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Prediction and Estimation of Capillary Pressure for Wettability and Wettability Variations Within Reservoir

Mohd. Nawī Derahman, University Technology Malaysia, and Muhammad Khurram Zahoor, University of Engineering and Technology, Lahore

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Abstract

Wettability is defined as a property of a fluid to coat a rock surface, but unfortunately it is not as simple as the name implies. Formation can be oil-wet, water-wet or of mixed wettability. These variations are due to the initial water saturation, composition of oil, salt contents in brine and mineralogy of the formation. Wettability and wettability variations affect the displacement behavior of one fluid by another. This can be demonstrated by a number of experiments, using same core, where the trend of capillary pressure curve changes with reference to changes in saturation. In relation to it, several correlations have been developed to estimate the capillary pressure as a function of saturation based on experiments.

In reality different types of wettability can exist in different regions of reservoir and moreover wettability existing at the time of discovery changes with the passage of time as a result of different processes for example, depletion, gas injection. To account for such variations and for proper understanding of displacement behavior within a reservoir a correlation has been developed, which can be used successfully for better reservoir surveillance.

With the help of this correlation, if atleast one capillary pressure curve is available, it is possible to estimate/ predict the capillary pressure under different wettability conditions, which can exist within the reservoir, during different stages of depletion, with the help of which proper history matching, forecasting and hence proper selection of enhanced recovery method is possible, resulting in better decision making and increased profitability.