Thus, the approximating functions found make it easy to find the values of the coefficient of resistance for a different Reynolds number, which in turn accelerates the solution of the problem of finding the value of the resistance force of a particle and, as a consequence, the value of its velocity in the flow of drilling mud.

So, in this work it is clearly seen that the knowledge gained from the course of higher mathematics is not enough in solving problems in your specialty, since there are such nuances that do not have universal application, but knowledge of which is necessary, because they greatly simplify and accelerate the search for a solution various tasks on the specialty.

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IDENTIFICATION OF DRILLING WELLS PROSPECTIVITY IN TECTONIC DEFORMATION AREAS OF PALEOZOIC DEPOSITS IN THE TOMSK REGION

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At the present time due to exploitation of hydrocarbon reservoirs in Jurassic and Cretaceous sediments in West Siberia, more and more attention is given to Paleozoic structures. They are poorly studied, as they have complex geologic and tectonic structure and there is a lack of geological and geophysical data about them. Nevertheless, integrated interpretation of the gained one-sided data about the Paleozoic can give the results of Paleozoic structures productivity assessment, favorable for raw hydrocarbons. Some complications of geologic and tectonic nature can be seen on the example of one of the fields in Tomsk oblast.

The field X is located in Nyurolskiy petroleum district in Tomsk oblast. This is the Parabelskiy area in Tomsk oblast. As far as tectonics are concerned, the exploration area belongs to the junction zone of two large first-order structures: Nyurolskiy depression and Pudinskiy megalithic bank. The block-tectonic model developed by V.S. Surkov, O.G. Zhero and others has been taken as a basis in this research [5].

According to the results of formation M testing conducted in 2015, well 3 has been recognized as non-productive. Core analysis shows that well 3 is located in the zone of tectonic deformation. This has also been confirmed with the material analysis by means of 3D common-midpoint method (CMP). It indicated anomalies connected with tectonic deformations (Picture 1) [4]. In Figure 1 faults are divided into 20 meter-buffer zones, which are expanding in zones with anomaly development. These anomalies can be interpreted as tectonically deformed zones. On the stage of hydrocarbon traps formation the capacitive component of these zones is filled with secondary alteration products of the host rock. On this stage the zones are unfavorable for drilling, however, it is too early to consider them as zones of non-reservoir rocks development.

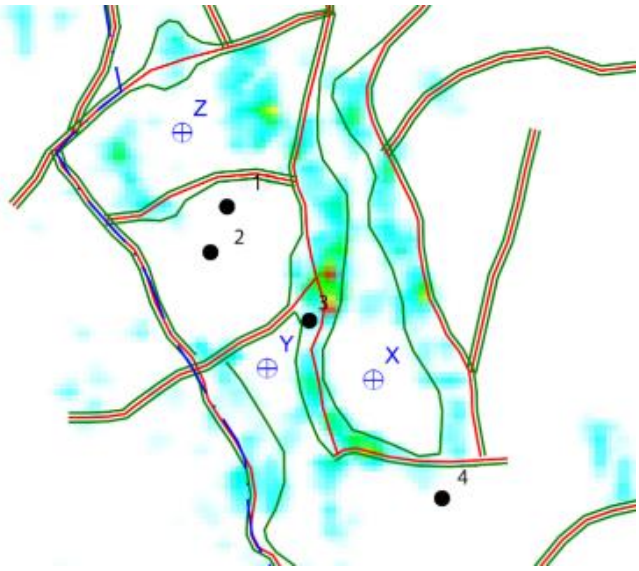

Fig.1 Distribution map of tectonically deformed zones

For the following drilling of side-tracking of well 3 or for the additional infill drilling at field X, three possible variants of drilling are suggested – X, Y, Z (Figure 2).

Selection of well location is determined by an intention to gain maximum of geological and geophysical data about block structure of pre-Jurassic sedimentary complex.

The location of suggested well points X, Y, Z is selected in such a way that drilling-in of formation M could be conducted until absolute depth mark – 2700 m, i.e. in maximally arched portion of the bed. In the given range wells 3 and 4 have been drilled. The oil content of weathering mantle slit and bed slit in well 4 has been confirmed.

For side-tracking drilling the following variants of location are suggested:

Well X. For drilling in this point the prospective targets are both formation M and M1. The main prospective is connected precisely with sediments of formation M1. As it has already been mentioned, the productivity of these sediments is confirmed by testing of well 4, which is structurally the highest one. Structurally well X is located 50 meters higher than well 4. Therefore, the prospective of finding hydrocarbons in formation M is increasing [1, 2].

Well Y is located in area which is maximally remote from tectonic deformations; this is made in order to avoid drilling-in of tectonically undeformed zones. Sediments of formations M and M1 are considered to be productive for a well test. The location of this well is quite conservative, as there is well 4 in this block, so risks to obtain a negative result are minimal.

For the drilling of an infill well the following location is recommended:

Well Z. According to the hypsometry, well Z is planned to be close to well 4; correspondingly, the probability of productivity of formations M and M1 is high. Moreover, for the drilling of this well the productivity of separately standing tectonic block will be specified [3].

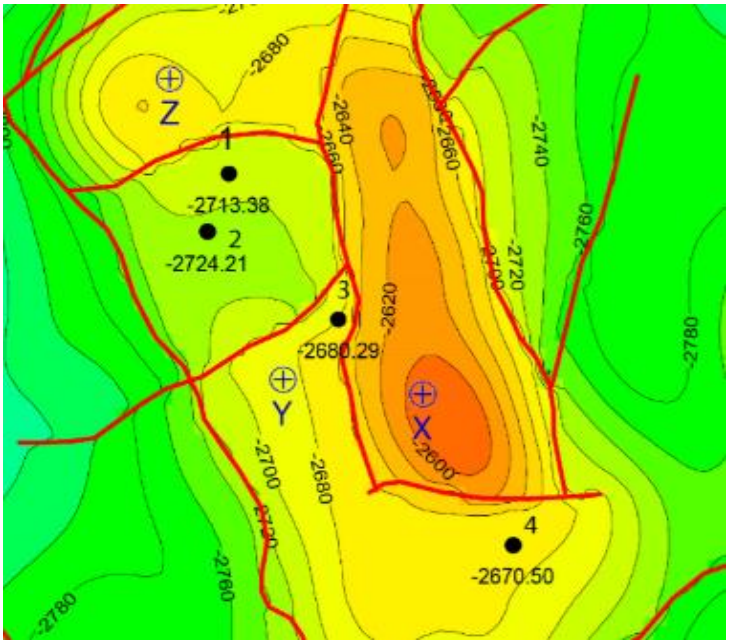

Fig.2 Map of reflecting horizon Φ2 with wells suggested for drilling

It also should be noted that precision of contour mapping based on reflecting horizon Φ2 works out to about 20 m and this fact has to be considered when conducting the drilling.

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