

## Forensic Investigation Of Corrosion Under Insulation From Rust Scale Sample

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### ABSTRACT

Corrosion under insulation (CUI) is among the leading damage mechanisms in oil refining and hydrocarbon production facilities. CUI reportedly drives 40-60 % of the piping-related repairs and constitutes 10% of the overall maintenance spending. Numerous conventional and advanced inspection measures look for the occurrence and severity of CUI. On the other hand, the CUI formation reasons, and kinetics may not be well understood with the common inspection strategies. Like any other type(s) of corrosion, the rust scale samples can provide useful evidence in understanding CUI. With clarity on drivers and kinetics, the root cause analysis and decision making for CUI management can benefit from such information on drivers and kinetics. This article addresses the three different case studies on the forensic investigation of CUI via chemical analysis of rust scale samples. Rust samples from various assets in downstream and upstream facilities were analyzed using x-ray diffraction (XRD) which revealed range of corrosion products such as hematite ( $\text{Fe}_2\text{O}_3$ ), goethite ( $\alpha\text{-FeOOH}$ ), akageneite ( $\beta\text{-FeOOH}$ ), magnetite ( $\text{Fe}_3\text{O}_4$ ), etc. The study then addresses the kinetics behind these corrosion products and suggests some practical measures for utilizing the forensic information on rust scale(s).

**Keywords:** corrosion under insulation, rust analysis, insulation