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# THE RESEARCH OF THE RELATIONSHIP OF THE COLLOID PHASE CONTENT AND RHEOLOGICAL CHARACTERISTICS OF DRILLING FLUIDS WHEN OPENING WEAKLY LITHIFIED CLAYS

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**Abstract**
The test was carried out using a pre-formulated clay-free water-based drilling fluid subjected to an artificial increase in the concentration of the clay phase. Based on the measurements, a coefficient was derived that determines the rate of contamination of the solution, which makes it possible to determine the value of the "critical" value of the plastic viscosity of the system, which is characterized by an increase in adhesive properties. The above technique can be used in most modern "conditionally clay-free" water-based drilling fluids.

**Keywords:** drilling fluids, adsorption capacity, plastic viscosity, clay-free drilling fluid, polyacrylates, lignosulfonates.

It is known that one of the main problems associated with drilling in weakly lithified active, swelling clays is the sticking of clay particles on the rock cutting tool (chisel, reamer), pipe locks and couplings and the formation of so-called "glands".
The rheological and structural-mechanical parameters of the drilling fluid are measured using rotational viscometers (devices are included in the State Register of Measuring Instruments, registration number 35936-07). The latter are currently represented mainly by Ofite and Fann models (the domestic analogue is VSN-3). The direct reading viscometers are rotary type instruments driven either by an electric motor or by hand.
The drilling fluid is poured into the annulus between two concentric cylinders. The outer cylinder or rotary sleeve (sleeve) moves at a constant speed of rotation - rotational speed. The rotation of the rotor hub in the liquid causes a torque on the bob

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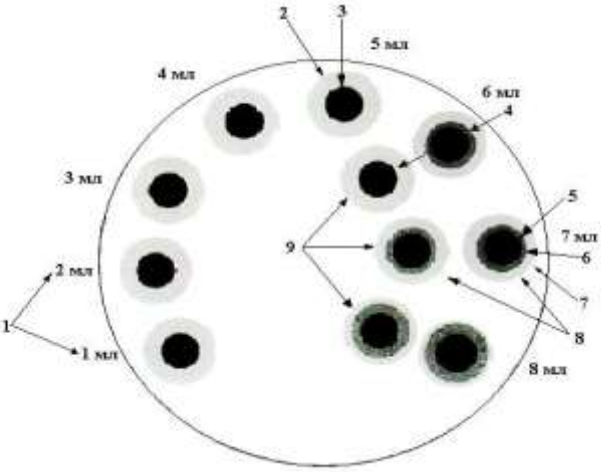
(weight) or inner cylinder. The rotational movement of the inner cylinder is restrained by a torsion spring, and a micrometer connected to the inner cylinder indicates its movement.

The tool constants are adjusted such that the plastic viscosity and dynamic shear stress are obtained using instrument readings at 600 and 300 rpm rotor sleeve speeds. The procedure for measuring plastic viscosity and dynamic shear stress (DSS) on devices of this type consists in measuring the angle of rotation of the inner cylinder when it rotates in the drilling fluid under study at a speed of 600 and 300 rpm. In this case, the value of plastic viscosity is equal to the difference between these two indicators.

The important aspect in the process of quality control and the level of contamination of drilling fluids is the determination of the adsorption capacity of the drilling fluid, which determines the amount of active colloids present in the drilling fluid, and indirectly demonstrates the concentration of the clay phase in the drilling fluid. The technique is based on the adsorption of methylene blue on clay particles.

The methylene blue adsorption capacity of a drilling fluid is an indication of the content of reactive clay components (bentonite or drill cuttings). Figure 1 shows a variation in the distribution of test drops on a sheet of filter paper, as well as examples of halos. The input of methylene blue can be made not only in 1 ml, the actual volume is determined by the expected content of the colloidal phase and for low clay solutions is usually 0.1 ml.




The quantitative value of the adsorption capacity according to the MBT method is determined by the formula:

[MBT] = 7.125.Vms,

where [MBT] is the actual value of the adsorption capacity, kg/m3,

Vmb – volume of methylene blue used for titration, ml

The analysis of the results presented in the graph clearly demonstrates that the dependence of the value of plastic viscosity (PV) on the content of the clay fraction

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(MW) in the solution within these values obeys the law of a linear function. However, this is true only at the minimum values of the content of the clay phase, i.e., for "conditionally clay-free" solutions.

Moreover, for different concentrations of chemical reagents, the slope coefficient differs, which, at given minimum concentrations of the clay phase, will be directly proportional to the concentration of chemical reagents in the drilling fluid, which additionally proves the negative impact of excessive treatment of the drilling fluid with chemicals.

