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# Development of Flushing Fluids to Prevent Gland Formation on The Chisel

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***ABSTRACT---*** *The article discusses how quite often in the practice of drilling plastic pipes on modern dimensional inhibited wash solutions, penetration rate decreases in2-3 times. An analysis of such a drop in mechanical speed indicates as the most influential reasons are the formation of a momentum on the bit and BHA. For the lips injuries of this complication when drilling plastic rocks need to be applied technical and technological solutions. Development of prophylaxis is necessary technical measures that can improve technical and economic indicators drilling plastic rocks. One solution is to use special reagents that prevent gland formation and improve drill ability. Existing directions for solving this problem when drilling inductile rocks are mainly associated with the improvement of the design to lot, improving the quality and organization of the flow of flushing fluid. Improving the design of the bit is carried out by optimization profile weapons bit; hydraulic profile; quantities, sizes, angles of attack and the shape of the cutting elements; location and direction of the prom chisel nozzles. In modern drilling technology for trouble-free plastic sinking rocks often use polymer inhibited flushing fluids. Improving their quality is achieved by introducing additional allowances, the choice of which is based on special scientific research work).*

***Keywords---*** *chisel, drill, fluid, rock, solution, reagents, research.*

## I. INTRODUCTION

In Uzbekistan, rocks of low strength predominate. Such rocks, when drilling with water-based drilling fluids, are prone to hydration, sticking to the bit and the layout elements of the bottom of the drill bones (BHA), which reduces the drilling speed and leads to various complications. Quite often in the practice of drilling plastic pipes on modern dimensional inhibited wash solutions, penetration rate decreases in 2-3 times. An analysis of such a drop in mechanical speed indicates as the most influential reasons are the formation of a momentum on the bit and BHA. For the lips injuries of this complication when drilling plastic rocks need to be applied technical and technological solutions. Development of prophylaxis is necessary technical measures that can improve technical and economic indicators drilling plastic rocks. One solution is to use special reagents that prevent gland formation and improve drill ability.

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Known additives to drilling fluids that inhibit the formation of oil seals when drilling with cutting-chipping action bits (RSD), do not fully provide a high level of effectiveness of the system Wells. Given that more than 50% of the rocks drilled in Uzbekistan are clay, the development of such reagents is promising and relevant.

To deal with oil seals, you need to know the causes and conditions of their occurrence innovations, have technical and technological means for their prevention or liquidation.

## II. METHODS OF RESEARCH

As a result of a review of research, some general. In order to reduce the likelihood of streak formation on the RSD bit, it is necessary provide a sufficient amount of open treatment space and area inter-blade holes in the bit for the removal of drill cuttings, optimizing the nozzles and provide sufficient hydraulic power. Reduced unproductive time due to the formation of oil seals on BHA elements can be achieved by limiting the mechanical speed drilling in plastic rocks using inhibiting water production waxy liquids with special additives or solutions on hydro-carbon basis (CBR), a decrease in the concentration of cuttings in the solution, etc. There are three main problems when drilling plastic clay genus: grinding of sludge, instability of the wellbore and gland formation - Chisel These problems are solved by similar methods: inhibition and encapsulate clays; decreasing their hydration by increasing the filtrate viscosity by blocking pores or stimulating osmotic overflow pore fluid into the wash solution, and the like. In solving the problem of momentum formation, there are some features. A momentum is formed immediately after drilled clay particles get into the washing solution. Its appearance is associated with additional pressing loads on drilled particles and with the formation of adhesive contact. Adhesive contact of a clay particle and a solid surface is mainly about comes under the influence of molecular forces of attraction and mechanical engagement.

The external pressing of the sludge particles to the BHA elements is due toa relatively small gap between the bit and the walls of the well and rotation of the bit. Absorbing water, the sludge particle may adhere to the water-soaked particles. Clays are characterized by small internal forces. clutch. Adhesion depends on the difference in adhesive and cohesive forces. Whether the cohesion forces are small and the adhesion forces are significant, then sticking occurs material to a hard surface.

Cohesive forces within a clay particle weaken when absorbed moisture from the solution. At the same time, the clay plasticity increases, which in turn depends on the content of water and clay (Figure 1).

