Analysis Application Of Gas-Liquid Mixtures In Low-Pressure Formation Discharge

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ABSTRACT

This article provides information on the features of using a gas-liquid mixture to clean the bottomhole of a well, the negative and positive effects of a gas-liquid mixture on the body of a well.

Keywords: Gas-liquid, speed, pressure, liquid, opening, drilling, speed, walls, wells

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.

Main part

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.

With balanced pressure, the well walls are maintained in a stable position, which determines the advantages of using gas-liquid cleaning agents during drilling;

prevention of packing , tool seizure, pipe breaks and other types of accidents;

prevention of pressure increase in the discharge line, pump compression, intensification of absorption and loss of circulation;

increasing the drilling speed by eliminating the need for repeated crushing of collapsed rocks;

simplification of the well design by partially eliminating intermediate casing columns used to cover the intervals of collapse ;

minimization of inter-layer flows that occur during poor-quality cementing, which is caused by the collapse of the well walls due to the eccentric nature of the installation of casing columns.

An analysis of the listed advantages allows us to conclude that when drilling wells with flushing with gas-liquid mixtures, the mechanical drilling speed can be increased, the cost of the well can be reduced, the quality of construction can be improved, environmental protection requirements can be met, and materials and reagents can be saved.

The rational area of application of the technology is determined by the conditions in which the advantages of gas-liquid cleaning agents are most fully manifested. The technology of cleaning a well with gas-liquid mixtures is recommended for use in the following cases.

Drilling in formations prone to absorption of cleaning agent filtrate.

Unsatisfactory well drilling speed.

Drilling large diameter wells.

Drilling in rocks prone to swelling and collapse when filtrate penetrates

Increased requirements for environmental protection and cementing quality.

The need to simplify the well design and reduce the number of intermediate columns.

Carrying out work in conditions of lack of stable supply of water and reagents.

Conclusion

Main parameters of gas-liquid mixtures. Parameters of aerated liquids are selected for the following conditions:

drilling a well at balanced pressure;

ensuring the required bearing capacity of the solution at a given pumping equipment capacity, drilling speed and well design;

economical use of reagents.

The main parameter of the gas-liquid mixture is the volume ratio of the liquid and gas phases. Let us define this ratio. Balanced pressure during drilling is observed in the case of equality of the hydrostatic pressure of the aerated liquid column up to the wellhead to the formation pressure. To ensure stable stability of the well walls, it is usually recommended to pass the well with repression on the formation within 0.03-0.05 MPa.

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