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Simulation Study on Reservoir Stimulation of Multi-horizontal Wells for Gas Hydrate Production in Low-permeability Reservoirs

The feasibility of hydrate exploitation technology has been verified by two rounds of trial productions in the South China Sea, but it is also faced with the problem of low gas production efficiency. Therefore, this paper proposed four different hydrate production cases with multi-horizontal wells, and established simulation models. Then the influence patterns of reservoir stimulation and offset distances on hydrate dissociation, saturation change and pressure distribution were studied. To understand hydrate dissociation behaviors and production performances, the coupling effects of multi-horizontal wells were discussed. Through simulation, the conclusions could be drawn: (1) Hydrate reservoir stimulation could effectively increase gas production. In these four production models, the cumulative gas production in Case C (multi-horizontal wells + reservoir stimulation) was 5.27 times that of Case A (only multi-horizontal wells) in 330 days. However, in Case D with screen completions the gas output was 15.58% less compared with Case C. (2) Different offset distances of horizontal wells had a relatively minor impact on cumulative gas yield and daily gas capacity. In addition, the variation range of hydrate saturation changed with offset distances of horizontal wells, indicating that hydrate dissociation occurred mainly around horizontal wells and fractures. (3) Considering inter-wells coupling, the daily gas rate and cumulative gas production of inner wells were higher than outer wells, and the cumulative gas volume increased by 6.4% in 330 days. Temporally and spatially, the hydrate saturation variation between wells was significantly faster than the outward expansion from horizontal wells. Moreover, nearer to the axis of the horizontal wells, the variation in hydrate saturation was more pronounced. These results could provide theoretical data to optimize marine hydrate development with multi-horizontal wells.

Biography

Li Xiaoyang has completed his MD at the age of 25 years from Jilin University and he is pursuing a doctoral degree at China University of Geosciences in Geological Engineering. He is the senior engineer of Institute of Exploration Techniques, Chinese Academy of Geological Sciences. He has published more than 25 papers in reputed journals and has been serving as an young editorial board member of reputed.