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Selective viscosifying for conformance control

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During water-flooding in heterogeneous reservoirs,high permeable layersform thief zones where water flows fastest causing early breakthrough. Large sections of oil in low permeable layers are bypassed resulting in high water cuts and low ultimate recovery factors. To overcome this problem a novel non-Newtonian and non-polymeric viscoelastic surfactant solution is used. Under simple shear this solution shows a non-monotonic shear thickening – shear thinning curve. Applied to a heterogeneous reservoir, this solution thickens,due to the high shear,as it flows through layers of high permeability. It thusselectively increases viscosity in high permeable strata whereas in low permeable strata the viscosityremains low. This added flow resistance to high permeable zones results in a reduced difference in flow rate between layers. A solution containing cationic surfactant CTAB (CetylTrimethyl Ammonium Bromide) and complex salt NaSal (Sodium Salicylate) dissolved in 3 wt% NaCl (Sodium Chloride) demineralized water is used. In a one phase parallel core flow experiment the solution is simultaneously pumped through two cores of different permeability. As pressure dropincreases the difference in flow rates decreases forming a more uniform flow. We found several surfactant solutions which can reduce the flow rate contrast by as much as eight times which could greatly benefit the recovery process.

Biography

Joris has completed his BSc. and MSc. in mechanical engineering at the Eindhoven University of Technology during which he came into contact with the oil & gas industry through an internship at Royal Dutch Shell. He is currently working as a PhD candidate at the Eindhoven University of Technology on a Royal Dutch Shell sponsored project on the use of viscoelastic surfactants for conformance control.

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