Matching EoS to Measured PVT Data of Gas Condensate Reservoirs

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Abstract

Equations of State (EoS) are simple mathematical models that describe the pressure /volume /temperature (PVT) behaviour of reservoir fluids under both in-situ and surface conditions. Many reservoir-engineering applications such as enhanced oil recovery, gas injection processes and modelling of depletion of gas and condensate reservoirs rely on using EoS to compute fluid properties under different thermodynamic conditions. However, it is generally observed that these correlations lack accuracy when compared to experimental data. This lack of predictive capability can be related to several factors such as inaccurate and insufficient C7+ characterization, complex chemistry of fluid and the uncertainties associated with the compositional data analysis due to measurements and samplings errors.

Hence, tuning EoS is critical to obtain reliable fluid characterizations. Usually this is done by modifying certain parameters in the correlations and using regression approaches to fit experimental data.

This work shows how EoS characterization can be improved to match laboratory PVT data for a number of selected samples of gas condensate reservoir from offshore Carnarvon Basin in Western Australia. The study will cover the essential steps and procedures followed to modify EoS. We further propose to test the following parameters against the predictive capability of EoS:

- Selection of EoS
- Splitting the plus fractions
- Modifying properties of plus fractions (i.e. ω, Pc, Tc)
- Modifying the binary interaction parameters (BIP's) between methane and C7+ and non-hydrocarbon and C7+ fractions.

A poor match from EoS with reservoir fluid properties will have deteriorating effects on reservoir modelling results where compositional simulation is needed. Predicting accurate fluid properties of gas condensate reservoirs is crucial in simulating the depletion of such reservoirs and thus predicting true reservoir recovery. This study will provide approaches and insights on tuning EoS to achieve reliable outcomes for modelling of gas condensates reservoirs.