

## Failure Analysis of a Hydrocarbon Carrying/Piping System

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**Abstract :** This paper presents the findings of a study conducted to investigate the wall thinning in a piping system carrying a mix of hydrocarbons in a petrochemical plant. A detailed investigation including optical inspection and several characterisation techniques such as optical microscopy, SEM/EDX, and XRF/C-S analyses was conducted. The examinations revealed that the wall thinning in the piping system was a result of high-temperature H<sub>2</sub>/H<sub>2</sub>S corrosion caused by a susceptible material for this mechanism and operating parameters and effluent concentrations beyond the prescribed limits. The sulfide layers found to testify to the large amounts of H<sub>2</sub>S that led to material degradation. Deposit analysis revealed that it consisted primarily of carbon, oxygen, iron, chromium and sulfur. Metallographic examinations revealed that the attack initiated from the internal surface and that spheroidization of carbides did occur. The article discusses in detail the contribution failure factors on the Couper-Gorman H<sub>2</sub>/H<sub>2</sub>S curves to draw conclusions. Recommendations based on the above findings are also discussed.

**Keywords :** corrosion, Couper-Gorman, high-temperature corrosion, sulfidation, wall thinning, piping system

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