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Boosting Production Ratio of Wells in High-Viscosity Oils Deposits with the Technology of Electric Effect

Meyliev Kh.B., Ermatov N.Kh., Shukurov A.Sh., Nuraliev J.T.

Senior Lecturer, Department of "Development and operation oil and gas deposits", Karshi engineering-economics institute, Karshi city, Uzbekistan,
Candidate of technical sciences, Associate professor of the department "Development and operation oil and gas deposits", Karshi engineering-economics institute, Karshi city, Uzbekistan,
Master of Karshi engineering-economics institute Karshi city, Uzbekistan,
Student of Tashkent chemical-technological Institute, Tashkent city, Uzbekistan.

ABSTRACT: The results obtained by fractional driving of the oil sample are presented. It is recommended that the technology of electrical exposure be used to increase the oil solvent coefficient of wells at high viscous oil fields. On the mapping location of the wells, the most appropriate wells were selected for the application of this technology.

KEY WORDS: coefficient, deposit, well, stratum, viscosity, debit, oil solubility, use, watering, method, acceleration, effect.

I.INTRODUCTION

This article considers the recommendations on the boosting the ratio under the effect on the formation (seam) and on the product with the electric charges, treatment of several wells with the forming systems interacting with each other. It is essential to know the conditions of the product accumulation and its physical and chemical properties to increase the wells' flow rate with electric effect on borehole bottom and the product (oil):

- For conducting an electrical treatment, the appropriate and efficient requirement is the well's pressure which should be higher than the average value concerning its depth;
- High formation temperature negatively effect on the whole process, the cause of which is worsening of electrical conductivity under the high temperature;
- The proportion of salts and various minerals in the composition of the product that will play the role of conductors should be high both in the reservoir and in the product itself. And as you know from geological exploration studies, salts and minerals are present both in the reservoirs and in the product itself;
- Metals in the composition of the product are of great importance since they will be the connecting elements between the product and the rock in the reservoir and therefore the more they are in the composition, the more efficient the process is, otherwise the effect of electrical processing will not give high results;
- The formation water has a direct role, if formation water is present in the soil or on the product itself, this increases the efficiency provided that these waters are in a closed system, otherwise, if the formation water is flowing and migrating, then the whole charge is electricity or part will go into these waters. So and so most of the charges go anyway into the ground, it is necessary to check the formation water, their composition and direction of movement;
- In one way or another, such factors as associated gases, solutions, product viscosity, reservoir porosity, etc. will affect the process anyway.

Considering all these factors the electrical treatment processing can be started. Several ways of actions are possible: direct electrical charging or contact effect; electromagnetic wave action or both at a time.

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II. METHODOLOGY

The most elementary direct effect is by connecting electric cables to the tubing or to the column itself, where a three-phase generator can be used as an electric source, which makes it possible to use several wells at once: by connecting the zero phase to several wells, and other phases to the wells around. The generator is connected to a transformer with an electronic voltage and frequency controller, connecting everything we turn on the 100 V generator and gradually raise the voltage (20-50 V in 2-3 hours), while all wells should be monitored for signs of a change in performance. There must be a fuse between the columns and the transformer in case of a short circuit or reverse current flow. The bottom hole zone is processed by electric charges by connecting to the casing strings of electric cables Fig 1 (to one casing string "+" the cable to the other "-").

