Oil Possibilities of the Perm Area

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Indications of oil in the Paleozoic rocks of the Perm area were first noted by A. A. Krasnopol’skiy (4) seventy years ago in the form of tarry smears in the Upper Devonian limestones on the Kos’va and Gubakha Rivers and in the Kungur “porous” limestones on the Kama River below Khokhllovka.

Oil exploration in the Perm district began after the discovery in 1929 of the Upper Chusov oil field in a buried limestone reef of the Artinsk stage. The discovery well was put in production on 15 August 1929.

After thirty years of oil exploration in the Perm district, in addition to the Upper Chusov field which is in the Cis-Ural downwarp, 19 oil fields have already been discovered in the platform part of the district. See Figure 1. At the present time oil is produced in seven fields: Krasnokamsk, Severokamsk, Polazninsk, Lobanov, Yarinsk, Kozubaev, and Tanyp. Three fields have been prepared by drilling for production: Kueda, Gozan, and Pavlovs. Six fields are being mapped: Kamennolozh, Vasil’ev, Byrka, Shumov, Moskud’insk, and Berezov. Exploration is on a stand-by basis in the Kamensk and Gondyrev fields and has been halted in the Shalashinsk field because of the small oil reserves. The Yarinsk and Kamennolozh fields are the most important in productivity of the wells, quality of the oil and casing head gas, and oil reserves.

These fields make it possible to plan an increase in oil production in the Permian district by 4.5 times during the period 1959-65 in comparison with 1958. The rate of increase of oil production here is to be more than twice that for the USSR as a whole.

High quality gas, present in great quantities in the oil of the Yarinsk and Kamennolozh fields, will be used by the city of Perm and in petroleum chemistry. Utilization of casing head gas will increase by 30 times during the seven years.

Five commercially oil-bearing units have been established in the Perm area in the Paleozoic: Artinsk-Sakmarian, Kashirsko-Namurian, lower Visean, Turonian, and Kynovsko-Givetian. In the lower Visean and Kynovsko-Givetian the oil pools occur in sandstones and siltstones; in the other units – in limestones and dolomites.

The distribution of known commercial deposits in the Paleozoic section of the platform portion of the district is presented in Table 1.

The largest number of deposits have been found in the lower Visean continental unit, which is generally called the coal-bearing suite.

Commercial deposits of combustible gas are invariably related to oil deposits in this district. Small gas caps have been observed on several oil pools.

For the commercial oil of the Devonian and Carboniferous sediments of the Permian area, changes have been established from the eastern fields to the western as follows: an increase in density and in sulfur and tar content; a drop in gas saturation, total pressure of dissolved gases, and of partial pressure of hydrocarbon gases along with an increase in the nitrogen content.

All known oil fields of the platform part of the area occur in gentle platform-type folds, domes, and brachy-anticlines; the flanks dip from a few minutes to 5° and rarely more. These gentle structures are complicated by swells. See Figure 1. Only the Shumov field occurs independently. An intensification of structures from the Lower Permian sediments to the top of the Devonian is characteristic of the local structures and of the swells to the west of the Artinsk reefs. Also related to this phenomenon is a decrease in the margins of the Carboniferous oil pools with depth: the largest are in the Moskov and the smallest in the Tournaisian stages. Below the Famennian stage, however, many local structures (Yarinsk, Tanyp) and even the Lobanov swell disappear; this is one of the causes of the absence here of oil pools in the Kynovsko-Givetian.

Along the east border of the platform and the west flank of the Cis-Ural downwarp in the zone of the Artinsk reefs, the structural forms observed in the Kungur and Artinsk sediments do not reflect the structures of the Carboniferous due to an abrupt increase of thickness of the Lower Permian sediments and the development of structures blanketing the reefs. Local structures in the Carboniferous sediments are not reflected in the Kungur stage in the area of development of salt in the Cis-Ural downwarp, where salt tectonics mask the rocks beneath the salt.