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Please fill in your manuscript title.	Predictive Model and Sensitivity Analysis in Describing Miscible CO2 Flooding Performance: Dual Benefits on the Utilization of Artificial Neural Network Validated from PVT Analysis Results

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Objectives/Scope:
Many developments of the predictive models on miscible CO2 flooding performance have been done for more than three decades. One of them is on the use of artificial neural network.

Methods, Procedures, Process: Careful choosing the reliable reservoir model including the crude oil composition within the range values of parameters following several enhanced oil recovery (EOR) screening criteria made on the decision on the use of oil composition of Wasson Field in USA under homogeneous sandstone reservoir as the starting point. The crude oil physical properties are analyzed through a commercial PVT simulator to get the viscosity correlation and MMP values on the combination three values (minimum, median, and maximum value) of C5 to C30 mole fraction, reservoir temperature and pressure.

Results, Observations, Conclusions:
These results are indirectly manifested in the reservoir depth that will dictate the maximum BHP injection, as the input of a commercial reservoir simulation and sensitivity analysis tool beside of other static homogeneous reservoir rock properties such as porosity and permeability. Total input parameters are 18, combining all of the possible affecting factors in miscible CO2 flooding performance with three values of each parameter dividing into 27 different simulation jobs, and also two total output parameters i.e. oil recovery factor (RF) and total volume of injected gas (GI). The building of neural network is based on the sensitivity analysis of synthetic reservoir simulation models through careful choosing on the transfer/activation function, number of hidden layer(s) and of neurons, and other optimization parameters such as learning rate (LR) and momentum constant (MC). It is optimized until reaching the minimum root mean square (RMSE) and/or the highest correlation coefficient (R2). The optimized weight and bias of each neuron in each hidden layer are the constant coefficients for building the linear correlation of related input-output parameters through certain activation/transfer function so that this correlation is the predictive model of this EOR method.

Novel/Additive Information:
Based on the weight distribution of first hidden layer, the proposed method on the analysis of the most important parameter are taking out and validated through PVT analysis results. However, this method is still under indirect qualitative analysis.