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SELECTING THE TYPE OF DRILLING MUD THAT PROVIDES WELLBOOT STRENGTH

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Annotatsiya

Quduqlarni burgʻilash jarayonida burgʻilash eritmalarining tarkibiga bir qator talablar qoʻyiladi va bajarilishi shart hisoblanadi. Quduqlarni burgʻilash jaaryonidan boshlab uni ekspluatatsiya qilishga topshirguncha yetti marta eritmalarni quduqqa kirishi va aylanishi murakkab omillarni va salbiy holatlarni keltirib chiqaradi. Buning natijasida tabiiy kollektor shikastlanadi va belgilangan debitga erishib boʻlmaslik holatlari koʻpgina Buxoro- Xiva regionida sodir boʻlganligi quduqlarni ishga tushirish jarayonida maʼlum boʻlgan holatlar mavjud. Koʻkdumaloq, Shimoliy Oʻrtabuloq, Janubiy Kemachi va Kruk konlarining koʻp davrlik ekspluatatsiya quduqlarda radial burgʻilash ishlari olib borilganda bunday asoratlar yuzaga chiqqan.

Аннотация

В процессе бурения скважин к составу буровых растворов предъявляется ряд требований, выполнение которых является обязательным. Учитывая, что за период от бурения скважин до ввода в эксплуатацию семикратная перегонка растворов приводит к возникновению в любой скважине “сложных факторов”и негативному влиянию на пропускную способность природных коллекторов, выявлены случаи такого негативного воздействия радиальным бурением скважин после десятилетнего и даже более длительного использования, что дает научную оценку технологическим процессам.

Abstract

During the drilling process, a number of requirements are imposed on the composition of drilling fluids, the fulfillment of which is a prerequisite. The seven times the fluids enter and circulate in the well from the start of the well drilling process until it is put into operation creates complex factors and negative situations. As a result, the natural reservoir is damaged and the set flow rate cannot be achieved, as is known in many cases in the Bukhara-Khiva region during the commissioning of wells. Such complications arose during radial drilling operations in multi-cycle exploitation wells of the Kokdumalak, North Ortabulak, South Kemachi and Kruk fields.

Tayanch so‘zlar

eritma tarkibi, mustahkamlikka ta’siri, karbonat qatlami, radial burg‘ilash, stvol ochish, asoratlar.

Ключевые слова

состав раствора, влияние на прочность, карбонатный пласт, радиальные бурения, вскрытия ствола, осложнения.

Keywords

solution composition, effect on strength, carbonate layer, radial drilling, shaft opening, complications.

Methodology. Based on practical and scientific sources, an analysis was conducted on drilling clay layers, ensuring the strength of the shaft, and reducing residual complications.

Introduction. The quality of the drilling process involves the collection of information on the requirements for strengthening the wellbore in shale formations, controlling the parameters of the flushing fluids, adapting the composition of the solution to the geological conditions of the formation, studying tectonic stresses, porosity pressures, characteristics of the location of shale rocks, their density, and the selection of the main dispersion medium of the drilling fluid, which requires minimizing the complexity of the wellbore.

Ensuring the stability of shale formations during drilling is one of the main problems in drilling wells with steep ends and large deviations from the steepness. Thus, 75% of the geological failure of oil and gas fields is associated with shale formations, and about 70% with the unstable state of rocks, which is associated with technological difficulties during construction. The experience of drilling wells is limited by the shortcomings in the methods for assessing the state and composition of shale formations, which do not allow for effective control of the parameters of the flushing fluids. As a result, this leads to a decrease in the technical and economic indicators of drilling and high-quality construction of wells [1].

The instability of the wellbore is a serious complication, the characteristics of which are associated with the conditions of drilling the formations and the design of the well. As a result, the type of drilling fluid is selected individually for each site, which will provide maximum strength of the wellbore wall. The same fluid will not have the same effectiveness in different areas. Many experts have developed a program for the selection of fluids, namely, the classification of shale layers by their mineral composition and structure [2].

