben Springer, environmental technician at Nucor Steel Tuscaloosa, reports the mill can produce more than 1.2 million tons of steel per year.

"The main goal was to monitor our water usage, and be able to troubleshoot it. We didn't have leaks yet, but if we did have an issue, we wanted to catch it quickly," says Springer. The old wireless system was only about 60% reliable based on the many times it lost and dropped communications, the number of transient errors we were getting, and how often we had to work on it. And then came WirelessHART!

Solution

Output from 57 different transmitters at the Tuscaloosa mill goes through four WirelessHART gateways, and their output is connected to seven radios from ProSoft Technology, which creates an IEEE 802.11 (Wi-Fi) wireless backhaul network. The radios create their backhaul network to the PLCs, and the data can be accessed by using an OPC server application.

Springer reports that the mill's new WirelessHART network achieved 100% data reliability that was on-time and validated. "It was much better than we expected," he says. "It's easy to get data out of the system. The WirelessHART signals go through buildings without

any problems, and its meshing provides for a strong network with only a few routers needed, which help make the network even stronger. Depending on the application, we also saved 50-80% with WirelessHART compared to the costs of a wired system."

Beyond checking water use at the mill, the Tuscaloosa team discovered they could also use WirelessHART to monitor 19 dP transmitters in the plant's bag house and water filtration system. "When you melt steel, one of the byproducts is dust, and so the bag house is basically a large dust collection system with big filter bags," explains Springer. "Measuring pressure drops in the bag house helps us determine when the bags need to be cleaned." Next, these results began to draw interest from the mill's overhead crane maintenance team, who realized they could use WirelessHART to monitor bearing temperature and vibration. The crane moves steel in and out of the mill's production process, and also transports its ladle for casting and forming products. Consequently, sensors and transmitters on the crane were added to the mill's WirelessHART-based network, where they deliver updates every 2-4 seconds. In the crane's gearbox/bearing monitoring application, savings were estimated at $150,000 - $250,000 per event because now they can monitor the bearings, and take action before a major problem disables the crane.

"Because of WirelessHART's reliable and automated monitoring, we can now plan maintenance to our processes and equipment, rather than having unplanned shutdowns due to equipment failure," adds Springer. "We're now able to provide accurate and reliable data for the process points measured. WirelessHART is helping us reduce cost and prevent costly downtime."

