

## **An Experimental Investigation of Chemical Enhanced Oil Recovery (Ceor) for Fractured Carbonate Reservoirs, Case Study: Kais Formation on Wakamuk Field**

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**Abstract :** About half of the world oil reserves are located in carbonate reservoirs, where 65% of the total carbonate reservoirs are oil wet and 12% intermediate wet [1]. Oil recovery in oil wet or mixed wet carbonate reservoirs can be increased by dissolving surfactant to injected water to change the rock wettability from oil wet to more water wet. The Wakamuk Field operated by PetroChina International (Bermuda) Ltd. and PT. Pertamina EP in Papua, produces from main reservoir of Miocene Kais Limestone. First production commenced on August, 2004 and the peak field production of 1456 BOPD occurred in August, 2010. It was found that is a complex reservoir system and until 2014 cumulative oil production was 2.07 MMBO, less than 9% of OOIP. This performance is indicative of presence of secondary porosity, other than matrix porosity which is of low average porosity 13% and permeability less than 7 mD. Implementing chemical EOR in this case is the best way to increase oil production. However, the selected chemical must be able to lower the interfacial tension (IFT), reduce oil viscosity, and alter the wettability; thus a special chemical treatment named SeMAR has been proposed. Numerous laboratory tests such as phase behavior test, core compatibility test, mixture viscosity, contact angle measurement, IFT, imbibitions test and core flooding were conducted on Wakamuk field samples. Based on the spontaneous imbibitions results for Wakamuk field core, formulation of SeMAR with compositional S12A gave oil recovery 43.94% at 1wt% concentration and maximum percentage of oil recovery 87.3% at 3wt% concentration respectively. In addition, the results for first scenario of core flooding test gave oil recovery 60.32% at 1 wt% concentration S12A and the second scenario gave 96.78% of oil recovery at concentration 3 wt% respectively. The soaking time of chemicals has a significant effect on the recovery and higher chemical concentrations affect larger areas for wettability and therefore, higher oil recovery. The chemical that gives best overall results from laboratory tests study will also be a consideration for Huff and Puff injections trial (pilot project) for increasing oil recovery from Wakamuk Field

**Keywords :** Wakamuk field, chemical treatment, oil recovery, viscosity

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