METHOD AND KEY STAGES OF SIDETRACKING AND DRILLING A SECOND WELL

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As the experience of other countries shows, the restoration of an idle well stock allows to increase hydrocarbon recovery at oil fields and increase oil and gas production. In the absence of technical and technological methods and means to perform workovers (bypassing contaminated reservoir zones or mechanical obstacles in the string), sidetracks are drilled, thus saving material and financial resources.

The method of drilling a new wellbore through a cut "window" in the casing (production) string allows to restore even those wells that cannot be repaired in any other way or are economically unfeasible.

Sidetracking and drilling of a second wellbore is a method of rehabilitation of wells that are technically impossible or economically unfeasible to repair using known methods. This method makes it possible to replenish the existing well stock, improve the development of deposits to replenish the development grid account by transferring wells from the upper horizons, increase current oil recovery, and reduce the time to recover residual oil reserves. In addition, this method allows to restore wells in areas where drilling new wells is difficult or unprofitable due to the conditions and state of reservoir development.

Practice shows that oil and gas wells are decommissioned for the following reasons:

-a gradual decrease in the well's production rate when its operation becomes unprofitable

-fracture, crushing or other damage to the production string

-Impossibility to clean the filtered well interval clogged with foreign objects and scrap; - Complex accident with underground equipment;

-constant and intensive crusting;

-continuous blocking of the perforated casing in the reservoir interval by contour water.

In all cases, except for the last one, a significant amount of hydrocarbon remains in the productive formations, which requires sidetracking and drilling an additional well.

The sidetracking and drilling of a second well consists of the following main stages:

1) Selecting the interval in the column for cutting the window.
2) Lowering and fixing the deflector in the casing.
3) Cutting the window in the casing.
4) Drilling the second borehole.
5) Preparation and running of the production string or "shank".
6) Cementing the casing (separation of layers).
7) Testing the casing for leaks.

When choosing the depth of the window cutting in the casing, it is necessary to take into account the well design, the nature of the underlying rocks, the technical condition of the casing, etc.

The interval for cutting the window is selected:

-for work performed in one column;

-in a section marked by clay rocks.

The design should begin with the selection of the bit for drilling the second borehole. The diameter of the bit that will be used to drill the second borehole for the production string or shank is determined by the formula:

$D_B = D_o - 2\delta$, where D_o – is the outer diameter of the casing in which the work will be performed, mm; δ – is the gap between the outer diameter of the casing and the bit, taking into account the possible maximum wall thickness of the casing (assumed to be 14-15 mm).

After selecting the bit, the diameter of the casing going down the drilled hole is determined by the formula:

$d_k = D_B - 2\delta 1$, where $\delta 1$ – is the gap between the well wall (whose diameter is conditionally assumed to be equal to the bit diameter)

After selecting and specifying the well design, it is necessary to select a cutting tool for cutting a window in the casing, the dimensions of which should be such that the bit, casing, geophysical survey equipment, etc. can freely pass through the window during operation. Next, choose the type of deflector.

A deflector is a tool designed to provide the necessary deflection of the reamers when cutting a window in the string and to provide the initial direction to the drilling tool when drilling the second borehole.

Before the deflector is lowered, the column in which the second borehole is being cut and drilled is inspected with a special template (guide), the diameter and length of which are determined by the formulas:

$$D_T = D_0 + (3 \div 4) \text{ mm} \qquad L_T = L_0 + (2 \div 3) \text{ mm},$$

where D_0 – is the largest diameter of the deflector to be lowered, mm; L_0 – is the length of the deflector to be lowered, m.

The deflector is lowered into the well on drill pipes to the bottomhole and the screws are cut off at a load of 40 kN. The dies come out of the windows of the die holder and fix the deflector in the well. When the load is increased to 60 kN, the stud is cut off and the deflector wedge moves along the inclined planes of the support so that the catching part of the chute is pressed against the inner wall of the column. When the load is increased to 80 kN, the bolts that secure the runner wedge to the deflector are cut off, and the latter is finally fixed in the well, after which the runner wedge is raised to the surface.

The cutting device, the general view of which is shown in Fig. 1, consists of a cylinder 1, in which a piston 2 moves under the action of the flushing fluid, which transmits the force through the pusher 4, spring 5 and lever 7 to the cutter 8. The device is centered in the column by means of guides 11. The device is lowered into the string in the cutting interval on the drill pipes. The drilling mud passes through the nozzles 3 of the piston 2, creates a pressure drop, under the influence of which the piston 2 and

pusher 4 move downward, while the return spring 5 is compressed, the cutters 8 are extended and cut into the wall of the column. The device is rotated by the rotor. After cutting through the column, the cutters operate in the milling mode. When the flushing fluid is stopped, the spring 5 returns the piston to service.

Universal cutting device UCD

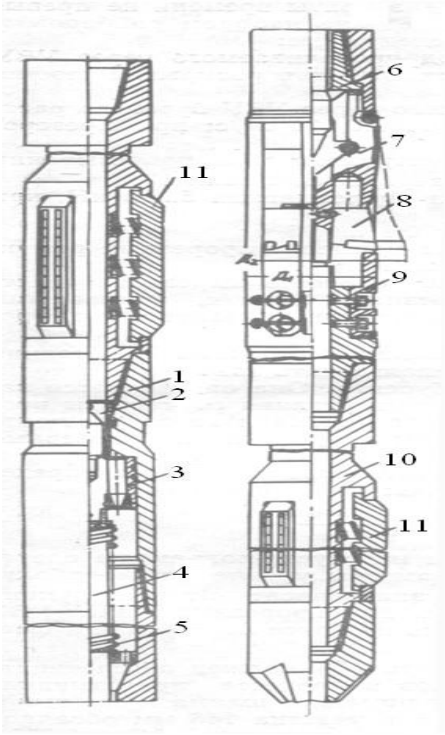

Fig. 1 Universal cutting device UCD

1 - cylinder; 2 - piston; 3 - nozzles; 4- pusher; 5- spring; 6- cartridge; 7-lever; 8- cutters; 9- limiter; 10- body; 11- guides

Hydrosandblasting method of cutting a slit-like window in the casing for directional drilling of an additional wellbore.

The essence of the method is as follows. First, a segment of the casing is cut and split in a given direction using a multi-tiered perforator. After that, the dismembered casing fragments are removed from the well using a magnetic trap. Next, a deflector is lowered into the well and a cutout window is templated using a casing cone router.

The following conclusions were made based on the work performed. The efficiency of implementing the method of drilling a new borehole in a production string depends on the right technology, equipment, devices and tools for performing individual operations, as well as the qualifications and experience of the performers. Returning emergency, inactive or abandoned wells to the stock by drilling a second wellbore is one of the main current methods for additional hydrocarbon production.

References

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