EXPERIMENTAL RESULTS ON THE EFFECTIVENESS OF AN IMPROVED EXCAVATOR BUCKET TOOTH DESIGN

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Abstract
In the process of drilling, in case of untimely lifting of cuttings from the bottom of the well, i.e. when the particles of the destroyed cuttings linger on the surface of the bottom of the well and under the action of hydrostatic pressure, a decrease in the efficiency of the rock cutting tool is observed.
This article discusses the movement of broken cuttings at the bottom of the well, its impact on the efficiency of the drilling process, and presents the results of experimental work to prevent the cuttings regime at the bottom of the well based on the improvement of the design of the rock cutting tool.

Keywords: drilling, boreholes, rock-breaking tools, sludge, sludge regime, rock, power, mechanical drilling speed, bit durability.

Introduction

In the process of drilling, the preservation of crushed rocks in the form of Sludge which appear munder a flicker instrument, their granulometric composition, shape and size, the movement of the rock under the flicker instrument after separation from the zaboy and its interaction with the body are called a sludge mode.
The occurrence of a sludge mode at the bottom of the screw leads to the fact that a certain part of the power being transferred to the gene flicker tool is spent on repeated splashing of the sludge , that is, increasing the energy consumption of the decomposition process, and decreasing the deepening of the screw. In addition, the preservation of the sludge mode at the bottom of the screwdriver accelerates the abrasion of the Matrix and teeth of the gender flicker tool.
The formation of a sludge mode negatively affects the durability of the gender flicker tool and the mechanical speed of drilling.
The relevance of the study of the sludge mode is confirmed by the analysis of the condition of the body of several types of gender flicker instruments. Analysis of the state of the matrix of drilling coronets and ball-bearing dolotes shows that the trace of ARCs and the depth of slots formed in a circle on the surface of the Matrix corresponds to the dimensions of the sludge[1].

The retention of the sludge mode under the body of the gender flicker instrument causes the teeth to fall out, accelerating the absorption of its matrix. The gender also causes the flicker tool to cause cavities and scratches on its teeth, causing them to be sucked away. In addition, the formation of a sludge regime reduces the mechanical rate of drilling by repeated fragmentation of rock detached from the Massif, and causes rock decomposition to exceed eneria consumption.

MATERIALS AND METHODS

Drilling process'sng performance is significantly influenced by the position of the body of the sex flicker instrument and its teeth, while the position of flicker instrument will depend on the movement of the sludge particles under its body [1]. From the above idea, it is important to research the dynamics and balance of the movement of sludge particles formed during the drilling process.

The number of sludge particles produced during the drilling process is the same as in one rotation of the gender flicker instrument during deepening:

$$B_{sh} = \frac{V_p}{V_{sh}}; \quad (1)$$

here, V_p is the size of the splinter gender under the splinter tool, V_{sh} is the size of a lump of sludge particle.

In this,

$$V_p = S_z \cdot h_{ayl} \cdot K_r \cdot K_t; \quad (2)$$

here, S_z is the surface of the zaboy; h_{ayl} is the deepening in the rotation; K_r is the coefficient of grinding of the gender; K_t is the coefficient of reduction of the volume occupied by the sludge as a result of the protrusion of teeth on the body of the gender flicker instrument.

If,

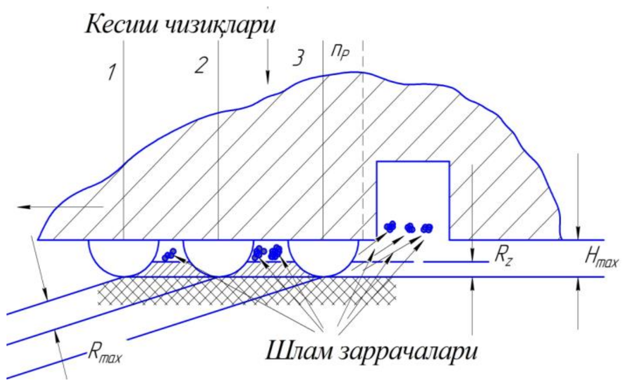
$$h_{ayl} = \frac{v_m}{n}; \quad (3)$$

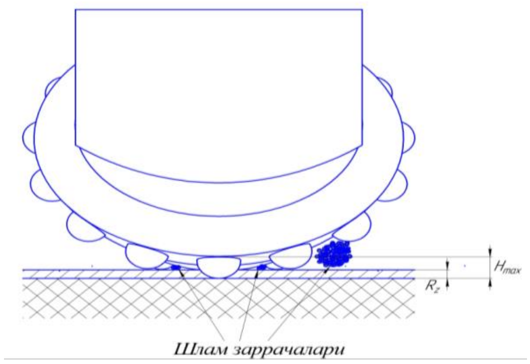
where, n is the number of rotations; v_m is the mechanical speed, if

$$B_{sh} = \frac{S_z \cdot v_m \cdot K_r \cdot K_t}{\overline{V}_{sh} n Z}; \quad (4)$$

here, Z is the number of sectors.

