Reservoir Modeling Process Controlled by Depositional Microfacies — A Case Study of Xing56 Block in Daqing oilfield, China

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Abstract

Xing56 Block belongs to Xingshugang area, is one of the main oil fields in Daqing, which has reached the middle to later development stage. The focal point in this area is how to reasonably predict the distribution of inter-well reservoir sand bodies. Xing56 block is less than 13km2, but there are more than 300 development wells with an average well space around 200m. This block has three-dimensional seismic data as well. Therefore, combing seismic information and well data, it is very important to solve the problem by using geological modeling method controlled by microfacies to evaluate and predict reservoir. In this paper, distributions of depositional microfacies of each layer were obtained that based on sub-layer of fine correlated and integrated seismic information. Furthermore, using approach of geological modeling controlled by microfacies, the corresponding geological model was established. In geological modeling methods, this paper presents a new idea of geological modeling which is an ideas of three step gradually constraint modeling controlled by facies. These are respectively as follows: First, to ensure the model of stochastic modeling consistent with the geological laws of facies-order, namely contact relations of each microfacies in vertical and lateral should be consistent with changes of facies-order. Secondly, to ensure statistical probability of microfacies in all realization of each stochastic models consistent with statistical probability after single-well microfacies data discrete to the three-dimensional grid of geological model. Briefly, the probability distribution of various micro-facies in the models should be almost same as the original microfacies division of single well determined by geologist. Finally, three-dimensional variograms of the microfacies in the model should be consistent with the result of quantitative geological knowledge base. Therefore, there are the three basic controlling elements for reservoir modeling. Through the above workflow, optimized multiple realizations so that the reservoir geological model of being suitable for this area has been obtained, which has revealed the reservoir distribution laws of the major layers and provide a reliable guarantee for oil field development.