

Renewable Energy Wall Loss Monitoring

In-service, high-temperature corrosion monitoring of high-pressure steam infrastructure in a green energy plant



Overview

A solution was sought to monitor a high-pressure steam containing vessel in a remote green power station. The asset had been experiencing high rates of wall loss when inspected with traditional ultrasonic inspection methods. The operator suspected that the wall loss rate was not linear and so sought to collect data at increased frequency to allow wall loss rate to be correlated with specific process conditions.

The asset to be monitored was a large diameter, thick-walled vessel operating at around 200 °C continuously. A series of pre-installed studs had been previously welded to the asset at key inspection locations. The vessel was situated at an un-manned remote unit and the wall thickness data needed to be accessible from a separate centralised facility.

The Challenge

A number of challenges around the deployment required a flexible monitoring solution.

- A high temperature wall thickness monitoring solution was required to operate over 200 °C continuously.
- The vessel was too large to deploy a high temperature HotSense™ sensor using straps.
- There were four of individual monitoring locations on the asset.
- The location was remote and un-manned with 24 hour access required to the wall thickness data.

The Solution

- Four HotSense™ 380 sensors with a foil coupling solution were chosen to provide a sensor which could survive above 200 °C and provide a stable and reliable thickness measurement.
- The HotSense™ welded stud deployment system was adapted to allow for installation on the pre-installed welded studs.
- A single CALIPERAY WirelessHART™ monitoring node was deployed. All four channels of the CALIPERAY were utilised to collect measurements from the HotSense™ 380 sensors. This provided the most effective solution to the customer.
- A HotSense™ Field Deployment Kit was deployed to site consisting of a WirelessHART™ gateway and industrial edge PC running the WAMP server to securely collect all data on site. A secure connection to the WAMP server was provided to allow the data from the system to be inspected and exported remotely.

- Measurements were collected at a high frequency to monitor periods of sudden wall loss.

Execution

- The HotSense™ sensors, CALIPERAY monitoring system and Field Deployment Kit were installed while the plant was operational. Data was immediately available in the secure WAMP server.
- Stable, repeatable measurements within 2.5 microns were collected with temperature compensation
- Over a three-month period, two significant wall loss events were detected on three of the sensors where 0.050-0.150mm of wall loss occurred over a 24-hour period.
- One sensor showed little to no wall loss over the monitoring period indicating the wall loss was not uniform and localised to a section of the vessel.



Figure 1: WAMP server analysis tool showing periods of accelerated wall loss on HotSense sensor 4.

Key deliverables

- Automated on-stream ultrasonic monitoring revealed non-linear wall loss not detected by conventional NDT.
- Data from the remote installation was made available at a centralised location where it could be compared with data from other process control sensors.
- The operator was able to define and detect the conditions which lead to accelerated wall loss.
- The operation of the plant was refined to minimise wall loss and maximise the lifetime and return on the asset.
- The asset is critical to the functioning of the plant and safely extending its lifetime with automated monitoring has reduced the requirement for planned or un-planned shutdown.
- The installation of the remote monitoring system has reduced the operational costs and increased the efficiency of this green energy producing plant.

Using HotSense™ installed sensors with CALIPERAY monitoring nodes and Field Deployment Kit **reduced the operational costs and increased the efficiency of this green energy producing plant.**