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Research Article

Elaboration of a Technology of the Water Inflow Prevention of the Well, Which Opened Up a Water Oil Reservoir

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ABSTRACT.
The technology for preventing the inflow of reservoir waters in a well which opened up a water-oil reservoir includes drilling a producing well, opening up the oil-saturated part and the water-saturated part of the reservoir for 10 m below the level of the water-oil contact, the descent of the casing string, carrying out works on cementing and fixing the wellbore, waiting for the cement thickening, the descent of the perforator to the packaging arrangement to the OWC level, carrying out the perforation, the descent of the packaging arrangement on pump-compressor tubing, consisting of two packers of the inflatable action, between which the perforated fitting pipe of 5 to 9 m long is attached with the help of couplings, to the OWC level. After the descent of the packaging assembly, the ball is dropped into the pump-compressor tubing, the backfill is injected in the required volume into the tubing string. In the injection process of the backfill, the rubber sealing elements of packers are in the decompressed state, the backfill is injected through perforations of the perforated fitting pipe into the reservoir at the OWCboundary. After carrying out works on the injection of the backfill, the tubing string is disconnected from the packaging assembly, the well remains on the WOC time, then the drill string with the cutter is lowered into the well, packaging arrangement drilling-out works are carried out with the wash away of metal cuttings and residues of the backfill in the well on the surface. On the completion of drilling-out works, from the bottom of the well to the roof of the water-isolating shield, a cement bridge is put, the perforator is lowered into the well in the interval of the oil-saturated reservoir part, the well is perforated and brought to the stable production.

Keywords: Oil-producing well, Water-oil reservoir, Water-oil contact, Packer packaging arrangement, Water-isolating works, Waterproof composition.

INTRODUCTION

In recent years, in the territory of Western Siberia, deep-lying low-amplitude oil reservoirs of the complex nature, confined to transitional water-oil zones, have been discovered. The majority of the oil and gas reservoirs is underlain partly or completely by bottom waters or are contoured with marginal waters. In the process of the development and pilot industrial works, especially in the operation of wells, as a result of the active advance of interfaces, two-phase inflows with an advanced water movement are usually obtained [1].

The increase in the productivity of wells and obtaining anhydritic industrial hydrocarbon inflows is a relevant problem, the solution of which will reflect on the increase in the effectiveness of preparing recoverable oil and gas reserves of industrial categories, the degree of utilization of raw material resources and the increase in the overall economic potential of the West Siberian region.

In order to prevent coning, especially during the operation of uniform reservoirs, waterproof shields are installed between the oil-saturated and water-saturated parts of the reservoir. The installation of artificial impermeable shields, as a rule, does not producea significant effect, since it cannot manage to create a shield of a large extent along the radius from the well axis. Thereunto, in the water-pressure regime, when

the pressure of bottom waters is the main source of energy in displacing the oil, the stationary position of the shield limits its (regime) energy capabilities by the creation of large hydraulic resistances [2, 3].

At the present time, there are many methods and devices for carrying out water-isolating works which have certain advantages and shortcomings.

The Object and Research Methods

The task raised before the authors is solved with the method of conducting water-isolating works in a well, which opened up a water-oil reservoir, as well as by increasing the work reliability of a device for its implementation.

The technical result when using the technology will be an increase in the effect duration of water-isolating works due to the creation of a high-quality water-isolating shield on the oil-water contact boundary, the increase in the effectiveness of water-isolating works.

The novelty of the technology lies in the use of a packaging arrangement on tubing pipes consisting of two inflatable action packers, between which a perforated fitting pipe with a length of 5 up to 9 m is attached with the help of coupling joints. Inflatable packers have bodies, wherein there are channels in the form of apertures for injecting a technological liquid into internal cavities located between bodies and rubber sealing elements; rubber sealing elements are attached to the bodies of packers with threaded joint retainer rings. In the lower packer inside there is a spring above the bead, on the top of which there is a movable bushing. From above, the movable bushing inside the packer is supported by a lug. The movable bushing has a saddle.

