

Improved Oil Recovery by Surfactant Flooding & Economic Modelling

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Various enhanced oil recovery methods including miscible gas injection, chemical, thermal and other methods are applied at the third phase of production after the primary and secondary recovery have been exhausted. Surfactant flooding is one of the chemical methods that is capable of recovering more oil by decreasing the IFT and/or wettability alteration. This objective of this work is to assess and select a design from various development options by means of a series of flooding sensitivity calculations that have been carried out to find the additional recovery using surfactant flooding, and by optimizing technical and economic parameters. This study has focused on the development of a method to test the economic viability of Enhanced Oil Recovery (EOR) where the challenge is to compare surfactant flooding scenarios with waterflooding, but not just based on incremental recovery using reservoir simulation calculations. Development options were used, include continuous surfactant injection, secondary surfactant flooding, and tertiary surfactant flooding and the effect of injection rate, surfactant concentration and slug size. The method was developed to address surfactant flooding, but it can be modified to suit other EOR methods. The method has been applied to a synthetic scenario with constant economic parameters, which has demonstrated the impact that oil price can have on the decision-making process. Results of the study reveal a general trend of increased oil recovery with the implementation of surfactant flooding over waterflooding in the range of 0.3 - 7%. In the continuous surfactant injection, the highest field oil efficiency of about 52% was achieved using surfactant concentration of 30 lb/stb at 2000 stb/d. The optimum development process from the technical and economic point of view is injecting 0.25 PV of surfactant as a tertiary recovery process using 25 lb/stb of surfactant and 2000 stb/d as an injection rate. The selected system yields an oil recovery of 48.91%. The outcomes of this project are expected to assist the oil industry in planning surfactant flooding for heterogeneous reservoirs; which is the case of most reservoirs in UAE.

Keywords: Enhanced oil recovery, surfactant flooding, continuous surfactant injection, field oil efficiency, and tertiary recovery.

Biography:

Dr. Gamal Alusta received his B.Sc. degree from Tripoli University-Libya 1994, MPhil, and Ph.D. degrees from the Heriot Watt University-UK. Dr. Gamal A. Alusta obtained his B.Sc., MPhil & PhD all in petroleum engineering. Dr. Alusta worked for Repsol (Akakus) oil operations-Libya, as a Senior Reservoir Engineering from August 3rd 1997 to March 5th 2008, where He also spent some time in the Drilling and Workover departments. He worked closely with Geoscientists, Drilling engineers and Production engineers to perform various activities both in the office and on-site. He also worked as a Petroleum Engineer at Woodside Energy North Africa in Libya from March 11th –Sep. 25th 2008. Currently He is working as Program Director for the Master of Petroleum Engineering and an Assistant Professor in Petroleum Engineering at United Arab Emirates University, UAE since Feb. 2014. This involves teaching various undergraduate and graduate courses in petroleum engineering and related areas. He has edited and refereed technical papers in widely respected journals. Dr. Alusta has completed a number of research projects in the area of EOR to International Petroleum Industries.