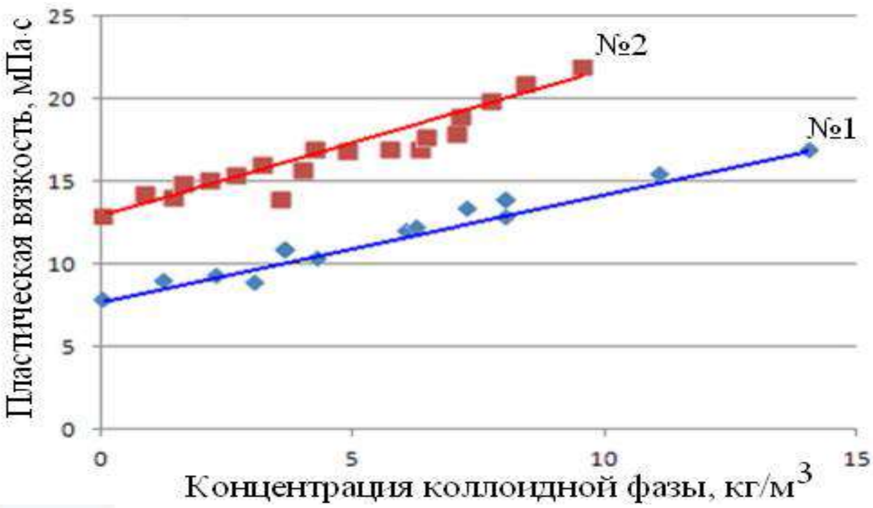


Figure 2.2. - Dependence of plastic viscosity on MBT, obtained during field studies.

Thus, returning to the above dependence, we can identify the following function:

y = kx + b, (2.22)

which, in relation to the situation under consideration, will take the form:

PV = [MBT]·k + PV0, (2.23),

where PV is the value of plastic viscosity in mPa□s,

[MBT] is the value of the parameter of the adsorption-exchange capacity of the drilling mud, expressed in kg/m3 of inorganic colloids contained in the mud (clay fraction),

PV0 is the value of plastic viscosity in (mPa□s) of a fresh solution without clay phase measured during circulation after averaging and stabilization mud parameters before drilling,

k is the coefficient that determines the degree of growth of the plastic viscosity parameter in the process of drilling fluid contamination with the clay phase, i.e., the change in the plastic viscosity of the drilling fluid with an increase in the content of the clay phase by 1 kg/m3.

Based on the above formula, the coefficient k can be easily expressed as

k = (PV – PV0)/[MBT], (2.24)

where PV and [MBT] are the average values of plastic viscosity in mPa □s and adsorption-exchange capacity of the drilling fluid, expressed in kg/m3 for the series of measurements under consideration.

The determination of this coefficient using the first few measurements of the technological properties of the drilling fluid will allow in the future to judge the degree of drilling fluid production during deepening in the intervals represented by weakly lithified rocks, provided that the concentration of chemicals in the drilling fluid is maintained at an optimal level.

Based on the foregoing, it is recommended to use, when drilling in weakly lithified clayey rocks, only solutions that can be conventionally taken for clay-free or, in some cases, low-clay systems, preventing a significant transition of their state into the incubation area, which to a large extent can mean excessive contamination of the drilling fluid with a colloidal phase.

The methods, instruments and materials for research.

This technique is intended to determine the value of the plastic viscosity parameter of a "conditionally clay-free" drilling fluid, corresponding to the transition of its state to intense gelation.

The essence of the method is to determine the dependence of the change in the value of plastic viscosity in the process of increasing the concentration of the colloidal phase. The technique is not applicable to drilling fluids with a high content of clay phase and is designed for water systems with clay content up to 15 kg/m3.

**References**

1. The adsorption tank according to the MBT method with methylene blue. Instruction dated 30.04.2003 OFI Testing equipment Inc. modifications 800, 900 dated 31.08.2007 OFI Testing equipment Inc.
2. Ryabchenko V. I. The management of properties of drilling fluids/ V. I. Ryabchenko. - M. Nedra, 1990. - p.142.
3. Ulyasheva, N. M. The technology of drilling fluids: The course-book for universities / N. M. Ulyasheva. - Ukhta, 2008. - p.164.
4. The textbook for mud engineers/ed. A. I. Penkova. - Volgograd: IKF, 2000. - p.240.
5. Ulyasheva, N. M. The physical and chemical methods of dealing with complications: textbook / N. M. Ulyasheva [and others]. - Ukhta: USTU, 2014. - p.119.