

An experimental study of gas flooding to improve oil recovery in shale oil cores

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Abstract

Production from shale oil reservoirs has increased rapidly in recent years. The recovery factors from these kinds of reservoirs are expected to be around 5-10%. Recent numerical studies and models have revealed that gas flooding could be an effective alternative. This paper presents an experimental study on the subject.

We used core plugs of Barnett, Marcos and Eagle Ford shales. A mineral oil (Soltrol 130) and a crude oil were used. Nitrogen and CO₂ gases were used. Our experimental results showed that the gas injection rate was limited by shale rocks. Without fractures, gas injection pressure suddenly shot up. Microfractures in the core plugs were needed to have reasonable injection rate and injection pressure. We used CT scanner to image the microfractures in the cores. Based on these observations, we optimized the injection-production configurations and development options. Our results showed that gas flooding might increase the recovery factor up to 20% depending on the injection pressure, available micro-fracture network, well configurations and development options.

The results in this study provide the data needed for the future effort to study gas flooding potential in the large field scale. The results also provide us with the data to further evaluate the feasibility to gas flooding in the field.