Contribution ID: **161** Type: **Poster Presentation**

Optimization of Water Control and Oil Stabilization Scheme for Edge and Bottom Water Heavy Oil Reservoir

Wednesday, 15 May 2024 09:25 (1h 30m)

In the development process of edge and bottom water heavy oil reservoir, the existence of edge and bottom water will affect the production effect of the reservoir. Compared with conventional oil reservoirs, edge and bottom water heavy oil reservoirs have a series of production problems, such as short oil production periods without water, rapid rise in water cut, high production cost, and low economic efficiency, resulting in generally low recovery factor. In this study, the advantages of N2, foam, CO2, and the viscosity reducer were used to give full play to their synergies through combination, the water control and oil stabilization technology of edge and bottom water heavy oil reservoir was formed to inhibit the coning of bottom water, reduce the viscosity of the oil, control the rise of water cut, and achieve the effect of improving the recovery factor. Four water control and oil stabilization schemes are designed in the paper, and the optimal water control and oil stabilization huff and puff technology scheme is identified as N2 foam + CO2 viscosity reducer + N2 through one-dimensional sand-packed tube physical simulation experiments. The results show that this scheme has the triple mechanism of N2 foam can slow down the coning of bottom water, CO2 and the viscosity reducer dissolving and energizing, the synergistic viscosity-reducing effect of deep propulsion, and N2 supplementing the formation energy, which can significantly improve the oil production, reduce the water production, and inhibit the rise of water cut. The final recovery factor reached 39.81%, an increase of 16.09 percentage points. The results of this study can provide a reference basis for the development of mining technology programs for similar blocks of edge and bottom water heavy oil reservoir after entering the high water cut period.

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Session Classification: Poster

Track Classification: (MS17) Complex fluid and Fluid-Solid-Thermal coupled process in porous media: Modeling and Experiment