

Light crude oil rheology under chemical solvents treatment

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Abstract. This work attempts to study the rheological behavior of Algerian light crude oil from Hassi-Messaoud field with and without chemical solvents in order to improve the flow characteristics. Using the rheometer AR2000, an experimental investigation was conducted to measure the rheological properties via flow test and dynamic mode (oscillation) at various temperatures. Several factors such as temperature (20, 30, and 45 °C), shear rate (between 0.01 and 700 s⁻¹), and solvent concentration (between 2 and 6% of toluene, naphtha, and kerosene) on the rheological parameters have all been studied for this purpose. The statistical parameter standard error (SE) provided justification for the experimental validation of the Herschel-Bulkley model. The results of the flow test showed that these solvents had a significant impact on the flow characteristics of light crude oil at various temperatures, with toluene being the most effective. The viscoelastic properties of crude oil were shown to be considerably influenced by temperature and solvent type, as demonstrated by the dynamic mode study that identified the complex modulus (G^*), elastic modulus (G'), and viscous modulus (G'').

Keywords: light crude oil; rheology; solvents; temperature; viscosity; viscoelastic behavior.

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