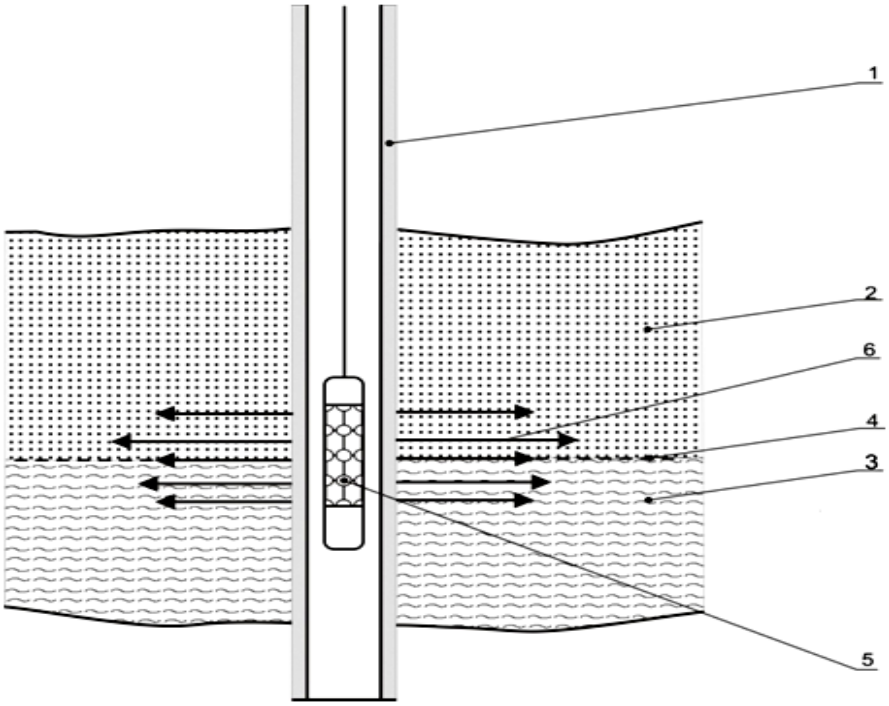

Fig. 1 Carrying out perforation works in the well at the OWC level. 1 – the well; 2 – the reservoir oil-saturated part; 3 – the reservoir water-saturated part; 4 – OWC; 5 – the perforator; 6 – the perforation.

The set task and the technical result are achieved by the fact that the technology of preventing the inflow of reservoir waters in the well, which opened up the water-oil reservoir, includes drilling the producing well, opening up the oil-saturated part and the water-saturated part of the reservoir for 10 m below the level of the water-oil contact, the casing string descent, carrying out works on cementing and fixing the wellbore, waiting for the strengthening cement time, the descent of the drill to the OWC level, conducting the perforation, the descent of the packaging arrangement on pump-compressor tubing, consisting of two inflatable action packers, between which a perforated fitting pipe with a length of 5 up to 9 m is attached with the help of coupling joints, to the OWC level. After the descent of the

packaging assembly, the ball is dropped into the tubing, the backfill is injected in the required volume into the tubing string. In the process of the backfill injection, rubber sealing elements of packers are in the decompressed state, and the backfill is injected through perforations of the perforated fitting pipe into the reservoir at the OWC boundary of the KSS. After carrying out works on the injection of the cement composition, the tubing string is disconnected from the packaging assembly, the well remains at WOC, then the drill string with the cutter is lowered into the well. At the end of the drilled works, from the bottom of the well to the roof of the waterproofing screen, a cement bridge is put in, the perforator is lowered into the well in the interval of the oil-saturated part of the reservoir, the well is perforated and brought to the regime.

