

STUDY OF SOME FEATURES OF THE PROCESS OF CONSTRUCTING WELLS IN HYDROCARBON FIELDS

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Drilling wells to extract oil and gas is the main activity of the industrial sector. Geological exploration work can also be included in this direction. Such work is carried out to determine promising areas for the placement of production wells. Currently, wells are being constructed not only on land, but also at sea (Fig. 1). Moreover, the number of offshore wells being constructed is steadily increasing. This circumstance can be explained by the significant depletion of onshore deposits [1].

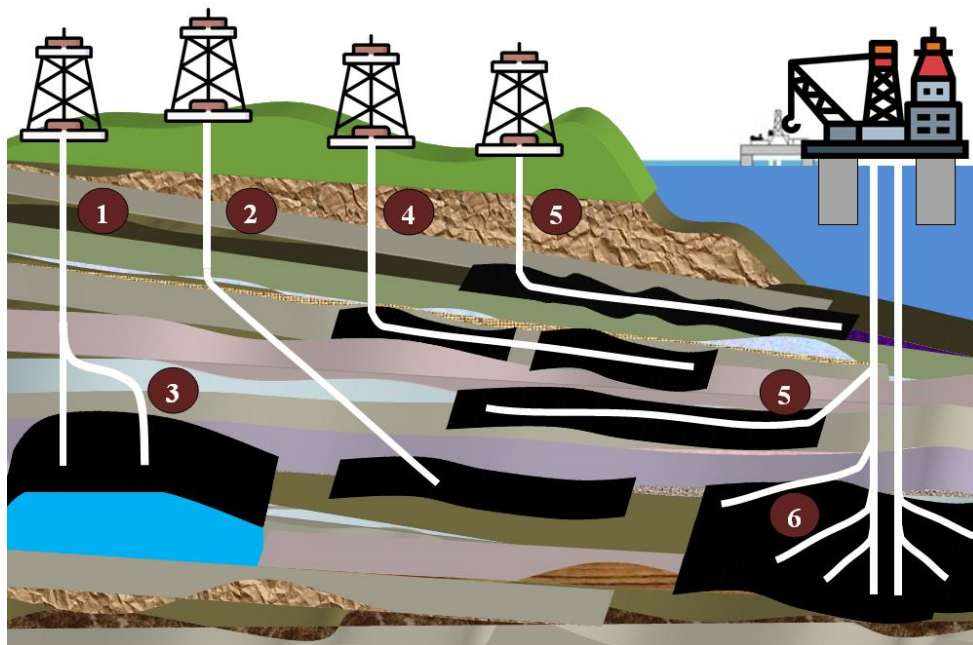


Figure 1. Schemes of location of wells in rock massif (1 – vertical well, 2 – directional well, 3 – well with S-like profile, 4 – vertical well with horizontal section, 5 – options for the location of horizontal sections of wells, 6 – multilateral well drilled from an offshore drilling platform)

Our analysis of sources of information on drilling wells allows us to draw a number of important conclusions. Wells in a strictly vertical direction are constructed very rarely. In accordance with such states of affairs, geological conditions can be called. The main one of these conditions is the anisotropy of the properties of rocks. This property of rocks intensifies the process of well curvature. The behavior of a well can be predicted in a certain way by studying the characteristics of the mechanical properties of rocks. It is almost impossible to avoid such curvature. However, it is possible to combat it and even take it into account in some positive way when designing a well profile [2].

Production experience shows that it is easiest to construct vertical wells. Such wells do not require large amounts of power to rotate the drill string. This is due to the

fact that the drill string has very little contact with the walls of the well. In vertical wells, it is quite simple to carry out the operation of casing the trunk. The process of cementing vertical wells is also carried out without complications, since there is a uniform filling of the annular gap with cement mortar. At the same time, vertical wells along their length in the productive formation interval do not allow obtaining a filtration surface of sufficient area. Inclined wells, especially horizontal ones, are partially free from this disadvantage. Given the relatively correct occurrence of the formations and the ability to construct horizontal sections of significant length in these formations, it is possible to achieve high hydrocarbon production rates.

