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DRILLING SOLUTIONS BASED ON HOVDAK BENTONITE AND THEIR APPLICATION TECHNOLOGY

Eshkurbonov Furkat Bozorovich [1], ***Abduraimov Jakhongir Bakhtiyor ugli*** [1]

[1] Republic of Uzbekistan, Surkhondarinskaya region, Termez

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Abstract

Chemical reagents are added to drilling fluids to improve their properties. Clay rocks are primarily used in the preparation of drilling fluids. These clays, depending on their mineral composition, are divided into 4 types. Montmorillonite, kaolin, hydro-micaceous and palygorskite minerals. Drilling fluids have specific functions, such as: cleaning the wellbore wall, removing rock from the bottom of the well, cooling the drill bit, blocking (weighing) the movement of gas and oil in the reservoir. Instead of drilling muds, water was also widely used. Drilling fluids are prepared based on the liquid phase, clay particles, and chemical reagents. Bentonite-based drilling fluids, currently used as the main raw material, yield high efficiency.

Keywords: *Paligorskite, bentonite, clays, weighting, barite, rocks, weighting, flotation, reagent, solution, drilling, lightening, well, liquid, montmorillonite, oil, gas*

Introduction

There is very little information about the drilling fluids created in the early stages. A solution in the form of liquid clay formed during drilling in wells drilled by the first rotor method was used. Undoubtedly, liquid clay was used at that time because there were no impressions of drilling fluids. The control of the physical properties of drilling fluids and changes in their properties were not recorded, as these questions were not controlled and practically created at that time. It can only be assumed that in cases where the drilling mud was very thick, it was diluted by vomiting water. The properties of drilling fluids show that when drilling at high speeds, work must be completed to ensure safety and maximize well productivity. The use of drilling fluids with controlled properties leads to significant costs, which must be economically justified. To do this, the drilling fluid must behave during the drilling process and be given the qualities required by the drilling conditions using the available chemical reagents (Aminov A. M., Makhamatkhojaev D. R.).

Chemical reagents are added to drilling fluids to improve their properties. Clay rocks are primarily used in the preparation of drilling fluids. These clays, depending on their mineral composition, are divided into 4 types. These. Montmorillonite (bentonite), kaolin, hydro-micaceous and palygorskite minerals.

Montmorillonite is a bentonite clay mineral. Bentonite clays are more effective than other types of clays. For example, if 16–24 m^3 of a mixture is obtained from bentonite, then 4–6 m^3 of a mixture is obtained from hydromica. Therefore, it is advisable to use a bentonite mixture. Hydro slurry is ubiquitous in terms of quantity, it is used only where there is no bentonite. However, when using hydromica, a sharp increase in the content of the solid phase is observed, and chemical reagents are often used to soften this solid phase. Kaolinite is practically not used in drilling.

Since the minerals of palygorskite are primarily linearly fibrous, salt-tolerant and high-quality mixtures are prepared. Paligorskite mixtures yield very good results in the process of drilling salt deposits (Yuldashev T. R., kat, o'q. Shonazarov E. B., 2019).

Purpose of the research: According to the requirements for mixtures, the water release of the mixtures within 12 hours should not exceed 2.5%. The Paligorskite mixture is in a salty environment, it is saturated with salt and does not excrete water at all. Clay is primarily used as a powder in mixtures. Currently, bentonite clays are extracted from the Navbakhor deposit (Yuldashev T. R., kat, o'q. Shonazarov E. B., 2019). Bentonite reserves are also found in large quantities in Hovdak, where the resulting samples are used to produce drilling fluids.

Table 1. *Chemical characteristics of bentonite*

Indicators	Flow rate (with SPV-5), S	Mixture density, g/cm³	Mixture yield, m³/t	Water retention, cm³ 30 min	Crust thickness, mm
Navbakhor bentonite	25	1.04	15	16	2
Kasantau Bentonite	25	1.06	10	18	2
Saltwort	25	1.30	2	30	3
Constantine bentonite	25	1.06	10	12	2
Hovdak Bentonite	25	1.05	15	17	2

Main technological features. Hydromica and bentonite are primarily used to obtain drilling fluids. The density of solutions prepared from hydromica is 1.15–1.25 g/cm³, while bentonite has a lower density of 1.05–1.08 g/cm³. Until relatively recent years, weighing solutions, i.e., high density, were used, which mainly served to accelerate the drilling process and assist the drill bit (drilling head). Barite ($BaSO_4$) is primarily used as a weighting agent ($\rho > 1.26$ g/cm³). Barite has a specific gravity of 4.48 g/cm³, and its granularity is very low. Barite is widespread in rocks, its extraction is mainly carried out in two ways (Yuldashev T. R., kat, o'q. Shonazarov E. B., 2019). These are the methods of gravitation and flotation.

