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Master Thesis Defense

Entitled

THE EFFECT OF CARBONATE ROCK WETTABILITY ON THE PERFORMANCE OF LOW SALINITY FLOODING: AN EXPERIMENTAL APPROACH.

by

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Date & Venue

3 pm

Sunday 15 November 2020

Microsoft Teams

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Abstract

The performance of low salinity flooding in different wettability environment is still unclear for the oil industry. The concessions among researchers is that low salinity does not work in water-wet carbonate oil reservoirs. In this project carbonate core flooding experiments on cores with different wettability's conditions, including water wet, oil wet, and intermediate wettability were performed at reservoir conditions of pressure and temperature. Seawater was selected as a base water and its concentration & composition were modified through dilution and/or spiking with sulfate. The base water was diluted with water 10 and 50 times and spiked with sulfate to 2 and 4 times its initial sulfate concentration. The displacement efficiencies of single water and sequential flooding employing three to four different waters were measured for different wettability environments. Results indicated that the optimum low salinity water is a function of the system wettability. The optimum brines for water-wet, oil-wet, and intermediate wettability systems are SW/10 (5700 PPM), SW (57000), and SW/50 (1140 ppm) respectively. The injection of very low salinity water (SW/50) in intermediate wettability environment displayed the heights displacement efficiency among the single brines employed in different wettability environments. Results also indicated that the performance of low salinity process in different wettability environments is strongly dependent on the dominant mechanism for the studied system, and there is no unique conclusion can be drawn regarding workability of LSWF for specific carbonate rock wettability system. Five different sequential brine flooding were performed employing carbonate rocks with different wettability environment. Sequential flooding IV which consist of seawater flowed by gradually diluted seawater in water-wet system displayed the height displacement efficiency. In general, all employed sequential brine injections performed better in water-wet environment except for sequential III, which consists of very low salinity (≈ 1000) flooding followed by the same water spiked by 2 and 6 times.

Keywords: Low-Salinity, Wettability alteration, Modified Water, Core Flooding, sequential flooding.