



PERA - Petroleum Engineering Research Analysis

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**Black Oil Tables**

PERA also developed a simplified PVT description from its EOS model for use in engineering calculations. These data include tables of density, viscosity, and phase amounts for the entire range of pressures and temperatures experienced from reservoir to surface conditions.

Other forms of PVT tables were also created from the EOS model – so-called “black-oil” tables. The black-oil quantities not only define the density, viscosity, and phase amount at any pressure and temperature, but they also quantify total shrinkage to stock-tank oil volume. Calculation of a black-oil table requires the definition of the path which the reservoir fluid takes from initial reservoir to stock-tank (surface) conditions – the so-called “surface process”.

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- The Zick EOS uses 11 components, with six being lumped pseudocomponents. The PERA model uses 40 components with one being a lumped pseudocomponent (C<sub>6+</sub>).
- Some methane-C<sub>n</sub> binary interaction parameters (BIPs) in the PERA model are temperature-dependent. In the Zick model, all BIPs are constant.
- Most hydrocarbon-hydrocarbon BIPs were assigned non-zero values in the PERA model, while only methane-hydrocarbon BIPs were assigned non-zero values in the Zick model.
- In the PERA model, slight adjustments were made to the four laboratory-reported compositions to develop a consistent, single EOS model, including the complex near-critical phase and volumetric behavior of all four samples. In the Zick model, only the composition of the SLB-118 fluid was adjusted, with the changes being considerably larger for methane and C<sub>30+</sub>, compared with changes required for the PERA model.

<sup>1</sup> Equation of State Fluid Characterization and Analysis of the Macindoo Reservoir Fluids<sup>1</sup>. Expert Report prepared on behalf of the United States. Aaron A. Zick, March 22, 2013.

Macindoo PVT Model Study (May 1, 2013) 18

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