

Localized Corrosion Management for Thermally Insulated Systems via Insulation Stand-offs and Low Point Drains

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ABSTRACT

CUI (corrosion under insulation) is a major damage mechanism affecting the integrity of process equipment, piping, and pipelines. CUI is known to create localized corrosion and pitting under thermal insulations which trigger non-linear corrosion rates and end up in unanticipated leaks in industrial assets. Reportedly, detection and management of CUI-driven damages constitute 10% of the maintenance budget in a typical refinery. This study simulates the CUI behavior of carbon steel under fibrous stone wool insulation using four testing conditions namely Isothermal wet, isothermal wet-dry, cyclic wet, and cyclic wet-dry. The weight loss of coupons under each test condition was converted into corrosion rate followed by characterization of damage modes namely pitting, uniform corrosion via microscope, and surface topography. It also compares the corrosion behaviors in closed-contacting insulation to those produced under contact-free insulation with low-point drains under similar testing conditions. Unlike closed-contacting insulations, coupons under contact-free insulation with low-point drainage resulted in uniform corrosion, insignificant pitting, and reduced corrosion rates under all testing conditions.

Key words: Insulation, corrosion under insulation, localized corrosion, uniform corrosion, corrosion mechanisms, optical microscopy, thermal cycling

INTRODUCTION

Corrosion under thermal insulations namely CUI (Corrosion under insulation) is a key degradation process in hydrocarbon facilities which poses asset integrity risks. ¹ CUI is reported as the reason