APPLICATION OF THE SCHMIDT HAMMER FOR DETECTING OF UNCOMPACTED AND UNCONSOLIDATED CORE SAMPLES

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The key goal of the modern petrophysics methodology is to ensure the quality and accessibility of laboratory analysis methods that fully comply with the requirements of existing technical regulations for working with core material. The main priority of the geological research development and the reality of the modern time are to solve the problems of core material consistency and to minimize technological disturbances [1-3].

Studies of unconventional rock reservoirs are crucial when working with core from Pokurskoe, Cenomanian formations and their analogues. Currently, an isolated technology is used for better consistency of the core during drilling and lifting it to the surface [4,5].

When the drilling tool is raised to the surface, the fiberglass pipe is removed from the drill string and cut without core extraction at the required intervals (usually 1 meter long). Pipe edges are closed hermetically with special blank plugs. These plugs of all fiberglass pipes are fixed with clamps. Pipes are marked and stacked in crates and sent for the research to the petrophysical laboratory. The use of fiberglass pipes does not allow the proper control of the hardness of core material placed in them.

It is vitally important to preserve the full-sized unconsolidated core material from crushing during transportation from the rig to petrophysical laboratories. Therefore, it is necessary to deliver it in specialized containers with shock-absorbers. The use of such technology leads to a significant increase in the cost of transportation compared with the conventional delivery of consolidated core material.

In addition, if the hardness assessment of core in pipes is absent, it limits the accuracy in determining the weak intervals of core. Special recommendations for samples splitting should be applied for unconsolidated intervals of core in petrophysical laboratories. These are used exclusively for pipes with unconsolidated core material.

The aim of this work is to describe the express method for determining the intervals of core, selected by isolated technology. The description is carried out without core extraction from fiberglass pipes. It prevents changes in water and oil saturation of the selected core material.

It is examined that the method for determining the intervals of slightly cemented reservoirs can be accomplished according to the following scheme. Firstly, holes are created in a fiberglass pipe by means of an electric drill to measure core hardness parallel to bedding using a Schmidt hammer (sclerometer). It is worthwhile to mention, that the Schmidt hammer works on the principle of elastic rebound and is a non-destructive method of measuring hardness. The diameter of the hole is determined by the diameter of the shock plunger or indenter of the Schmidt hammer. Holes are drilled along the length of the fiberglass pipe in increments of 25-30 cm. The drilling depth is determined by the wall thickness of the fiberglass pipe. Assaying holes in a pipe must be performed with using a depth adjusting collar. Full-sized core should be remained without damage when holes in a pipe are being drilled.

Secondly, the holes in the pipes after drilling are immediately hermetically sealed with removable rubber plugs. The rubber plug can only be removed when direct measuring of core hardness is conducted. After taking the measurement, the rubber plug is to be inserted back into the drilled hole.

Thirdly, the instrument is calibrated on two collections of unconsolidated and consolidated samples accordingly. These collections are selected with taking into account the lithology of the core material of the studied field. It should be done before measuring the core hardness by using a Schmidt hammer for each field separately.

A decision on the degree of core consolidation and the choice of the method of its delivery from the rig to the petrophysical laboratory is made, based on the results of determining the hardness of a full-sized core material selected by using an isolated technology. The technology of the sample splitting is also considered in the study.

To sum up, the main advantage of the method presented is the possibility to determine the intervals of unconsolidated core promptly. This core is selected by an isolated technology, without extraction from fiberglass pipes.

References

1. Morev A. V., Morev V.A. Selection of the optimal conditions of the core samples preparation to petrophysics researches// Estestvennye I tekhnicheskie nauki. – M., 2014. – № 11 – 12. – P. 141 – 144.
2. Morev A.V., Solovyova A.V., Morev V.A. Optical methods for identifying hard clay core samples during petrophysical studies// Journal of Applied Spectroscopy. – 2018. Vol. 84. №. 6. pp. 1078 - 1080.
3. Morev A. V., Morev V.A. To question about determining of weak intervals of core// Estestvennye i tekhnicheskie nauki. – M., 2018. – № 9. – P. 50 – 52.
4. Morev A. V., Pitkevich V.T., Morev V.A. Improving of core samples selection for petrophysical studies// Estestvennye i tekhnicheskie nauki. – M., 2018. – № 9. – P. 53 – 56.
5. Pat. 2604220 Russia Int. Cl. G01 №1/30 Indicator for rapid estimation of content of clay in core samples Morev A. V., Morev V. A. Date of filling. 24.11.2014; Date of publication. 10.12.2016, Bull.№34. – 5 p.