Barite obtained by gravitation is of higher quality than barite obtained by flotation.

Table 2. *Indicators of different varieties of weighting barite*

№	Indicators	I type	II type
1.	$BaSO_4$ content, %	92	87
2.	Density, g/cm³	4.25	4.15
3.	Moisture content, %	1.5	1.5
4.	The content of water-soluble salts, %	0.30	0.35
5.	No. 009K sieve residue, %	4	4
6.	The number of particles measuring 5 microns, %	5	10

Drilling fluids have specific functions, such as: cleaning the wellbore wall, removing rock from the bottom of the well, cooling the drill bit, blocking (weighing) the movement of gas and oil in the reservoir. Instead of drilling muds, water was also widely used. Drilling fluids are prepared based on liquid phase, clay particles, and chemical reagents

(Yuldashev T. R., kat, o'q. Kholbazarov I. R., Kurbanov A. T., 2015).

The gas phase is also used in the cleaning of wells, and the role of air is also of great importance. The gas phase is pumped into the well using a compressor. The gas or air phase pumped into the well is supplied with PAV (a substance that activates the elastic surface) (Yuldashev T. R., kat, o'q. Kholbazarov I. R., Kurbanov A. T., 2015).

Table 3. *Types and quantity of PAV*

№	Types of PAV	PAV content, %	Crushed rock: water coming out of the layer
1.	Sulfanol, NP-1	0.23	1:2
2.	"Progress", OP-10	0.10	1:2
3.	KAUFE-14	0.12	4:1
4.	"Azolyat-A"	0.10	1:2

Drilling mode: The parameters of the drilling mode depend on the speed of the drill bit's rotation, its load value, the amount of fluid supplied for pipe flushing, and its properties. High efficiency is achieved when all these parameters work. The cutting speed of the cutter is adopted, which is called the mechanical cutting speed and the cutting speed of the cutter (Yuldashev T. R., kat, o'q. Kholbazarov I. R., Kurbanov A. T., 2015).

It is calculated using the following formula:

$$V_m = h/t_{dril} \quad (1)$$

$$V_r = h/t_{dril}+t_{sub} \quad (2)$$

Here, Vm, Vr are the mechanical transition and flight speed of the drill bit; h is the depth of the drill bit; tbur + talm is the time spent on drilling and changing the drill bit.

The following important factors influence this indicator.

1. Natural factors, including the composition of rocks, mechanical properties, and their depth layers.

2. Technical and technological factors, the design of the drill bit, methods of rock crushing, strength and power of drilling rigs.

3. Experience and skills of workers, the process of organizing work.

Research results: This research was conducted at the Termez State University of Engineering and Agrotechnology. Drilling fluids were obtained in laboratory conditions using Hovdak bentonite by scientists at the University. These solutions were tested during drilling.

Currently, the main task is to correctly select these mitigators. Its primary function is to facilitate the uplift of the resulting rock and clay solution by lightening the drilling mud. This is due to the fact that if the clay emulsion formed during drilling remains at the bottom for a long time, the liquid in it will separate and solidify, which has a significant impact on the work. This research paper attaches great importance to this. Table 4 presents a number of types of reagents used to improve drilling properties. These reagents were used during the research, and positive results were obtained.

