Proactive control of cresting in homogeneous oil reservoirs : an experimental study

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Proactive Control of Cresting in Homogeneous Oil Reservoirs - An Experimental Study

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Abstract

Cresting in horizontal wells is a well-known reservoir problem usually described as the insurgence of effluent(s) (unwanted water and or gas) through the perforation of the well, which is produced together with oil. Cresting is majorly affected by pressure drop, resulting in uneconomic oil production rates and large volumes of oil could be left behind due to premature shut-in of the well.

This study experimentally investigates the use of electromagnetic valve in proactively controlling production of water during cresting from homogeneous thick- and thin-oil rim reservoirs, based on the principle of capillarity (reservoir wettability) and effluents (water and gas) breakthrough time. A time, half the approximated initial effluents breakthrough time, was pre-set for the electromagnetic valve to close. The valve closed almost immediately at the set-time thereby shutting oil production temporarily, causing the water and gas height levels to recede by gravity and capillarity. The efficiency of this technique was compared with an uncontrolled simulation case, in terms of cumulative oil produced and water produced at the same overall production time.

Using the cresting control procedure, higher percentages in oil produced and water reduction were observed in the cases controlled proactively. An increment of 3.56% in oil produced and decrement in cumulative water produced of 9.96% were observed for the thick-oil rim reservoir while little increment in oil produced of 0.7% and lower water reduction of 1.03% were observed in the thin-oil rim reservoir. Hence, the effectiveness of the cresting control procedure depends on the oil-column height in the reservoir.

Keywords
Homogeneity, Capillarity, Cresting, Breakthrough time, electromagnetism