PREPARATION OF MICROSCANER DATA AND CORE PHOTOS FOR JOINT ANALYSIS AND LINKING

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Lithological characteristics of productive formations - structures, net thickness, anisotropy of permeability are important aspects of the development of carbonate deposits. Geophysical researches of wells are a universal tool for establishing general bedding patterns, determining the type of facies environment. Also, with the help of well logs, one can assume the saturation of rocks with fluid and make calculations of the reservoir properties, for example, porosity.

However, the geophysical researches of wells do not guarantee absolute accuracy, since only it shows the magnitude of the physical fields recorded in the rocks. This allows you to make an assumption about the characteristics of the breed but does not disclose all the uncertainty, since different elements of rocks can correspond to one response. For an improved understanding of the properties of the filtration medium, a comprehensive analysis is needed, implying a comparison of the results of studies of various kinds, identification of general patterns, their interpretation, and ligation.

FMI (Formation Micro Imager) is an electric micro imager, a logging tool developed by Schlumberger for imaging the interior surface along a wellbore. Using this image, you can define the parameters of the existing fracture zones. FMI images are recorded with 192 electrodes with the help of 8 instrument shoes. A special focusing contour directs the measurement currents into the formation. The low-frequency component of the recorded signal is informative to determine the petrophysical and lithological characteristics of rocks, and the high-frequency component is used to detail the image. The probe depth reaching 762 mm is comparable to the depth of sensing the logging devices. The image is normalized by calibration by the supporting low-frequency resistance signal with greater depth of the research, the registered device itself, or according to the resistance data, registered other side logging devices. The list of the main task FMI includes structural and textural analysis, the analysis of fracture and secondary porosity, rock stress analysis, assessment of the state of the wellbore, as well as a detailed binding and core orientation, macrofacial analysis.

Preparation of images obtained using an electric micro imager, first need to be displayed so that the right and left side of the image corresponding to the northern azimuth direction (Fig. 1).

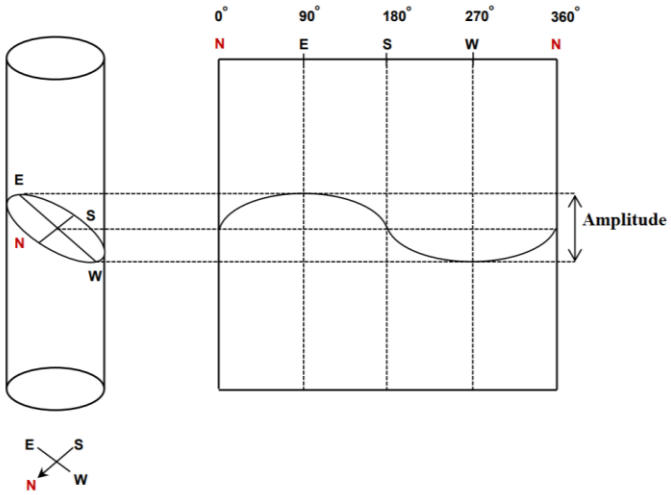

Fig.1 Determination of the azimuth of the crack and the angle of its fall based on the micro imager data (FMI) [2]

To accomplish the tasks set, first of all, it is necessary to analyze the system of fractures in the well which includes its qualitative and quantitative assessment. In order to determine the prevailing direction of fracturing for the subsequent planning of well placement and ensuring fluid filtration to them, the dip angles and azimuths of the fracture strike are determined. For this gole the borehole diameter and the magnitude of sinusoidal amplitude are used, obtained on the basis of the FMI data image, reduced to the form shown in Figure 1 [3].

The following parameters can also be attributed to a quantitative assessment of the fracturing of a mountain bed:

– fracture wings;
– fracture opening;
– fracture permeability;
– fracture intensity.

Conducting cracks are isolated, which are recognized on images as conductivity anomalies, as well as resistive cracks, which the resistance anomalies recognize. Usually, the presence of calcite, quartz, pyrite, or clay is such anomalies. Next, begin directly to the quantitative evaluation of fracture, the main task is to determine the fissure opening because it has a precisely significant effect on the well flow [4].

