The Viscosity of Squalane Revisited - An Updated Reference Model

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Squalane ($C_{30}H_{62}$; 2,6,10,15,19,23-hexamethyltetracosane), a pure fluid, has been identified as a reference fluid suitable for the calibration of laboratory viscometers and as a reference fluid in the field of elastohydrodynamic lubrication (EHL). Based on an exhaustive review of literature data, new experimental measurements, and a novel regression technique, a reference model was proposed by Schmidt et al. in 2014. The proposed model was valid in the ranges of pressure and temperature sufficient for conditions found in the petroleum industry. However, the model was insufficient for ultra-high pressure seen in the tribology industry. An extension was developed in a pragmatic way to extend the pressure limitation of the original model. The extension accurately modelled the viscosity data at the ultra-high pressure conditions; however the extension did not have smooth derivatives. To resolve the inadequacy of the extended model, two models, the Improved Yasutomi Correlation and a new hybrid viscosity model have been used to correlate all of the available viscosity data in the open literature. The viscosity data and the developed models will be discussed in the context of the Stickel functions of temperature and pressure. The results offer a comprehensive correlation of the pressure (0.1 – 1350 MPa) and temperature dependence (169.5 – 473.1 K) of the low-shear viscosity of squalane.