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Horizontal well for enhanced recovery technology in tight gas based on reservoir structure research

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Sulige gas field is the largest tight sandstone gas field in China with low porosity, low permeability, high reservoir heterogeneity, and low single well production, but has huge reserves and high production capacity. Horizontal well is the key technology to develop such tight gas field, and the practice has proven its advantage in improving single well production. But as a whole, whether the horizontal well enhance the recovery efficiency of gas field or not is still a controversy because of the vertical sparse distribution of profit plays. In solving such problem, this paper presents a new concept of concentration ratio of the vertical profile reserves. And on the basis of this concept, three sand body distribution models have been established. They are single thick block type, multi period vertical overlap panconnected type, and multi period dispersed partially connected type. Reservoir recovery of horizontal well under different sand body combination has been studied, and technical measures to improve the recovery rate of horizontal wells have been proposed. The results show that straight wells is not perfect due to the "blocking zone" present in compound sand body of the braided river sedimentary system. The horizontal well can overcome the influence of "blocking zone" to improve the producing degree of reserves within the layer. However, the layered sand body dispersed, horizontal well development will lead to the vertical bearing department of gas reserves is not sufficient, reducing interlayer recovery degree. For the reserves concentration greater than 60%, single period and multi period vertical overlap panconnected type, using horizontal well development can significantly improve the producing degree of reserves and recovery, whose I + II wells are more than 70% proportion. For the multi period disperse partially connected reservoirs with less than 60% concentration of reserves, the development of vertical well pattern and the optimization of the horizontal well location by desserts can improve the recovery by more than 10%.

Fig: Sand thickness map of H8shang, H8xia and S1 in Sulige

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3. Guo Zhi, Jia Ailin, He Dongbo, Tang Haifa. Control factors on the formation of effective reservoirs in tight sands: Example from Guangan and Sulige Gasfileds[J]. Oil & Gas Geology, 2016,34(1): 78-82.
4. Tang Haifa, Jia Ailin, Peng Shimi, et al. Stochastic modeling of sedimentary microfacies-lithofacies in proluvial fasn reservoir[J]. Journal of China University and Development, 2010, 34(3): 12-17.

Biography

Haifa Tang has her expertise in oil and gas production in development geology. Horizontal well is the key technology to develop such tight gas field, and the practice has proven its advantage in improving single well production. But as a whole, whether the horizontal well enhance the recovery efficiency of gas field or not is still a controversy because of the vertical sparse distribution of profit plays. In solving such problem, he presents a new concept of concentration ratio of the vertical profile reserves. And on the basis of this concept, three sand body distribution models have been established. They are single thick block type, multi period vertical overlap pan connected type, and multi period dispersed partially connected type. Reservoir recovery of horizontal well under different sand body combination has been studied, and technical measures to improve the recovery rate of horizontal wells have been proposed.

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