After the secondary porosity analysis, we find cavernous intervals, after which we carry out its qualitative characteristic. The calculations are based on the Archi Dakhnov equation in the washed zone.

Having allocated and defining all cracks and cavities on the image, we carry out texture analysis, according to which terrigenous sediments or carbonate are distinguished.

Also directly produce rock stress analysis, since in the process of drilling in the well can form technogenic cracks and bore (Fig. 2). The presence of technogenic fracturing or breakouts makes it possible to estimate the direction of maximum and minimum horizontal stress.

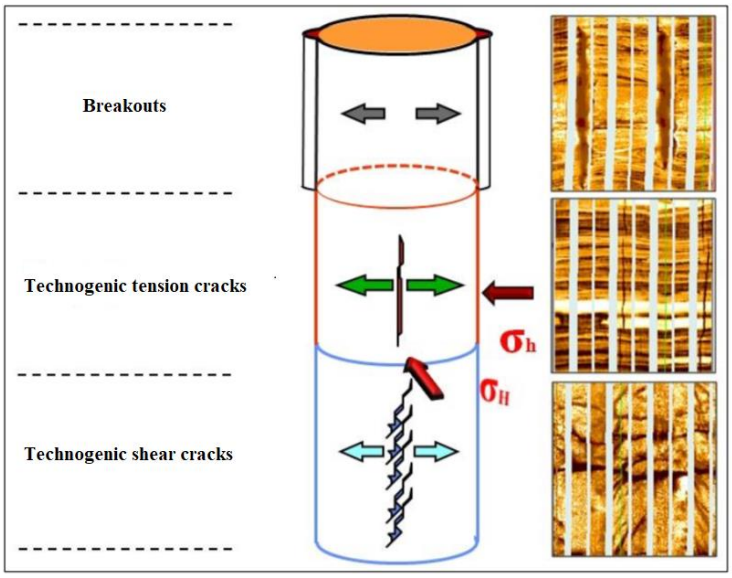

Fig.2 Rock stress analysis

Technogenic cracks are formed in the direction parallel to the direction of the maximum horizontal stress. The breakouts are formed in the direction parallel to the direction of the minimum horizontal stress.

Ultimately, for further comparison of FMI and core data, and macrofacial analysis is made of detailed linkage of the core with FMI images. When linking this data, it is necessary to target the core on the position of the reference point.

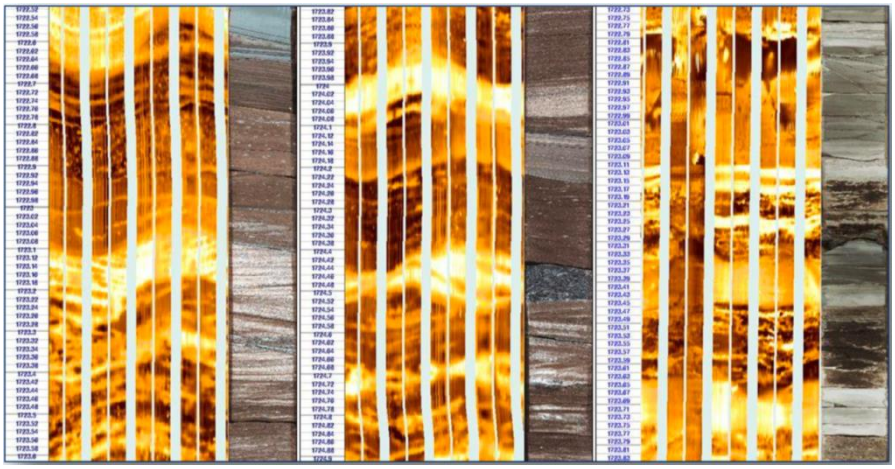

Fig.3 Example of detailed linking core

The use of well microscanners is applied not only for carbonate but also for terrigenous deposits in Western Siberia. Accounting for qualitative and quantitative evaluation of fracture with FMI allows you to create the most believable three-dimensional geological models that can form the basis of a realistic hydrodynamic model of the field. Integral analysis of FMI images with the interpreted parameters of the prevailing fractures and their types, in conjunction with core photos, allows for a high-quality texture analysis of the reservoir rocks, as well as to establish the regularities of the filtration flow with maximum accuracy.

References

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