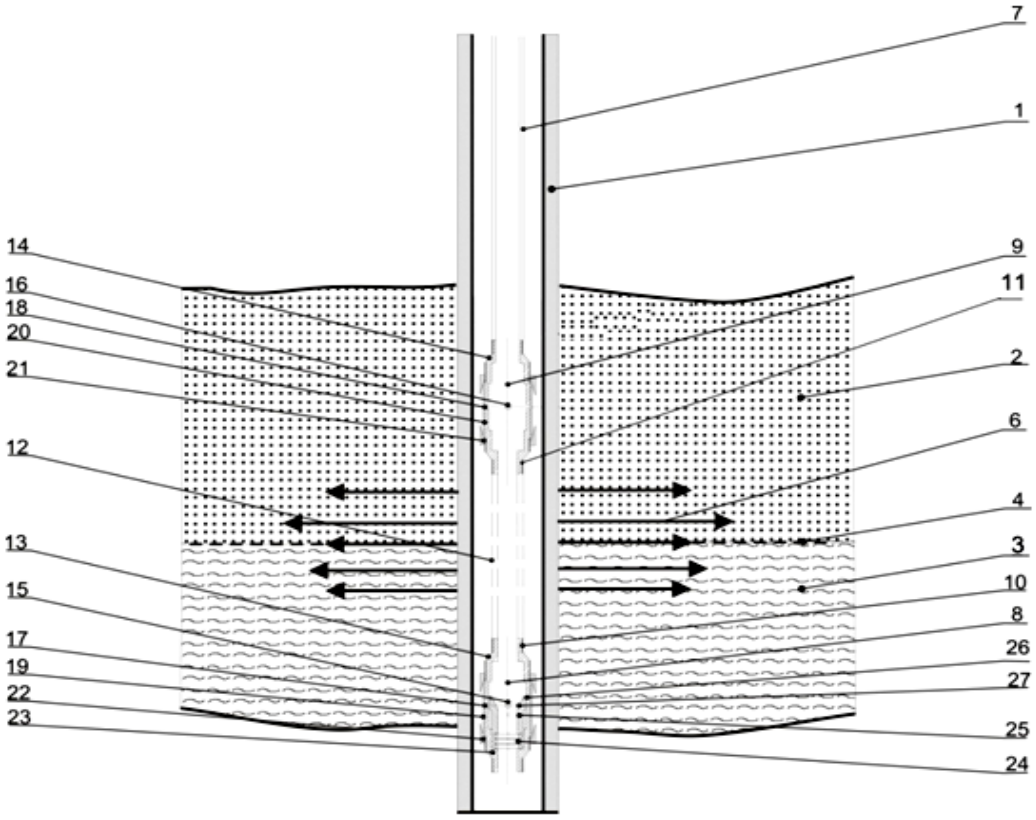

Fig. 2 The descent of the packer arrangement. 1 – the well; 2 – the reservoir oil-saturated part; 3 – the reservoir water-saturated part; 4 – OWC; 6 – the perforation; 7 – the tubing; 8, 9 – inflatable action packers; 10, 11 – coupling joints; 12 – the perforated fitting pipe; 13,14 – packer bodies; 15, 16 – channels in the form of apertures; 17,18 – cavities; 19, 20 – rubber sealing elements; 21, 22 – stopper rings; 23 – the bead; 24 – the spring; 25 – the movable bushing; 26 – the lug; 27 – the seat.

The technology is implemented as follows [4].

A method for preventing the inflow of reservoir waters into the well which opened up the water-oil-reservoir includes drilling a producing well (1), opening up the oil-saturated part (2) and the water-saturated part (3) of the reservoir for 10 m below the oil-water contact (4) (OWC), the descent of the casing string, carrying out works on cementing and fixing the borehole (1), waiting for a time of cement thickening (WCT), the descent of the perforator (5) (for example, of the cumulative action) on the cable to the OWC level (4) and performing the perforation (6) (Fig. 1) .

The descent of the packaging arrangement on tubing (7), consisting of two inflatable action packers (8) and (9), between which with the help of coupling joints (10) and (11) a perforated fitting pipe (12) with a length of 5 up to 9 m is attached to the OWC (4) level. Inflatable packers have bodies (13) and (14), wherein there are channels in the form of apertures (15) and (16) for injecting the process fluid in internal cavities (17) and (18) located between the bodies (13) and (14) and the rubber sealing elements (19) and (20). The rubber sealing elements (19) and (20) are attached to the bodies of the packers (13)

and (14) with the help of threaded connection retaining rings (21) and (22). In the lower packer (8) there is a spring (24) located inside above the bead (23), on the top of which there is a movable bushing (25). From above, the movable bushing (25) inside the packer (8) is supported by the lug (26). The movable sleeve (25) has a seat (27) (Fig. 2).

