

Realtime Erosion Monitoring of Remote Wellheads

In-service, erosion monitoring to maximise well productivity, increase safety and reduce costs.

- Maximise production, based on known erosion rates
- Increase safety, reduced site activity & personnel exposure to X-ray
- Reduced costs by automating data collection remotely

Overview

A well head at an oil producing upstream facility operated by Shell required increased surveillance and monitoring of specific pipe elbows after representative structures at other sites displayed increased wall loss. The well was being operated at the upper threshold and the inspection frequency had been increased as a risk mitigation strategy. This required a team to visit the well weekly and collect radiographic testing (RT) profile images of the elbow to monitor wall loss. An alternative automated strategy was required which could remotely monitor 4 x NPS 2" elbows on the wellhead without human intervention to enable real time wall thickness and wall loss rates to be collected. The realisation of this strategy would deliver major benefits by maximising well productivity and increasing safety.

The Challenge

There were a number of key specification points that limited the deployment of wall thickness monitoring solutions:

- The elbows to be monitored were small external diameter (NPS 2" Schedule XX S) and a challenge for mounting UT probes.
- The wellhead was located in a remote location with no existing communication infrastructure and the data needed to be transferred to manned location for monitoring.
- The wall loss rate could be extremely slow but could accelerate if a sand extraction event were to occur, and as such the monitoring solution needed to be accurate, precise, reliable and able to collect and transmit measurements at least every 12 hours.
- The system needed to be installed during operation of the well requiring intrinsically safe certification for FM Class 1 Div 1 operation.

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The Solution

- 2 x Ionix HotSense™ sensors were deployed on the Tubing Line and 2 on the Casing Line. All were wired to a Mistras WirelessHART CALIPERAY™ ultrasonic monitoring system to make automated, accurate, precise and reliable thickness measurements every 12 hours. The system is intrinsically safe certified for use in FM Class 1 Div 1 applications.
- The HotSense™ sensors were deployed onto the NPS 2" pipes using the clamp deployment system during operation of the well.
- A Field Deployment Kit was installed which consisted of a WirelessHART gateway, power supply and cellular modem to provide direct data transfer to remote server. WAMP software was installed on the server for data collection and analysis as well as management of the system.
- The measurements collected from the UT system over a 6 month period were validated against RT profile images captured at the start, mid-point and end of the trial.



Figure 1: The system configuration and sensor install locations.

Execution

- The full system solution was successfully deployed during live operation with data immediately available at the data sever.
- After 6 months of logging, the system was compared to RT profile images and validated as a viable alternative for monitoring the well heads.
- The largest wall loss rates were detected on the Tubing Line – 0.033-0.044 mm/pa (0.0007-0.0009 inch/pa) with no detectable wall loss in the casings. These low values provide justification that the well is operating safely and provide additional opportunities to increase the production if required.
- The solution was left in place for continued monitoring in case wall should accelerate during a sand extraction event.



Figure 2: Example RT profile validation of the UT sensor measurements.

Key deliverables and benefits

- Frequent, consistent and high-quality wall thickness data collection now enables the customer to **maximise well productivity and increase safety.**
- The measurement was validated as an upper operating threshold, risk mitigation strategy compared to the alternative – RT profiling.
- Process and Production engineers have access to integrity from the remote site allowing **optimisation of production**, enabling profitable decisions to be made based on measurable data.
- Maintenance planners can make informed decisions on repair and replacement, **optimising maintenance project costs and planning.**
- Continuous monitoring enables wall thickness data to be automatically collected twice per day from remote and hazardous locations - avoiding the requirement for transportation, hot work permits and exposure of staff to hazardous environments –**enhancing safety and personnel risk reduction measures and reducing inspection costs.**
- Using HotSense™ installed sensors with CALIPERAY™ monitoring nodes allowed for **automated, robust and reliable wall thickness measurements to be collected from live assets.**

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