

Automated Corrosion Monitoring for Downstream Alkylation Units

Non-invasive, corrosion trending with wireless ultrasonic probes and monitoring system



Overview

An alkylation unit (AU, Alky) is a critical component which is heavily impacted by the switch to alternative feedstocks. An economically valuable asset, the Alky is key to the production of high-octane, premium gasoline grades, adding significant value to the refinery operation. Typically fed from the fluid catalytic cracking unit (FCCU) upstream, the process combines shorter chain hydrocarbons using sulfuric (SA) or hydrofluoric (HF) acid as a catalyst. Vulnerable to corrosion, which can be severe in HFAUs, which if unaddressed can lead to the release of hazardous acids and hydrocarbons, risking safety of personnel, and loss of production. Adapting to changing conditions and feedstocks is essential for safe and efficient operation.

Increasingly, refinery operators are beginning to explore the processing of alternative feedstocks as part of a wider decarbonisation strategy. For example, the change from crude to co-processing alongside renewable fuels, such as cooking oils and wastes animal fats, introduces a range of asset integrity challenges, including an increase in the presence of water and variable feedstock quality and contaminants. This can lead to significantly increased wall loss from corrosion damage mechanisms which makes managing this impact on the asset integrity of the plant critical.

A solution implemented by several global Alky operators, is to deploy HotSense ultrasonic, non-intrusive, remote thickness monitoring. Trending the wall loss rate of critical process piping and vessels of the alkylation unit whilst on-stream, removes the risk to personnel, and enables data driven process decisions, to maximise variable feed throughput and run lengths whilst minimising outages.

The Challenge

There were a number of challenges around the deployment in and around an Alkylation unit which require a flexible monitoring solution:

- High wall loss rates due to corrosion necessitating frequent inspections and conservative replacements.
- Urgent need for rapid detection of changes in wall loss rates for timely process control decisions.

- Operating in a hazardous environment with the presence of HF/SA and ATEX/IECEX compliance requirements.
- Solutions required often within a two-week timeframe to fit around maintenance and inspection schedules.
- Limited access in confined and hot spaces.

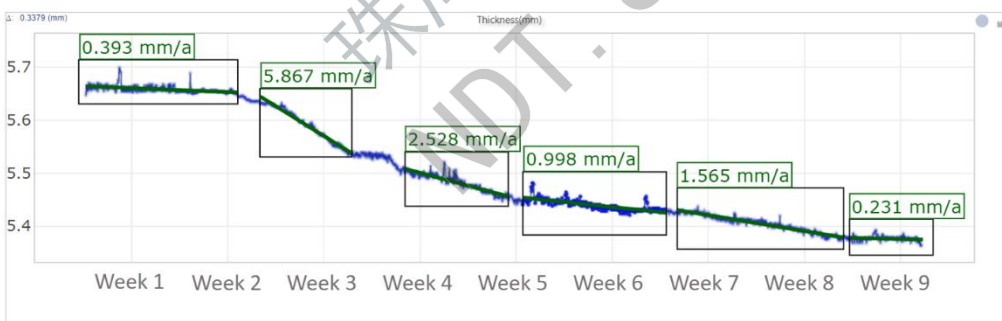
The Solution

- Implementation of HotSense Field Data Logging Kit with CALIPERAY and HotSense transducers installed.
- Utilization of WirelessHART network and self-contained data server for real-time data collection and analysis.
- Deployment of high precision HotSense 380 UT probes known for durability in harsh and extreme environments
- Wide range of deployment options including mechanical straps, catering from NPS2" to NPS22" pipes, and stud welding options for larger vessels and in confined spaces.
- Ensured safe operation within the corrosive AU environment.

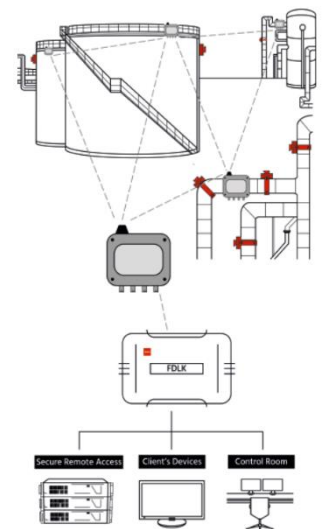
HotSense CALIPERAY Wireless UT Monitoring System

Execution

- Ionix partners with local site NDT service providers to execute AU projects efficiently and typically within 2 weeks of accelerated wall loss being detected by the inspection team.
- Trained for deployment of the complete solution, including installation, network setup and commissioning.
- Pay-per-point model facilitated rapid implementation without the need for capital expenditure.
- Process and integrity teams given immediate access to data, including thickness and temperature measurements at one-hour intervals.
- High-precision trending measurements enabled the detection of wall loss and rate changes within days.
- The local NDT contractor manages the entire system, measurements, maintenance and data presentation.
- Integration of process and asset integrity conditions with 24-hour data access empowered real-time decision-making.



Example thickness trends from the included WAMP trending and control software. Corrosion rates for the gated periods are shown in green. The high precision measurements enable rapid detection of wall loss trends



Key deliverables

- **Data-Driven Decision-Making:** On a particular AU of concern, Asset and Operations Managers were given access to high precision trends to utilise alongside process data to link wall loss to process change events, and guide decision making to deliver business objectives. Operators benefited from both thickness and temperature trends and were able to identify previously un-expected conditions.
- **Maximizing Operational Efficiency:** Rapid deployment of the system to respond to changing production requirements enables process optimisation to maximise efficiency.
- **Increased Production and Revenue:** Utilising trends to detect changes and forecast future asset integrity requirements, the operator optimised run length, maximising the amount of feeds which could be run between replacements.