Well productivity increase by simultaneous application of action of chemical reagents and pulse-wave action to the bottomhole formation zone

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© V.M. Svitlytskyi
Doctor of Technical Sciences
B.I. Chaychenko
Ukrgazvydobuvannia PJSC

The pa per presents a method of increasing the productivity of wells through a combination of influence of chemical agents with cyclic hydrodynamic pulses.

Key words: well, productivity, chemical reagents, pulsator valve type, cyclic hydrodynamic pulses.

The bottomhole formation zone (BFZ) is subjected to the most intense action of various physical, mechanical, hydrodynamic, chemical, physical and chemical factors caused by the extraction of liquids and gases from the formation or their buildup in the deposit in the course of its development. The BFZ condition- predetermines to a significant extent the total oil and gas production, debit of the mining and reception capability of injection wells. The permeability of reservoir rocks is deteriorated significantly compared to the natural permeability. This is due to the formation of sediments made of clay particles, asphaltenes, resins, waxes, salts etc. in BFZ pore space. The result is the sharp increase in liquid and gas filtering resistance, well flow rate reduction etc. In the fields with paraffin base oil the formation of monolithic surface layers of sediments can lead to a significant reduction in flow rate and even complete clogging of BFZ pore space [1].

To clean BFZ from sediments generated in the pore space, a number of methods is used, which can be subdivided into three main groups: chemical, mechanical and thermal [1].

Recently, the new methods of effect on the bottom zone of the reservoir are widely used. The researchers' attention is increasingly attracted by methods creating the cyclical effects reservoirs, i.e. thermal, acoustic, hydrodynamic [1, 2].

The research has established that the creation of cyclic hydrodynamic and thermal fields qualitatively affects the increase of gas and oil yield and intensification of the deposit development rate with low reservoir permeability, in particular its bottomhole zone [3-5].

To create the cyclic hydrodynamic pressure pulses the valve type pulsator (VTP) was designed, the scheme of which is shown in the figure.

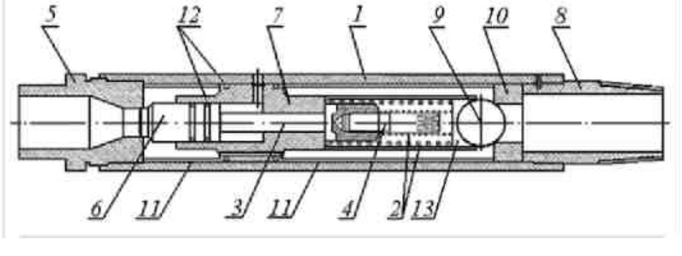

Fig. Valve type pulsator: *1* - body, *2* - spring;
3 - rod, *4* - finger, *5* - cap *6* - piston, *7* - fitting;
8 - connector, *9* - ball *10* – adapter, *11* - bushings, *12* – compaction rings, *13* - saddle

The principle of its action is as follows. The valve type pulsator is immersed directly into the well in the range where the bottomhole zone must be cleaned from sediments. The device is attached to the tubing or a column of flexible long tubes (Coiled Tubing) via the connector. The chemical reagents required to perform the process are fed from the measuring cylinder via a plunger pump under the pressure into the valve type pulsator via the tubing through the connector *8*. Passing through the adapter *10,* the fluid compresses the ball *9,* pressed to the adapter with a spring *2*. Under the pressure of the fluid the ball moves down compressing the spring, the hole is opened and the liquid begins to fill the piston chamber, passing through the holes in the choke *7*. When the liquid fills the piston chamber and is compressed until the pressure above the piston *6* is not less than the pressure beneath it, the piston begins to rise up, thus closing the inlet through the action of a finger on the ball and opening the outlet. The fluid starts leaving out of the piston chamber through the nozzle *5* with a high speed. The pressure in the chamber drops down, and the compressed spring instantly straightens and, acting through finger *4* on piston *3,* move it down, closing the outlet. Then the whole process repeats again.

It follows from the above that the outlet closure rate depends on the stiffness of the spring and its compression degree. However, you should consider that the increased reverse piston speed will increase the piston impact strength on the outlet, which may contribute to do the destruction of the walls. The significant spring stiffness also influences the ball displacement. Therefore, you need to choose the most optimal value of the spring stiffness.

Overall, the complete pulsator operation cycle can be conventionally subdivided into four stages:

the ball, under the pressure of the fluid created by the pump, falls down, opening the hole for the flow of fluid into the piston cavity;

keeping the ball in the final position and its filling with the piston chamber fluid;

under the influence of the fluid pressure difference arising due to the difference of cross section planes affecting the piston, piston movement and simultaneous movement of the ball with a spring to its original position and their overlapping of the hole for fluid supply to the piston chamber;

return of the piston under the action of the spring to its original provisions due to lowering of the pressures under the piston.

Finally, it is necessary to add that the valve type pulsator operation can be adjusted by change of the pressure or fluid consumption by the pumping unit. Meanwhile the change of the amount of fluid fed at the pulsator outlet does not affect the pressure, but changes the operation frequency.

Conclusion

Thus, the proposed method of removing the mud sediments from the pore space of the BFZ using the valve type pulsator will help to improve the efficiency of the well productivity recovery process, which will primarily allow increasing the flow rates of production well and reception of injection wells significantly.

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NEWS

European Shale Gas May Add 1 Million Jobs

The shale gas production in Europe may add 1 million jobs, make the industry more competitive and reduce the regional dependence on the imported energy resources. This is stated in the study of the International Association of Oil and Gas Producers (IGP). This study performed by independent consultants also stresses that the shale gas production during 2020-2050 could provide the economy with extra EUR 1.7 to 3.8 trillion.

"The shale gas production will provide significant economic benefits, said Ronald Festor, Director of the IGP European Branch. - Each cubic meter of the produced shale gas means a reduction of its imports, which will increase the number of jobs, revenue, and improve the energy security. Therefore, we should encourage the shale gas exploration."

The study models the impact of the shale gas production on the economy of 28 EU countries according to three scenarios differing by the production levels. According to the studies, the shale gas operations may create 400 to 800 thousand extra jobs by 2035 and 600 to 1100 thousand extra jobs by 2050, and most of them will be created in the areas most affected by the economic crisis. The own production may reduce the dependence on gas imports by 62 to 78%. The less Europe will spend on energy imports, the more it will be able to invest in its economy. During 2020 to 2050 the investment in the EU countries may increase by EUR 191 billion. The own gas production can also reduce the energy prices compared with the scenario where shale gas programs will not be implemented. The relatively low prices will increase the income of individuals and reduce the cost of products thus making them more competitive in international markets.

http ://www. ogj/articles/2013/ll/eu-shale-gas-production