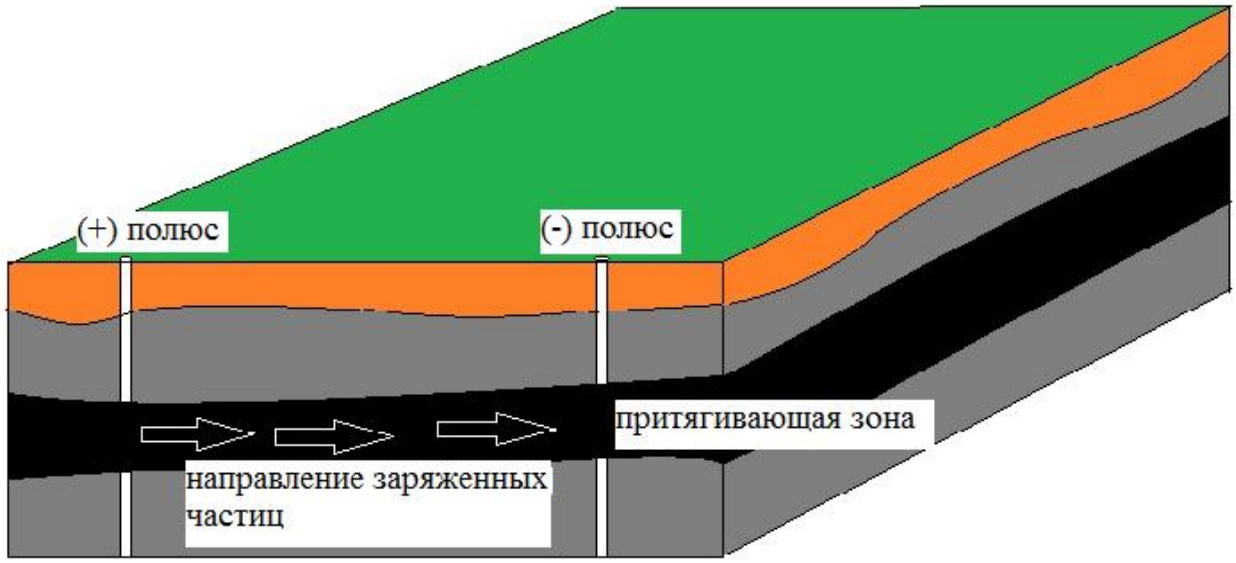

Fig 1: Scheme of Electrical Stimulation.

After connecting the cable and turning it on, charges will rush along the casing, but due to the fact that cement conducts electricity, most of the charges are absorbed into the ground, the rest of the charges reach the bottom hole zone and rush to the opposite charge and thereby a kind of chain (columns, source of energy, the ground).
It takes some time for a sufficient number of charges to accumulate in the bottom hole zone due to the loss of charges on the way to the bottom hole zone. The deeper the well, the more time is required for processing. Figure 2 shows the well diagram (production wells with a zero phase connection and three wells with connected phases with voltage). The surface shows electromagnetic lines of circulation of electric charges. These charges will interact with the product and direct them to the production well.

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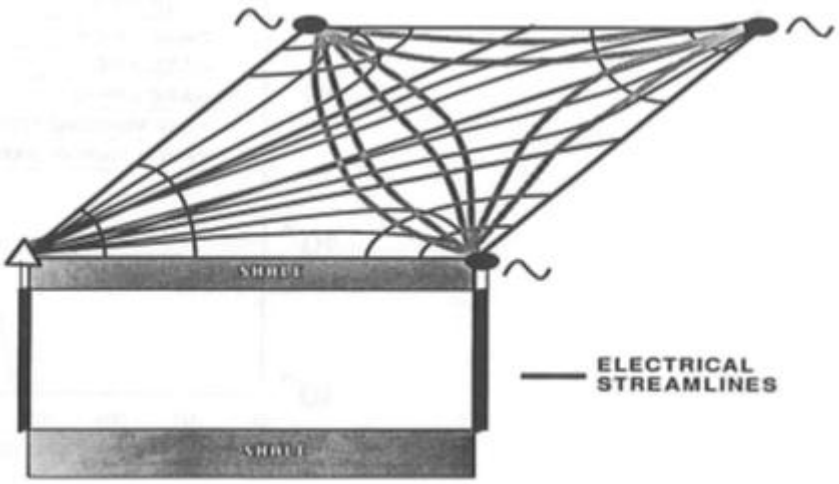

Fig 2: Scheme of a simplified pole connection for an analytical example.

