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Geomechanical modeling of well sections based on the results of complex geophysical and geological-technological studies during the drilling process

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In recent years, a large number of studies have accumulated on the process of interaction of a rock-cutting tool with rock, in which methods and means have been proposed for determining the physical and mechanical properties and abrasiveness of rocks. Among them are experimental studies, studies based on the analysis of geological and geophysical information, as well as those based on classification methods. As a result, methods have been proposed that make it possible to evaluate the properties of rocks both from cores, cuttings, using the results of geophysical surveys of wells, and data from geological and technological studies during the drilling process. The construction of a geomechanical model involves the use of data from areas of neighboring wells that have characteristics similar to those of the well under study. As is known, to obtain a geomechanical model it is necessary to have a sufficient amount of information.

Geological and technological research during the drilling process, which has become widely used in world practice in recent years, makes it possible to solve a number of problems during the drilling process when information about the section of the well being drilled is missing or is available in limited quantities. The use of the results of geological and technical information in combination with geophysical surveys of wells allows for a deeper study of the section and thereby improves the quality of decisions made.

Solving problems of modeling technological processes is significantly complicated by the presence of uncertainty associated with both the use of random and fuzzy variables. Random variables convey that the quantities under study can take on different values with different probabilities. Fuzzy variables convey approximateness in determining the very values of these quantities. In addition, fuzzy values may be preferable when there is insufficient statistical data and related information necessary for more reliable estimates. Such assessments of the mechanical properties of rocks can be made based on data on their physical properties, assessed using geophysical surveys of wells using probabilistic-statistical methods and fuzzy set theory. The study of the considered dependencies made it possible to develop a reasonable calculation scheme for assessing the characteristics of the geological section. At the same time, it should be noted that in the absence of data from core-sludge studies or marked dependencies that make it possible to assess the indicators of the mechanical properties of rocks, the latter can be assessed using a geological and petrographic description of the rocks. The task in this case is to analyze and summarize information about the properties of rocks in order to create convenience in assessing the drillability of rocks.

The use of complex geological and technological information makes it possible to obtain more reliable information and thereby increase the efficiency of the design decisions carried out during drilling operations. This is very important for making the right decisions and allows you to quickly solve various problems related to the selection of bit types and operating parameters, and the assessment of complicated intervals.

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