PVT Phase Behaviour Studies on Natural Gas Condensate Fluids – What Accuracies, What Price, What Cost?

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We present experimental measurements and modeling results for three natural gas fluids: a lean gas at reservoir conditions; a rich gas around sub-sea pipeline conditions; and a processed gas from a gas processing facility, around on-shore high pressure pipeline conditions. All fluids are sourced from the North West Shelf fields, offshore Western Australia.

The PVT measurements (constant composition expansion, constant volume depletion, liquid dropout, liquid density, phase boundary location, cricondentherm determination,) were conducted in a large (4.5 liter) cell, optimized for the study of gas condensates. While the cell is primarily designed for industry applications rather than scientific studies, nonetheless we have quantified the accuracy and reproducibility of results in this cell using the above fluids and we contrast our capabilities with standard commercial approaches, procedures and equipment.

The PVT cell was designed for optimal visual access to the sample space and we present some video footage of the measurements and fluid behaviour.

The fluid behavior has been modeled using a number of equations of state, and the modeling results compared to the experimental measurements. Additionally, for the third fluid, acoustic measurements have been made in the one-phase and two-phase regions. (These are described in a companion paper at this Symposium.)

Finally, the economic implications of these p-V-T studies (both the results and their uncertainties) are assessed in an industry context.