Wirelessly Networked Tank Farms

PEPPERL+FUCHS

Challenge

A petrochemical tank farm with 23 storage tanks is already connected to the control system via conventional wiring. The tanks are now being retrofitted with additional level measuring technology. The new explosion-proof sensors have a 4-20 mA interface or a HART interface. All of the additional measuring points will be connected to the central process control system. A connection via cables is not considered for economic reasons. All level measurements are to be mapped in the tank farm's higher-level control system so that measurement and diagnostic data can be used in real time. The sensor network should allow field devices to be added easily to provide maximum future-proofing. A battery-powered wireless solution is to be avoided.
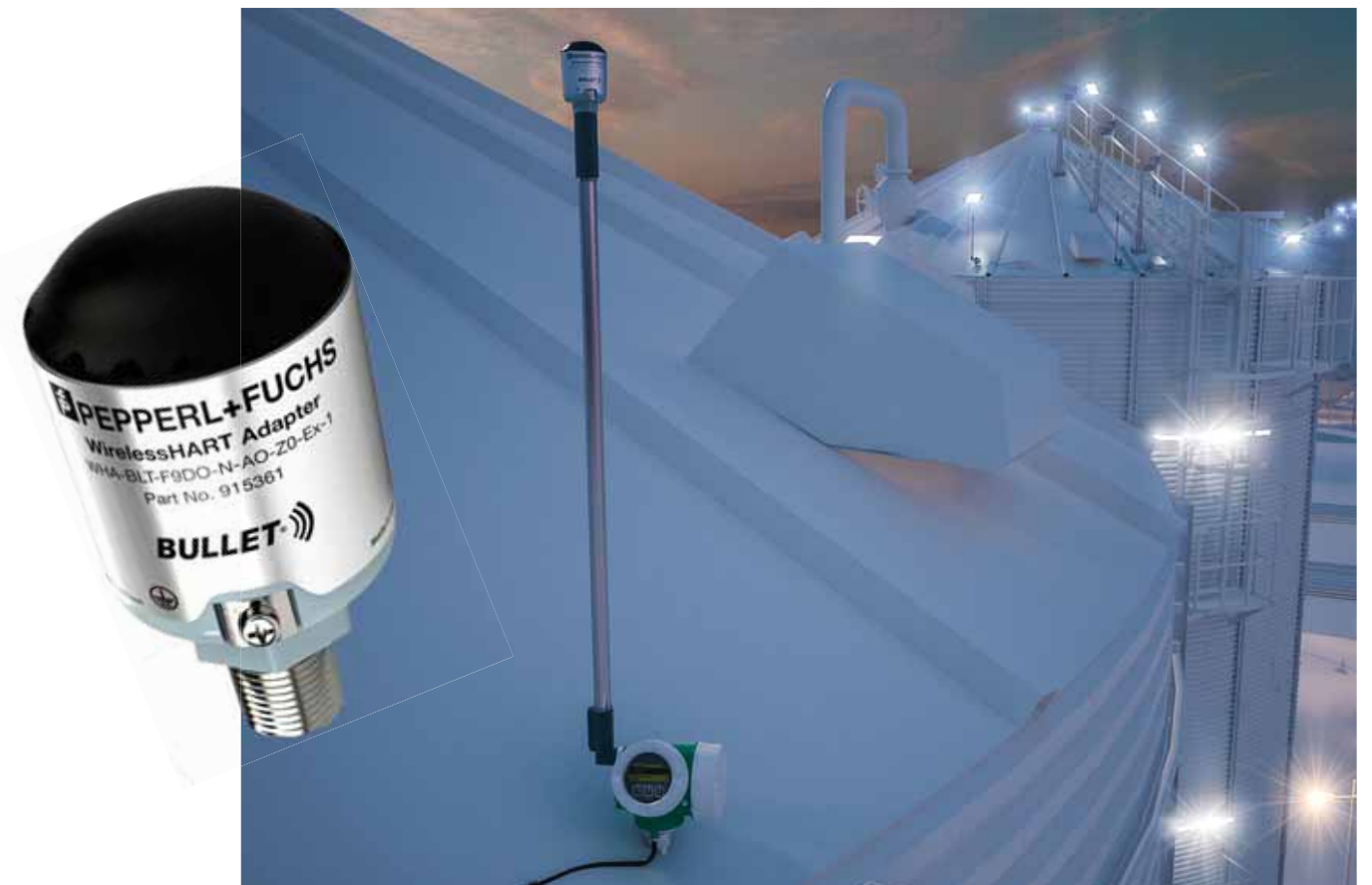
Solution

The BULLET WirelessHART adapter meets the requirements and can be integrated within the existing loop while also supplying itself with 24V from the lighting system. The adapter, which can be used either in Ex d or Ex i, makes it possible for level sensors and other field devices with 4-20 mA output or HART interface to communicate wirelessly with the control system. With HART field devices, the multidrop functionality of the adapter makes it possible to collect data from up to eight field devices. The newly integrated sensors in the tank farm have a permanent, secure wireless connection to the control room. Process data and water levels are monitored continuously, and diagnostic data is provided for condition monitoring and predictive maintenance.

