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Laboratory evaluation of cyclic CO_2 injection for shale oil reservoirs

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Abstract

The low recovery and very high oil volume remaining in shale reservoirs are a strong inspiration to investigate the application of enhanced oil recovery methods in shale oil reservoirs. Latest numerical studies have revealed that huff-n-puff method could be an effective method to increase recovery factors in shale oil reservoirs. Very limited data are available on the performance of CO_2 huff-n-puff for shale oil reservoirs. In order to show the efficiency of huff-n-puff technique, a laboratory work was conducted using cores from Barnett, Mancos and Eagle Ford to evaluate the potential of cyclic CO_2 injection. Many design parameters such as soaking period, number of cycles, and injection pressure were considered to evaluate the feasibility of CO_2 cycle injection. Cores were fractured because fractures provide a large contact area for the injected CO_2 to penetrate and diffuse through the low permeability matrix.

Laboratory results indicated that cyclic CO_2 injection improved recovery of shale oil cores from 10 to 35% depending on injection pressure and number of cycles. Our earlier work has shown that such cyclic gas injection is a promising method. The purpose of this study was to develop a better understanding of the performance of cyclic CO_2 in shale oil reservoirs.