

Charging of Oil Fields on the Steep Slope of the Western Shijiutuo Uplift: Preservation and Loss of Crude Oils

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9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The Bohai Bay Basin is a typical Cenozoic rift basin in eastern China. In the northwestern basin, Paleogene and Neogene reservoirs have been found on the steep slope on the footwall of the boundary fault, western Shijiutuo Uplift, while Neogene reservoir have been found at the bulge area on the hanging wall of the boundary fault. Based on gas chromatography (GC), gas chromatography-mass spectrometry (GC-MS), QGF/QGF-E, petroleum inclusion, nitrogen compounds, hydrocarbon losses and conservation, the steep slope zone of the western Shijiutuo Uplift were analyzed for the first time. The oil source of the steep slope zone and the bulge area were homologous, dominated by the third member of the Shahejie Formation, with minor supply of the first member of the Shahejie Formation. The nitrogen compounds indicated that the oil migrated from the steep slope to the bulge area. The hydrocarbon accumulation at the steep slope took place earlier or coincided with that of the bulge area, indicating simultaneous depletion and conservation of oil and gas . The QGF/QGF-E analysis showed that the Paleogene reservoir on the steep slope featured early accumulation and obvious loss, when the boundary faults were more active than 25m/Ma or the fault dip was 30-60 degrees, whereas the Neogene reservoir featured late hydrocarbon accumulation and unobvious loss. The results showed that, the steep slope zone benefitted the Neogene reservoirs at the bulge area and the steep slope reservoirs as a migration channel, while it served as the accumulation place of the Paleogene reservoirs. The tectonic pattern of the boundary fault determined the preservation and the loss of the crude oils.