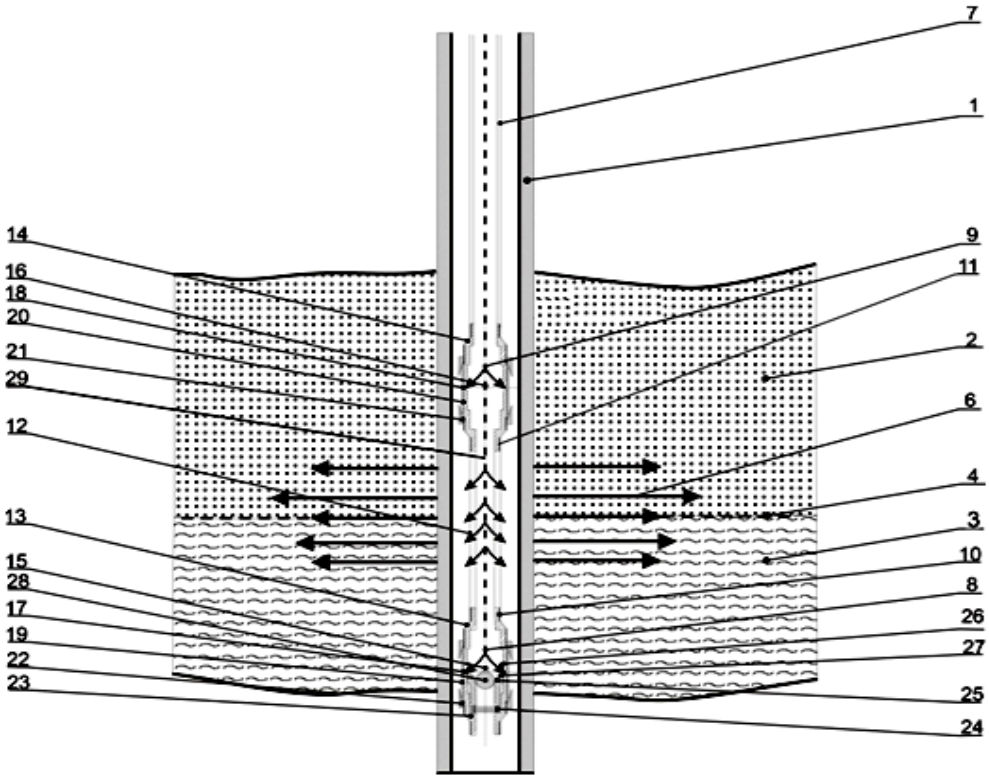

Fig. 3 The injection of the water-isolating composition. 1 – the well; 2 – the reservoir oil-saturated part; 3 – the reservoir water-saturated part; 4 – OWC; 6 – the perforation; 7 – the tubing; 8, 9 – packers; 10, 11 – coupling joints; 12 – the perforated fitting pipe; 13,14 – packer bodies; 15, 16 – channels in the form of apertures; 17,18 – cavities; 19, 20 – rubber sealing elements; 21, 22 – stopper rings; 23 – the bead; 24 – the spring; 25 – the movable bushing; 26 – the lug; 27 – the seat; 28 – the ball; 29 – the direction of backfill injecting.

After the descent of the packaging assembly, the ball (28) is dropped into the tubing string (7), the ball (28) passing through the tubing string (7), the upper packer (9) falls into the seat (27) of the movable bushing (25) located inside the packer (7). After that, the injection (29) of the oil-well makeup in the required volume is injected into the tubing string (7) (Fig. 3).

During the injection, the ball (28), which is in the seat (27), under the action of the hydraulic pressure of the oil-well makeup, squeezes the movable bushing (25) of the packer (8), the spring (24) located above the bead (23) is compressed and the channel (15) opens. The oil-well makeup, injecting into the channel (15), stretches the rubber sealing element (19) of the packer (8), thereby providing sealing the packer (8) with the casing string wall of the well (1). Then, in the process of the injection, the oil-well makeup enters perforations of the perforated fitting pipe (12), as well as into the channel (16) of the upper packer (9). The rubber sealing element (20) of the packer (9) begins to stretch and compact with the wall of the well casing string (1). In the process of the oil-well makeup injection, rubber sealing elements (19) and (20) of the packers (8) and (9) are in the unclamped state, and the oil-well makeup is injected through perforations of the perforated fitting pipe (12) into the reservoir at the OWC boundary (4) [4, 5].

