Oil Pools in the Sediments of the Shiraki Series of the Patara-Shiraki Field

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The productive strata in the sediments of the Shiraki series (Meotis–Pontian) of the Patara-Shiraki oil field undergo abrupt changes in lithologic composition and thickness both horizontally and vertically along the section. The thickness of individual sandy strata is variable, and sandstones often pinch out completely, being replaced by shales.

A regularity in the distribution of the sandy reservoirs was found and was a basis for determining the prospects for producing oil in the Patara-Shiraki region.

The Patara-Shiraki oil field is located 30 km southeast of the regional center of Tseti-Tskaro and 18 km in this same direction from the Mirzaani oil area. It occurs on a monocline with a dip to the north (angles of 35–45°) of the beds of the Apsheron, Akchagyl, and Shiraki series. From the south side the flexure is upthrust onto the younger sediments of the Apskeron and Akchagyl. On a basis of lithology the Shiraki series is divided into an upper unit (Pontian) and a lower unit (Meotis). The Meotis is characterized by an alternation of strata of gray and gray-brown shales and also gray, medium to coarse grained sandstones with a thickness of 1000 m. Some varieties of sandstones are very coarse grained with gravels of limestone and carbonate rocks. The Pontian with a thickness of 700 m is composed largely of conglomerates with rare beds of sandy shale and sandstones. The Akchagul-Apskeron stage is also represented by conglomerates with beds of loam and strongly sandy shale with a thickness of more than 700 m.

Commercial oil occurs in sediments of the lower unit of the Shiraki series. Drilling has encountered several oil-bearing strata: XIII, XIIIa, XIV, XIVa, XV, XVa, XVI, XVII, XVIII, and XVIIIa.

According to geological-geophysical data, in the sediments of the lower unit of the Shiraki series there are two groups of pools of the lithologic type (with a dissolved gas drive): lens and channel (string) deposits.

The lens oil pools are of small commercial importance. Lenses of sandstone saturated with oil are encountered by one or two wells, rarely by more, and have a limited area. The thickness of the oil-bearing sandstones generally does not exceed 10 m. These pools are exploited after working out the main oil horizons occurring below by reentry or connecting. To the pools of this group are referred the oil pools of strata XIIIa, XIVa, XVa, XVI, and XVII.

The channel deposit (string) oil pools are more widely distributed. To these are referred the pools of oil-bearing strata XIII, XIV, XV, XVIII, and XVIIIa. Each of the oil pools of these strata occurs in a narrow sinuous belt of sandy sediments characterized by abrupt changes in lithologic composition and thickness in different directions.

Of the above mentioned pools, those of strata XV, XVIII, and XVIIIa are the main commercially oil-bearing ones.

The oil pool of stratum XV has the form in plan of a narrow sinuous belt (Fig. 2-A) which extends from the northwest to the east in the area under consideration. The width of the belt ranges from 150–200 to 450–500 m. The thickness of the sandstones varies from 3–5 to 10–15 m; moreover, there is an increase in thickness along the median line that joins points of maximum thickness of the sandy sediments.

The productive stratum is nonhomogeneous. It is composed of inequigranular, predominantly medium- to coarse-grained sandstones with admixed gravel. Its lithologic composition and thickness change sharply in different directions. The stratum is represented along the median line largely by coarse-grained sandstones with inclusions of fine gravel. To the north and south the thickness of the sediments changes (Fig. 2b); they are enriched in clay fractions. In this connection the thickness of the sandy sediments decreases due to individual sandy beds dropping out of the section.

The oil pool of stratum XV has two boundaries of pinch out of the sandy sediments—a north and a south–beyond the limits of which the productive stratum passes into a clayey facies.

The initial yield of oil from the wells was from tenths of a ton to 5 tons per day. The productivity depends on variation of the lithologic composition and thickness of the sandy stratum. The most productive wells are located along the median line. Oil production decreases to the north and south with distance from this line.