Below is the scheme of the movement of sludge particles under the body of the diamond - toothed coronac and the ball body of the sharoshkala dolota in Figure 1A, B.





a B

Figure 1. Movement of sludge particles under the body and between the teeth of the diamond-toothed coronac and the ball dolota.

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When The Shape of the sludge particles is spherical

$\overline{V}_{sh} = \frac{3}{4}\pi\frac{D_{sr}^{z}}{8} = \frac{1}{6}\pi D_{sr}^{z};$ (5)

$B_{sh} = \frac{6S_z \cdot v_m \cdot K_r \cdot K_t}{\pi D_{sr}^{z} Zn};$ (6)

here, D_{sr}^{z} – - average diameter of zaboy

These sludgeslur particles, formed at the bottom of the screwdriver, are in the process of drilling when the jeans perform work on the absorption of the material of the flicker tool. The amount of drilling sludge between the gender flicker tool and the bottom of the squash will depend on the size of the teeth sticking out of the Matrix body, the volumetric tooth richness of the gender flicker tool body, the bikirhood of the genus, etc.

In the general case, the amount of the drilling sludge per unit volume is for the slitting being carried out [2]:

$B_z = \frac{B_{sh}}{V_z - V_t - V_v};$ (7)

here, V_t – the volume of teeth protruding from the body; V_v – the size of the genus at the bottom of the squash.

In here,

$V_z = S_k\left(\overline{H}_{max} - \frac{R_z}{2}\right);$ (8)

$V_v = \frac{R_z}{2}S_k;$ (9)

$V_a = n_s V_{as} S_k;$ (10)

here, S_k – working surface of the body of dolota; $\overline{H}_{max}$ – on the cutting line, the average size of the maximum height of the teeth; r_z – zaboy Gadir-an indicator of buduration (GOST 2789-72); n_s – the number of diamond teeth in the working body of dolota; V_{as} – the volume of teeth protruding from The Matrix.

Thus, the sludge concentration between the bottom of the squash and the body of the gender flicker instrument is as follows [2]:

$K_z = \frac{V_p}{(V_z - V_t - V_v)} = \frac{S_z \cdot h_{ayl} \cdot K_r \cdot K_t}{Z\left[S_k\left(\overline{H}_{max} - \frac{R_z}{2}\right) - \frac{R_z}{2}S_k - n_s V_{as} S_k\right]} = \frac{S_z \cdot h_{ayl} \cdot K_r \cdot K_t}{ZS_k\left(\overline{H}_{max} - R_z - n_s V_{as}\right)};$ (11)

It means that

$K_z = \frac{V_p}{(V_z - V_t - V_v)} = \frac{S_z \cdot h_{ayl} \cdot K_r \cdot K_t}{ZS_k\left(\overline{H}_{max} - R_z - n_s V_{as}\right)};$ (12)

Thus, as can be seen from expression 12, the concentration of the sludge between the gender flicker instrument and the zaboy will depend on the deepening of the dolota during a single rotation, the indications of the dolota, and the thunder of the zaboy.

The dimensions of the sludge particle are of great importance when absorbing the matrix of a gender flicker instrument. The interaction of the minimum size of the sludge particle with the matrix material constitutes the following [3]:

$D_{min} = \overline{H}_{max} - R_{max};$ (13)

here, R_{max} –maximum protruding height of the rock in zaboy.

In the process of drilling, sludge particles directly affect the toothless part of the matrix of the body of the gender flicker instrument, the surface of which will be as follows:

$S_m = S_k(1 - n_s S_a);$ (14)

Thus, the matrix of the gender flicker tool is abrasive absorbed by the particles of the drilling sludge, the absorbent effect of the sludgeparticles will depend on the constructive and technological performance of the gender flicker tool.