After conducting works on the oil-well makeup injection, the tubing string (7) is disconnected from the packaging assembly, and the well (1) remains in the WOC regime. After this, the drill string (30) with a milling cutter (31) is lowered into the well, works on drilling out the packaging assembly are carried out with washing out metal cuttings and oil-well makeup residues in the well (1) to the surface (Fig. 4).

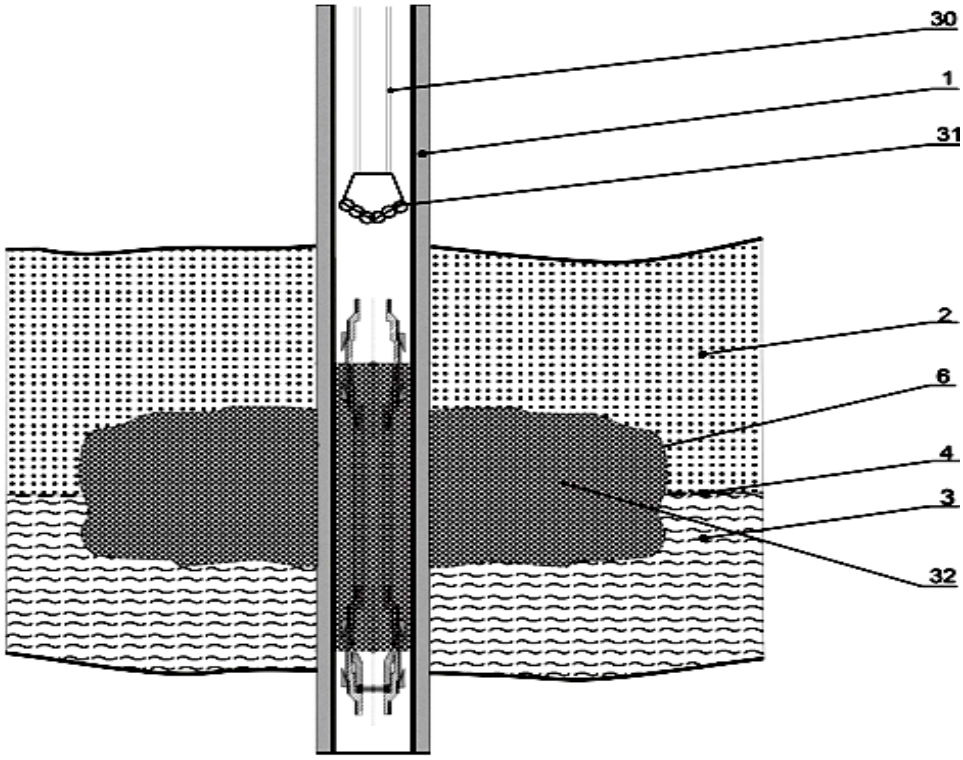

Fig. 4 Drilling out the packing arrangement with packers. 1 – the well; 2 – the reservoir oil-saturated part; 3 – the reservoir water-saturated part; 4 – OWC; 6 – the perforation; 30 – the drill string; 31 – the milling cutter;32 – the water-isolating shield.

Upon the completion of drilling-out works from the borehole bottom (1) to the water-isolating shield (32) roof a cement plug (33) is put, the perforator (34) is lowered into the reservoir oilsaturated part (2) (Fig. 5), the well (1) is perforated and brought to the stable production.

