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MULTICOMPONENT ANALYSIS OF RESERVOIR WATER FROM WELLS №855 OF THE BOSTON FIELD AND NO45 OF THE AVVAL FIELD

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A B S T R A C T

The main purpose of the water supply system while maintaining reservoir pressure is to extract the required amount of water suitable for injection into the reservoir, distribute it between injection wells and pump it into the reservoir.

K E Y W O R D S

Water supply, recycling, highly mineralized, calcium content, formation water, concentration.

Introduction

The main purpose of the water supply system when maintaining reservoir pressure is to provide the required amount of water required for injection into the reservoir, distribute it between injection wells and pump it into the reservoir. The specific choice of water supply system depends on at what stage of development the corresponding location of occurrence is likely to occur.

Currently, they are trying to implement pressure maintenance from the very beginning of field development. In this case, a large amount (almost 100%) of fresh water is needed, since production wells at this stage practically produce water-free products. Subsequently, the wells become increasingly watered, and associated water appears in ever-increasing quantities, which must be disposed of. In this regard, water supply systems must be modified and adapted to the specific conditions of field development. The designed water supply system must provide for an increase in water cut in well production and the need to dispose of all so-called industrial wastewater, including storm water, associated water, water from oil treatment plants, etc.

This complicates and somewhat increases the cost of the water supply system, since there is a need for special treatment of wastewater, purification from oil products and suspended matter, and combating the increasing corrosion of process equipment and water pipelines. However, wastewater, as a rule, containing surfactants introduced at oil dehydration and desalting plants, has improved washing and oil-displacing abilities, which should lead to increased oil recovery.

The specific choice of water supply system depends on the sources of water for injection into the reservoir, which can be:

- open bodies of water (rivers, lakes, seas);
-groundwater, which includes under-channel waters;

-aquifers of a given field;
-wastewater consisting of a mixture of produced water produced along with oil;
-water from settling tank farms, oil treatment plants, storm water from field facilities.

The water used for pressure injection should not cause the formation of insoluble compounds upon contact with formation water, which can lead to clogging of pores, or, as they say, must be chemically compatible with formation water. Water quality is assessed primarily by the following parameters: the amount of mechanical impurities (ESF - the number of suspended particles), petroleum products, iron and its compounds, which, when oxidized with oxygen, produce insoluble sediments that clog the pores of the formation, hydrogen sulfide (H_2S), which promotes corrosion of water pipelines and equipment, microorganisms, as well as the salt composition of water and its density.

The designed water supply system should provide for an increase in the water cut of well products and the need to utilize all the so-called field wastewater, including storm water, associated water, water from oil treatment plants, etc.

In order to comply with measures to protect nature and the environment, the water supply system in any case should provide for 100% disposal of wastewater and the operation of the entire system of pressure maintenance according to a closed technological cycle.

This complicates and somewhat increases the cost of the water supply system, since there is a need for special treatment of wastewater, its purification from oil products and suspension, and the fight against increasing corrosion of technological equipment and water conduits. However, wastewater, as a rule, containing surfactants, introduced at oil dehydration and desalination units, has improved washing and oil displacement capabilities, which should lead to increased oil recovery.

The results of a multicomponent analysis of the composition of formation water from well №835 of the Boston field and №45 of the Avval field are shown in Table №1

Table №1

Field	№ of wells	Ions, mg/l						J_{com}, mol/l	Miner-ya, mg/l	pH	Density, g/cm^3
		Cl^-	SO_4^{2-}	HCO_3^-	Ca^{2+}	Mg^{2+}	Na^++K^+				
Boston	835	46098,0 1300,4	237,8 4,95	671,0 11,0	1202,4 60,0	364,5 30,0	29431,7 1226,3	90,0	94000,0	7,4	1,016
Avval	45	113472,0 3200,9	1506,9 31,39	366,0 6,0	9919,8 495,0	2835,1 233,3	60238,9 2509,95	728,3	230679,8	6,8	1,104

According to the results of the analysis, the formation water of well № 835 of the Boston deposit is highly mineralized (94.0 g/l), with a specific gravity (1.016 g/cm3), with prevailing concentrations of chlorine ions (46.1 g/l) and alkali metal ions (29.4 g/l). The calcium content (1.2 g/l) significantly predominates over magnesium (0.4 g/l), and hydrogen carbonates (0.7 g/l) over sulphates (0.2 g/l). In terms of chemical composition, the water is hard (90.0 mol/l), the reaction of water is slightly alkaline (pH 7.4).

According to hydrochemical indicators (r(Na+/Cl-) and r (Cl- - Na2+)/Mg2+), the produced water belongs to the chlorocalcium type (according to the classification of V.A. Sulin), the value of the sulfate-chlorine coefficient is low (0.38).

The formation water of well №45 of the Avval deposit is represented by brine, with mineralization (230.7 g/l), with specific gravity (1.104 g/cm^3), with prevailing concentrations of chloride ions (113.5 g/l) and alkali metal ions (60.2 g/l). The calcium content (9.9 g/l) significantly predominates over magnesium (2.8 g/l), and sulfates (1.5 g/l) over hydrogen carbonates (0.4 g/l). In terms of chemical composition, water is very hard (728.3 mol/l), the reaction of water is slightly acidic (pH 6.8).

According to hydrochemical indicators (r(Na+/Cl-) and r (Cl- - Na2+)/Mg2+), the produced water belongs to the chlorocalcium type (according to the classification of V.A. Sulin), the value of the sulfate-chlorine coefficient is low (0.98).

Findings

1. The reservoir water of well №835 of the Boston deposit is highly mineralized (94.0 g/l), calcium chloride type (according to the classification of V.A. Sulin) and low sulfate (0.38). The reaction of ppasti water is close to neutral (pH 7.4). These indicators indicate that the environment is not aggressive. Time between failures for the last two failures is 818 days.
2. The reservoir water of well №45 of the Avval deposit is represented by calcium-chloro-type brine, with salinity (230.7 g/l), low sulfate (0.98). The reaction of water is slightly acidic (pH 6.8). Mean time between failures for the last failure is 701 days.

Recommendations

1. Well №835 of the Boston field must be monitored for salt composition, as it has a tendency to salt deposition.
2. Well №45 of the Avval field must be monitored quarterly for the aggressiveness of the environment.

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