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Phase Behavior Modelling of Libyan Near-Critical Gas-Condensate Field

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Abstract : Fluid properties in states near a vapor-liquid critical region are the most difficult to measure and to predict with EoS models. The principal model difficulty is that near-critical property variations do not follow the same mathematics as at conditions far away from the critical region. Libyan NC98 field in Sirte basin is a typical example of near critical fluid characterized by high initial condensate gas ratio (CGR) greater than 160 bbl/MMscf and maximum liquid drop-out of 25%. The objective of this paper is to model NC98 phase behavior with the proper selection of EoS parameters and also to model reservoir depletion versus gas cycling option using measured PVT data and EoS Models. The outcomes of our study revealed that, for accurate gas and condensate recovery forecast during depletion, the most important PVT data to match are the gas phase Z-factor and C7+ fraction as functions of pressure. Reasonable match, within -3% error, was achieved for ultimate condensate recovery at abandonment pressure of 1500 psia. The smooth transition from gas-condensate to volatile oil was fairly simulated by the tuned PR-EoS. The predicted GOC was approximately at 14,380 ftss. The optimum gas cycling scheme, in order to maximize condensate recovery, should not be performed at pressures less than 5700 psia. The contribution of condensate vaporization for such field is marginal, within 8% to 14%, compared to gas-gas miscible displacement. Therefore, it is always recommended, if gas recycle scheme to be considered for this field, to start it at the early stage of field development.

Keywords : EoS models, gas-condensate, gas cycling, near critical fluid
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