

### **Chemical methods of impact on the bottomhole formation zone**

**Abstract:** When drilling wells there are changes in the distribution of internal stress in the surrounding bottomhole zone.

Casing perforation begins to be accompanied by short-term impacts on the bottomhole zone (BHZ) by a shock wave of varying frequency, which affects the rock crystals, causing a piezoelectric effect on their boundaries. During the production process, all of the oil extracted from the reservoir must pass through certain zones near the bottomhole, and produced water must pass through the CCD of the injection wells. Each such process takes place at specific temperatures and pressures that are different from those of the reservoir fluid in question initially. As a result, hydrocarbon elements and salts accumulate in the bottomhole zone. To reduce filtration resistance, it is necessary to apply a number of measures that increase permeability, improve connectivity to the core and increase the system of channels that facilitate flow and reduce energy losses.

The ways in which CCDs are affected are divided into groups: chemical; thermal; and mechanical.

Chemical methods of impact on bottomhole formation zone are applied when there is a possibility to dissolve rock or elements, which can deposit and worsen permeability. These may include: salt, ferrous deposits, etc.

Acid treatment is one of the most common treatments with chemicals. Hydrochloric acid helps dissolve calcareous and dolomitic formations, which form the basis of carbonate rocks.

A telling property is the fact that the chloride elements dissolve well in water and can be easily removed from the treated surface. As a result, the existing channels increase in size and new cracks appear. Modern technologies of chemical influence on the bottomhole formation zone (BFZ) At the moment there is a huge number of technologies that can selectively influence a certain formation interval. They have also perfected techniques that allow for depth control, which is a really important metric when viewed from a practical standpoint. Various additives to the acid solution protect downhole equipment made of metal from chemical corrosion.

Specialists can also be credited with developing effective impact on carbonate and terrigenous rocks. To the experience was added knowledge in the use of a variety of acid solutions: hydrofluoric acid; chloroacetyl; sulfamine; acetic acid, etc.

Acid treatment involves delivering acid solutions to the bottomhole at a certain pressure. Acid solutions penetrate into small pores and cracks in the formation and begin to expand them. At the same time new channels are being created through which oil penetrates to the bottom of the well. For acid treatment we mostly use water solutions of hydrochloric and hydrofluoric (hydrofluoric acid). The acid concentration in the solution is taken equal to 10 - 15%, this is connected with the danger of corrosion damage of pipes and equipment. [1] However due to the wide use of highly effective inhibitors of corrosion and decrease of corrosion risk the acid concentration in the solution is increased up to 25 %-28 % which increases the efficiency of the acid treatment. The duration of acid treatment of wells depends on the following factors: temperature at the bottomhole, genesis of rocks of the productive formation, their chemical composition, concentration of the solution, injection pressure. Technological process of wells acid treatment includes filling the well with the acid solution, squeezing of the acid solution into the formation while sealing the wellhead by closing the wellhead gate. Once the squeezing process is complete, the well is left under pressure for some time to allow the acid to react with the reservoir rocks. The duration of the acid treatment after squeezing is 12-16 hours at the fields with the temperature at the bottomhole not exceeding 40°C. [2]

Hydrochloric acid actively dissolves limestones and dolomites, of which carbonate rocks mainly consist. A unique property of this interaction is that the reaction products - calcium chloride, magnesium chloride, carbon dioxide - are well soluble in water, and this allows them to be removed from the reaction zone. It follows that existing filtration channels increase in size and/or new channels appear in the interaction zone of the working acid solution. Such channels are usually referred to as dissolution channels.

Nowadays technologies have been developed, which are able to influence the necessary formation interval, i.e. selectively, as well as technologies with depth control, which is very important from practical point of view. [3] Various additives to the acid solution can reliably protect the metal equipment of wells from chemical corrosion. Technologies of effective impact on both carbonate and terrigenous rocks have been developed. They have accumulated the experience of using not only hydrochloric but also many other acids (hydrofluoric acid, acetyl chloride, sulfamic acid, acetic acid and others).

List of references:

1. <https://www.neftegaz-expo.ru/ru/articles/2016/himicheskie-metody-vozdeystviya-na-prizaboyuyu-zonu-plasta/>

2. <http://www.15rosneft.ru/osvoenie-skvazhin/ximicheskie-metody-vozdjstviya-na-prizabojnuyu.html>
3. <https://www.chem21.info/info/1462567/>