Conditions of Formation of Hauteriv-Barremian-Lower Aptian Sediments on the Crimean Plain and Their Oil-Gas Prospects

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The Hauteriv-Barremian-lower Aptian sediments occur at the base of the platform cover of the North Black Sea basin. Commercial oil and gas have been found in these sediments in the Oktyabr and Tat’yanov areas, which are in the south part of the North Crimean downwarp.

The age range of the Lower Cretaceous sediments is not the same everywhere: Hauteriv to lower Barremian in the Crimean foothills, Hauteriv to lower Aptian in the central part, and upper Aptian to lower Albian in the northern Sivash area.

During a time span of more than 12 million years (late Hauteriv - early Aptian) a succession of fluvial, deltaic, lacustrine, and shallow-water near-shore deposits collected. The basin had a differentiated paleo-relief. See Figs. 1-3.

Comparison of reservoir properties of different genetic types shows a relationship to conditions of deposition. Rocks of deep-water marine facies have very low values of open porosity and permeability of 0.01-0.1 md. Somewhat better parameters are characteristic for rocks of flood-plain and shallow-water deposits. Average open porosity ranges from 1.71% in the Ryleyev area to 3-4% in the Oktyabr and Zapadno-Oktjabr areas. See Fig. 2. Sediments of the lagoonal facies have yet better parameters. Average open porosity of Neocomian-Aptian sandstones in Tarasovka well 5 in 7.24%, and gas permeability reaches 1 md. Fluvial sediments of the paleo-Dnieper and paleo-Moloch rivers have good reservoir properties. See Fig. 2. Open porosity of the sandstones ranges from 5.89 to 18%, and gas permeability from 1 to 100 md. Rocks of the paleo-delta in the Krasnogvardey area have the best reservoir properties in the eastern part of the Crimean Plain. Open porosity of the sandstones reaches 22%, and gas permeability exceeds 363 md.

The fluvial sediments of the central and eastern parts of the Crimean Plain may contain oil and gas pools of both the anticlinal and non-anticlinal types. The most favorable for exploration for fields of the anticlinal type are the Tat’yanov, Pervomay, Abrikosov, Peredov, and Arabat structures, which have been outlined by seismic surveying in zones where fluvial and deltaic sediments are present.

On the north border of the North Crimean downwarp there is much interest in zones of pinchout of basal Neocomian-Aptian sediments on structural embayments that have been disclosed by seismic surveys.