

ABSTRACT

on the dissertation work in the specialty
"6D070600 - Geology and exploration of mineral deposits" on the topic "Research
the causes of complications in the construction of geotechnical wells and
development of measures to fix them"
of the doctoral PhD candidate Moldabekov Murat Smanovich

The thesis is devoted to the study of the geological nature of the complications arising from the drilling of geotechnological wells and the development of measures and technical means to prevent them.

Relevance of the work

However, when constructing geotechnological wells, depending on the lithological structure of the geological section at its different stages, complications can occur, such as the instability of the walls of wells, the formation of cavities, the occurrence of which leads to an increase in the actual diameter, and this in turn leads to a deterioration in the conditions of transportation of the products of destruction (the formation of sludge plugs, oily formation and etc); the curvature of the wellbore, which leads to uneven development of the developed block; low well productivity during development, etc.

This work is dedicated to solving the above mentioned problems.

The aim of the thesis is to increase productivity and reduce the cost of work in the construction of geotechnological wells, increase the operational reliability of geotechnological wells and their service life, which is achieved by research on the development of new formulations of drilling fluids that prevent the formation of cavities in the geological section, studies to maintain the well route in a given direction; research on obtaining project production rate during the development and on the basis of these studies, the development and implementation of improved technologies and technical means.

In accordance with the goal, the work provides for the solution of the following main tasks:

- determining the causes of the formation of cavities in the geological section and the theoretical substantiation of the possibility of developing new formulations of drilling fluids that prevent the "dissolution" of clay rocks;
- determination of the geological causes of the natural curvature of wells and theoretical studies to increase the rigidity of the drill;
- development of measures to keep the well track in a given direction and the development of technical tools to increase the rigidity of the drill;
- development of a technical tool for decolmatizing the productive horizon with a cavitated liquid.

The idea of the work is:

- 1) Using various reagents for flushing fluids prevent the "dissolution" of clay rocks that make up the walls of the well in a geological section;
- 2) to increase the rigidity of the drilling rig to prevent the curvature of the wells;

3) Using of reactive force to rotate the projectile, cavitating the washing liquid in order to decolmate the walls of the wells in the productive horizon and filter column.

Methods of research. The solution of the above tasks was carried out by generalizing domestic and foreign experiments for constructing both hydro geological and technological wells, conducting analytical and theoretical, experimental and industrial research, developing benches and instruments, and statistical processing of experimental and industrial research.

Scientific originality:

- on the basis of the conducted research, the condition of well walls stability in a geological section has been determined, at which the lateral pressure does not exceed the yield strength of rocks and the hydrostatic pressure.

- it was found that the rate of removal of particles by the flow of flushing fluid is directly proportional to the square of the bit diameter, the difference in particle densities and fluids, the mechanical drilling speed and inversely proportional to the difference in squares of the borehole diameters and drill pipes and the difference in densities of the rising and falling flushing fluid.

- it was determined that the number of crests of half-waves on which stiffeners should be installed is directly proportional to the angular velocity of rotation of drill pipes, the axial load and inversely proportional to the mass of one meter of drill pipes and the distance Z from the column section under consideration to its zero section.

- it was found that the dimensionless parameter (cavitation number) K is directly proportional to the difference between the hydrostatic pressure and the saturated vapor pressure of the liquid and inversely proportional to the product of the density of the medium and the square of the flow velocity at the entrance to the system, as well as the flow rate of the liquid jets from the cavitators allows to obtain the reactive force providing rotation of the device.

Scientific provisions for the defense:

- the developed formulation of washing liquid prevents the “dissolution” of clay rocks composing the walls of wells in geological section;

- The designed bottom hole assembly prevents the erosion of the walls of the wells;

- developed measures and technical means prevent the curvature of wells;

- developed devices for decolmatising a filter column using reactive force to rotate a projectile produce a cavitated liquid.

The practical value of the research results is as follows:

- a formulation of drilling fluids was developed, which prevents the “dissolution” of clay rocks in a geological section, which can be used when drilling wells for various purposes: hydro geological, technological, for oil and gas, etc .;

- a device has been developed and tested under production conditions that increase the rigidity of the drill, allowing preventing the curvature of wells (protected by a provisional patent of the Republic of Kazakhstan).

- devices for the development of geotechnical wells were developed and tested under production conditions at the facilities of JSC Volkovgeology and LLP “Semizbay-U” (the Irkol field).

Implementation of research results

The research results are used in the work on the development of technical means to prevent the curvature of wells; in the development of new devices for the development of hydro geological and technological wells; in the development of new formulations of drilling fluids that prevent cavern formation in the geological section of wells. The developed technical means passed industrial tests in expedition's No. 7 and No. 23 of "Volkovgeology" OJSC, "Semizbay-U" LLP of the Irkol deposit.

Approbation of work results. The main results of the dissertation were reported at scientific-theoretical conferences, at the meetings of the department "Geological survey, prospecting and exploration of mineral deposits."

Publications. According to the results, 9 articles and scientific reports were published, of which 1 article was published in a publication with a non-zero impact factor included in the Scopus database, 3 articles were published in scientific journals recommended by the Ministry of Education and Science of the Republic of Kazakhstan and the Ministry of Education and Science of the Russian Federation, 1 article was published in the collection of reports of the International Conference of Foreign Countries (Bulgaria, 2016), 4 articles were published in collections of the International Conferences, the developed technical tools are protected by 1 provisional patent of the Republic Faces of Kazakhstan.

Content and structure of the work. The thesis consists of an introduction, 5 chapters of general conclusions and recommendations, set out on 134 pages, contains 36 pictures, 10 photos, 15 tables, a list of references, including 67 titles, and 5 appendices.