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A Method for Predicting the Phase Behaviour of Trinidad Gas Condensates

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Abstract: *Gas condensate compositional simulation studies are conducted to evaluate gas and condensate reserves. This is carried out when making comparisons of production methods for the economic development of a reservoir. The experimental data needed for the evaluation are dew point pressure, gas compressibility factor (z factor)), liquid volume and produced gas (Constant Volume Depletion, CVD data) and are nowadays determined from a tuned Equation of State (EOS). However the open literature has shown that there is no consistency in the number of Single Carbon Number (SCN) groups, EOS tuning parameters, lumping schemes and weight factors applied to the experimental when tuning an EOS for use in compositional simulation studies, particularly for gas condensate fluids. Publications have shown that the two most widely used sets of parameters from the EOS that are tuned are the Binary Interaction Coefficient (BIC) with the critical properties and acentric factor or BIC and the EOS coefficients called the omegas (Ωs). The number of SCN groups used for tuning varies from ten to more than forty. However, there are currently no criteria for selecting the most reliable lumping scheme that will give similar accuracy to using the many SCN groups except by trial and error or by algorithms designed to test a number of schemes and from which the best one is selected. In this paper, the Peng-Robinson EOS has been tuned and tested to predict CVD data for six Trinidad gas condensate samples. Compositional analysis greater than Single Carbon Number 24 (SCN24) is required for the SCN route. The two sets of tuning parameters were used with and without the volume shift parameter (VSP). Our parametric study demonstrated that the VSP should not be applied with the Ωs when tuning the Peng-Robinson EOS. With weight factors of 1 for liquid volume, 10 for gas compressibility factor and without the VSP, the Ωs give better prediction of CVD data than the critical properties and acentric factor even with the VSP included. The SCN groups for one sample were lumped into six Multiple Carbon Number (MCN) groups using the simple Whitson's lumping scheme. Our tuning technique with the Ωs and with our new weight factors for the experimental data, gave differences of less than ±4.0 % from the tuned EOS predictions before and after lumping of the SCN group so that complex algorithms are not necessary to select an appropriate lumping scheme to reduce cost and computer time when performing simulation studies. The tuning technique with only one regression step, showed consistency in tuning the Peng-Robinson EOS with the Ωs and could be used for simulation studies of Trinidad gas condensate systems.*

Keywords: *Gas Condensate, Equation of State, tuning parameters, weight factors, Trinidad*