The difficulty here is that the properties of clay minerals, since they consist of variable constituents, are determined by large numbers and are divided into separate groups. The following factors affect the strength of the wellbore: tectonic stresses, porosity pressures, the characteristics of the location of the clay rocks, and their degree of compaction.

The first step in selecting the main dispersion medium for the drilling fluid, which requires minimizing the complexity of the wellbore, is to collect as much information as possible about the geology, the history of the development of stress in the rocks, and the distribution of waste in specific regions. The temperature and pore pressure gradients, the amount of water in the clay minerals under the formation conditions are determined from the logging data. Studies are carried out on samples of the clay layers that require complexity.

The following operations are performed in laboratory research:

The analysis of clay minerals using X-ray diffractometers involves measuring the cation exchange properties of the reacted cations and determining the cations. If the necessary equipment is not available, it is impossible to conduct unspecified studies, so methylene dye tests are performed. As a result of this test, information is obtained about the approximate volume fraction of montmorillonite in the clay layer.

Construction of an adsorption isotherm by the Chenevert method. This method is based on determining the points of the isotherm with the abscissa and ordinate, which, under formation conditions, are equal to the amount of water in the formation. This parameter characterizes the potential pressure of the shale layer, i.e., the water absorbed from the drilling fluid. The activity of water under formation conditions determines the pressure of the shale layer [2].

When choosing the type of drilling fluid, data on geological conditions and the results of laboratory studies are very important in ensuring the strength of the wellbore with a large deviation from the steepness. According to J.R. Gray, the following factors are important to consider when choosing flushing fluids: Hydrocarbon-based solutions provide strong and complete protection against montmorillonite muds. At economically small depths, it is permissible to reduce the strength of wells and use polymeric potassium chloride solutions [4,5].

To control anomalous upper formation pressure or to counteract high shear activity in the rocks of the zones at high stress, a drilling fluid is used that contains a large amount of solid phase (limestone, humate-potassium). In deep wells, it is advisable to use solutions with a balanced active aqueous phase based on hydrocarbons.

In cemented clay formations exposed to significant tectonic forces, the wellbore fracture process results in a loss of strength regardless of the type of drilling fluid used [3]. In such cases, it is recommended to use drilling fluids that are easy to clean (bentonite hydrated with polyacrylamide potassium chloride solution or potassium chloride with xanthan gum).

For example, in terms of ensuring the strength of the wellbore, we can see that errors were made during the reinforcement period when the well's output decreased during the exploitation period at the Kokdumalak, North Ortabulak, Kruk, and South Kemachi fields, which were studied through radial drilling.

After opening the side shafts in carbonate layers, washing was carried out using a 10% hydrochloric acid solution. In the Northern Ortabulak deposit, 2 hours were spent drilling side shafts at intervals of every 100 m. A total of 5 wells were selected in the North Ortabulak field. These wells are located in different sections of the field, and some wells were not cemented. These wells were drilled vertically or obliquely. In 4 of the selected wells, the side shaft was drilled at the same level in all four directions. Of these, well No. 116 was drilled in two levels due to the difficulties encountered. In the selected well No. 44, a side shaft was opened in two directions, and in the remaining four wells, 100 m long side shafts directed in four directions were successfully completed and oil flow was achieved. After drilling and opening all side shafts, they were flushed with 10% HCl hydrochloric acid and put into operation.

Result. The following results were achieved during radial drilling operations in the field. In well No. 87, a side shaft was drilled radially and the well is located in the southern part of the field and four side shafts were drilled, the depth is 2450.9 m. And the length of each side shaft is 98 m. Before radial drilling operations, the well's flow rate was 56.6 bar/day. After the side shaft was opened, this indicator was 69.8 bar/day, which means that the efficiency indicator increased by 23%.

Well No. 79 is located slightly north of the center of the field and the productive interval of the well was reinforced and radial drilling was carried out through 4 side shafts, each 100 m long. Difficulties arose during the radial drilling of this well, two of which were drilled at a level of 2436.7 m, and the other two at a level of 2456 m. When analyzing the causes of the difficulties in the drilling process, it was found that the contact of the pipe with the well wall during the cementing of the wells was of poor quality. Before the use of radial drilling, the well flow rate was 10.6 bar/day, but after the sidehole was opened, this indicator was 54.0 bar/day, and the efficiency indicator was 403%.

