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The Petrophysical Parameters Analysis of Pirallahi Field of the Absheron Archipelago

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SUMMARY

The research object is Pirallahi oil-gas field of Absheron archipelago, in particular the geological section of Kirmaky suite of Productive series. Based on the method of Integrated areal interpretation of geological and geophysical data the current state of field development is analyzed. On Kirmaky suite of Pirallahi field, the initial and current oil saturation, porosity, shale and sand content values in the reservoirs of the geological section of each well were calculated and compared with the actual results of new drilled 24 wells investigations by Impulse-Neutron-Neutron Logging method. After summarizing and determining the statistical average values of petrophysical parameters, the petrophysical maps of Kirmaky suite were compiled on initial and current oil saturation, porosity, shale and sand content. The 3D model and structure map, based on top values of the suite, were compiled as well.

Introduction

Absheron archipelago, covering the northern part of the South Caspian Depression, is characterized by the highest density of the initial and current potential oil and gas resources. Major oil and gas-condensate reservoirs of archipelago are located in the Lower Pliocene Productive series (PS), with which the prospects of further oil and gas production development are connected in the country. Despite more than a century history of industrial development of its oil and gas deposits, Absheron archipelago remains to be the most highly promising region not only offshore, but also on the whole Azerbaijan. For increasing oil production volume with discovery of new deposits, it is necessary to pay serious attention to the improvement of the old fields' development process.

The conditions of residual hydrocarbon saturation in porous and permeable rocks commonly arise because of repeated absorption cycles of hydrocarbon-water and drainage promoted by trap breaching and aquifer encroachment. Depending on the porosity, permeability, and wettability of the rock, a significant portion of the oil reserves could remain in residual form within reservoir rocks.

The principal aim of our research is to justify that in fields at the late stage of development there are still a significant amount of residual hydrocarbons.

Method and Theory

The integrated summaries, based on the results of the geological and geophysical investigations data for hydrocarbon saturation prediction, were not carried out properly and the results of many years field developments were not analyzed at the level of modern requirements in various areas of oil and gas regions and exploration objects.

During our investigations we have used the method of the integrated areal interpretation of geological and geophysical data for the study of the current state of development and assessment of remaining reserve of oil and gas fields (Hajiyev, 2012). This method includes the creation of information database based on: well logging data of drilled wells; accumulated geological and production data during the reservoirs production; use of hydrodynamic research data for the purpose of study the dynamic processes of development target.

The relationship between well logging data of Apparent Electric Resistance (AER), Self-Potential (SP) and Impulse-Neutron-Neutron Logging (INNLL) were studied by using cluster-analysis as well.

The research object is Pirallahi oil-gas field of Absheron archipelago, in particular the geological section of Kirmaky suite (KS) of Productive series. The field is located on the western part of the Absheron archipelago on the same-name island, separated from the north-east coast of the Absheron Peninsula by the relatively narrow strait of the north-west - south-east strike. On the basis of the conducted geological investigations of the Pirallahi field, it tectonically consists of two anticlinal uplifts - Southern and Northern Pirallahi, separated from each other by large faults.

Kirmaky suite of Absheron oil-gas region, which is a vast reservoir of oil and gas according to lithofacial characteristics of sediments and energy conditions, markedly differs from other horizons of Productive series. Lithologically it is represented by sand and clay alternation (Babayev, 2006). The share of Kirmaky suite deposits accounts for about 30 % of the initial balance reserves of Productive series. The KS deposits had been developing over several ten years, but within the Absheron region the lowest oil recovery factor have deposits of this suite. Therefore questions of KS oil recovery attract special attention.

513 wells of the total drilled stock, the Kirmaky suite was revealed in section of 457 wells. The values of petrophysical parameters of porosity, shale, sand content and oil saturation were obtained after the processing the well logging data.

According to Kirmaky suite of the Pirallahi field, the oil saturation value in the reservoirs of the geological section of each wells were calculated and compared with the actual results of wells investigations by Impulse-Neutron-Neutron Logging method, as well as with the results of well logging data interpretation, measured in the new drilled 24 wells, which penetrated an object, in the period of 2009-2012 years (Seyidov, 2007).

The figure below illustrates the petrophysical maps of the Kirmaky suite on the values of initial, current oil saturation and their difference (Fig.1).

Figure 1. *Petrophysical maps of Kirmaky suite of the Productive Series of Pirallahi oil-gas field of Absheron archipelago.*

- a) initial oil saturation on Electric Logging data;*
b) current oil saturation on Impulse-Neutron-Neutron Logging data;
c) difference between Electric and Impulse-Neutron-Neutron Logging data.

Conclusions

After summarizing and determining the statistical average values of petrophysical parameters, the petrophysical maps of Kirmaky suite were compiled on initial and current oil saturation, porosity, shale and sand content. The 3D model and structure map, based on top values of the Kirmaky suite, were compiled as well.

At present time, as this object has a significant amount of oil reserves, in the future to achieve a high value of ultimate oil recovery, it will help to better place the wells for the infill drilling.

References

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