Geology and Development of Karazhanbas Oil Field

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Karazhanbas oil field on Buzachi Peninsula of Kazakhstan is on the crest of the Buzachi uplift in an anticlinal fold of east-west trend. It is within the ~330 m closed structure contour and has an area of 23.0 by 4.2 km and amplitude of 90 m. The south flank is more gentle than the north, where angles of dip are 2 and 4 degrees, respectively. The fold has two crests: west and east. Faults of various trend are present: from east-west to north-south.

A model of the reservoir was developed in 1977 based on drilling and testing of 80 delineation and exploration wells. Reserves were calculated for the Lower Cretaceous and Middle Jurassic parts of the section. The field came on stream in 1980, and more than 1500 wells had been drilled with it at the beginning of 2002.

In spite of the high density of drilling, study of the geology continues up to the present. Particular attention is given to lithostratigraphic subdivision and correlation of the Jurassic productive elastics. These are characterized by abrupt facies changes and absence of persistent markers. Drilling of new wells on the east pericline of the structure has yielded information on the position of faults and the structure of the Middle Jurassic pools (Horizons Yu-I and Yu-II).

Synthesis of the geological and geophysical data has made it possible to refine the geological model of Karazhanbas oil field.

The section penetrated by the drill in the study area includes Lower Triassic, Middle Jurassic, and Lower Cretaceous rocks. The boundaries between the litho-stratigraphic complexes are characterized by large breaks in deposition in sediment accumulation and sharp angular discordances. The complete thickness of the Lower Triassic (30-40 m) has not been penetrated by many wells. Age of these rocks has been determined as Olenekian.

Jurassic sediments have been reached by the drill on the periclines and down-dip flanks at depths of 390-500 m; they have been eroded over a large part of the crest. These sediments are referred to the Bajocian and Bathian Stages of the Middle Jurassic and have maximum thickness of 100-125 m. They are host to productive horizons Yu-II (lower Bajocian) and Yu-I (upper Bajocian-Bathian).

The Lower Cretaceous sediments are ubiquitous and rest with stratigraphic or angular discordance on eroded Lower Triassic and Jurassic. Depth ranges from 20 to 480 m. The section penetrated by the drill includes sediments of Neocomian age (Barriasian-Valanginian, Hauterivian, Barremian), with total thickness of 170-190 m, and also Aptian (75-90 m thick) and Albian (thickness up to 140 m).

Presence of commercial oil has been established in the Lower Cretaceous (A-1, A-2, B, V, G, and D) and Middle Jurassic (Yu-I and Yu-II) at depths of 250-500 m.

Productive horizons A-1, A-2, B, V, G, and D are in the Hauterivian-Barremian of the Neocomian. The main oil reserves are concentrated in horizons A, G, and Yu-I. The pools are the blanket-crest type and are fault sealed.

Stratum A-1 is the uppermost stratum of the productive section. The pool is the blanket-crest type and is fault-sealed on the north. Pool height is 97 m. At the top of stratum A-1 is a 1-2 m basal bed of the Aptian, which is present almost everywhere. Average total thickness of stratum A-1 is 5.0 m, and effective thickness is 3.7 m.

Stratum A-2 is below stratum A-1 and has a local distibution. The oil pool is the blanket-crest type and is lithologically and fault sealed. Effective oil saturated thickness is 8.6 m.

Stratum B within the field has a more discontinuous areal distribution than stratum A-1. Average thickness is 6.0 m. Effective thickness is 3.9 m.

Stratum V is ubiquitous in the study area. Average total thickness is 5.9 m, and effective thickness is 3.1 m.

Stratum G is present throughout the field, has been penetrated by all production wells, and is the main production target. Average total thickness is 15.7 m, and effective thickness is 12.2 m. At the base of Stratum G is a thin blanket reservoir, which is separated from Stratum G by a dense carbonate bed. Effective thickness of Stratum G is 0.4-8.6 m.

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