Forecasting Gas Compressibility Factor Using Artificial Neural Network Tool for Niger-Delta Gas Reservoir

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DOI
http://dx.doi.org/10.2118/184382-MS
Document ID
SPE-184382-MS
Publisher
Society of Petroleum Engineers
Source
SPE Nigeria Annual International Conference and Exhibition, 2-4 August, Lagos, Nigeria
Publication Date
2016

Abstract

Accurate prediction of gas compressibility factor is important in engineering applications such as gas metering, pipeline design, reserves estimation, gas flow rate, and material balance calculations. This factor also is important in calculating gas properties such as gas formation volume factor, gas isothermal compressibility, viscosity and density. Compressibility factor value shows how much the real gas deviates from the ideal gas at a given pressure and temperature. Most often, compressibility factor values can be determined experimentally from collected laboratory samples but frequently this measurement is not always available. In such cases, the natural gas property can be determined using empirical correlations or iteratively using equation of state (EOS). Therefore, the aim of this work is to develop ANN model to accurately predict the gas compressibility factor; as well to compare its performance with existing empirical gas compressibility factor correlations. The new model was developed using 513 PVT data points obtained from Niger-Delta region of Nigeria. The data used wasrandomly divided into three parts, of which 60% was used for training, 20% for

validation, and 20% for testing. Both quantitative and qualitative assessments were employed to evaluate the accuracy of the new model to the existing empirical correlations. The ANN model performed better than the existing empirical correlations by the statistical parameters used having the lowest rank of 1.37 and better performance plot.

File Size 697 KB **Number of Pages** 11

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