Non-traditional hydrocarbon deposits

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Abstract. The article describes results of the study of non-traditional hydrocarbon deposits. Reservoir properties of rocks with various types of pores, the dependence of quality of raw materials on the natural conditions of rock formation were analyzed. Problems of exploration and exploitation of non-traditional deposits were identified.

1. Introduction
In Russia and other countries, reserves of easily extracted hydrocarbon deposits are being depleted. There are no traditional deposits with a conventional structure and a development system. They are being replaced by deposits with complex geological conditions requiring different deposit development methods.

2. Materials and methods
In research materials and publications on oil reservoir physics, there are different classifications of rocks as key reservoirs of oil and gas. However, only traditional easily recoverable reserves are studied. They are replaced by non-traditional deposits, such as the Bazhenov deposit (Western Siberia) [1, 2, 3].

3. Results and analysis
For the two-hundred-year-old history, traditional and non-traditional oil deposits have been studied and explored.

The first ones are pore reservoirs located in sand formations; there are more than 60% of granular reservoirs (Fig. 1a) often located in anticlinal structures and 40% of fractured reservoirs located in carbonate rocks (Fig. 1b). Oil properties are usually poor (high sulfur content, paraffin content) due to the proximity of underground mineral water, gas, salts, etc. But these conditions make it possible to establish the regime of exploitation of deposits with a low reservoir pressure.

The researchers are studying non-traditional deposits such as the Bazhenov Deposit (Western Siberia) located at depths of more than two kilometers. Its uniqueness is due to the large-scale spread over the area with a thickness of twenty meters. All this became possible thanks to the unique deposit formation conditions.

The Bazhenov deposit was formed in the Jurassic period, 120 million years ago, in a huge marine basin with a large number of representatives of flora and fauna which died during the onset of cold waters of the Arctic. This territory was under the tectonic impact which allowed bottom sediments to transform into shales [4-8].
A unique feature of the Bazhenov Deposit which determines its industrial value is its high oil saturation. This oil has high commercial characteristics, and it can be imported without processing.

It is not clear how large oil deposits can be located in the clay thickness in large quantities. It is not in compliance with oil reservoir physics. Reservoirs can be of three types: granular (pore), fractured, and mixed. The former ones are a result of rock formation (during sedimentation). They are located in sandstones; the latter are mainly carbonate rocks. This type is accompanied by caverns. It is considered as a secondary process due to tectonic processes or chemical leaching in rock carbonates. The third type is of mixed origin.

According to literary sources, the Bazhenov Deposit is thinly fractured, including traps of pure oil. This condition is caused by sea activity and paleoclimatic and tectonic conditions.

The development of reserves of the Bazhenov Deposit is more promising than alternative directions focused on maintaining oil production - the northern shelf in the eastern Urals, new areas of Eastern Siberia. The Bazhenov Deposit has a developed infrastructure (Figure 2).
4. Discussion and conclusion

One can conclude that the Bazhenov stratum is a porous rock cut by cracks. These pores contain oil which goes to the bottom of the well through fractured pores. The mixed reservoir is located between cracks that block oil. Due to the fact that water and other fluids cannot approach the area, the oil composition is good. These cavities consist of oil-permeable and clay rocks. The Bazhenov Deposit is very complex and unconventional. For its development, there are no effective methods. It is necessary to study non-traditional development methods [9; 10]. Since classical systems cannot be used, there is a risk of dry zones.

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