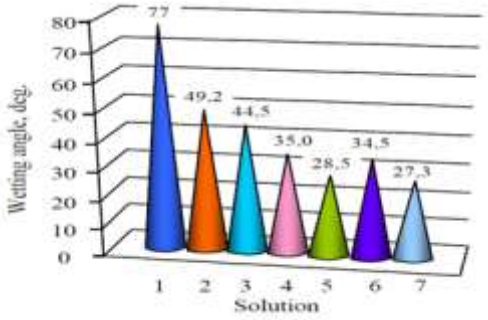

**Figure 1:** The value of the contact angle on the surface of the sample for aqueous surfactant solutions 1 - water; 2 - 0.05% solution of catamine-AB; 3 - 0.1% solution of catamine-AB; 4 - 0.05% solution of OP-7; 5 - 0.1% solution of OP-7; 6 - 0.05% solution of sodium LABS; 7 - 0.1% solution of sodium LABS

Clay particles, the state of which corresponds to the plastic zone are prone to gland formation on the bit and BHA, then cause the above problems. In initially dry clay, the material is too dry to be significant. A tendency to stick. However, with increasing water content clay ductility increases and tendency to stick increases. Ata further increase in the water content in clay, it becomes so plastic and weakly bound, which is easily dispersible. Such a loosely coupled material is easily washed off with jets of washing solution. So, from chart shows that there is a zone of increased risk of momentum formation, Slate too dry so fall to the chisel.

Worn to the plastic state of the drilled clay rock, in which run cohesive forces are weak. The position of this zone will depend on the type of slant, the type and content of clay minerals and its swelling pressure. If shales are drilled, prone to momentum formation (fall into middle zone), you can avoid problems as follows:1. Dehydration of sludge in order to transfer it from the plastic zone to "Dry." It can be achieved using a wash solution, capable of forming a membrane on the surface of a clay particle and osmosis dehydrate (due to the difference in salt concentrations in solution and in pores) clay rock. This method is also carried out using the CBR or solution with an activity of the aqueous phase below the activity of water in the drilledclay.2. Hydration of the sludge before it passes into the yield zone: the sludge disperses. It is easily washed off the surface of the bit. Achieved using the disperser gushing wash solutions. However, the use of such wash races formation can cause problems with wellbore stability and worsen lower rheology of the solution due to the increased production of the solid phase.3. The formation on the particles of sludge boundary layer (for example, lipophilic surface treatment with surfactant) to prevent clay adhesion its between themselves and with the surface of the bit. The first and second approaches are applicable only if the content water in clayey rocks and its tendency to stick are known in advance. Then yes, we could apply this strategy if there is an obvious problem gland formation and it is known that the rock being drilled is in plastic noon zone. Otherwise, the sludge originally located in the “dry” zone, can be moistened to a plastic state, thereby creating a problem gland where it was not there. This situation may occur when drilling. well compacted shale with low reactivity dispersion solution. There is also a chance of draining clean sludge located in the zone of increased ductility, and increase again the danger of gland formation. This situation may occur when drilling.

Young shales with high reactivity to inhibitory strong osmotic dehydrate solution ratios. Guided by the described methods to prevent the formation of glycols, one can hypothesize that the most effective new and universal way to prevent gland formation is the formation of boundary layers on the surface of the particles of sludge, preventing their sticking together and with the surface of the drilling tool. The second chapter substantiates the choice of experimental research methods, which were used in the performance of the thesis. To achieve the goals it is necessary to assess: ability clay particles to form a gland in solutions of test chemical reagents; the strength of the adhesive interaction of clay with the surface metal in the environment of washing liquids; effect of flushing fluid additives bones for their dispersing activity; influence of flushing components solution for hydrophobization of the metal surface and surface tension water; lubricating and foaming ability of the components under development additives; the influence of the developed additive on the inhibitory ability and general technological parameters of flushing liquids. To conduct

experiments to study the effect of flushing properties solutions for the process of omental formation was experimentally designed installation.

The dried sludge is removed from the rod and weighed. (t). The specific gravity of the gland on a metal rod (g / cm 2) is calculated according to the formula: t court = t / 108.33. The technique reproduces the process of gland formation quite well. on BHA elements and allows you to evaluate the effect of flushing components fluid to adhere clay mud to the metal in the drilling fluid under dynamic conditions. To determine the adhesion force to the metal and the autogenesis of the drilled particles clay mud to each other was designed experimentally. Principle of operation installation borrowed from the device of the same name intended for measurement and control the adhesive strength of the coating on various designs. The results obtained using this experimental setup allow it is possible to evaluate the effect of various additives in the washing solution on the strength of compressed clay material with a metal surface in the environment of the solution

