DETECTION OF CORROSION UNDER INSULATION (CuI) USING ADVANCED ELECTROMAGNETIC INSPECTION TECHNOLOGY

Ankit Vajpayee P.Eng. C.Eng.[1]

[1]Vice President, Russell NDE Systems Inc., Canada

Corrosion under Insulation (CUI) is one of the most expensive issues our industry is facing today. For a reliability specialist in a hydrocarbon processing environment, this issue has the potential to be catastrophic. For example: refinery's steel piping is subject to temperature fluctuations. Thermal insulation applied to the pipe or vessel mitigates the effects, but the presence of seams, gaps or other discontinuities in the insulation layer makes them susceptible to infiltration by outside moisture or from the process environment. The result of infiltration is moisture held in contact with the pipe – resulting in CUI. Its occurrence can be unpredictable and undetectable based on visual examination. Traditional methods of addressing this issue involve selective removal of insulation for visual inspection, radiography or spot thickness measurements with PEC (Pulsed Eddy Current). This paper discusses the development and deployment of an Advanced Rapid Inspection Technique for detection of CUI without the need to remove the insulation. A Bracelet probe is connected to a Ferroscope 308 instrument while the latter is connected to a computer for instrument control and data acquisition. Instrument settings can be optimized so that highest possible sensitivity to defects is achieved for the probe at given pipe wall thickness. The probe can be designed so that a part of the pipe circumference is inspected per scan. Multiple scans cover the entire circumference. Bracelet probe technology confirms that the absolute coil channels that detect general corrosion and differential coil channels that detect more localized corrosion. It also displays the mix channels that identify corrosion at or next to the embedded studs. Together with this information and Remaining Wall Thickness FFS (Fitness for Service) calculations can be executed. The application of the Bracelet technique has been demonstrated globally to be feasible for assessing pipe conditions. The technique shows high sensitivity to local wall loss and general wall thickness variations including those from manufacturing tolerance. The advantages include flexibility of one probe for many pipe sizes, pipe condition assessment with or without insulation, and true in-service NDE technique.