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Optimization Of Oil Recovery Using Heated Low Salinity Water (Lsw) In The Horizontal Sand Pack Column During Water-Flooding For Oil Recovery Application

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ABSTRACT

Water-flooding is a prevalent technique for secondary oil recovery that is capable to increase oil recovery by up to 45% overall. Due to its accessibility, affordability, and simplicity, water flooding is the most frequently used oil recovery technique. However, conventional water flooding which basically uses seawater is able to extract up to 45% oil. Thus, in this study, thermal recovery was introduced by raising the temperature of the low salinity water (LSW) to investigate the percentage of oil recovery during water flooding and 100ppm low salinity water was used for this purpose. The current study used a horizontal sand pack column to optimize the temperature of low salinity water and the injection of LSW was carried out throughout the column to displace the residual oil. The column was initially packed with sieved 125micrometer of sand for constant homogeneity. Initially, formation water which comprised with NaCl, CaCl₂ and MgSO₄ was introduced inside the column together with light oil and was aged overnight. TAPIS oil and kerosene oil, with viscosity of 0.001382 Pa.s (1.382cP) and 0.09583 Pa.s (95.83cP) were used as low velocity light-oil in this study. The injection rate was set to 1 mL/min, 2 mL/min, and 3 mL/min respectively whereas, the temperature of the LSW was heated at 50 °C, 70 °C, and 90 °C subsequently. Heated water was supplied continuously throughout the sand pack which was heated using water blanket to retain heat at 70°C (reservoir temperature). In conclusion, 3 mL/min and 70°C were identified as optimum parameters and the oil recovery experiment was proceeded with liquid radiotracer using Technecium-99m (Tc-99m) intervention and resulted with 73% of yield. Nevertheless, the radiotracer intervention only provides the Residence Time Distribution (RTD) models which describe the behavior of the sand pack during water flooding process.

Keywords: water-flooding, heated low salinity water (LSW), secondary oil recovery, thermal recovery, radiotracer, technetium-99m (Tc-99m)