Pacific Rubiales Energy Monitors Remote Wellheads with WirelessHART

Critical Steam Tracing Monitoring a Necessity for Petrochemical Complex

Application: Wellhead Monitoring
Industry: Oil & Natural Gas
Location: South America

Application: Steam Trap Monitoring
Industry: PetroChemical
Location: Unreleased

Challenge

For the extraction of the heavy crude oil, several boreholes (five on average) are clustered together to form a "pad". The project involves the measurement of pressure, temperature and flow of each wellhead. The crude oil is piped to a manifold, which monitors the material flow from five wellheads and feeds it into a central pipeline. Each manifold is equipped with a flowmeter and a pressure transmitter, which determine the productivity of the five boreholes. Using traditional wired solutions, adding sensor points for each of the wellheads and getting that data back to the main supervisory system is costly, largely due to their remote nature and extended cable lengths and trenching requirements.

Pacific Rubiales is a Canadian and Colombian registered producer of oil and natural gas. The company is the largest independent oil and gas exploration and production company in Colombia. It is focused on identifying growth opportunities, primarily within the Eastern Llanos Basin as well as in other areas in Colombia and northern Peru. Pacific Rubiales has a strong and growing reserve base, and is maximizing future production prospects through its exploration activities.

Solution

When Pacific Rubiales Energy were looking for a more flexible solution to monitoring yield at their wellheads, they chose WirelessHART technology as the answer. All twelve instruments are equipped with WirelessHART SWA70 Adapters that communicate with a WirelessHART SWG70 Fieldgate. This transports the data collected from the network to a supervisory system.

Plant Asset Management is also part of the package and is done with the aid of the web-based W@M platform. In comparison to conventional methods, the use of WirelessHART technology has greatly reduced the wellhead installation time from 15 days down to 3 days. 400 m communication cable and associated costs were saved per head as well as 100 m³ of cable channels and a remote I/O.

Benefits

The WirelessHART system saves a lot of money due to less cabling costs and less time to startup a system. Projects and operations can be carried out faster and more flexibly. At Pacific Rubiales Energy this process optimization reduces operational costs (OPEX) in the areas of oil and water treatment and water injection.

Application

A global petrochemical company designed a steam tracing system to ensure their products maintain liquidity during transportation from various units in the refinery. During the design phase, the customer was concerned about steam traps failing in a closed position creating temperature loss in their process, resulting in a process upset. The company implemented 130 steam trap monitors from Armstrong International to ensure failed steam traps did not hinder process performance. The steam trap monitors could be installed as the process was being started due to the non-intrusive design.

Goal

The customer did not want to run wired instrumentation to this part of the plant as there was long distance ranges and no open IO in the unit. Critical steam traps must be continuously monitored and alerts of a failure were expected within one hour of the occurrence. Alerting capability needed to be implemented in the control system of the unit for quick response times, eliminating additional software, which requires maintenance and constant updates.

Solution

Installing 2 WirelessHART gateway and 130 non-intrusive transmitters, the customer was able to span the entire unloading unit, providing a cost-effective solution in a short time frame. This allowed the customer to monitor their unloading area to ensure material was continuously moving through the system and would not solidify because of a failed steam trap. The WirelessHART gateway and transmitters were integrated into the local control system, eliminating the need for additional software to determine the steam trap conditions.

Benefits

The customer was able to eliminate 60% of the wiring cost by providing a wireless solution utilizing the WirelessHART mesh network while installing 130 wireless, non-intrusive steam trap transmitters.

The installation and commissioning of the project was 1/3 the time it would have taken to install the same system with wired transmitters, resulting in a quicker startup process and lower labor costs. Integration to the customers control system was seamless and the wireless network could be expanded in the future for cost effective monitoring of various other applications in the unit.

60% reduction of wiring costs!

Chemical Manufacturer Improves Safety and Reduces Costs with Smart Wireless Solution

Application: Railcar Chemical Storage
Industry: Chemical
Location: USA

Challenge

Croda Inc. is a wholly owned subsidiary of Croda International Plc, a U.K.-based manufacturer and worldwide supplier of oleo and industrial chemicals. The Mill Hall plant had a problem monitoring rising temperatures in railcars containing chemicals. Normally, three railcars are remotely located on-site. Since the railcars are frequently moved, hardwiring of temperature sensors was not practical. Employees had to climb to the top of each car once a day to check the temperatures and record each reading. This was a time-consuming procedure that during wet or icy conditions presented a fall potential.

