Comparative Study of IOR Scenarios Applied to Heavy Oil Reservoirs: WAS, SWAS and Solvent-soak

To date, there is no proven recovery technique that can be successfully applied to the heavy oil reserves. Recently, solvent injection is introduced as an attractive method for such reservoirs. However, a little work has been addressed to compare the efficiency of different injection schemes: water and solvent injection either simultaneously or alternatively and solvent-soak. In this work a series of solvent and water injection processes are conducted on horizontal $\theta$-spot glass micromodels which are initially saturated with the heavy oil under several fixed flow rate constraint. A digital camera was used and the successive images of solvent into heavy oil were recorded on a PC. The oil recovery factor was measured from analysis of provided pictures. Two sandstone patterns etched on glass and three network patterns with different pores structure have been used. The results confirm that the ultimate oil recovery of WAS scheme is higher than the SWAS scheme and the solvent-soak scheme stands at a higher position than both. In addition, the WAS scheme shows more recovery in comparing with the continuously solvent injection scheme at the same solvent consumption. In addition a validated simulation model via laboratory data was provided to carry out sensitivity analysis of different parameters which are expensive and difficult to perform on experimental setup. Good agreement observed between simulation results and experimental data. This work illustrates that the glass micromodel may successfully be used for studying new IOR/EOR techniques applied on heavy oil reservoirs.

Keywords: IOR, Heavy Oil, WAS, SWAS, Solvent-soak, Micromodel
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