The most important are strata because different strata have different chemical composition which interacts with electricity differently. Some strata conduct electricity well, some reflect and there are ones that can hold charge. It is essential to investigate strata their degree of interaction with electricity to apply the electrical treatment.

Figure 3 shows the location of the wells, the black dots – the wells to which the cables (+ and -) are connected and they serve as the electrodes (conductors) to the reservoir, the triangles – production wells can be connected to the zero phase or nothing can be connected.

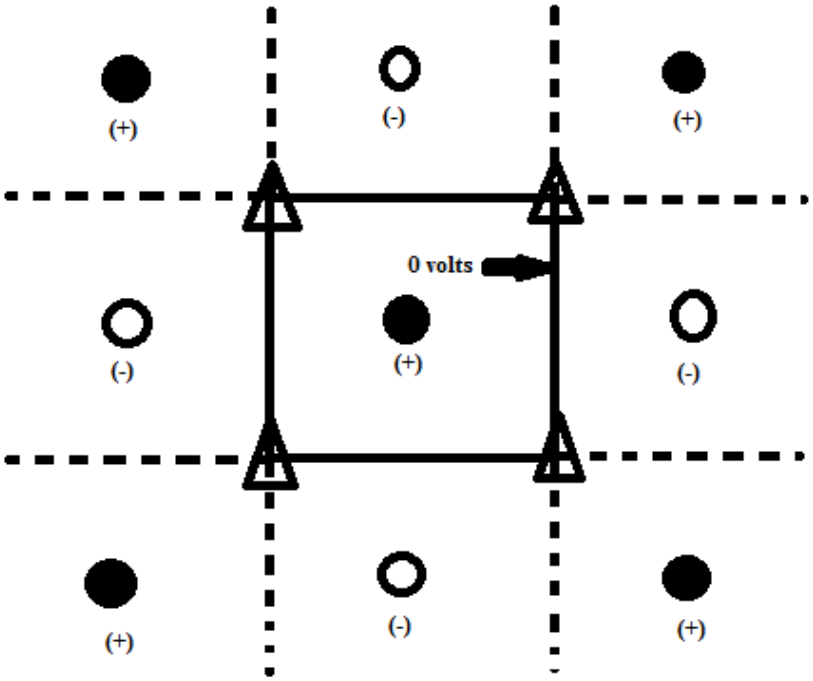

Fig 3: Multiphase circuit.

Dotted wells with connected cables will begin to interact with each other and the product in this area begins active movement and circulation. As a result of this, the circulating product passes through the bottom hole zone (for this, a spot well is located in the center of the producing wells) and thus the oil recovery increases. Depending on the

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rock, and more precisely on their degree of interaction with electric charges, the flow rate will increase from 10% to 80% or more.

III. RESULTS

The principle of operation of electric processing consists in the interaction of charged particles with the product and the rest of the matter between the columns and the bottomhole zone. In conventional electrical processing, as they said, an electric cable is connected with one pole (+) to one column, and to the other (-) pole. Due to the electric charge between the columns, the temperature and thereby the pressure gradually increase. In addition, as mentioned above, columns, product and earth begin to act as a single mechanism i.e. two wells operate as one with a single bottomhole zone. Under the influence of electricity, the product in a single bottomhole zone passes into an excited state (active). Hydrocarbons themselves can conduct electricity poorly, but still the temperature acts, and the product is in the channels and porosities that interact with electric charges.

All various objects and substances are composed of molecules, and those, in turn, are made of atoms, which determine the physical and chemical properties of matter. Formations, for example, consist of a combination of numerous molecules (mainly those that are in a solid state under normal conditions). So the product itself consists of molecules, but with a more specific composition (hydrocarbons).

As you know, all atoms are made up of protons, neutrons and electrons. An electron revolves around a nucleus (a positively charged proton and an electro-neutral neutron), only in hydrogen at the most important component in oil, the nucleus consists of one proton.

