

CASE STUDY

Online Risk Monitoring of CUI for Cold Insulation Pressure Vessels and Pipes

Application Benefits

Dynamic Risk Assessment of LPG pipeline in arid climate in Saudi Arabia.

Client

أرامكو السعودية
saudi aramco



Saudi Aramco -
Saudi Arabia

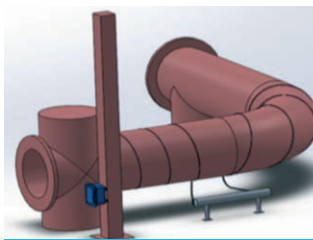
Key Benefits

- Provide online risk and corrosive conditions to decide the scope of inspection during a turnaround or shutdown
- Enabling the transition from calendar-based inspection to condition-based & data driven inspection program

Challenge

Pipelines operating at sub-zero temperatures (cold insulation pipelines) cannot be visually inspected while in operation. This is due to the fact that the insulation removal for visual check leads to ice formation on the surface rendering it uninspectable while in operation. Moreover, the insulation cannot be reinstated while ice is present on the surface as often the insulation for this application is specialised cellular glass (FOAMGLAS) with vapour sealing capability.

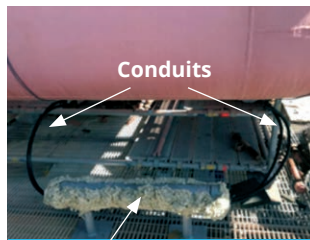
The only time these pipes can be inspected is during a turnaround or shutdown which is very expensive. Hence the challenge is to provide data about likely risk of the pipe without opening the insulation to scope out their inspection (or not).



CR Node and Moisture Sensor attached to an accelerated test section



1) Moisture Sensor



2) Accelerated Test Section



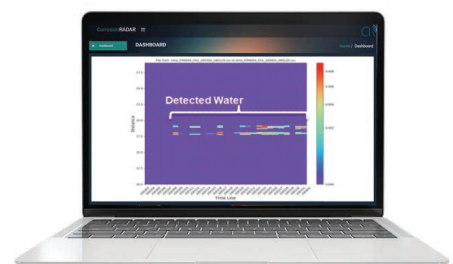
3) Corroded Section Under Insulation

Solution

CorrosionRADAR's Moisture and Corrosion Sensors are permanently embedded under the insulation to detect the presence of water and monitor corrosivity levels - providing an online assessment of CUI risk on the pipe.

The data from sensors are analysed using **CR CUI Risk Analytics Software**.

The output is then presented in traffic-light risk levels to make data-driven decisions for inspection scoping and planning.



Since deployment, **CorrosionRADAR's Moisture Sensors** have successfully detected and monitored cycles of water penetration through the insulation.

CorrosionRADAR's Corrosion Sensors have successfully monitored the corrosivity levels within the insulation and detected the presence of CUI - enabling an early intervention.



Results

The **CR Systems** were installed on a Propane pipeline operating at -45 degrees celsius with intermittent service - frequently cycling between ambient and -45 degrees celsius.

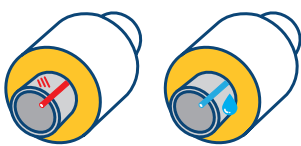
- The key assumption was that the insulation system with FOAMGLAS is vapour sealed and hence no condensation should occur on the pipe surface which can lead to corrosion
- The **CR Sensors** were installed under the insulation during a shutdown. Continuous monitoring revealed presence of moisture thereby confirming compromised vapour seal of insulation
- The **CR CUI Risk Analytics** assessed the corrosive conditions under insulation to be at 'High Risk' of CUI and upon a scheduled inspection, high levels of corrosion was observed
- Without **CorrosionRADAR** technology, this level of corrosion would have gone unnoticed which could have led to a dangerous leak on the pipe and an unscheduled shutdown.



CUI PoF Quantified: Very High

The ability to monitor wetness cycles within insulation coupled with CUI RISK analytics, enabled the client to take early corrective actions to avoid corrosion

Sensor Types



Corrosion

Moisture

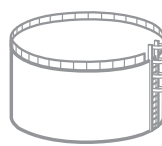
Asset Types



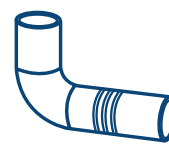
Column



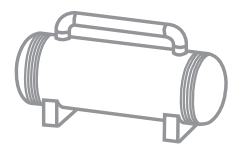
Dryer



Storage Tank



Pipeline



Heat Exchanger

You have been reading about **CorrosionRADAR's CUI Risk Monitoring System** as applied to a pipeline. To find out about Corrosion Monitoring Systems or the application of our technology on other assets, please visit our website.



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