

Industrial Gas Company Expedites Start-up of Leak Detection for Heat Exchangers with Emerson™ Smart Wireless Technology

RESULTS

- Mitigated risk of EPA fines and clean-up costs
- Added layer of environmental protection
- Saved \$54,000 in total installed cost vs wired measurements
- Eliminated possibility of accidental plant shutdown due to wire shorts during ring out



APPLICATION

Heat exchanger for lube oil cooling

CUSTOMER

A Fortune 250 Industrial Gas Company in the U.S.

CHALLENGE

When an industrial gas company was recently cited for a lube oil leak into the lake nearby, the plant took quick action to find the source. They discovered a heat exchanger used to cool lube oil for compressors, large motors and pumps had a breach between the shell and tubes. “We use water to cool our lube oil,” said the Project Manager. “It is preferred over glycol systems because of the higher heat transfer efficiency. Unfortunately, it also has a higher rate of scaling, especially in this case since water comes from a nearby lake without any filtration or softening.”

Water flows directly from the lake into the shell of these cooling units and is returned directly to the lake as well. Scaling eventually caused a breach on the outside of one of the tubes, which runs at a higher pressure than the water-filled shell side. As a result, lube oil leaked into the lake. “We carefully measure the water temperature to be sure we are well within regulations,” he said, “but did not have adequate leak detection in the case of a breach. We relied on our PM (preventative maintenance) rounds to catch any potential leaks and fix them before an environmental incident.”

When the breach occurred, the plant purchased several new double walled heat exchangers to avoid a repeat of the incident. In these new exchangers, cooling water flows inside tubes, each tube inside another larger tube that also carries glycol. All of this is enclosed in a shell that carries the hot lubricating oil. As an additional safety guard, they decided to implement on-line monitoring for pressure measurement of the annular space between the outside of the water tube and the inside of the glycol tube for every heat exchanger used to cool the lube oil. This provides immediate detection of a breach.

“The wireless instrumentation network provided just what was expected. It was installed and connected to a PC in the control room in days instead of weeks, with a more than \$50,000 cost advantage. We now have an added layer of protection against accidental leaks, and greatly reduced the risk of EPA fines and clean-up costs.”

Project Manager



PM rounds were not adequate to monitor the health of heat exchangers used for cooling lube oil from motors, pumps and compressors.

“Environmental safety is an important part of every manufacturing plant,” said the Project Engineer. “But we must be as cost effective as possible. Costs are rigorously scrutinized for non-productivity related projects.” PM rounds were used exclusively because conventional on-line leak detection systems are too expensive to install and require significant downtime. The plant needed an affordable solution that could be installed without sacrificing detection quality and reliability while having a minimal impact on plant production schedule, installation schedule and resources.

SOLUTION

The customer purchased thirteen Emerson 3051S Wireless Pressure Transmitters with a single wireless gateway, and installed them on the annular space between the outside of the water tube and the inside of the glycol tube of each of the lube oil cooling units. Wireless technology provided the shortest measurement start-up schedule at the minimum total installed cost, without sacrificing reliability. “Measurement reliability was of top importance since the data will likely be scrutinized by the EPA, who continuously monitors rivers and lakes for contamination,” the engineer stated. “Evidence of ground, water and/or air contamination carries heavy fines and sometime criminal prosecution. We were comfortable using wireless because the self-organizing mesh network from Emerson is field proven to provide greater than 99% reliability.”

Equipment and measurement points are spread out to the property line with some confined within steel buildings. “Our network spans over 500 feet,” he continued. “Since some of the wireless transmitters are inside steel buildings we installed three wireless repeaters to ensure a strong signal from every device. The repeaters also served to strengthen the network when it was first installed, since only a few units were instrumented initially. The new exchangers were installed in phases, and once completed we repurposed the repeaters to sit outside the steel buildings.”

The project team decided not to integrate the points into the PLC host. They wanted an independent HMI in the control room, and quickly integrated all thirteen points via Ethernet TCP/IP into a PC. The points were configured to alarm any change in pressure. High pressure could indicate a leak of the water into the glycol, and a low pressure alarm indicates a breach of the outside shell. These alarms prompt technicians to physically inspect the heat exchanger in question.

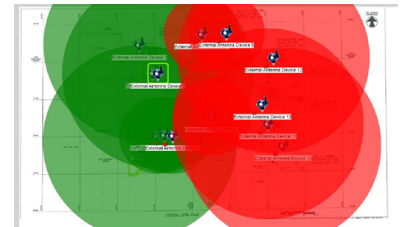
“Wireless eliminates most activities associated with wiring design and installation. Cabinets, wire, terminations, cable tray design, fusing, installation drawings, and a host of other activities are gone,” he said. There was no need to schedule, manage or follow up by an electrical designer or electricians. There was no added demand on I/O, and cabinet expansion was not required. The plant also noted the low maintenance cost with an 10-year battery life at 1-minute updates and the added confidence of having the battery voltage alarm to ensure continuous operation.

An important benefit was that wireless eliminated the possibility of accidental plant trip/shutdown due to wire shorts during testing and ring-out for these devices. There were no wire ring-outs, no troubleshooting, and no ground loops. “The wireless instrumentation network provided just what was expected, concluded the project engineer.” “It was installed and connected to a PC in the control room in days instead of weeks, with a more than \$50,000 cost advantage. We now have an added layer of protection against accidental leaks, and greatly reduced the risk of EPA fines and clean-up costs.”

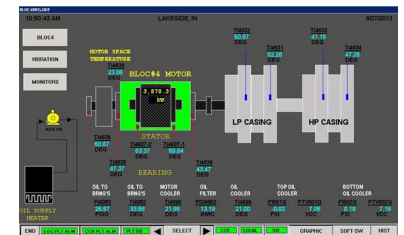
The system has been running for two years, and continues to provide reliable data. Other monitoring points have been added for unrelated measurements, further increasing the cost advantage and strengthening the wireless network. This identical system was duplicated in 2015 at an entirely different plant.



Dense plant topography of metal and concrete, tanks, walls, piping, structure, and buildings was not a problem for the wireless network.



AMS® Suite wireless planning tools such as this – showing device ranges – aid device placement to achieve over 99% reliability.



The Smart Wireless Gateway enabled straight-forward integration to the HMI.

RESOURCES

Emerson Process Management Chemical Industry

www.emersonprocess.com/chemical

Emerson Smart Wireless

www.emersonprocess.com/wireless

Wireless pressure transmitters ensure asset integrity to protect the environment from tube breach on lube oil cooling system.

Standard Terms and Conditions of Sale can be found at: www.rosemount.com/terms_of_sale.

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