

5th International Conference on

Advances in Chemical Engineering & Technology

October 04-05, 2018 | London, UK

The influence of chemical inhibitors on the rheological properties of waxy crude oil

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The world demand for energy has led oil companies to expand their operations in cold environments such as the offshore deepwater and onshore for more reservoirs. During hydrocarbon production in the cold environment, these oil companies are challenged with the problem of wax deposition from the crude oil building up on the pipe wall. It leads to increase in operational and remedial costs, while suppressing oil production. Wax inhibitors are one of the mitigation technologies that have been examined for its influence on crude oil viscosity and wax appearance temperature (the temperature at which the first crystal of wax starts to deposit from crude oil). During this work, the performance of some wax inhibitors such as acetone, copolymer + acrylated monomers coded W804, and copolymer + acrylated monomers coded W805 was evaluated to determine their effects on the crude oil rheology, using the programmable rheometer rig at gradient temperatures 55 to 0°C and shear rate 120 1/s. The synergy of using mixtures of such chemical inhibitors has been examined by adding 250, 500, 1000, 1500 and 2000 ppm of the mixtures of inhibitors to the crude oil. The first mixture includes acetone with copolymer + acrylated monomers (W804), and the second mixture includes acetone with copolymer + acrylated monomers (W805). These mixtures work well compared to their original components. The wax appearance temperature of the used crude oil in this study without inhibitors is 30°C. The first mixture of inhibitors reduced the wax appearance temperature of oil to 25.2, 24, 18.4, 16.8, and 15.4°C, at concentrations 250, 500, 1000, 1500 and 2000 ppm, respectively. While, the second mixture of inhibitors reduced wax appearance temperature of the crude oil to 24.3, 21.7, 16.7, 15.3 and 14.2°C, at concentrations 250, 500, 1000, 1500 and 2000 ppm, respectively. This blend of the inhibitory properties and significant reduction in wax appearance temperature and oil viscosity provides a unique contribution in wax elimination methods.

Recent Publications:

1. Theyab M A and Yahya S Y (2018) Introduction to wax deposition. International Journal of Petrochemistry and Research 2(1):126–131.
2. Theyab M A (2018) Severe slugging control: simulation of real case study. Journal of Environmental Research 2(1):1–9.
3. Theyab M A (2018) Wax deposition process: mechanisms, affecting factors and mitigation methods. Open Access Journal of Science 2(2):112–118.
4. Theyab M A (2018) Fluid flow assurance issues: literature review. SciFed Journal of Petroleum 2(1):1–11.
5. Theyab M A and Diaz P (2017) An experimental and simulation study of wax deposition in hydrocarbon pipeline. Global Journal of Engineering Science and Researches 4(7):27–40.

Biography

Muhammad Ali Theyab has completed his PhD in Chemical, Process and Energy Engineering, MSc in Petroleum Engineering from London South Bank University, and BSc in Chemical Engineering from Tikrit University/Iraq. He is employed at the Iraqi Ministry of Higher Education and Scientific Research. His research interests include fluid flow assurance-wax deposition and enhanced oil recovery. He has authored several technical papers and is a Member of SPE.

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