

Application of Pyridine-based Water-soluble Corrosion Inhibitor in Offshore Sweet Oil Pipeline

Authors : M. S. Yalfani, J. Kohzadi, P. Ghadimi, S. Sobhani, M. Ghadimi

Abstract : The use of oil and water-soluble corrosion inhibitors has been established in Iranian oil and gas production systems for a long time. Imidazoline and its derivatives are being extensively used which are known as conventional corrosion inhibitors. This type of product has shown significant performance and low side effects, so that could monopolize the market of inhibitors in this region. However, the price growth of imidazolines, as well as the development of new lower-cost components with similar or even higher performance than imidazoline, have influenced the exclusive market of imidazoline-based products. During the latest years, pyridine and its derivatives have challenged imidazoline due to their remarkable anticorrosive properties and lower prices as well. Recently, we presented a formulated water-soluble inhibitor based on pyridine - an alkyl pyridine quaternary salt (APQS) - which could successfully pass all lab tests and eventually succeeded in being applied in an offshore sweet oil pipeline. The product was able to achieve high corrosion protection (> 90 %) with the LPR technique at low dosages of 15-25 ppm under severe corrosion conditions. Moreover, the lab test results showed that the APQS molecule is able to form a strong and persistent bond with the metal surface. The product was later nominated to be evaluated through a field trial in an offshore sweet oil pipeline where PH₂S < 0.05 psi and CO₂ is 6.4 mol%. The three-month trial - extended to six months- resulted in remarkable internal protection obtained by continuous injection of 10 ppm inhibitor, which was as low as 1 mpy measured by both weight loss corrosion coupons and online ER probes. In addition, no side effects, such as tight emulsion and stable foaming, were observed. The residual of the corrosion inhibitor was measured at the end of the pipeline to ensure the full coverage of the inhibitor throughout the pipeline. Eventually, these promising results were able to convince the end user to consider pyridine-based inhibitors as a reliable alternative to imidazoline.

Keywords : corrosion inhibitor, pyridine, sweet oil, pipeline, offshore

Conference Title : ICCECP 2025 : International Conference on Corrosion Engineering, Control and Protection

Conference Location : Barcelona, Spain

Conference Dates : August 16-17, 2025