UNIVERSITI TEKNOLOGI MARA
Kolej
Pengajian Kejuruteraan

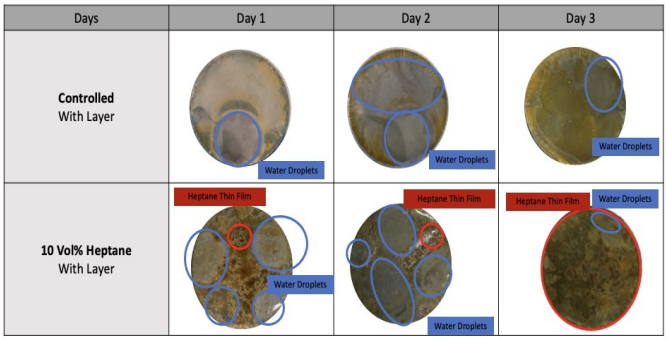
DIGEST: RESEARCH & INNOVATION

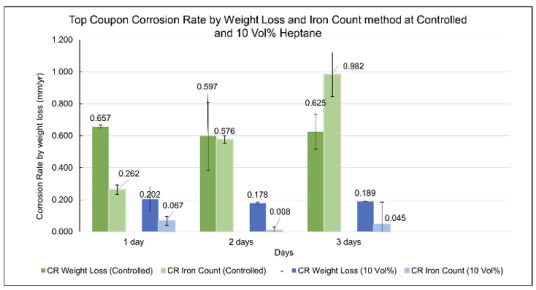
College of Engineering

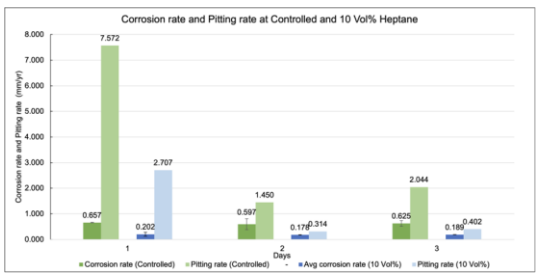
Volume 2, 2024
eISSN : 2805-573X

Effect Heptane on Top-of-Line Corrosion Mechanism in Sweet Water Hydrocarbon Co-Condensation Environment

Global oil and gas production involves extracting and treating wellhead fluids such as crude oil, natural gas, and brine before production can begin—offshore structures like multiphase piping and deviation drilling extract oil and gas from reservoirs. Subsea production starts in the reservoir, followed by drilling to create a well for extraction. The oil and gas are transported to a processing plant via an underwater pipeline and riser system. Additional processing is required for natural gas to meet export standards.







Natural gas is categorized into three types: gas from gas wells, gas associated with other formations, and gas from condensate reservoirs. The processing of natural gas depends on the presence of liquefiable hydrocarbons. Gas from gas wells consists mainly of methane, while gas associated with other formations contains abundant liquefiable components. Gas-condensate reservoirs contain a high percentage of dissolved heavier hydrocarbons like heptane. Natural gases also contain acid gases such as hydrogen sulphide and carbon dioxide.

Pipelines are the primary mode of transportation for natural gas, oil, and condensate, although they can suffer from containment loss due to leaking, inadequate equipment design, defects, and corrosion. Factors like rain, humidity, salt water, and chemicals cause external corrosion of pipelines. Proper design, material selection, routine maintenance, and inspection are essential for preventing corrosion. Understanding how water and hydrocarbons co-condense and wet the pipe wall is critical for preventing corrosion.

Our study examined the impact of introducing a small amount of heptane on the top-of-line corrosion process in a water hydrocarbon co-condensation sweet environment. The results highlighted the significant influence of n-heptane on the Water Corrosion Rate (WCR), showing a substantial 90% difference in WCR with and without heptane. This directly impacted the Top of Line Corrosion (TLC) rate, exhibiting a notable 70% contrast in the TLC rate with and without heptane. Although the pitting rate was slightly higher without heptane, the WCR and TLC rates remained stable in both scenarios, potentially due to consistent gas and steel temperatures. It is worth noting that the experiments did not directly compare the duration of exposure.

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