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A Semi-Analytical Method for Predicting Three-Phase Flow Production in Condensate Gas Reservoirs

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During the condensate gas production process, condensate oil will precipitate, the phase state will change, and the seepage mechanism is complex. There are currently few analytical models for multiphase flow. Therefore, a semi-analytical method for three-phase flow production in condensate gas reservoirs is studied. Considering the vaporized oil ratio, solution gas-oil ratio, and solution gas-water ratio, the differential equations of oil saturation and water saturation are obtained through the two expressions of each of the production gas-oil ratio and the production water-oil ratio. The relationship between saturation and pressure can be solved. Given the gas rate, based on the three-phase material balance equation, the average reservoir pressure at any point in time is obtained, and then the production gas-oil ratio and production gas-water ratio are obtained, so as to obtain the changes of oil rate and water rate over time. From the pseudo steady state gas rate formula, the bottom hole flowing pressure can also be obtained. Compared with the numerical simulation results, the correctness of this method is verified. This method considers the three phases of oil, gas, and water, including dissolved gas and volatile oil, and provides an efficient semi-analytical approach for production dynamic analysis, which facilitates the practical application of petroleum engineers in condensate gas reservoirs.

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References

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Conference Proceedings

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Primary author: WANG, Yaxian

Presenter: WANG, Yaxian

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