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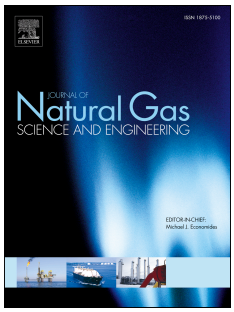

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Assessment of total oil Production in gas-lift process of wells using Box-Behnken design of experiments in comparison with traditional approach

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Abstract

Artificial gas lift is a primary enhanced oil recovery technique, in which gas is injected into the oil wells to pump out the oil in the tubing. Pumping gas is an expensive process, therefore the total gas used in gas lift is limited by daily availability constraints. Assessment of gas lift operations can be performed using mathematical methods, which are complex and cannot determine the best well for gas lift injection. In this paper the Box–Behnken experimental designis used for assessment of a gas lift well network production and the results of this method are compared to classic methods in which the type of the response function is known. This model uses statistical methods to generate a mathematical model for gas lift operation.

The results show that Box-Behnken method leads to an average error of 1.35 % by using 15 data and a ten-term polynomial equation while the mathematical model leads to an error of 0.09 % using 60 experimental data and a thirty-term polynomial equation. In other words implementing design of experiments could be relied upon as a rapid and elementary method for estimation of production rate in a gas lift operation, due to its simplicity and requiring only few numbers of experiments. This model can also determine the impact of each well on total oil production, which is of great importance in gas lift operations especially when gas injection is limited. Although in this method we left out the interaction effects between the wells, it can be used for initial estimation of assessment of gas lift wells.

Key Words: Box-Behnken Design, Design of Experiments, Gas Lift, Mathematical Modeling

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