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Analysis of Production Dynamics of Fractured Horizontal Well with CO_2 Huff and Puff in Shale Reservoirs

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ABSTRACT

In view of the current situation of the lack of suitable calculation models for the analysis of production dynamics of fractured horizontal well with CO_2 huff and puff in shale reservoirs， based on the process and mechanism of CO_2 huff and puff, an analytical model for the production dynamics of fractured horizontal well with CO_2 huff and puff in shale reservoirs was proposed, in which took into account the changes in crude oil viscosity and volume caused by the difference in CO_2 concentration at different locations in the formation after soaking and the adsorption and desorption process of CO_2 in the shale matrix. The solution was performed by Laplace transform and the factors affecting pressure and production rate during the production of fractured horizontal well with CO_2 huff and puff were analyzed. The results show that the seepage flow of fractured horizontal well with CO_2 huff and puff included seven flow stages: wellbore storage, hydraulic fracture radial flow, hydraulic fracture linear flow, laminar fracture to hydraulic fracture flow, matrix to laminar fracture unsteady flow, two-three-four zone transition flow, and boundary control flow; bedding fracture had a significant effect on pressure and production early, and the greater the inflow capacity, the smoother the pressure derivative, the higher the production rate; the greater the amount of CO_2 adsorbed in the matrix, the slower the pressure front propagates, the lower the required differential pressure, the greater the production rate of fractured horizontal well, and the longer the stable production time; the CO_2 diffusion coefficient mainly affected the flow of bedding fracture and matrix to bedding fracture, the larger the diffusion coefficient, the smaller the differential pressure required for constant production, and the larger the production rate; with the increase of throughput rounds, the production rate of fractured horizontal well increased, but the increase decreased.

KEYWORDS

Shale oil; fractured horizontal well; CO_2 huff and puff; concentration distribution; analytical model

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