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**Chemical Engineering Thermodynamics****Viscosity profile prediction of a heavy crude oil during lifting in two deep artesian wells<sup>☆</sup>**

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**Abstract:**

It has been known that the productivity of artesian wells is strongly dependent on the rheological properties of crude oils. This work targets two deep artesian wells (>5000m) that are producing heavy crude oil. The impacts of well conditions including temperature, pressure and shear rate, on the crude oil rheology were comprehensively investigated and correlated using several empirical rheological models. The experimental data indicate that this heavy oil is very sensitive to temperature as result of microstructure change caused by hydrogen bonding. The rheological behavior of the heavy oil is also significantly impacted by the imposed pressure, *i.e.*, the viscosity flow activation energy ( $E_{\mu}$ ) gently increases with the increasing pressure. The viscosity-shear rate data are well fitted to the power law model at low temperature. However, due to the transition of fluid feature at high temperature (Newtonian fluid), the measured viscosity was found to slightly deviate from the fitting data. Combining the evaluated correlations, the viscosity profile of the heavy crude oil in these two deep artesian wells as a function of well depth was predicted using the oilfield producing data.

**Keywords:** Heavy oil; Rheological properties; Empirical correlation; Viscosity

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