Using the installation, you can evaluate the kinetics of changes in the adhesion force between contacting surfaces after the initial moment (t = 0 min) ingress of sludge particles into the wash solution. Test surfaces pressed against each other with a specific unit load, after which tear is removed and the force required to tear the clay sample away is measured metal. This force is used to calculate the adhesion forces or autogenic (depending on depending on where the separation occurred):F= F- Gadgautnegcip + oSp 5where F w / a yT or is the force of adhesion or autogestion, N;Fotp — force of separation of the tested samples from each other, N; Section + arr - dead weight of the upper cylinder and clay shale, N. The specific force of separation of shale from metal is calculated: FR? neg __ads / autoed~ ~ oh ~"sample where F ™ r is the specific force of separation of shale from metal, N / cm 2 ;Sample - contact area of the clay sample (2 ') with the lower metal cylinder (2 ").A method for evaluating the temperature dispersion of clay sludge in the medium of a washing solution in dynamic conditions, which allows Makes a conclusion about the effect of drilling fluid additives on preservation clay particles integrity. The method is based on weighing those who have not converted to fine state of sludge particles after their stay in the washing solution. Methods for determining interfacial surface tension are also given. pressure, wetting angle of a metal surface from an aqueous solution, friction coefficient of the metal-metal pair on the LUBRICITY friction machine TESTER "OFITE", foaming and emulsifying abilities water surfactants, inhibitory ability of washing solutions on a tester slight expansion of OFITE shale, etc. The third chapter presents the results of comprehensive studies on the process of formation of adhesive interaction of clay particles with metal.

Surface in the medium of the washing solution. Justified recipe proof the OPTIBUR additive, as well as its effect on the parameters washing solution. To establish the effect of polymers used to control properties of flushing liquids, on the adhesion of sludge to metal was investigated gland formation on a metal rod at a constant concentration polymer under study and increasing clay concentration in drilling the creator. Experiment (gland formation on a rotating metalcore) simulates the natural production of the clay phase in the drilling fluid in the presence of the investigated polymer. Clay contains only untreated PBN bentonite powder in different concentrations and is the base for comparison. The change in specific gravity of the stuffing box on the rod with increasing concentration of bentonite powder PBN in aqueous solutions of various poly measures. According to the results of research, some conclusions are made. Adding of studied anionic and nonionic polymers in working concentrations in glia crude solution leads to an increase in the specific gravity of the stuffing box on the metal clay rod, which means to increase the strength of adhesive contact clay sludge with a metal surface. Increase in polymer or clay concentration in polymer-clay races Creator increases the likelihood of an momentum formation. The smallest gland formation is

obtained in partially hydro-high molecular weight polyacrylamide (HGPA)(paragraph 4 of table 1).The addition of a high molecular weight polymer to the solution results into a greater increase in the specific gravity of the gland in comparison with a low-molecular weight. Nonionic polymers polyethylene oxide and polyvinylpyrrolidone (PEO and PVP) comparatively slightly increase the specific gravity of the stuffing box on the metal sky rod.

## III. RESULTS

Testing low molecular weight polymers as cationic (VPK-402), and anionic partially hydrolyzed polyacrylonitrile (41J1 AN) at low concentrations showed that their use leads to almost100% prevention of gland formation on a metal rod. Thus, some polymers can reduce adhesion forces. Clay sludge with a metal surface, however use is only higher mentioned polymers does not always ensure compliance with all requirements presented to washing solutions. This leads to the need for Changes in Polymers - Filtration Reducers and Drilling Rheology Regulators solutions, which degrades the release properties of the solution and requires it to clay processing reagents gland on elements of the NSCF. The effects of various clay and lubricant swelling inhibitors have also been studied. Additives for the formation of oil seals. Addition of inhibitors and lubricants additives leads to a decrease in the specific gravity of the stuffing box on the metalcore, others - to increase. However, the studied reagents do not lead to representing the formation of oil seals. Additional processing required washing liquid reagent that reduces the adhesion of clay particles to metal leaf surface. To prevent gland formation and increase the effectiveness of rhenium plastic rocks we have developed a complex reagent- “OPTIBUR”. According to the hypothesis put forward earlier, for the prevention of gland formation When drilling plastic rocks, it is necessary to add a complex reagent containing non-polar liquid and Surfactant. In order for the non-polar liquid to pass into the volume of the aqueous solution and distributed on the surfaces of clay particles, well walls and metal drilling tool, it is also necessary to add to the reagent composition emulsifier and water repellent in precisely selected concentrations.

