**Simulation of Polymer –Alkaline and Low Salinity Water Flooding in Naturally Oil Fractured Reservoirs**

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**Abstract**

The world's proven oil reserves are gradually declining due to increased production and fewer new fields being discovered that led to the enhancing oil recovery from existing fields has gained attention in recent years. Low salinity waterflooding is currently being explored for the tertiary recovery phase, while it has long been used for the secondary recovery phase. Furthermore, chemical flooding has proven a successful enhanced oil recovery technique, especially when chemical costs have decreased in relation to oil prices. Chemical flooding and low salinity flooding methods have both been successfully tested in various field and laboratory investigations. Additionally, studies have looked into how sensitive chemical flooding is to salinity, with both positive and negative results. In this study, a robust mathematical multiphase fluid flow model for simulating the low salinity/chemical flooding in naturally fractured reservoirs in a three dimensions space is presented. The model is based on the finite element technique in a poro-elastic framework using the FORTRAN language. 3-D permeability tensors are calculated for the subsurface fractures using boundary element technique.

This study presents a full investigation of various flooding techniques in naturally fractured oil reservoirs, particularly low salinity water flooding and its combination with chemical flooding techniques, including alkaline flooding, polymer flooding, and alkaline -polymer (AP) flooding.

Key findings reveal that the low salinity effect significantly aids in altering wettability from oil-wet to water-wet states. Although the positive influence of low salinity during initial flooding phases was noted, it does not drastically differ in terms of overall recovery. The presence of low salinity in chemical solutions notably enhances oil recovery across all combinations, primarily through increased viscosity of polymer solutions, enhancing sweep efficiency. Further optimization of salinity conditions in alkaline is crucial for minimizing interfacial tension (IFT). The results indicate that the advantages of low salinity extend to tertiary water flooding as well, confirming its efficacy over high salinity alternatives.