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Study on the coupling mathematical model of gas-water two-phase seepage and wellbore pipe flow in fractured horizontal Wells in volcanic gas reservoirs

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The volcanic gas reservoir of Xushen gas field is the main production layer of natural gas development in Daqing reservoir in the future. Although this kind of gas reservoir is rich in resources, it is difficult to develop because of its poor physical property and complicated seepage mechanism. Most of the gas wells are fractured horizontal wells, with low single well production, small well control dynamic reserves, water layer generally developed at the bottom, and low stable production capacity of gas Wells. Therefore, it is of great significance to study the gas-water two-phase productivity of fractured horizontal Wells in volcanic gas reservoirs.
Based on the principle of gas-water two-phase seepage and the non-linear seepage mechanism of gas reservoir, according to the principle of equal flow rate and momentum theorem, combined with the nature of gas and the actual gas state equation, taking into account the internal friction pressure drop of wellbore, acceleration pressure drop and ball seat pressure drop, this paper establishes a matrix-natural fracture-artificial fracture-wellbore volcanic gas reservoir fractured horizontal well gas-water two-phase seepage and wellbore pipe flow coupling mathematical model, and solves the model by VB programming. The productivity and pressure distribution are predicted. At the same time, the influencing factors of gas-water two-phase productivity of fractured horizontal wells in volcanic gas reservoirs are studied. It is found that the degree of influence of stress sensitivity coefficients of different media on productivity is natural fracture or secondary fracture stress sensitivity coefficient, artificial main fracture stress sensitivity coefficient and matrix stress sensitivity coefficient from large to small. The high-speed nonlinear coefficient has great influence on the productivity, while the starting pressure gradient has little influence on the productivity. Finally, the accuracy of the model is verified by using the production data of five existing horizontal wells, with an average accuracy of 90.28%. The results show that the research results in this paper have certain reference significance for productivity prediction of fractured horizontal wells in low permeability volcanic gas reservoirs.

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References

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Primary author: Prof. CHENG, Fu

Co-author: LI, Qingyuan (13244696989)

Presenter: LI, Qingyuan (13244696989)

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