The bond between the atoms in the molecules is obtained due to the electromagnetic interaction, as is the bond of the electrons with the nucleus.

So in the strata of rocks, for example, the most common mineral is quartz. Quartz in contrast to hydrocarbons is in solid state. This is because elementary particles (nucleons and an electron) in high concentrations require more and more energy. This explains the state of aggregation. All substances have an aggregate state that changes with changing environmental conditions in which the substance is located (temperature and pressure). If we take the normal state (T = 20 ° C and a pressure of one atmosphere of 0.1 MPa) in relation to different substances, we get the following: the larger the components of the atom (proton, neutron and electron), the denser the substance, but when different atoms are joined, the density will fluctuate in fairly high limits . As for hydrocarbons, hydrogen is the lightest element and due to this, hydrocarbon starting from methane (the largest relative amount of hydrogen) is light (gas) and less dense. With increasing carbon in the composition of hydrocarbon compounds, they become heavier and denser, changing the transitional conditions of aggregate states.

IV. DISCUSSION

Temperature affects the electromagnetic bond in substances (to their mutual attraction and repulsion). On this basis, with the help of electricity, you can affect the temperature change using the charges (positive and negative) of electricity. In fact, it will be a huge electromagnet, increasing the pressure on the layers and the product, and for one it will act as a surfactant (surfactant).

Why does oil stick to porosity walls making it difficult to migrate along microchannels, and why are hydrocarbon molecules so stick to each other? And why does viscosity change with temperature? The fault is electrostatic charges of substances (product and rock). Saturated hydrocarbons, due to the greater amount of hydrogen, have less attractive interaction with the rock and more repulsive interaction (depends on free charged particles and various interactions between them). In addition, saturated hydrocarbon molecules are more active in motion. And paraffins (C_n H_ (2n-6)) with a significantly larger amount of carbon, heavier than this and is associated with enhanced interaction with the rock (attraction). And because of the small amount of hydrogen (the main source of movement of hydrocarbon molecules), repulsion is less. In addition, paraffins interact with each other, which increases the need for pressure exponentially.

Under the influence of temperature paraffin molecules begin to repel each other (the source of which is thermal energy), accelerating in motion, thereby passing into a fluid state. But in conditions of occurrence underground, the temperature is not as high as pressure, they are narrowly interconnected - the higher the temperature, the higher the pressure. But still the product is difficult to get. Pressure is to blame for everything; they are interconnected in a split. A product under high pressure will not change its state in sufficient quantities due to temperature if it is under pressure. In

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order for the effect to be achieved, the temperature must be reached, which violates the proportionality of pressure and temperature.

It all depends on the charged particles and their concentration. As you know, charges with the same poles repel, and with different attract. Considering everything related to petroleum products and their basis at the quantum level, it is possible to use the charges themselves directly to change the properties of the product and the reservoir, thereby increasing oil recovery.

V. CONCLUSION

It is difficult to directly affect the charges directly inside the atom, and there are no technologies available on an industrial scale yet. But the principle of action itself can be used, namely, to use the mutual attraction of different charges and repulsion of the same. In essence, turn the field into an artificial magnet (formations), or apply the same principle on a smaller scale for one or a group of wells. To do this, you need to charge the surrounding product (formation) with a certain charge (-) and then gradually charge the product with the same (-) charge. Then there will be their mutual impact (reservoir and product) in the form of repulsion from each other. In fact, this will not manifest itself explicitly, but the change will still be in the form of an increase in pressure, which is pretty good and the larger the quantitative volume of charges in the reservoir and in the product, the greater the pressure and the greater the oil recovery. This is the most basic way to increase oil recovery using electricity.

More advanced technology can be applied by charging the well with the opposite charge (+)making up force of attraction. This can reduce production time and significantly increase the oil recovery.

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