THE MAIN PART

Under the body of the gender flicker tool, as a result of each of its rotations, the sludge particles are separated, and as they increase in the number of rotations, the number of cuttings separated is reduced, in which the volume of the sludge formed at the bottom of the screwdriver is equal to the volume between the working body of the dolota and the zaboy,

Three-ball dolotas are widely used in the construction of operational squash, and diamond-toothed ring-shaped coronets are widely used in the implementation of exploration and reconnaissance.

In order to eliminate the formation of a sludge mode at the bottom of the screwdriver during the drilling process, changes were made to the construction of a three-ball dolota and a diamond-toothed ring-shaped coronka. In this, shovels were placed on the paw part of the three - ball dolota,and on the tooth-top body of the Corolla along the Groove Line, these modified constructions are presented in Figures 3 a, B.

A

B

Figure 3. The construction was improved to three-ball dolota (A) and diamond-toothed coronac (b).

The placement of the shavings on the feather part of the three – ball dolota and on the body of the diamond-toothed coronka (3A,B-figures) creates force as a result of the rotation of the dolota during the drilling process, and as a result allows you to effectively clean the bottom of the squash from the sludge, eliminating

In order to research the effectiveness of the above-proposed structure of improved three-ball dolota and diamond-toothed coronks, experimental work was carried out at the central Uzbekistan party of the State Unitary Enterprise "Regionalgeology" (Figure 4).

EXPERIMENTAL RESULTS

The mechanical speed and durability of the improved three-ball dolota and diamond-toothed coronka, the construction of which was proposed during the experimental work, was compared in different drilling modes with traditional dolotas of this type

Figure 4. The proposed construction is an experimental test of an improved three-ball dolota and diamond-toothed coronac.

Experimental work was carried out in the following drilling modes: the pressure given to dolota (P_{os}) 5, 10, 15 kN, the number of dolotani rotations (n) 103, 200, 300 rot/min, washing-up liquid consumption (G) 110 l/min, organized categories f = 8, 9 va 10

The results of the experimental work confirmed that the application of a coronac with an improved three-ball dolota and Diamond Teeth, the proposed construction, will increase the mechanical speed of drilling a screwdriver and the durability of a gender flicker tool.

Figure 5 shows a graph of the mechanical speed of squaring, the dependence of dolota on the number of revolutions when the axial pressure is 10 kN.

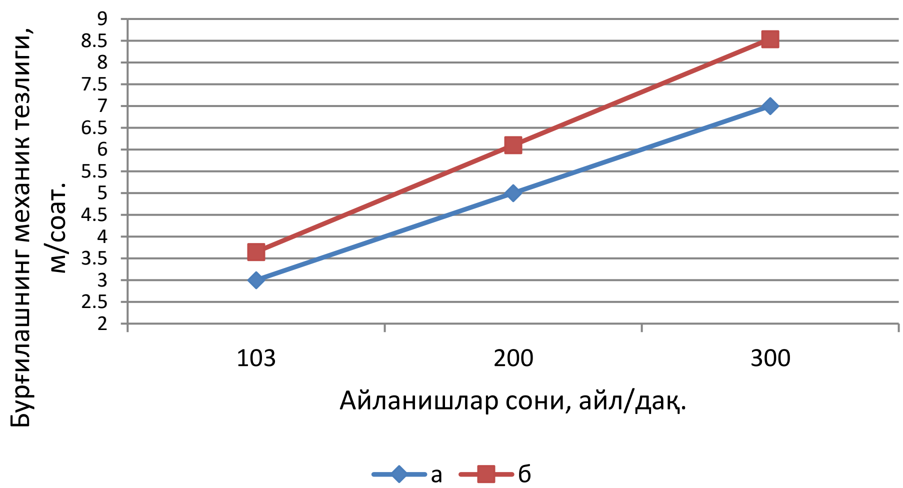

Figure 5. The mechanical speed of drilling is the dependence of dolota on the number of revolutions.

a) traditional three-ball dolota, b) the proposed construction is an improved three-ball dolota.
As can be seen from the graph of the dependence of the mechanical speed of drilling in Figure 5 above on the number of revolutions of dolota, the mechanical speed of drilling increased by 20-22% compared to conventional dolota in exchange for the proposed three-ball dolota.
Also, the throughput and durability of the developed dolota and the diamond-toothed ring-shaped coronka were researched during drilling of several types of squash, the hardness of which is equal to categories 8 and 9.

CONCLUSION

It was observed that the durability of the three-ball dolota increased by 16-17%, the throughput increased by 20%, and the throughput increased by 22% when the three-ball dolota and coronacas, whose construction was developed and proposed for application, were improved.

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