Process Features Discovery Of Low-Pressure Layers

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ABSTRACT

This article provides information on the complexity of drilling into low-pressure formations and the use of balanced pressure drilling technologies during drilling, as well as the rate of displacement of the gas-liquid mixture and the causes of adverse effects.

Keywords: formation, pressure, liquid, opening, drilling, speed, rock, solutions, gas-liquid, filtrate.

Introduction

Opening a formation with low pressures (even when using progressive drilling fluids) is significantly complicated. During circulation, large pressure differences arise on the formation, which causes a violation of its natural structure, complete absorption of the drilling fluid. In case of catastrophic absorption of the drilling fluid, the filtrate with sludge and other impurities penetrates to such a depth, from where it is impossible to extract it during development.

To open low-pressure formations, it is recommended to use balanced-pressure drilling technology with gas-liquid mixtures. In addition to the improved quality of formation opening (due to the balanced pressure in the wellbore and formation), the drilling technology allows for an increase in drilling speed due to the intensification of face cleaning. At low flow rates and low removal capacity of cleaning agents, a significant volume of sludge is not carried to the surface, but is repeatedly ground and re-ground at the face. Therefore, most of the energy is used not to destroy the face, but to grind and crush the sludge.

Main part

The increase in the speed of the flow carrying away the sludge allows to increase the mechanical drilling speed during reverse flushing by 2-4 times, and during core hydrotransport - by an order of magnitude. The use of methods that provide high speeds of the ascending flow is not always possible, for example , at well depths of more than 200 m, the absence of a special tool, etc. The mechanical drilling speed can be increased not only by increasing the speed of the ascending flow, but also by increasing the bearing capacity of the cleaning agent. Usually, they strive to increase the bearing capacity of the cleaning agent by increasing the viscosity, specific gravity and strengthening the structural properties of the solution. This way of increasing the bearing capacity of the cleaning agent has not found wide application for two reasons.

The first reason is the increase in the differential pressure on the face and on the rock being destroyed when using weighted solutions with pronounced structural properties, and as a consequence, in the decrease in the intensity of

rock destruction and the mechanical drilling speed. Usually, the use of weighted solutions with increased removal capacity leads to a decrease in the mechanical speed compared to drilling with water flushing or lighter solutions.
The second reason is irreversible clogging of the aquifer, a decrease in permeability during filter zone and well performance characteristics . In addition, the use of weighted solutions leads to the formation of an elastic film on the well walls, the presence of which contributes to a decrease in the quality of casing cementing, the occurrence of interlayer flows and a threat to the environment. environment.
The most progressive direction in the field of improving well flushing is the development of gas-liquid mixtures and the technology of their preparation. Gas-liquid mixtures, on the one hand, have a high bearing capacity, usually 8-9 times greater than the carrying capacity of a similar volume of water, and on the other hand, do not create excessive differential pressure on the bottomhole, which causes accelerated destruction of the rock and timely removal of its well.
When exploiting a groundwater deposit, depletion occurs levels and an increasing number of wells are penetrating low-pressure formations. Well drilling in such conditions can only be effective if a pressure balance is ensured in the well-formation system, i.e. balanced, equilibrated pressure. Creating a balanced pressure in the well-formation system when drilling non-artesian wells (non-self-flowing) is possible using lightweight gas-liquid cleaning agents. The pressure balance on the well walls allows them to be maintained in a stable state and prevent absorption of the filtrate solution.

Conclusion

Preventing the absorption of the filtrate solution when using gas-liquid cleaning agents allows achieving the following advantages during drilling:
ensuring the possibility of using the rotary drilling method with flushing in absorption sections;
timely removal of drilled rock along the entire wellbore, increasing drilling speed;
minimization of swelling of clay rocks during filtrate penetration, prevention of tool drag, elimination of the need for wellbore calibration;
minimization of aquifer colmatation , improvement of filtration properties of the near-wellbore zone, improvement of well performance characteristics;
simplification of well design by partially eliminating intermediate columns to cover absorption intervals;
saving water, reagents and energy;
Reduction of contamination of the section during drilling, preventive measures for environmental protection.

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