Solution

Emerson Process Management successfully applied a Smart Wireless solution. No matter where the railcars may be positioned at the Mill Hall plant, a wireless temperature transmitter on each car sends minute-by-minute temperature readings to a central host. Croda uses this information to improve the performance and safety of their facility. In this way, Emerson's wireless system contributes to overall plant safety, making operators aware of any unexpected temperature rise, while saving the company about $15,000 per year in reduced maintenance. The wireless temperature transmitters are quickly and easily installed atop a railcar upon its arrival at the site, and they remain there until the car is about to be removed.

The wireless communications pass through a Smart Wireless Gateway (receiver) and on to the plant's DeltaV™ control system.

While the operators watch for rising temperatures, transmitter performance and diagnostics are simultaneously checked by Emerson's AMS® Suite: Intelligent Device Manager.

According to Denny Fetters, Instrument and Electrical Designer for Croda, "Emerson's wireless solution not only saves us time and money, since plant personnel no longer have to monitor those railcars daily; it has also greatly enhanced the overall safety of the plant and our personnel. We are pleased with the performance of the Rosemount transmitters and Emerson's self-organizing mesh network. No matter where a railcar is positioned on-site, the quality of the transmission is unaffected, and the signals integrate seamlessly into our control system."

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>
> **Denny Fetters**
> Instrument and Electrical Designer

Refinery Increases Profitability by Using Opportunity Crudes While Minimizing Corrosion Problems

Application: Corrosion & Erosion Monitoring
Industry: Oil & Gas Refining
Location: Europe

Challenge

Low commodity prices have changed the financial considerations for all phases of the oil and gas industry, including downstream operations such as refineries. For some facilities, the only means to improve profitability is to buy opportunity crudes – feedstocks from secondary sources at lower-than-market prices. These feedstocks are less expensive because they often carry corrosive and erosive contaminants capable of destroying production piping and equipment from the inside out.

> " For a refinery processing 300,000 to 500,000 barrels each day, saving even $1 or $2 per barrel of feedstock cost can improve the profit picture considerably – but this approach can add costs through increased corrosion of piping and equipment if not monitored properly."

Determining the condition of various pieces of piping and equipment through manual inspection is not reliable, often forcing producers to risk equipment failure by running units too long or requiring them to be too cautious and shut down or replace items that could still operate safely. Some facilities add corrosion inhibitors, but this is costly and the effectiveness is difficult to evaluate. Moreover, the chemical mix and dosage rate may need to be adjusted with each new batch from a different source as corrosiveness varies widely.

Solution

Managers of this refinery made an intentional choice to process opportunity crudes routinely for the cost advantage. Aware of the associated problems, they decided to deploy appropriate components and systems to monitor pipe and vessel wall thickness to determine the degree of metal loss resulting from processing high total-acid number crudes.

Technicians installed about 400 Rosemount Wireless Permasense transmitters on equipment in critical areas. These transmitters monitor wall thickness continuously and send data to analysis software via a WirelessHART network. The ability to install these transmitters without the very high cost of adding cabling made the project far more affordable. Since each transmitter has an internal power module sufficient to operate for five years and more, the maintenance cost of the transmitters is effectively zero.

The analysis software provides a current thickness reading in the context of historical data and trends. Watching it over time shows trends with sufficient resolution and precision (repeatability of ±10 microns) to determine the rate of metal loss for a specific batch of crude running for as little as a week. Since the facility typically runs 40 to 50 batches from various sources over a year, the software can effectively catalog the characteristics of each, identifying those which tend to cause the heaviest damage. Where corrosion inhibitors can be used, the continuous data provides an indication – in a matter of days – if the inhibitor is working properly and if the dosage is correct. This information can also be cataloged for future reference.

