Hazim H Al-Attar et al., J Pet Environ Biotechnol 2014, 5:4
http://dx.doi.org/10.4172/2157-7463.S1.008

OMICS Group Conferences
Accelerating Scientific Discovery

2nd World Congress on
Petrochemistry and Chemical Engineering
October 27-29, 2014 Embassy Suites Las Vegas, USA

# Low salinity flooding in a selected carbonate reservoir: Experimental approach

**Hazim H Al-Attar, Mohamed Y Mahmoud, Abdulrazag Y Zekri, Reyadh Almehaideb and Mamdouh Ghannam**
United Arab Emirates University, UAE

Low-salinity water flooding has been used to improve oil recovery for many decades. Several theories regarding the mechanism of low salinity flooding have been discussed in the literature including interfacial tension reduction, wettability alteration, change in pH value, emulsion formation, and clay migration. This work presents the results of flooding tests on selected carbonate core samples taken from Bu Hasa field in Abu Dhabi using sea water and two field injection waters, Um-Eradhuma (UER) at 197,357 ppm and Simsima (SIM) at 243,155 ppm. These results were used to evaluate the effects of brine salinity and ionic composition on the possible interactions of limestone rock/ brine/ and oil system and to identify the oil recovery mechanism. The field injection waters were diluted to salinities of 5,000 and 1,000 ppm and the optimum salinity was determined and then modified by varying the sulfate and calcium ion concentrations. Wettability alteration was determined by contact angle measurements. Interfacial tension measurements of the studied systems were also performed in an attempt to evaluate the flow mechanism with low salinity flooding.

The experimental results revealed that a significant improvement in the oil recovery can be achieved through alteration of the injection water salinity. Reducing the salinity of UER water from 197,357 ppm to 5,000 ppm resulted in an improvement of oil recovery from 63% to 84.5% of OOIP and the latter salinity was used to evaluate the impact of changing the sulfate and calcium ion concentrations on oil recovery. Results also indicated that sulfate concentration has a significant effect on the flooding process and that increasing the sulfate concentration beyond some optimum concentration of 46.8 ppm resulted in a negative effect on the flooding process. Contact angle measurements indicated that lowering the solution salinity could shift the wettability of the system towards intermediate wettability levels and that the UER water exhibits higher shift toward intermediate wettability compared to other waters. Results also indicated that there is no clear correlation between the improvements in oil recovery and interfacial tension and the pH of the studied systems. The results of this work are useful for people working in this field.

hazim.alattar@uaeu.ac.ae