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Numerical Simulation Study of Water Flooding Process before Implementing Gas-EOR Applications in Consolidated Porous Media

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The two-phase displacement in porous media is significant for water flooding "WF" process due to improving oil recovery. EOR methods are then used, and these strongly depend on the reservoir conditions and properties. Based on EOR applications, gas injection has been the second common method in petroleum industry to increase oil recovery. Numerical model for immiscible two-phase flow in three dimensions in porous media and the solution of this model are studied. Porous media in this paper is assumed homogenous porous media. Brine is an aqueous phase which is mimicked Saudi formation brine. Synthetic oil and medium crude oil are used as oleic phase. The effect of pressure, temperature and crude oils factors on WF process has been investigated using commercial software. In order to increase oil recovery after WF process, several techniques in gas injection have been studied, these can be miscibility levels and injection schemes 'Continuous Gas Injection 'CGI', Water Alternating Gas Injection 'WAG' and Simultaneous Water and Gas Injection, 'SWAG'. Solution of numerical model is approved using two methods which are namely Implicit Pressure and Explicit Saturation method and Implicit Pressure and Implicit Saturation. In WF process, oil recovery increases with decreasing the injection pressure due to delay the breakthrough of displacing fluid. Oil recovery for high API is more than oil recovery for medium API because the viscosity ratio between displaced and displacing fluid for high API case is almost equal one so the displacement is piston-like. For miscibility factor, fully miscible CGI has highest oil recovery rather than immiscible and near miscible CGIs. SWAG scheme has more oil recovery comparing with WAG injection as well as CGI. Gas injection in secondary stage is more achievable rather than gas injection in tertiary stage in order to improve macroscopic and microscopic movements between displacing and displaced fluid.

Biography

Ali AlNetaifi is an Assistant Professor at King Saud University, Saudi Arabia