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О ВЛИЯНИИ РАЗЛИЧНЫХ ФАКТОРОВ НА РАБОТУ НАКЛОННО-НАПРАВЛЕННЫХ СКВАЖИН

ABOUT EFFECT OF VARIOUS FACTORS ON THE OPERATION OF DIRECTIONAL WELLS

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Аннотация. Продуктивность наклонно-направленных скважин определяется, как известно, множеством различных факторов, связанных как с природными условиями, так и с параметрами их бурения и эксплуатации. Следует отметить, что учет влияния всех факторов при одновременном воздействии их различных комбинаций на работу скважин на основе существующих методов исследования представляет значительные трудности. В связи с этим на современном этапе изучения данного вопроса целесообразно путем анализа и статистической обработки геологической и промысловой информации выявить характер влияния основных факторов, оказывающих наиболее существенное влияние на работу наклонно-направленных скважин. множество.

Ключевые слова: скважина, фактор, разработка, месторождение, дисперсионный анализ, выборка.

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Annotation. The productivity of directional wells is determined, as is known, by many different factors associated with both natural conditions and the parameters of their drilling and operation. It should be noted that taking into account the influence of all factors with the simultaneous impact of their various combinations on the operation of wells based on existing research methods presents significant difficulties. In this regard, at the present stage of study of this issue, it is advisable to identify the nature of the influence of the main factors that have the most significant impact on the operation of directional wells through analysis and statistical processing of geological and field information array.

Keywords: well, factor, development, field, variance analysis, sampling.

Currently, in the implementation of the task of significantly increasing oil production, a special role belongs to offshore oil fields. The development of the offshore field is carried out in difficult conditions, characterized by natural, climatic, geological, commercial and technological features. Under these conditions, as is known, the implementation of geological and technical measures (GTM) and the transition to the gas-lift method of oil production, after the cessation of flowing, is limited due to the complexity of the structure of gas compressor stations [1].

In this regard, the development and widespread use of express methods that make it possible to find optimal solutions in relation to some basic production processes are becoming the most important scientific and technical task.

One of the characteristic features of offshore fields is also that their development is carried out mainly by cluster directional drilling of the deposit [2].

The geological structure and physical and energetic characteristics of productive horizons of oil fields do not depend on their location on land or in offshore areas of the same geological area. However, the approach to solving geological, technological and technical problems associated with the exploration and development of offshore and onshore oil fields is fundamentally different, even if their characteristics are similar.

There are a number of theoretical and experimental studies characterizing the operation of directional wells. These works can be divided into two groups:

1) creation of theoretical foundations for designing the development of oil fields with horizontal, inclined and multilateral wells, which boil down to the development of calculation methods, in particular, the flow rates of these wells and obtaining calculation formulas suitable for practical use;

2) studying the mechanism and finding methods for increasing the efficiency of fluid lifting, as well as determining the hydraulic resistance in an inclined well.

When the development of offshore oil fields, as well as fields in hard-to-reach areas with harsh climatic conditions, is carried out mainly by drilling directional wells, in which the curvature of the borehole begins not in the zone of opening the productive formation, but much higher, the most important issue remains the study of the influence of curvature on the hydraulic characteristics of movement (flow) [2].

Currently, a very limited amount of theoretical and experimental research makes it difficult to develop a sufficiently reliable methodology for calculating hydraulic resistance in directional wells.

To establish not only the fact of the influence of a particular factor on the course of the process, but also the degree of influence of individual factors and their interactions, we apply one of the statistical methods, namely, analysis of variance. Analysis of variance is especially effective when studying several factors simultaneously.

With the classical research method, such a study is carried out by changing only one factor, and leaving the remained unchanged.

With this method, a lot of time is spent, since for each factor its own series of observations is carried out, which is not used in the future when studying other factors [3].

In analysis of variance, each observation serves to simultaneously evaluate all factors and their interactions. It is especially important that in this case it is often possible not to conduct parallel observations, limiting oneself to only one observation for each combination of levels of the factors being studied.

Analysis of variance is the initial stage of research, which allows us to answer the question: are there statistical relationships between the analyzed parameters and is it worth continuing to study them?

In addition, an essential feature of variance analysis is that it makes it possible to more accurately find the mean square error of the experiment as a whole with a small repetition of different options [4].

To carry out analysis of variance, the following conditions must be met.

1. The resulting characteristic or its transformed function can be considered as a random sample from the general population, subject to the normal distribution law
2. Factors influencing the effective sign must be correlated.
3. Variances across groups should be homogeneous.

Thus, we can conclude that in conditions of incompleteness of field data, the use of mathematical and statistical methods when processing the information array makes it possible to make prompt and informed decisions aimed at regulating technological processes with possible forecasting of the development of the system, which in turn has a positive effect on development and production processes.

Conclusion

1. Based on the analysis of geological and field information on wells in offshore fields, the most likely factors influencing the productivity of directional wells are selected.
2. The use of rank correlation allows us to determine the most significantly influencing factors.
3. The use of variance analysis allows for a quantitative assessment of individual and interrelated factors affecting the productivity of directional wells.
4. Thus, the integrated use of mathematical tools in assessing the productivity of directional wells allows us to conclude that the angle of deviation of the wellbore from the vertical in the zone of opening the productive formation has a significant influence.

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