As an emulsifier, it is preferable to use a nonionic surfactant. (Nonionic surfactants) that do not react with hardness salts and do not pollute when mixed with produced water, nonionic surfactants do not form insoluble sediments and do not} permeate the bottom hole zone. In this case, nonionic surfactants should They are distributed in a non-polar liquid, emulsify this liquid in water and Do not interfere with its distribution on the surfaces of clay and metal. To that the surface tension at the interface is non-polar liquid - water should not be lowered, as this will increase the work of adhesion in accordance with the known Young’s equation. The use of surface-active substances (surfactants) can lead to radical hydration of clay sludge and its transition to a zone of increased area static, which in turn will lead to increased dispersibility of the sludge, and its transition into solution in the form of a colloidal fraction. In most cases, this undesirable, since there are problems with the rheology of the solution, its one hundred flexibility, control of the solid phase and the stability of the walls of the well. So Thus, along with good emulsifying ability, nonionic surfactants should not lead to increased dispersion of sludge. As a result of research by changing the surface tension on the border of kerosene -water in the presence of various Nonionic surfactants revealed that all numerical requirements in that one degree or another correspond on-ionic surfactants based on ok-"o. °°. '° ' 2; about. 3° <05° ' 6 Ethylated Fatty The concentration of surfactants, the effect of nonionic surfactants to reduce surface tension acetylated links in mole-water solution at the border with kerosene Kul _ <<

SintaN0LI)> T a k and E from y-occurred the effect on the surface tension of water at the border with keroblue fatty acid diethanolamide (DEA). It is seen that Sintanol ALM-2 these- the surface tension of water at the interface with a non-polar liquid is less all studied non-ionic surfactants. Studies of the influence of nonionic surfactants on the stability of emulsions and pension formation in aqueous solutions (tables 2 and 3).Table 2 - Effect of nonionic surfactants on the stability of emulsions Name of surfactantALM-2ALM-7ALM-10Sintanol BVDEA Stability time at maximum surfactant concentration , Fatty acid esters(biodiesel)> 128755I-20 oil50.50.5<0.5<0.5Emulsions of mineral oil I-20 with 5% and 10% Syntanol ALM-2 (hydro-phylic-lipophilic balance 6 ^ -8) remained stable for 5 hours, then stratified. As can be seen from table 2, the most stable emulsion, with fat esters acids, and with mineral oil forms Syntanol ALM-2. Influence of nonionic surfactants on pricing in aqueous solutions Name of surfactant Base solution No. 1No. 1 + ALM-2No. 1 + ALM-7No. 1 + ALM-10No. 1 + Sintanol BV No. 1 + DEA the density of the solution after foaming, kg / m 3104010301000102010308 50According to the results of studies, we can conclude that the highest DEA has the nascent effect, and Syntanol ALM-2 has the lowest. The best of the tested reagents for the preparation of integrated the release agent “OPTIBUR” is Syntanol ALM-2. In order to select a water repellent agent, a change in the nature of wetting was studied. The surface of the metal surface initially moistened with water, with oil-soluble surfactants in non-polar liquid. In the process of testing drops A liquid fluid containing an oil-soluble surfactant floats up in the aquatic environment and in contact with the surface of the metal. As objects studies capable of dissolving or distributed in nonpolar liquids and leading to a change in the nature of the wettability of hydrophilic surfaces from the aquatic environment, cationic oil-soluble were considered surfactants (surfactants) Alkamon OS-2, various imidozol-These are the previously studied nonionic surfactants. From the measurement results of the edge wetting angle - 2 ™metal surface1st °one hundred it becomes clear that but strong oil solubility s; & 120water repellent is Is: you KPAV Alkamon OS-2.1* • • "Further studied hydro- s and phobizing abilities ^ previously considered nonionic surfactants. In zoCHX P-1E29MP. P-1333MSk P-162-09th Apkomon OS-2ɵ (P-1329M> = 87.4074 * 5.222210310 (0)ɵ (P-1333M) = 124.9375 * E5.3125 * Iod10 (O9 (P-W-OE) = 132.4665 * 22.79721og10 (s)e (Alkomon OS-2) = 173 * 40T_od10 (c)The concentration of PAE I non-polar liquid, % the drop test process is not polar fluid pop up and wet overwater metal content nonionic surfactant (Fig. 6).In the process of testing revealed that diethanolamine and Sintanol ALM-2 Preferuse in full traction (in the aqueous phase) less 0.05% as they result to additional distribution nonpolar fluid on charged surfaces metal and clay rock. Molecules developed edible additives are adsorbed on a hydrophilic surface. Effect of concentrations various oil soluble reagents on change in the edge angle of the selective wetting a metal surface• DZAA bout Sintanol ALM-2About SyntacholALM-7 /D Sintanol BVΦ AJIMтIOLAB concentration in polar fluid. % /Effect of non-surfactant concentration in aquatic environment to change the contact angle selective wetting of metal surface clay particles, borehole walls, metal and ensure the formation of a layer of non-polar liquids on it. As a result of gathered contact face “clay particle - metal” is represented by a non-polar layer liquid from additives. Nonpolar fluids have low cohesion performance, defined by non-specific dispersion interactions. Due to weak of molecular attractive forces of attraction inside the nonpolar boundary fluid the friction between the metal and the sludge particles is easily destroyed by the circulating solution, and the formation of the momentum does not occur. As the basis for the preparation of release agent, you nonpolar fluids whose cohesion work is minimal: polyalpha-lefins (PAO) and fatty acid esters (biodiesel). Selected reagents not for harmful to the environment and decomposed under aerobic and anaerobic conditions. In order to