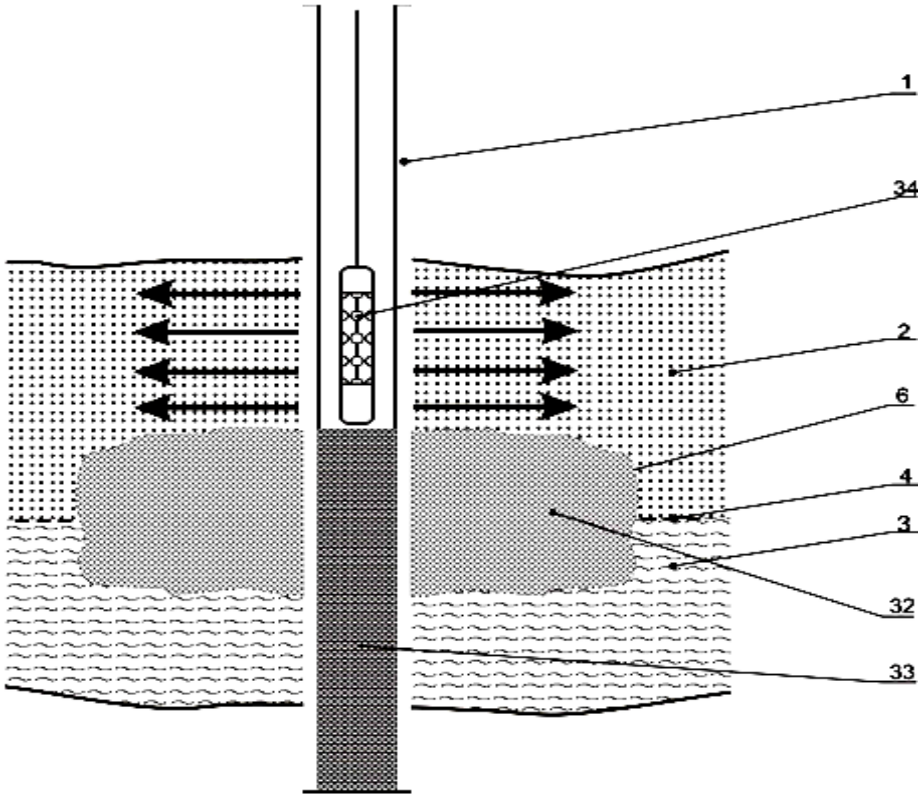

Fig. 5 Carrying out perforation works in the reservoir oil-saturated part. 1 – the well; 2 – the reservoir oil-saturated part; 3 – the reservoir water-saturated part; 4 – OWC; 6 – the perforation; 32 – the water-isolating shield; 33 – the cement plug; 34 – the perforator.

REFERENCES

[1] K.V. Strizhnev. Repair and Isolation Works in Wells: Theory and practice, Nedra, St. Petersburg, 2010.

[2] I.I. Kleschenko, I.I. Kleshchenko, D.S. Leontyev, V.A. Dolgushin, J.S. Popova, A.A. Ankudinov, Revisiting the installation of water-isolation shields in oil wells when tightening the cone of bottom waters, Drilling and Oil 5 (2015) 30-31.

[3] A.N. Kulikov, D.Yu. Eliseev, A.P. Rozhkov, The influence of geological and technological factors on the effectiveness of physical and chemical OER technologies and their improvement, Geology, Geophysics and Development of Oil and Gas Fields 6 (2011) 59-66.

[4] D.S. Leontyev, I.I. Kleschenko, N.A. Leontyeva et al., Patent 2665769 of the Russian Federation, IPC E21B 43/32 (2018.02); E21B 33/10 (2018.02), The Method to Prevent the Inflow of Reservoir Waters in the Well Which Opened up a Water-Oil Reservoir, 2018.

[5] D.S. Leontyev, A.A. Kustyshev, I.I. Kleschenko, A.K. Yagafarov et al., Patent 2613067 of the Russian Federation, C09K 8/504 (2006.01), C09K 8/506 (2006.01). The Makeup for Repair and Insulation Works in Wells, 2017.

[6] Akar E, Batçık KE, Acar C, Ton Ö, Canaz H, Baydın S, et al. A Comparative Analysis of the Effects of Melatonin and Nimodipine on Vasospasm. J Clin Exp Invest. 2018;9(3):113-8.

[7] MIRZAMASOUMZADEH, B., & MOLLASADEGHI, V. (2013). EFFECTS OF OSMOTIC STRESS ON CHLOROPHYLL AND PROLINE DIFFERENTWHEAT CULTIVARS, UCT Journal of Research in Science, Engineering and Technology, 1(1): 12-13.

[8] Aghajari, Z., Loghmani, L., Ilkhani, M., Talebi, A., Ashktorab, T., Ahmadi, M., & Borhani, F. (2018). The relationship between quality of learning experiences and academic burnout among nursing students of Shahid Beheshti University of Medical Sciences in 2015. Electronic Journal of General Medicine, 15(6).