The Causes of Fluctuation of Hydrodynamic Pressure in Wells and Recommendations for its Reduction

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Abstract. The paper presents a rationale for excluding the fracture while running the tool and identified ways to reduce the hydrodynamic pressure. It is known that the pressure in the borehole to stabilize its walls is adjusted by changing the density of the drilling fluid. However, the pressure surge in the well is observed when running the drilling tool, which leads to significant absorption mud or fracturing layer. That this will lead to significant cost overruns solution and affect the resistance of the borehole. The purpose of the work to define the conditions that exclude hydraulic fracturing when running the tool and identify ways to reduce the hydrodynamic pressure
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1. Introduction

It is known that the pressure in the well to stabilizeits wallsis controlled by varying the density of the drilling fluid. However, the jump in pressure in the wellis observed when running the drilling tool, which can result in significant lost circulation or fracturing of the "weak" layer. [1,2,3]

2. Experimental part:

Diagram of the process of descentis shown in Figure 1.Drilling tools of mass Q lowered into the well with the speed and slowed to build the next candle. Well penetrated a "weak" layer having pressure $P_{пл}$

Each descent drilling tools for sybsequent build a candle is the kinematics of the 3 zones (Fig.2): 1 - down with an acceleration in the time interval, t_{condit} 2-descent constant speed V_0, (time t_0), 3 – slow motion tool until it stops (time braking $t_{braking}$). [4,5,6].

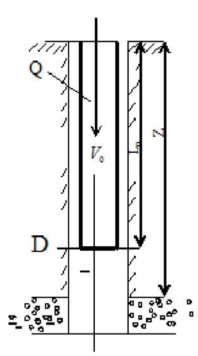

Fig.1 Scheme of the descent in to the well drilling tools

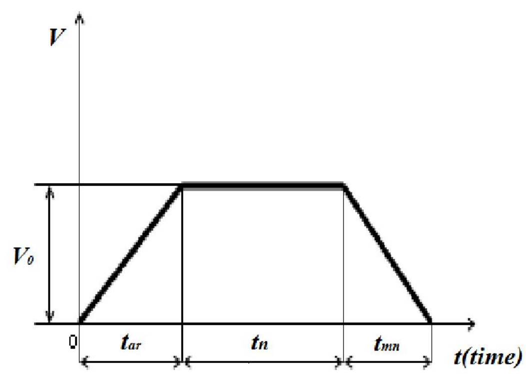

Fig.2 Changes in velocity V drilling tools from time when running in hole.

When braking to slow the tool is determined by the formula:

$$a = V_0 / t_{braknig}, \qquad (1)$$

Where is the deceleration projectile.

In this case. The drilling tool will operate the braking force F, equal to:

$$F = Qma = Q(1 - \frac{\rho_g}{\rho_{st}}) \frac{V_0}{t_{braking}}, \qquad (2)$$

where Q- weight drilling tool kg;

ρ_g, ρ_{st} - the densities of the fluid and material drilling tools.

When braking, the tool suspended by an elastic rope on the mud that fills the well, will be transferred to pressure $P_д$ equal to:

$$P_d = \frac{F}{\pi D^2/4} = \frac{4ma}{\pi D^2} = \frac{4Ql_0(1-\rho_g/\rho_{st})V_0/t_{braking}}{\pi D^2}, \quad (3)$$

Where the d – diameter of the drilling tools;

In addition to the pressure P_∂ due to the inertia of the moving tool with a slowdown, the "weak" layer of the pressure of filling the borehole fluid. The condition to prevent fracturing and absorption of the solution will be:

$$\frac{4Q(1-\rho_g/\rho_{st})V_0}{t_{braking}\pi D^2} + \rho_g gz \prec P_{pl}, \quad (4)$$

Where z- depth "weak" formation;
g -acceleration combined incidence.
(4) we can find the deceleration tool, eliminating hydraulic fractiring

$$t_{braking} \geq \frac{4Q(1-\rho_g/\rho_{st})V_0}{(P_{pl}-\rho_g gZ)\pi D^2}. \quad (5)$$

Thus, with the increase in V_{0_2} the rate of descent and weight and drilling tools necessary to increase the deceleration time, and with increasing the diameter of the well and the difference ($P_{pl} - \rho_g gz$)– reduced.

With the descent of the pressure shell is spent on structural failure mud, but its value is insignificant P_d compared to the pressure given by (3). Therefore, without much error can use the formula (5), subject knowledge quantities in the right part. As an example, Figure 3 shows the calculated dependence $t_{braking} = l(P_{pl})$. The dotted line shows the mud pressure $P_s = p_g gz$ depending on the depth of formation. The analysis of these relations shows that with the increase of the difference ($P_{pl} - g_g gz$) deceleration time is significantly reduced, and the decrease of this difference increases dramatically, asymptotically approaches the vertical $P_s = p_g gz$.[7,8,9,10].

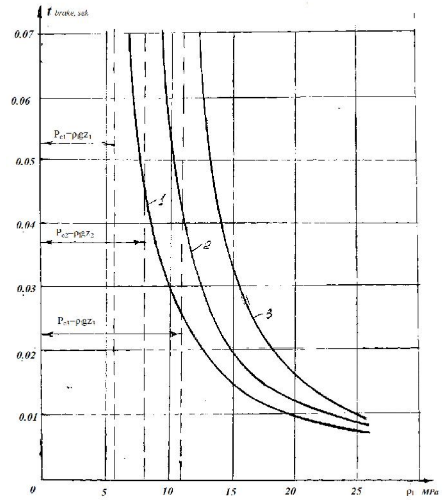

Fig.3 The dependence of the inhibition of the formation pressuret $t_{braking}$ P_{pl} at

Various Seam z(1 – z_1=500m; 2 – z_2=750m; 3 – z_3=1000m:). Adopted: the density of the drilling fluid $\rho_l = 1100 kg/m^3$ density material drill pipe $\rho cm = 7850 kg/m^3$ drilling tool running speed V_0 =1m/sek; hole diameter D=0,215m.

3. CONCLUSIONS

1. Formula (5) to determine the deceleration tool when running well, which excludes fracturing, depending on the geological and technical parameters in the above formula.

2.Umenshenie difference between reservoir presure and the hydrostatic pressure of the drilling fluid ($P_{pl} - \rho_g gz$) leads to a sharp increase in the braking time t_{torm}, which reduces the performance of descent - lifting. To prevent this, use a lower mud weight, switch to wash aerated liquids, foam, air purge and open structure for depression.

3. Encouraged to develop advice that would allow carry descent drilling tool according to the specified time of inhibition, which in turn is automatically tuned to the rational value to the weight of the landing tool, shutter speed, the depth of the reservoir, the density of the solution and drilling diameter drilling.

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