determine the optimal composition of the developed counter-ad-OPTIBUR drilling fluid additive was a plan for experiment, the optimization parameter was selected (specific separation strength of clay simple sample from a metal after 10 minutes in solution).

An analysis of the obtained regression equation showed that the optimal on the concentrations of Syntanol ALM-2 and Alkamona OS-2 are 2% and 1%, respectively. In the developed composition, a different ratio of biodiesel is possible and PAO within the range of variation, however, taking into account the high cost PAO, for the effective work of the developed additive, just adding polyalphaolefins at a concentration of 20%.The specific force of separation of the clay sample from the metal after 10 minutes clay in solution with the addition of 3% of the developed reagent:- 15 N / cm, which is 3.7 times less than when contacting the test surface fresh medium waxy solution without additives;- 3 N / cm 2 , which is 17 times less than when contacting following surfaces in the environment mineralized flushing solution without additives. This decrease in adhesion clay to metal should weighty to fix problems with adhesion, enlargement, but clay on the face sludge sticking to the do lot hat and elements of the BHA.

## IV. CONCLUSIONS

A significant reduction in the coefficient of friction of the pair "metal - metal". When adding the developed complex reagent to a typical Lime-clay solution a decrease in the filtration rate. The complex additive contains a mixture of environmentally friendly burning medium of surfactants and synthetic liquids. The additive covers the metal surface with a hydrophobic layer of synthetic liquids, which minimizes gland formation and from drilling equipment nose. No. £ 23 - "0 minutes1 minute3 minutes5 minutes10 minutes. It was found that the addition of the reagent is an effective obstacle. It agrees with the dispersion of clay sludge. When developing additives to flushing to solution is also review edits impact on general technological parameters for the purpose of their deterioration. Install but that reagent addition Glazed base polymer Base solution + 3% "OPTIBUR" solution preservation of integrity clay sludge (% by weight) in solution in the flushing races creativity does not affect its basic dimensions, therefore, it’s at change in practice does not constitute any danger. The fourth chapter contains the contents of the technical documentation on manufacture and use of the complex reagent "OPTIBUR"; introduced regulations on the optimization of mining RSD bits and the prevention of gland education; reagent field test results described.

It is established that to prevent gland formation it is necessary treat the wash solution with an additive capable of forming a layer not polar liquids on contact surfaces. Using the proposed mechanism for the formation of clay glands not elements of BHA found that the adhesive strength of clay particles with a metal surface when moistened, first increase It arises due to the increase in the ductility of dry clay, and then decreases due to its dispersing and reducing strength. There is a high-risk area gland formation related to the plastic state of the drillable clay rock. The position of this zone depends on the type of rock, the content in clay minerals and moisture. A new complex reagent for prevention has been developed. Gland formation during drilling of plastic rocks. Also times the technical documentation for its production was worked out and approved. The introduction of the reagent into the drilling fluid showed it satisfactory compatibility with flushing fluid, puffs and no grip of the drilling tool was observed. Application of release agent addition of OPTIBUR additive allowed to drill a well without formation of oil

nicknames on the bit and BHA elements. A set of technological recommendations (regulations) on metal formation prevention during drilling of plastic rocks.

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