

Standalone Wireless Network improves Maintenance Management: alarm management and advanced diagnosis at a Refinery in Argentina

Fabian Robin

Refining Site Team Leader, Emerson Process Management

Summary of the application

The Refinery showcased in this paper has an approximate production of 190,000 bpd which supplies over the 60% of the local market.

The refinery's control system receives 11 thousand signals, all of them 4-20mA and HART, but diagnostics are only obtained from 5% of them. To solve this, the Instrument Maintenance Department developed a "Wireless Maintenance Network" for critical instruments. This paper describes the network development and expansion with special focus on the Refinery's harbor case: wireless technology adoption to transmit reliable custody transfer data to the Management Office.

The Refinery's Maintenance Department had to optimize downtime activities to decrease costs. One of the requirements was having access to the diagnosis information available in the installed HART devices. This would provide additional benefits, like the ability to improve predictive maintenance and, consequently, improve the plant's availability. Additional concerns were fast execution and a bounded budget.

An exclusive Maintenance network was created, fully available to recognize alarms and diagnose critical instruments.

On the trial stage Wireless Thumbs were first incorporated on 10 critical instruments to test the standalone wireless system and incorporated in the existing AMS. The instruments tested were positioners, Coriolis flowmeters and pressure transmitters from several brands. After this trial, the network counts now with 60 devices connected.

After the implementation the company is able to get diagnostics from critical devices, decreasing the risk of unexpected shutdowns and the plant's downtime. This was achieved due to the over 99.9% systems reliability.

The first 10-device network installation and commissioning was performed in 1 day and allowed saving \$ 75K on wiring and installation activities.

Regarding the Coriolis meters at the harbor, the previous installation had severe communication problems with the Plant Information PI system. The company targeted changes in communication towards a robust protocol and to get diagnostics into Maintenance Wireless Network to follow meters traceability and performance and allowing General Management get accurate data on the harbors downloads and uploads. Additionally, calibration issues were solved and advanced diagnostics were obtained, increasing the availability of the Coriolis flow meters.

Description of the original situation

Diagnosis information

The maintenance department had to optimize downtime activities to decrease costs. One of the requirements was having access to the diagnosis information available in the installed HART devices. This would provide additional benefits, like the ability to improve predictive maintenance and, consequently, improve the plants availability. Additionally, execution had to be fast and budget was bounded.

The harbor

The harbor is the refineries largest custody transfer point, where the fiscal measurement of all products entering and leaving the refinery was entrusted to Micro Motion Coriolis meters. The General Management office wanted to obtain reliable and accurate data about the products downloaded and uploaded. The legacy network transmitting the information provided an intermittent communication and important data was lost.

Coriolis meters measured the flow rate of products downloaded (100% crude oil) and uploaded (90% refined products) at the harbor facilities. The installation had severe communication problems with the Plant Information PI system. The company targeted changes in communication towards a robust protocol and to get diagnostics into Maintenance Wireless Network to follow meters traceability and performance.

Lube Oil tank farm

The project scope was to monitor 120 tanks at the refinery Lube Oil tank farm to control stock and overfill, two of the most critical operational problems that have never been fully solved. The project's tight budget couldn't afford the required infrastructure needed to power additional 4-20mA or Fieldbus devices, collect the signals, and transmit them to the tank farm's control system.

Solutions

Maintenance Network

The Maintenance Department decided to create an exclusive wireless network fully available to recognize alarms and diagnose critical instruments.

Wireless Thums were first incorporated on 10 critical instruments to test the standalone wireless system and incorporated in the existing AMS. The instruments tested were positioners, coriolis flowmeters and pressure transmitters from several brands.

Harbor signals

Wireless technology was the solution to ensure accurate information delivery to the Management office. Wireless THUMs were added to the Coriolis meters, and a repeater and a Gateway were incorporated to the wireless architecture to collect the information from the field and transmit it to the PI system to share with the General Management office ensuring network robustness, easy installation and commissioning, complied with the requirements for this application. AMS allows real time measurement monitoring, diagnostics and documentation tracking.

Lube oil tank farm

The solution designed combines WirelessHART technology and solar power panels. WirelessHART sensors and transmitters were installed, and wired radar level transmitters were equipped with THUMs that convert the HART signal into WirelessHART. Solar panels provide power for transmitters, repeaters and redundant wireless gateways.

All signals are connected to the AMS software which provides maintenance information and reports allowing real time measurement monitoring, diagnostics and documentation tracking.

Results and conclusion

After the implementation of the maintenance network the company is able to get diagnostics from critical devices, decreasing the risk of unexpected shutdowns and the plants downtime. This was achieved due to the over 99,9% systems reliability.

The first 10-device network installation and commissioning was performed in 1 day and allowed saving \$ 75K on wiring and installation activities.

Regarding the harbor custody transfer points, the WirelessHART Network solved the communication reliability issues, allowing General Management get accurate data on the harbors

downloads and uploads. The network also solved calibration issues and allowed obtaining advanced diagnostics, increasing the availability of the Coriolis flow meters.

As for the tank farm, combining wireless and solar power technology allowed savings of up to \$1 million, compared to a 4-20mA or Fieldbus solution, and saved 400 man-hours on installation time. Commissioning and start up were accelerated, improving the tank farm production process. Maintenance personnel now have access to higher quality reports and online process diagnostics.

Author Biography

Fabian Robin

Ingeniero Químico recibido en la Universidad Tecnológica Regional Buenos Aires

25 años de experiencia en Instrumentación y Control.

Más de 10 años en Emerson Argentina, como responsable de ventas en Refinación de Micro Motion y productos de Flow.

Desde el 2011 lidera el grupo de Refinación en Emerson Argentina.

Fabian está casado y tiene dos hijos.

Bibliography