An important stage in the design of the well construction process is the development of their design (Fig. 2). This term refers to the diameters of individual sections of the wellbore, their length, and mounting options. It should also be noted that cementing options need to be considered [3].

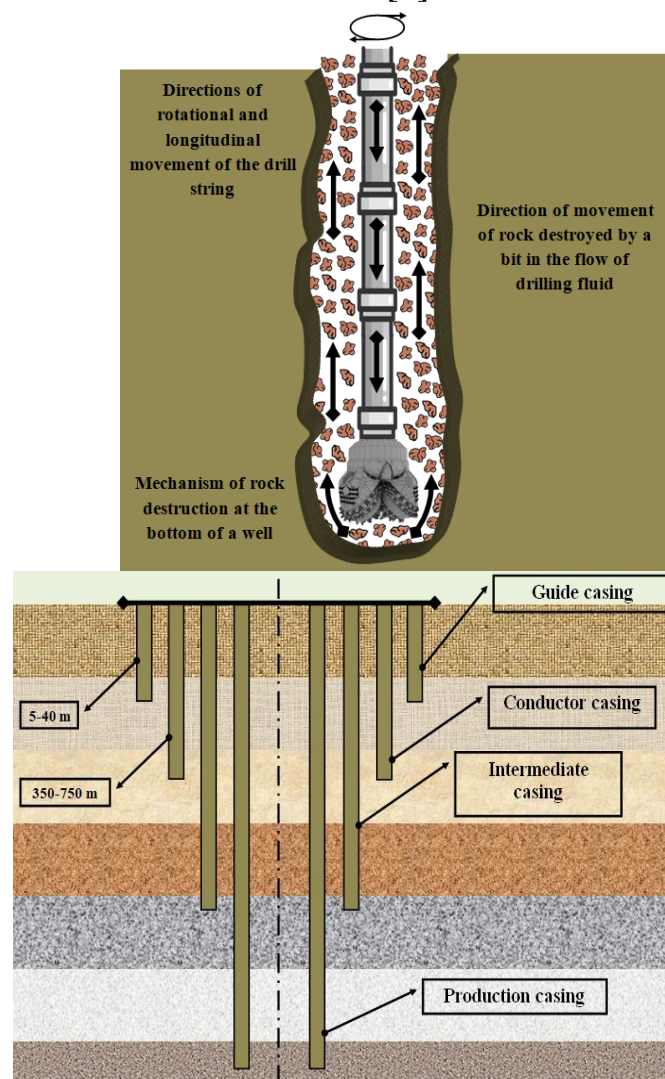


Figure 2. Wellbore design option and its flushing process

The design of the well should ensure an unhindered process of its construction. In addition, the well design necessarily provides for the creation of a reliable communication channel with productive mineral horizons.

The processes of cleaning the wellbore from destroyed rock ensure the efficiency of the drill bit (Fig. 2). Timely removal of drill cuttings eliminates premature wear of

the bit and its failure. Flushing fluids also contain lubricating additives, which are necessary to maintain the normal operation of drill bit supports in the form of bearings.

When developing formulations for flushing fluids, it is necessary to take into account as much as possible all the geological features of rock layers. The main complications during the construction of wells include the collapse of their walls and swelling. Such complications can be avoided by imparting certain technological properties to the flushing liquids. These properties relate to the increased density of the washing liquid, binding free water.

A large class of reagents used for the chemical treatment of washing liquids belongs to surfactants. Such substances make it possible to intensify the processes of rock destruction and provide inhibition of negative phenomena in the wellbore. For the effective use of surfactants, laboratory determination of the nature of their effect on individual rocks is necessary [4].

Taking into account the versatility of the well construction process, it should be noted that most complications in the wellbore arise when the design for its construction is imperfect. This can be avoided by studying best practices, using new technologies, promptly responding to changing drilling conditions, and correctly recognizing pre-emergency situations, the main characteristics of which are discussed in this scientific work.

References

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