Effect of Knowledge of Bubble Point Pressure on Estimating PVT Properties from Correlations

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Abstract : PVT properties are needed as input data in all reservoir, production, and surface facilities engineering calculations. In the absence of PVT reports on valid reservoir fluid samples, engineers rely on PVT correlations to generate the required PVT data. The accuracy of PVT correlations varies, and no correlation group has been found to provide accurate results for all oil types. The effect of inaccurate PVT data can be significant in engineering calculations and is well documented in the literature. Bubble point pressure can sometimes be obtained from external sources. In this paper, we show how to utilize the known bubble point pressure to improve the accuracy of calculated PVT properties from correlations. We conducted a systematic study using around 250 reservoir oil samples to quantify the effect of pre-knowledge of bubble point pressure. The samples spanned a wide range of oils, from very volatile oils to black oils and all the way to low-GOR oils. A method for shifting both undersaturated and saturated sections of the PVT properties curves to the correct bubble point is explained. Seven PVT correlation families were used in this study. All PVT properties (e.g., solution gas-oil ratio, formation volume factor, density, viscosity, and compressibility) were calculated using the correct bubble point pressure and the correlation estimated bubble point pressure. Comparisons between the calculated PVT properties and actual laboratory-measured values were made. It was found that pre-knowledge of bubble point pressure and using the shifting technique presented in the paper improved the correlation-estimated values by 10% to more than 30%. The most improvement was seen in the solution gas-oil ratio and formation volume factor.

Keywords : PVT data, PVT properties, PVT correlations, bubble point pressure
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