Mathematical Modeling of Enhanced Oil Recovery Using Immiscible Water Alternating Gas (IWAG) Process

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Abstract

The main objective of the current study was to investigate application of Immiscible Water Alternating Gas (IWAG) method in Enhanced Oil Recovery (EOR) process. In order to have a better understanding of the process, water injection as well as immiscible gas injection processes should be separately studied. Black Oil Model (BOM) was employed to reach the final equations required for estimation of pressure and saturation domains. By solving these equations all the reservoir parameters can be determined. The governing equations were discretised using Finite Volume Method (FVM). Implicit Pressure–Explicit Saturation (IMPES) formula was employed to solve the equations. Application of the EOR process was studied simulating a case study by way of the IWAG method. The system equations were solved and related codes were written to simulate the process. Simulation results were compared to those obtained from commercial software CMG. The results confirm a higher oil recovery in IWAG technique when compared to waterflooding and immiscible gas injection processes one by one.

Keywords: Reservoir, Modeling, EOR, IWAG

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A Laboratory Study of Immiscible Hot WAG Injection in a Fractured Model

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Abstract

There are different techniques in order to enhanced oil recovery in the reservoirs and water alternative gas injection is an effective method for enhanced oil recovery. In this method slug of gas and water were injected into the reservoirs alternatively. The WAG process has been proved effective in providing mobility control for horizontal gas floods, as demonstrated by many field applications, most of them aimed at reaching miscibility between injected gas and the reservoir fluid. Immiscible WAG (IWAG), on the other hand, has a smaller record of field experience. The development of the Water-Alternating-Gas (WAG) process was aimed at improving flood profile control. The higher microscopic displacement efficiency of gas combined with the better macroscopic sweep efficiency of water significantly increases the incremental oil production over a plain water flood. This study deals with a new hot water alternative hot carbon dioxide injection as an EOR technique in a fractured sand pack and also compare it to the other current EOR methods. Hot water alternative hot carbon dioxide was used for the first time in this research and the results show that this method was more effective than other EOR methods.

Keywords: EOR, Fractured sand pack, Immiscible Hot WAG Injection, Soaking