Table 4. *Reagents used to improve drilling properties*

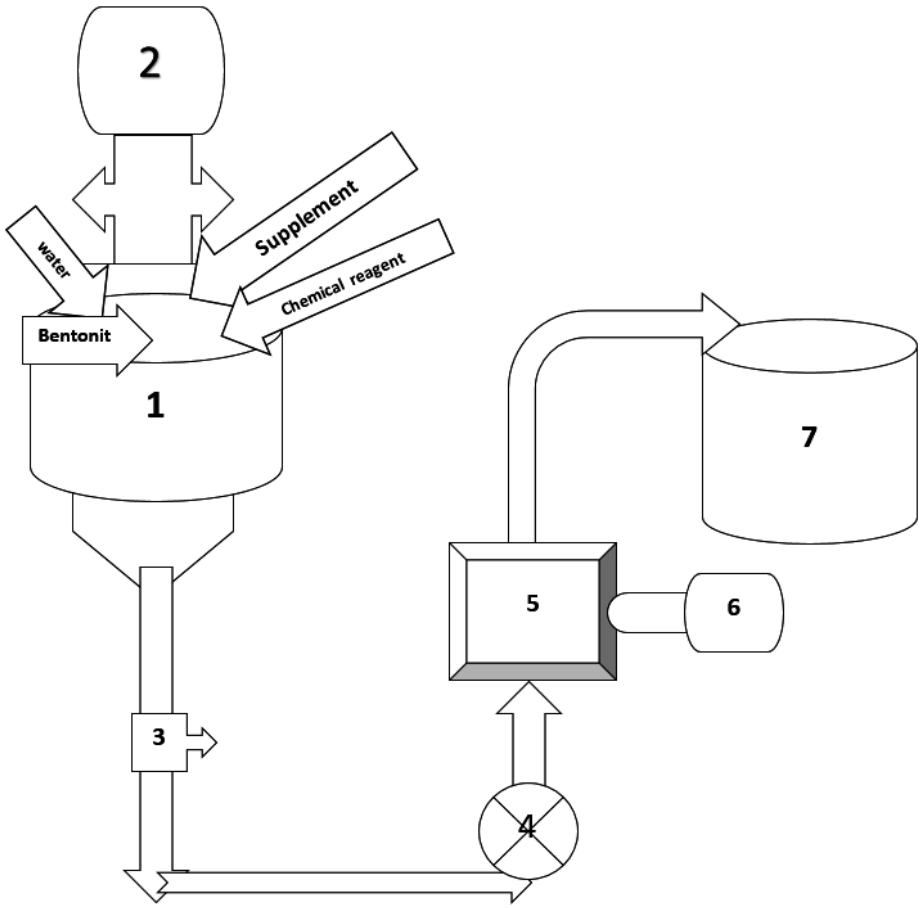
№	Function to perform	Reagents
1.	Dehydration-reducing reagents	UHR (coal-alkaline reagent), KSSB
2.	Reagents that reduce fluidity and viscosity	(In a sulphite-alcohol bar). CMC (carboxymethylcellulose), hypan, K-4, starch
3.	Inhibitors	Nitrolignin, sunide,
4.	Fatty substances	Hetane, FXLS, phosphates, etc.
5.	Emulsifier	Potassium chloride, magnesium chloride, lime, table salt, etc.
6.	Foam removers	SMAD-1, graphite, oil, suapstock, and other oils.

№	Function to perform	Reagents
7.	Reagents that change hydrogen parameters	OP-7, OP-10, sulfonate.

These reagents are used in an amount of 3–4% of the total volume of the drilling fluid.

This figure shows the technological scheme for obtaining a drilling fluid.

Figure 1. *Drilling fluid preparation scheme*



1-reactor-mixer, 2-engine, 3-fluid feed valve,
4-pump, 5-mechanical-chemical disperser (MCD),
6-engine, 7-ready drilling fluid

According to this scheme, the study of the developed technology for producing heat-and salt-resistant drilling fluids based on Hovdak clays using MCD at a speed of 2100 rpm shows high efficiency compared to the traditional method.

Conclusion: Based on the results presented above, samples obtained from bentonite clays are widely used in drilling fluids. The main indicators of Khoddak bentonite also correspond to the drilling fluids obtained from Navbakhor bentonite and other regions. Based on these indicators, we consider the use of bentonite from the new deposit to be a solution to several problems in obtaining and using drilling fluids. During the drilling process, the tasks of drilling muds are to prevent the destruction, breakage, and decrease in the speed of the process of the drill bit (drilling head). Laboratory experiments have proven the possibility of using this bentonite as a drilling fluid, as it possesses the aforementioned properties and possesses a very good adhesion process with water and rocks.

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Contact: furqat-8484@mail.ru; jabduraimov64@gmail.com