No. 92 - the well is not reinforced, has a side shaft and is located in the eastern part of the field. It has 4 side shafts with a length of 100 m and a depth of 2457 m. Before the radial drilling, the well's flow rate was 64.1 bar/day, but after the process it was 79.2 bar/day and the efficiency increased by 24%. Unsupported well No. 44 was drilled with a side shaft and is located in the northern and western parts of the field. The radial drilling process was difficult and the wellshaft was enlarged due to the strong acid treatment prior to drilling and the dissolution of the formation rocks under the influence of the kilota. Therefore, there were difficulties in centering the column. Despite the difficulties, two wells were drilled. The length of the first well is 94 meters, and the second well is 23 meters and its depth is 2451.3 m. As a result of drilling two wells, the well's flow rate increased from 50.9 bbl/day to 94.9 bbl/day (86%).A side shaft was drilled in vertical well No. 116, located in the northwestern section of the field. The reason this well did not produce any production until radial drilling was carried out was that the porosity and permeability of the rock in this part of the field were found to be very low, and no flow was observed from the formation to the well.

According to the geological study of the rock and the analysis of hydrodynamic studies, the boundary of the impermeable layer was crossed when penetrating deeper into the formation through radial channels. A total of 4 side shafts were drilled, each 100 meters long and located at two heights. Thus, 8 side shafts were drilled in this well, but the work done did not bear fruit. As a result of radial drilling, the well's productivity increased from 1.25 bar/day to 5 bar/day.

In general, radial drilling operations at the Northern Ortabulak field can be considered effective. Based on the results of drilling operations, the reason for the low flow rate of well No. 116 was poor collector properties. Experimental tests on the progress of radial drilling operations were successfully carried out. Analyzing the test data obtained as a result of using radial drilling technology, it is justified to apply this technology to a number of Kokdumalaq, Kruk, and South Kemachi fields, which are currently being exploited in the depletion period, where formation pressure has decreased and reservoir properties have changed.

According to the experimental data of radial drilling operations in the Northern Ortabulak field, the successful implementation of radial drilling operations in other fields requires the correct selection of a well complex. When the pressure in the formation is 70% of the initial pressure during the effective implementation of the radial drilling process, the flow into the well accelerates and the efficiency of the technologies used to increase oil recovery is high. The situation at the Northern Ortabulak field does not meet these criteria, as the wells were started by radial drilling, and after a certain period of time, the flow rate, which was initially high, decreased due to a decrease in pressure. This situation was also observed in wells at other fields, the Kruk and South Kemachi fields.

In the radial drilling process, this type of complexity meets the criteria for several types. During the radial drilling of well No. 44, due to the expansion of the wellbore as a result of acid treatment of the well, the equipment could not be centered. In well No. 79, the effectiveness of radial drilling was affected by poor-quality cementing work in the wells. Therefore, when using radial drilling technology, it is necessary to properly plan and justify the drilling work in the well based on experimental testing.

Conclusion: When analyzing the flow rates from the wells during the operation period, it was found that the reservoir productivity decreased during the last stage of operation of the field. This situation can be concluded that the acceleration of flow to the well slowed down due to the decrease in reservoir pressure.

When opening up clayey layers, the desired filtration properties of the polymer drilling fluid can be achieved by adding starch or industrial cellulose when permeable layers are present.

When conducting geophysical surveys in a well or when the use of a solution in fresh water is required due to environmental requirements, it is recommended to use a polymeric diammonium phosphate solution.

The conditions under which the research is conducted should be as close as possible to the conditions that occur in the well. No drilling fluid can provide wellbore protection if the primary properties of the fluid are not controlled. For these reasons, it is necessary to further investigate the properties of the drilling fluid and carry out corrective work based on them.

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