Undersaturated oil viscosity correlation for adverse conditions

Bergman, D.F. America United States
Sutton, R.P. Marathon Oil Company, United States


Abstract
The determination of viscosity is required for evaluation of the pressure drop resulting from flow through porous media, tubing or pipelines. Viscosity is a necessary property to ascertain well productivity or to properly size tubing, pipelines and pumps. Numerous methods exist to estimate viscosity for computer calculations. Oils encountered in deep water environments are often highly undersaturated - in some cases in excess of 15,000 psi. For transport, the dead oil must be pumped in an environment with temperatures as low as 35°F. At this temperature, the dead oil atmospheric viscosity can be in excess of 500 cp. The pressure required to pump oil through pipelines from deep water can exceed 3000 psi at the pump on the platform and over 5000 psi at the sea floor. The pressure effect on viscosity results in a significant additional increase in this property which can adversely affect pipeline performance. The existing methods for estimating undersaturated viscosity were not developed using data that encompasses the pressure or viscosity range that are currently encountered by the industry. A large database comprised of 1,399 oils and 10,248 data points was constructed to evaluate the accuracy of existing correlation methods. Pressure differentials up to 25,000 psi and viscosity in excess of 1000 cp are included in the database to ensure that viscosity at both typical conditions and the extreme conditions encountered in deep water are represented. The existing methods are shown to be inadequate over this wide range of conditions. A new method was developed that offers improved accuracy and consistency over the expanded range of viscosity and pressure differential. Copyright 2006, Society of Petroleum Engineers.

Indexed keywords
Atmospheric viscosity; Deep water; Viscosity correlation; Viscosity pressure

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