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Evaluation of the EOR potential in shale oil reservoirs by water and gas flooding

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Abstract

With the relatively modest natural gas price, producing oil from unconventional shale reservoirs, which are less common and less well understood than conventional sandstone and carbonate reservoirs, has attracted more and more interest from oil operators. Though many tremendous efforts have been done on the development of shale resources, the ultimate oil recovery is still low (5-10%). For the important role of shale resources in future oil and gas industry, more stimulation and production strategies must be considered and tested to find better methods to improve oil production from shale reservoirs.

In this paper we use the simulation approach to evaluate the EOR potential in shale oil reservoirs by gas flooding and water flooding. We first validate a base model, and discussed the determination of miscibility parameter and injection pressure. Production behavior and oil recovery of different schemes are discussed through sensitivity studies. Simulation results of primary production, gas injection and water injection are compared in this paper. Results show that miscible gas injection has better effect on improving oil recovery from shale oil reservoirs than water injection. The solvent injected into the reservoirs above MMP can be fully miscible with oil, and reducing oil viscosity greatly, in addition to the mechanism of pressure maintenance. Our simulation results indicate that the oil recovery can be increased up to 15.1% by using gas injection in a hydraulically fractured shale reservoir, compared with the original 6.5% recovery from the primary depletion. The oil recovery from water flooding is about 11.9%.

The results indicate that miscible gas flooding could be a good prospect in developing shale oil resources.