



Petrophysics Features of the Hydrocarbon Reservoirs in the Precambrian Crystalline Basement

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A prerequisite for determining the distribution patterns of reservoir zones on the section of crystalline basement (CB) is the solution of a number of problems connected with the study of the nature and structure of empty spaces of reservoirs with crystalline basement (CB) and the impact of petrological, and tectonic factors and the intensity of the secondary transformation of rocks.

We decided to choose the Novoelhovskaya well # 20009 as an object of our research because of the following factors. Firstly, the depth of the drilling of the Precambrian crystalline rocks was 4077 m (advance heading - 5881 m) and it is a maximum for the Volga-Urals region. Secondly, petrographic cut of the well is made on core and waste water, and the latter was sampled regularly and studied macroscopically. Thirdly, a wide range of geophysical studies were performed for this well, which allowed to identify promising areas of collector with high probability. Fourth, along with geological and technical studies that were carried out continuously (including washing and bore hole redressing periods), the studies of the gaseous component of deep samples of clay wash were also carried out, which indirectly helped us estimate reservoir properties and fluid saturation permeable zones.

As a result of comprehensive analysis of the stone material and the results of the geophysical studies we could confidently distinguish 5 with strata different composition and structure in the cut of the well. The dominating role in each of them is performed by rocks belonging to one of the structural-material complexes of Archean, and local variations in composition and properties are caused by later processes of granitization on different stages and high temperature diaphoresis imposed on them.

Total capacity of reservoir zones identified according to geophysical studies reached 1034.2 m, which corresponds to 25.8% of the total capacity of 5 rock masses. However, the distribution of reservoirs within the cut is uneven. The manifestation of reservoir properties of crystalline rocks and their gas content is to a high degree connected with those parts of the cut of the well that are represented by Bolshecheremshanskaya series of rocks. The analysis of the distribution of reservoir intervals that were identified in the well section # 20009 according to the geophysical studies showed that they tend to coincide with the intervals of intensive secondary changes and rock breaking, or with contacts of series of rocks or thick layers of rocks that differ greatly in physical and mechanical properties. About half of the potential reservoir zones are characterized by explicit, well-defined fractures, which was determined according to core and wastewater samples, as well as with the help of caliper gauge. The rocks of a Bolshecheremshanskaya series were more exposed to the repeated impact of the parallel processes (mylonitization, diaphoresis, migmatization, etc.), or they were simply more affected by these processes, and that led to the characteristic distribution of collector areas, temperature and gas anomalies along the borehole cut. The presence of Bolshecheremshanskaya quartz series in the material composition of the rocks caused, firstly, increased amount of fractures, and secondly, the preservation of the porous-cavernous space frame within the superimposed secondary processes.