

Integrated Reservoir Modeling of the Deltaic Reservoir in Wuliwan Area, Ordos Basin, North China

Renpeng Li¹

¹China University of Petroleum, Beijing, China

Abstract

Wuliwan area is located at the middle part of Shanbei slope, Ordos basin, North china. Chang 6 oil formation, which is the main oil-bearing interval of the study area, develops delta front subfacies. Being in the late period of oilfield development, the residual oil distribution is mainly controlled by the reservoir heterogeneity. To characterize the strong heterogeneity of Chang 6 deltaic reservoir, 3-D reservoir modeling can be a valid method. The study area has a gentle structure with the dip angle less than 1,982 wells are covering an area of 128 km², the minimum of well spacing is about 200 meters and the reservoir dynamic data is adequate. Based on the achievements of single layer correlation (the minimum thickness of single layer is about 5 meters), a subtle stratigraphic framework was established, which can be used to build the fine structural model. Taking advantage of the dense well pattern and the subtle stratigraphic framework, analysis on regional microfacies was conducted with the combination of dynamic data and the conceptual model. Thus, space extension, superimposed relationship and connectivity of the delta front sand bodies were figured out. Furthermore, we are able to get a series of reservoir sand body parameters (the plane span, average thickness of underwater channel and mouth bar, channel mainstream line in each single layer). Object-based algorithm was applied to build the facies model, the parameters required as input data has been obtained in the previous step. Constrained by the facies model, property models (porosity, permeability and NTG models) were constructed using sequential Gaussian simulation. Reservoir numerical simulation was adopted to optimize the property model. Multiple realizations of the property model were used in the process of numerical simulation. Through history matching, the results of numerical simulation were comparable to the reservoir dynamic data. According to the matching degree of the simulation results and the reservoir dynamic data, we were able to judge which realization of the property models had best characterized the heterogeneity and compartmentalization of the deltaic reservoir. Adjustment can also be made to the property model for further optimization.