

Direct Integration of HotSense™ UT Wall Monitoring Sensors into Plant Optimisation and Control Systems

Reliable data, available in the locations you need it, leads to better decision making and decisive action.



Overview

A European refinery had identified a number of high temperature locations which were showing increased corrosion and required increased monitoring. They sought an automated system which could provide automated, on-stream wall thickness measurements with data being used by both asset integrity and process control teams. The customer had an active WirelessHART network which was feeding data from a range of process and safety sensors directly to their Process Optimisation software within the plant control room. The automated UT system needed to integrate with the host WirelessHART network and feed data to the control systems. The data also needed to be accessible to the plant asset integrity team who sat outside of the plant fence. All of this needed to be achieved without the installation of any additional IT infrastructure and without adding additional cybersecurity protection measures.

The Challenge

- The plant used an established WirelessHART network already connected to the Process Optimisation system. There was no capacity to add new gateways or repeaters.
- Data needed to be made available inside and outside the plant using the current IT infrastructure i.e. without the installation of additional firewalls or other network components to maintain the stringent cyber security systems.
- All of the installation locations required a minimum ATEX Zone 1 certified solution and would need to operate at between 150-380°C. One of the locations posed a particular challenge as it required monitoring a pipe directly above a heat exchanger where ambient temperatures could exceed 250°C, too hot for any electronics or monitoring hardware.

The Solution

- HotSense™ intrinsically safe UT sensors were deployed with the CALIPERAY WirelessHART monitoring node, see Figure 1.
- The CALIPERAY system is the only fully WirelessHART compliant UT monitoring system and can be integrated into any WirelessHART network, irrespective of the back-haul / gateway and sensor manufacturer. Each CALIPERAY node can be connected to up to 4 HotSense sensors, all with integrated thermocouples for temperature compensation.
- CALIPERAY performs all the thickness calculations in the field and presents the Process Variables to the gateway, which are then able to pass directly in to the host control and historian systems. This includes:
 - Thickness
 - Temperature
 - Remaining battery life
 - Warning alarms
 - Other sensors diagnostic information
- The Web Access Management Portal (WAMP) software was installed on a PC and is used to manage the WirelessHART network for the purpose of remote systems management and maintenance, as required.
- HotSense™ sensors were deployed with the strap deployment system to allow for installation without the need for stud welding. The entire HotSense sensor is designed to survive continuous use at high temperature allowing for deployment in hot ambient locations. The sensor is connected to the CALIPERAY unit to allow for it to be positioned outside of the hot zone, without the need for a service port in the insulation / weatherproofing at the sensor.



Figure 1: HotSense™ and CALIPERAY installation

Execution

- The HotSense™ installation locations were identified and baseline UT thickness measurements made by inspectors.
- The sensors were installed on the heat exchanger during a shutdown period as the area was too hot to be accessed outside of this period. High temperature cables of length 1m, combined with 15m flexible cables, allowed the CALIPERAY to be installed in a nearby location away from the extreme ambient temperatures.
- The CALIPERAY units were all joined to the local WirelessHART network without the need for additional gateways or repeaters by sharing the various existing gateway join credentials. After joining, the Process Variables could all be viewed using the gateway web page. The local Process Technology and Process Instrumentation teams were able to link the data to the site Process Optimisation System using their current OPC and integrated CALIPERAY tags, see Figure 2.

- The data was made available to process control teams within the plant fence, and to asset integrity engineers on the business network via the plant historian.
- No additional backhaul or IT infrastructure was required and all data was managed in line with the plant cybersecurity strategy.

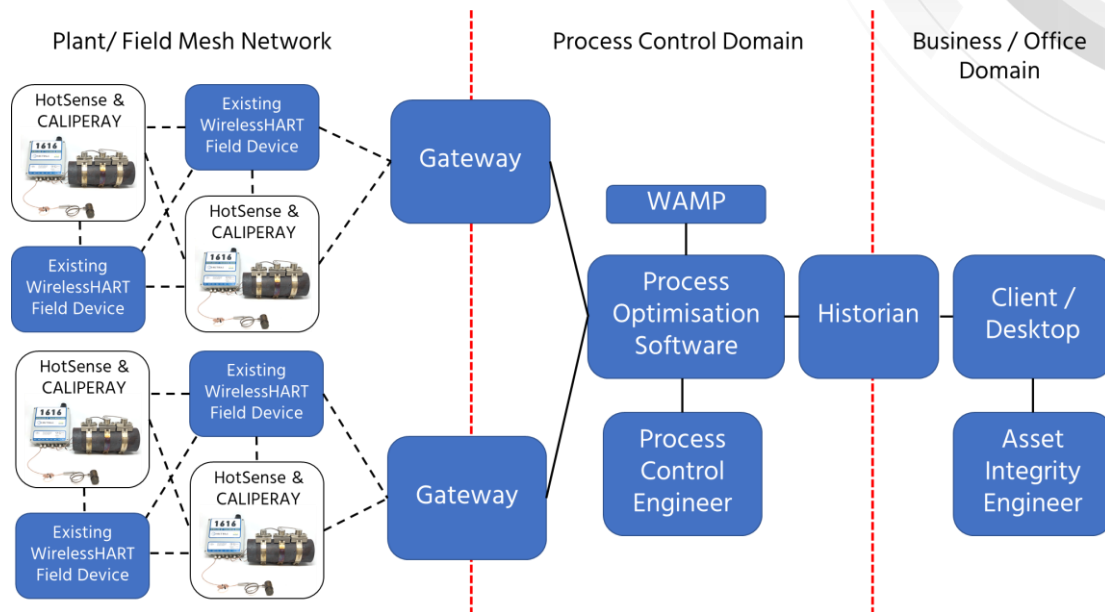


Figure 2: Network and data flow schematic showing integration of HotSense & CALIPERAY into the already established network without the need for additional infrastructure or IT security.

Key deliverables

- **On-stream wall thickness data was delivered direct to the Process Optimisation system** using already established WirelessHART infrastructure minimising CAPEX spend and IT implementation costs.
- **Direct integration with client networks and software maximises plant Cyber Security** whilst making data available across both plant and business networks.
- **Live, high quality, wall thickness and trending information** available alongside other data sources enabling better production decision-making and increasing productivity
- Installation of HotSense above heat exchangers improved safety by reducing exposure of inspectors to hazardous locations, helping the refinery meet critical safety targets.

Using HotSense™ installed sensors with CALIPERAY monitoring nodes allowed for a low-cost implementation of UT wall thickness monitoring solution which delivered data direct to plant control systems using already established WirelessHART networks.