With both current and historical data, operators can project the rate of metal loss and determine the expected remaining life of any part of the process piping or equipment with a high degree of confidence. This minimizes the potential for a disastrous failure, and also the cost of an unnecessary shutdown prompted by uncertainty.

Once sufficient data and trend information had been collected, facility engineers were able to analyze the effects of specific operating conditions in addition to the characteristics of the crude oil. In one particularly telling situation, overall corrosion increased noticeably system-wide, beyond that attributable to the crude batch. Analysis of operating conditions showed a strong correlation between the aggressive corrosion and a change in a critical process parameter.

Since this was identifiable in a short time, the change was mitigated before the damage became worse.

Refinery Improves Safety and Saves Money Installing WirelessHART Gas Detectors

American Oil and Gas Company Automates Offshore Hub

Application: Fenceline Monitoring
Industry: Oil & Gas Tank Farm
Location: USA

Application: Unmanned Platform Monitoring
Industry: Upstream Natural Gas
Location: Southeast Asia

Overview

Many industrial process facilities are located adjacent to communities. Operators are required through regulation (i.e. EPA 325), to protect their assets and employees, as well as the surrounding community from gas leakage risks by identifying and mitigating hazardous air pollutants.

Challenge

A major North American Oil and Gas company purchased a tank farm that adjoined their refinery. The acquired asset did not have adequate fence line monitoring and needed to be brought into compliance. The time and cost to install traditional wired point detectors were not acceptable.

Did you know?

Storage tanks are one of the most common sources of gas leaks. They are always located some distance from the central facility and sometimes near residential areas. If the wind is blowing away from any wired detectors onsite, for example, plant operators may not know of any leaks until residents call in complaining about the smell. Multiple wireless sensors could cover more tanks, and they could all be networked through a common gateway.

Solution

United Electric's revolutionary and first of its kind Vanguard WirelessHART Gas Detector allowed the company to meet the inspection deadline for compliance, but also capitalize on $400,000 of savings.

The installed cost of the devices, with labor, was 1/5th of the initial wired gas detection proposal. Taking advantage of its existing WirelessHART network, the company quickly and economically expanded their coverage of toxic and flammable detection assets.

What would have taken nearly $500,000 and months to install using wired devices, was completed in a couple of weeks at a fraction of the cost. The ultimate payoff however, is protecting the health of the community living in close proximity.

$400,000 in SAVINGS!

Challenge

Operational excellence for this American based company means protecting the safety and health of people and the environment as well as conducting operations reliably and efficiently, with a goal to achieve world-class performance.

As a step toward this, the customer wanted to modernize a 30-year old wellhead platform offshore of Southeast Asia. The goal was to eliminate unnecessary travel to the remote platform, automate process data documentation, and reduce production losses.

The platform is a hub with 16 active wellheads as well as production headers from 4 nearby platforms, with power generation equipment to support the five platforms. If there is an issue on any of the platforms, production losses could last for days, particularly during the monsoon season where bad weather makes it hazardous for the technicians to travel to the platform.

Since it is too costly to introduce additional infrastructure on an offshore platform, the Oil and Gas Company needed a solution that was reliable, could fit within the confines of an offshore platform and didn't exceed the power limitations.

"Overall, we have reduced costs and improved safety by eliminating unnecessary travel to remote platforms, improved production by responding more quickly to trips in production, and eliminated reporting errors."
Facility Engineer
Oil and Gas Company, Offshore Southeast Asia

requirements and gives us the reliability we need to optimize production. Low power consumption of the gateway (6 Watts) has helped us keep the existing hybrid with no modification."

Over 40 wireless points were integrated through the smart Wireless Gateway into a SCADA host. These included 24 Rosemount® Wireless 648 temperature transmitters, of which 16 included non-intrusive pipe clamp sensors to monitor temperature on each of 16 wellheads. The remaining eight transmitters monitor the receivers and the production headers.

