

Forward Modeling of a Thin Sand-Shale Interbed: Taking the P Reservoir in Block B1 of D Oilfield as an Example

Huilin Li¹, Rui Gao^{1,2,3}

¹School of Earth Sciences and Engineering, Sun Yat-Sen University, Guangzhou, 510275, China, lh_lin92@163.com

²Institute of Geology, Chinese Academy of Geological Sciences, Beijing, 100037, China

³Research Center on Deep Exploration, Chinese Academy of Geological Sciences, Beijing, 100037, China

After more than 50 years of development, the D oilfield has entered the later stage of oilfield exploitation. Accurately predicting the distribution of the remaining oil has become the main target at this stage. Taking the B1 block as the experimental area, a prediction of the remaining oil distribution in D oilfield was carried out. The P layer of the Putaohua Formation is one of the main oil-producing layers of the B1 block. The P layer is a shallow-water delta plain deposit, with sedimentary microfacies such as main river channel, abandoned river channel, and fracture fan. The thickness is generally 0.7-7.8 m, the average thickness is 4.3 m, the continuity is poor, and the distribution is fragmented.

In the past, people have done considerable research, using the techniques of pseudoacoustic wave, spectral decomposition, and dense well pattern and well-to-seismic integration joint inversion and so on, to predict the sand-shale rock of the thin P layer. And the prediction results of sand bodies in the thin layer of P are different from those in the actual situation, which could not meet the demand of the remaining oil development and oilgas production and storage in the D oilfield.

By analyzing the characteristics of geology, logging and seismic response characteristics of the research area, this paper analyzes the causes of reservoir prediction failure by using the seismic wave forward method and puts forward a reservoir prediction suitable for the B1 block.

Based on the logging data and the results of regional geological research, the causes for the previous failure of the distribution prediction of sand bodies were analyzed. It was found that the sedimentary microfacies such as main river channel type, abandoned channel and fracture fan are the main reasons leading to the failure of sand body distribution prediction of the thin P layer in the research area. The statistical analysis method was used to fit the natural gamma and inverse mean wave impedances of well bypass of all sample wells and five types of seismic facies, and to predict the natural gamma at the well point. It was found that the precision of fit is obviously improved, and the relative error of prediction significantly decreased. An idea of predicting thin interbedded layers of sand shales by seismic facies is proposed.