https://doi.org/10.29013/AJT-22-5.6-37-39

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BASIC REQUIREMENTS FOR THE SELECTION OF DRILLING FLUIDS IN ORDER TO INCREASE THE OIL AND GAS RECOVERY OF RESERVOIRS

Abstract. This article considers, depending on the drilling conditions, the main technological requirements for increasing the oil and gas recovery of productive formations. The purpose of the article is to choose a drilling fluid for a directional well, which must meet the necessary requirements to reduce the risk of drilling and casing strings being seized. The article describes in detail the specific technological requirements of drilling fluid for successful drilling operations in deep wells in fields with difficult mining and geological conditions.

Keywords: Solid phase, fluid, regeneration, hydrotreated fuel, hydraulic funnel, vibrating screen, centrifuge.

In the drilling process, the drilling fluid used must meet specific technological requirements for a number of its main properties, expressed quantitatively and requiring measurement, control and maintenance at a given level.

Depending on the drilling conditions of oil and gas wells, their depth and the complexity of the composition of the cleaning agents used, the control of their parameters can be divided into three levels.

The first level includes the control of drilling mud parameters, which is mandatory for all wells and performed with the help of instruments. Density, conditional viscosity, static shear stress, filtration index (water output), filtration crust thickness, stability, daily sludge (colloidality), sand content.

The second level, corresponding to complicated drilling conditions, is supplemented by the determination of plastic viscosity, limiting dynamic shear stress, water loss at elevated temperatures, oil gas content, solid phase composition, surf stress (for emulsion solutions), degree of mineralization (ion content Cu, Mg, Na, K, Cl, etc.).

The third, most complete and detailed level of control of the parameters of drilling fluids performed by special devices for determining the lubricity of the solution, shear stress of the filtration crust, heat treatment of solutions and other parameters [1].

The variety of drilling conditions, on the one side, and the differences and requirements that are imposed at various stages of drilling a well, on the other, led to the appearance of several types of washing fluids.

All these liquids are divided into three main groups:

a) water-based washing liquids; these include water and clay solutions;

b) oil-based washing fluids;

c) gaseous working agents.

Drilling experience has shown that, when rinsing with water, the costs of clay, chemicals and the amount of work are sharply reduced. The general condition of the borehole in carbonate rocks is improved and the number of tacks and tightening of the drilling tool is also significantly reduced.

But water is not a universal washing liquid, and has the following disadvantages that limit the scope of its application:

– it cannot form a thin and strong crust on the walls of the well, which would cement the walls and

prevent them from shedding and filtering the washing liquid into the layers;

– can not hold the drilled rock in a suspended state, when the circulation is stopped by the pump;

– reaction with particles of drilled rocks, dissolution and saturation with salts that cause corrosive effects on equipment and drilling tools;

– penetration through the pores into the formation and a sharp decrease in the efficiency of oil permeability during the opening of oil-saturated formations.

The clay solution is a colloidal-dispersed system, which is formed by very thoroughly mixing of some clays with water. In the process of such mixing of clay with water, and also as a result of the penetration of water between individual clay particles, the clay is dispersed into small and minute particles.

Clay-based solutions have the following advantages:

– glinization of the walls of the well during the destruction of rock;

– holding the fragments of the drilled rock in a suspended state;

– there may be less penetration of the washing liquid through the walls of the well into the rocks;

– does not cause corrosion of drilling equipment and tools.

The negative side of the clay solution is the following:

– when opening oil and gas saturated formations with the formation of penetration into the pores of solid particles that can reduce the efficiency of oil and gas recovery of formations.

Oil-based solutions are used to increase the return of oil-bearing formations during opening and hydraulic fracturing, as well as in unstable clay-salt deposits. The elimination of colmatation and the watering of productive horizons makes it possible to increase the flow rate of oil and gas many times [2].

At well № 147 North Goturdepe, it is recommended to use weighted, chemically treated water-based drilling fluids as a flushing fluid from zero to a depth of 4206 meters, and from a depth of 3800 meters to 4555 meters, an oil-based solution.

The necessary properties of drilling fluids are determined by geological conditions and process requirements.

Drilling in the range of 0–600 meters under the conductor Ø426 mm is recommended to be carried out on an oil-emulsion humate-lignosulfonate drilling fluid.

Drilling in the range of 600–3800 meters under technical columns of Ø324 mm and 244.5mm is recommended on aluminum-quartz drilling fluid of the ALKAR-3 type and from an interval of 3800–4206 meters under a technical column on hydrocarbon drilling fluid.

Drilling of an interval of 4206 meters to 4555 meters for an operational filter shank Ø139.7mm is recommended to be performed on a hydrocarbon drilling fluid, since the operational part of the well is planned to be drilled obliquely directed.

The choice of drilling fluid for a directional well should take into account several important points: in particular, the need to reduce the risk of column snapping. For this purpose, on the one side, it is necessary that the weight of the solution be minimal, but correspond to the working pressure, and on the other side, the correctness of the formulation of the solution formula is important. The use of special additives, as well as the optimization of the geological, chemical and physical characteristics of the solution, can minimize the friction between the barrel and the drill string, as well as the risk of differential pressure caused by filtration processes due to the formation of a thin, elastic and impermeable filtration crust, which prevents the pipes from pushing through and, consequently, their adhesion to the walls of the barrel. These are both problems they can be significantly leveled due to the use of a reversed emulsion or a hydrocarbon-based drilling fluid.

At well № 37 North Goturdepe, it is recommended to use weighted, chemically treated water-based drilling fluids as a flushing fluid from zero to a depth of 4206 meters.

Drilling in the range of 0–600 meters under the conductor Ø426mm is recommended to be carried out on an oil-emulsion humate-lignosulfonate drilling fluid.

Drilling in the range of 600–5200 meters under technical Ø324 mm, Ø244.5 mm columns and an operational shank Ø139.7 mm is recommended on aluminum-quartz drilling fluid of the ALKAR-3 type.

At well № 156 North Goturdepe, it is recommended to use weighted, chemically treated water-based drilling fluids as a flushing fluid from zero to a depth of 4100 meters, and from a depth of 4100 meters to 4300 meters, an oil-based solution.

Drilling in the range of 0–400 meters under the conductor Ø324 mm is recommended to be carried out on an oil-emulsion humate-lignosulfonate drilling fluid.

Drilling in the range of 400–4100 meters under intermediate columns Ø324 mm and Ø244.5 mm is recommended on aluminum-quartz drilling fluid of the ALKAR-3 type.

Drilling of an interval of 4100 meters to 4300 meters for an operational filter shank Ø177.8 mm is recommended to be performed on a hydrocarbon drilling fluid.

At well № 200 North Goturdepe, it is recommended to use weighted, chemically treated water-based drilling fluids as a flushing fluid from zero to a depth of 4900 meters.

Drilling in the range of 0–600 meters under the conductor Ø426 mm is recommended to be carried out on an oil-emulsion lignosulfonate drilling fluid.

Drilling in the range of 2000–4900 meters for a technical column Ø244.5 mm and an operational shank Ø177.8 mm is recommended on aluminum-quartz drilling fluid of the ALKAR-3 type.

On all four wells, it is recommended:

– adjust the parameters of the drilling fluid and the consumption of chemical reagents according to the actual mining and geological conditions of drilling;

– it is necessary to determine the properties of drilling fluids according to geological conditions and process requirements.

Seawater is used for the preparation of clay solution and the regulation of the solid phase content, as well as for the mixing of reagents [3].

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