The customer has now successfully transitioned the Hub to a fully automated platform that is operated via radio. Wellhead casing pressures and temperatures can be continuously monitored for early indication of down-hole problems, as well as verify that the operational characteristics of well containment are within design limits. Seamless integration with the host means early notification for operators to take action when necessary.

Solution

The customer implemented a mixture of wired and WirelessHART devices during the retrofit to optimize monitoring and control of the platform while keeping power limited to that provided by the existing power hybrid.

Wireless instruments monitor wellhead status on all 16 wells of the Hub, as well as gas receiving for all 5 platforms, production headers, and the fuel skid. "The Emerson wireless solution enabled us to meet the limitations imposed by an offshore platform" says the Facility Engineer. "It minimizes power and space

Since installing wireless, remote monitoring has replaced technician trips to the platform. In fact, wireless monitoring has shown that no trips have been required, providing significant cost savings. The rich field intelligence has also minimized production losses, and seamless integration with the local host means automated production reports that are free of human error.

The list of our contributors below represents a snapshot of companies providing WirelessHART solutions for the market. There may be other WirelessHART suppliers around the world and we encourage everyone to seek out all available WirelessHART solutions for their individual applications. In particular, we encourage the use of Registered WirelessHART solutions. All Registered products can be found on our website: www.fieldcommgroup.org/registered-products.

Armstrong International

Armstrong International is a Global Organization providing Intelligent Steam/Air and Hot Water System solutions that improve utility performance, lower energy consumption and reduce environmental emissions while providing an "enjoyable experience". With over a century of Thermal Utility Experience, Armstrong plays an important role in helping customers around the world understand and solve critical steam, air and hot water system related problems.

Armstrong offers WirelessHART Steam Trap Monitors.

Contact: Smartservices@armstronginternational.com
www.armstronginternational.com

Emerson Automation Solutions

Emerson Automation Solutions is a global technology and engineering company providing innovative solutions for customers in industrial, commercial, and residential markets. Our Emerson Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs. With our automation expertise – from projects to operations – we focus on helping businesses hit their targets and move into Top Quartile performance. Wireless capabilities include Pressure, Temperature, Level, Flow, Corrosion & Erosion, Acoustic, Discrete, Vibration, Position, Safety & WirelessHART Adapter.

Contact: RMT-NA.SpecialistWireless@Emerson.com
www.Emerson.com/Wireless

Endress+Hauser

People for Process Automation. Endress+Hauser is a leading supplier of industrial measurement and automation equipment. It has a comprehensive FOUNDATION Fieldbus and HART instrument portfolio covering flow, level, pressure, analysis, temperature and system components. Wireless capabilities and products include our SWG70 (WirelessHART gateway) and SWA70 (WirelessHART Adapter). The SWA70 can be connected to any HART or 4-20mA field device installed in a plant.

Contact: info.us.sc@endress.com
www.endress.com

Pepperl+Fuchs

Pepperl+Fuchs is the undisputed market leader in intrinsically safe explosion protection components and offers a complete range of customized solutions for hazardous areas and critical applications. Our solutions are employed in a wide variety of industries and applications including oil and gas, chemical, pharmaceutical, power plants, and many more. With the most comprehensive range of industrial automation products including WirelessHART gateways, Adapters and Temperature converters. Pepperl+Fuchs is uniquely qualified to provide professional service, expert support, and unmatched performance – whatever your application might be.

- WirelessHART gateways (Modbus, EIP)
- Loop powered Bullet WirelessHART adapters
- Battery powered WirelessHART adapters
- Temperature converters

Contact: gcusick@us.pepprl-fuchs.com
www.pepperl-fuchs.com/usa/en/classid_2434.htm

United Electric Controls Company

UE is focused on protecting equipment, processes, personnel, and the environment. Our products are critical for safety, alarm and emergency shutdown functions, with uncompromising quality produced from innovative design and superior lean manufacturing. UE's Vanguard, a native WirelessHART gas detector, provides operators with more than five (5) years of continuous detection for toxic and explosive gases.

Contact: insidesales@ueonline.com
www.ueonline.com