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Deryaev Annaguly Rejepovich,
Candidate of Technical Sciences, Senior Researcher,
Scientific Research Institute of Natural Gas
of the State Concern "Turkmengas",
Ashgabat, Turkmenistan

BASIC REQUIREMENTS AND FEATURES OF WELL DRILLING TECHNOLOGY FOR DUAL COMPLETION OF SEVERAL HORIZONS

Abstract: This article discusses the basic requirements and features of well drilling technology for dual completion (DC) of several horizons. A number of problems encountered during the simultaneous operation of several horizons, mainly with different characteristics (reservoir pressure, permeability, porosity, saturation pressure, oil viscosity, and others) are described productive formations and solutions for their development by independent grids of wells, as well as dependent factors for choosing the design of the wells of the DC. The article substantiates the position that the use of expanding packers on a hydrocarbon solution after 72 hours to expand and completely isolate the zone of productive formations in the open borehole, reducing the cementing of the open borehole, as well as excluding the colmatation of productive formations with cement mortar.

Keywords: oil and gas phenomenon, conductor, shoe, annular space, gap, casing string, wellhead, preventer.

During oil production, one often has to face the problem of simultaneous operation of several oil-bearing horizons having different characteristics (reservoir pressure, permeability, porosity, saturation pressure, oil viscosity, and others) by one well. In addition, each horizon sometimes contains several layers with different characteristics that require an individual approach to their development. Even within the same formation, characterized by sufficient geological uniformity, there are always interlayers with different permeability, separated by thin impermeable interlayers. Filtering by such layers can occur independently. Moreover, different pressures and oils with different properties may exist in separate formations, which necessitates separate operation of the formations. The presence of several horizons or formations with different characteristics makes it necessary to develop them by independent well grids [1]. Experience in the development of oil fields shows that more than half of all capital investments are accounted for by drilling wells. This task should usually be solved at the first stages of development, and sometimes at the stage of exploration or pilot operation of the field, when information about its geological

structure is limited due to the small number of wells.

The main requirement is to dual completion of wells on the basis of various studies and detection devices by composition, to determine the share in the production of each reservoir.

The use of the descent of two-lift tubing is necessary in the following cases:

– wells with significant differences in reservoir properties of formations and characteristics of oils;

– flooded wells with large pressure drops;

– for joining an already exploited low-productivity horizon, the operation of which is unprofitable by a separate well;

– wells with a large distance in depth between objects.

Implementation efficiency:

– reduction of drilling volumes due to the use of the hole of one well;

– simultaneous operation of facilities with different reservoir characteristics and properties of oil;

– increasing the profitability of individual wells by connecting other development facilities or layers of different properties of one development facility.

The technology of drilling wells for dual completion differs in design from conventional wells. The choice of the design of such wells depends on the following factors:

– availability of productive horizons;

– compatible drilling conditions;

– stability of the drilled rock in the descent section of the operational filter shank;

– during two-lift operation, it is necessary to mount the wellhead with a casing string of at least Ø244.5 mm and use it as an operational column.

– if there are several layers in the well, it is necessary to mount some of them with casing pipes Ø244.5 mm, to ensure the operation of the well, one of the descending elevators on a 244.5 mm casing string.

– fastening of the remaining lower productive horizons must be made with casing pipes or filters Ø177, 168 mm or 139.7 mm in order to operate them with a second elevator.

In oil wells, in order not to damage the reservoir properties of productive formations, a drilling fluid based on hydrocarbon oil is used to open them. Drilling with an oil-based solution eliminates the tightness during the construction of vertical and directional wells.

In order to increase the drilling speed, screw downhole motors with diamond bits are usually used. In the composition of the layout of the bottom of the drill strings during drilling, a logging device is lowered to accurately determine the opening of productive horizons and in order to obtain logging data.

The choice of the diameters of the last technical column and the operational shank is selected to the accuracy, for the correct selection of packers, gas lift valves, mandrels, circulation valves and other tools in order to assemble them into pumping and compressor pipes and descend into the casing.

The descent of the operational shank made up of casing pipes or filter Ø139.7 mm, 168.3 mm and 177.8 mm is carried out on drill pipes. To securely attach them to the intermediate column Ø244.5 mm, a special packer is installed on the first pipe (head) of the operational shank using the pressure created at the mouth, which is packed onto the wall of the casing Ø244.5 mm.

The choice of the type of packers and circulation valves is made depending on the diameter

of the last intermediate technical column, the operational shank and the expected pressure of each reservoir.

All casing columns are cemented to the mouth. Only in the case of the descent of the operational filter shank, fastening with cementing is not performed and the separation of productive layers from each other is carried out by special expanding packers, which are equipped as part of the layout of the descent filters [2].

The expansion of the packers occurs after the descent of the production shank filter column to the well under the influence of drilling fluid, the deflated packers begin to expand after 72 hours and completely isolate the zone of productive formations in the open borehole.

There are different types of expanding packers that expand on drilling fluid, the basis of which is water and hydrocarbon. The choice of the type of expanding packers for isolating an open hole depends on the type of drilling fluid used.

The most difficult task when drilling wells for the purpose of simultaneous separate operation with the use of oil-based drilling fluid is high-quality cementing of the open hole. Since the cementing of casing strings in the presence of oil solution on the well is not possible, because there are lubricating properties that can cause poor-quality cementation with the formation of channels between the cement stone and the open hole or premature cementation. When cementing, it is necessary to use a buffer solution to completely displace the oil-based drilling fluid from the open borehole [3].

When using oil-based drilling fluid in the drilling process, all drilling equipment used, especially rubber elements, must be resistant to the effects of oil and strictly comply with fire safety. After the descent of the operational shank, the wellhead is equipped with special anti-blowout equipment for the descent of two elevators into the well simultaneously. Perforation of all layers is performed from the bottom to the top. For the purpose of safety, perforation on all wells developed by the method of dual completion was carried out with cumulative perforators PKO-86, PKO-102 and Enerjet – 42 on drilling fluid. The descent of parallel elevators of pumping and compressor pipes is carried out on special spider elevators. By creating excess pressure, a leak test of packers and other elements included in the layout of the two-lift operation of the well is carried out.

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