Study on shallow-water delta characteristics by utilizing seismic sedimentologic methods in Zilaitun Oilfield, Huanghua Depression, East China

Shan Liu (1) and Jiahao Wang (2)

(1) Key Laboratory of Tectonics and Petroleum Resources (China University of Geosciences), Ministry of Education, Wuhan, China (liushine@hotmail.com), (2) Key Laboratory of Tectonics and Petroleum Resources (China University of Geosciences), Ministry of Education, Wuhan,China(cugwangjiahao@163.com)

Shallow-water delta is characterized by widely distributed distributary channels from plentiful previous studies. But how to tenuously depict its planar geomorphology remains a difficult problem at present. This paper discussed the feasibility of seismic sedimentologic methods to interpret distributary channels distribution and summarized shallow-water delta characteristics. Huanghua Depression of Bohai Bay Basin is the Cenozoic rift basin in east China. Zilaitun Oilfield lies in the Kongdian buried-hill belt of Huanghua Depression. The oil layer is mainly distributed in the Paleocene Kongdian Formation.

From core samples, 1st member of Kongdian Formation mainly consists of finer grain-size sandstone and amaranth mudstone, revealing a shallow-water environment. In the sandstone of distributary channels, sedimentary structures such as erosional surface, lag deposit, parallel bedding and trough cross-bedding are developed, illustrating an intensive hydrodynamic condition. Combining logging data, shallow-water delta mainly developed delta front subfacies. Microfacies of the delta front include subaqueous distributary channel, mouth bar and interdistributary bay in study area. A vertical discontinuous sequence was formed on account of the lack of distal bar. Subaqueous distributary channels are characterized by cylinder and conical well log curves.

By extraction of RMS amplitudes from 3-D seismic data, seismic strata slices reveal banding distribution of sand bodies. Cylinder and conical logging curves demonstrated that these sand bodies are developed in distributary channels. The NE-trending anastomosing and dendritic distributary channels are widely developed in 1st member of Kongdian Formation. When the lake expanded, the river frequently bifurcated and diverted due to the rise of the relative lake-level, forming deep and wide anastomosing distributary channels. These channels extended as far as 13.2 km. The width is from 600 m to 1000 m. The average thickness of sand bodies is 4.5 m. When the lake shrank, the provenance is far from the lake shoreline. Distributary channels became shallow and narrow with few bifurcations. These dendritic distributary channels are about 11.7 km long and 500 m to 800 m wide. The average thickness of sand bodies is 2.4 m. Contrasting well log sections, sand bodies from anastomosing distributary channels have good connectivity, pointing out potential exploration targets in study area.