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*EXPERIMENTAL STUDY OF LOW SALINITY WATER FLOODING AND FRACTURING EFFECTS IN
LOW PERMEABILITY CARBONATE RESERVOIR*

by

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Abstract

In past decades, there were numerous research works demonstrated that salinity alteration of injected water could enhance the oil recovery. Low salinity water (LSW) injection is a type of Enhanced Oil Recovery (EOR) method which attracts the industrial and researchers because of its simplicity to use the implications, environment-friendly nature, and less cost. In addition to, hydraulic fracturing, also known as hydraulic stimulation, is another EOR method that improves hydrocarbon flow by creating fractures in the Low Permeability Formation (LPF) that connects the reservoir and wellbore. Fractures will increase the permeability of reservoir and give the flow path for hydrocarbon to be produced. The main objective of this study is to compare between low salinity injection and fracturing as a recovery technique for LPF. The LSW flooding tests conducted, with several salinity concentrations (157,662, 72,927, 62,522, 6,252 and 1,250 ppm), in both artificially fractured and non-fractured carbonate cores that filled with crude oil. The properties of injected water and its dilutions (LSW) have been thoroughly investigated in the laboratory. The crude oil and low permeability chalky limestone core samples (permeability ranges from 0.01 - 1.2 millidarcy) were selected from oil fields in the United Arab Emirates (UAE). The experiment shows that seawater (SW) diluted ten times (6,252 ppm) is the optimum salinity in enhancing the oil recovery for selected reservoir condition. Additional oil recoveries for SW and SW diluted ten times are 4.9% and 12.7% respectively. On the other hand, the fractured system produced up to 7.4% incremental oil recovery more than the non-fractured system. Moreover, a combination of fracturing and LSW (6,252 ppm) improved the best recovery by 17.7% of remaining oil in place over the formation brine injection. Fines migration and dissolution that may lead to wettability alteration were investigated as the reason behind LSW flooding. Results of this study could be used as an additional reference in selecting most efficient EOR method that could be applied by the UAE and worldwide companies to enhance oil recovery for low permeability carbonate reservoir.

Keywords: Enhance oil recovery, low permeability carbonate reservoir, low salinity waterflooding, fracturing.