Buried Structural Traps in the Upper Paleozoic Sediments of the Orenburg Region and Their Oil-Gas Prospects

A. V. Orel

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A new direction for exploration in the Orenburg region is for oil and gas pools on buried structures in the upper Paleozoic sediments of the outer border zone of the Peri-Caspian depression. A large break in deposition has been found here - from the beginning of the Bashkir stage to the Sakmar stage. On the whole the extent of the break increases from west to east and from north to south. It is as much as 900 m.

Variation in stratigraphic completeness of the section indicates the transgressive nature of the upper Paleozoic rocks. Resting on the eroded surface in the direction of increasing depth of erosion are successively younger deposits of the Moskovian stage, Upper Carboniferous, and finally Lower Permian. The line of pinchout of the Upper Carboniferous extends from the northeast parallel to the west border of the Cis-Ural downwarp and then swings northwest, parallel in general to the border step of the Peri-Caspian depression. See Fig. 1.

The distribution of thickness of the Lower Permian rocks is very differentiated. In the direction of increase in the extent of the break this thickness increases sharply and then once more decreases.

The change in thickness of the Artinsk-Assel sediments is accompanied by a change in lithology. Gray, shallow-water limestones with increasing thickness are replaced by light cavernous organo-clastic varieties, and on passing through the border step with an abrupt reduction in thickness they go to dark, microcrystalline deep-water limestones with beds of dolomite and marl. Thus, the zone of increase in thickness in the Lower Permian is a bioherm, which formed on the flank of a relatively deep-water basin.

The complex distribution of thicknesses of rocks of the Lower Permian and Upper Carboniferous in the border zones of the Peri-Caspian depression and Cis-Ural downwarp indicates significant structural difference between the surface of the Artinsk sediments and the top of the Bashkirian rocks on the outer border frames. The relationship of these two complexes in vertical section suggests a high-amplitude anticlinal flexure on the surface of the post-Bashkirian unconformity (Fig. 2).

An important exploration indicator for buried structural traps are non-closed positive complications on the surface of the sub-salt rocks. Very interesting are structural noses that represent regionally tilted anticlinal structures. Buried folds may be present at depth. See Fig. 2.

The Bashkirian sediments are very amenable for exploration for such traps. They are productive in the Berdyan and Kopen areas on the south of the Sol-Iletska projection. The oil pools here are associated with carbonate reservoirs and are sealed by Verey clayey-carbonate beds. Also very favorable are rocks of the lower Visean and Tournaisian, which occur beneath a seal of the clastic carbonate complex of the Bobrikov horizon.