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DEVELOPMENT OF COMPLEX METHODS FOR PROCESSING MARINE PRODUCED WATERS

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Annotation:*Absheron peninsula groundwaters are characterized by high minerality, because their salt content is different. We can look at these aquifers as a source of various salts and minerals. This gives us the reason to treat groundwater as a desalination object. Previously, during desalination of seawater, residual products were returned to the sea. This had a serious impact on the flora and fauna of that region. In terms of complex processing, formation water is considered as important as sea water.*

Treatment of formation waters is one of the urgent problems of the modern oil industry. This problem is typical for the Absheron peninsula. Because the Absheron peninsula has more than two centuries of oil history. In this region, there is a high amount of groundwater, which also comes out of water wells dating back to the Soviet era.

Key words: residual products, flooded wells, Na-cationization, processing methods.
Açar sözlər: Qalıq məhsullar, su basmış quyular, Na-kationlaşdırma, emal üsulları.
Ключевые слова: Остаточные продукты, затопленные скважины, Nакатионизация, методы переработки.

Introduction

The reviewed article is dedicated to the development of complex technological schemes for the treatment of groundwater. These schemes mainly consist of the separation of important substances such as iodine and bromine in the groundwater, as well as the treatment of groundwater in the most efficient way and pumping it into wells.

Development of technologies for complex treatment of Absheron formation waters, investigation of removal of industrially important substances such as iodine, bromine, boron, and provision of softening of formation waters by applying the Na cationization method.

Various processing methods and chemical-technological schemes are used in order to clean formation waters. These methods differ from each other both according to the nature of the applied technology and according to the physical and chemical processes that take place.

When choosing a processing method, it is necessary to pay attention to the fact that in the future, the disposal and neutralization of the obtained compounds is possible in a simple way.

In recent times, mainly such cleaning methods are used: direct separation of impurities; transformation of impurities; change of phase state of water and impurities; biochemical cleaning.

It is known that as long as the oil extraction processes continue, it is inevitable that the formation waters will come to the surface and enter both the soil and the water. This leads to disturbance of the ecological balance in those areas. Therefore, it is necessary to transport and process groundwater without spilling into the environment.

Experimental part

Taking into account the diversity of formation waters of the Absheron peninsula, attention was paid to the oil waters of the Binagadi Oil and Gas Extraction Department (NPD) as a research object for the development of complex processing technologies. First of all, this is explained by the fact that thermal processing of underground layers is carried out in that

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NDP. On the other hand, this NQCI is close to the industrial zone of Absheron. We have mentioned that groundwater contains various salts and valuable components. This gives us the reason to consider them as valuable mineral raw materials. These valuable components include iodine, bromine, boron, lithium, strontium, etc. belongs to. It is also possible to obtain radium, uranium and other trace elements from the contents of these waters in the future.

The process of removing salts from the formation waters is similar to the treatment of chemically polluted waters generated in thermal power plants. Because these waters are mainly in the form of NaCl-CaCL $_2$ -MgCl $_2$ -H $_2$ O system./1/

Studying the chemical composition of groundwater is very important. From the sample of formation water taken from the well, it is known which horizon it belongs to. Formation waters mainly contain Na, K, Ca, Mg and other metal salts. Salts of alkaline earth metals are rare. Formation waters differ from other waters mainly due to the following characteristics: - high degree of mineralization; low content of CaCl $_2$ salt; low or no presence of sulfate compounds.

Geophysical methods are used to study the formation waters of hydrocarbon wells, to study and compare the cutting of wells./2/

The composition and properties of formation water in Absheron oil and gas fields are different in different layers, and it is also possible to find them in one layer. However, in most of the layers, the mineralization and salt content of the formation waters are located in the cross-section of the responsible layer with a certain regularity. Mineralization is most abundant in the upper part of the productive layer (the amount of salts in the water is 160-170 g/l). as the depth increases, the mineralization decreases and in some places it is even equal to 100 g/l. Sodium chloride and alkali metal chlorides are mainly present in the upper part of the productive layer. These are considered cod waters. Toward the deep layers, alkaline waters with bicarbonate salts prevail/3/.

Almost the last time The chemical elements in the Absheron reservoir, their quantity, value and the possibilities of their use in the national economy are investigated and studied by many researchers. The highly mineralized waters contain many industrially important trace elements (in Ramana, Surakhani, Bibiheybat and Neftchala fields) and salts. Environment These waters are discharged into the Caspian Sea, which is dangerous for the oil industry. Therefore, the study of formation waters and their effective use is an urgent issue for Azerbaijan, an oil country./4/

We noted that Absheron's groundwater is highly mineralized. For this reason, the formation of turbidity in the water was observed in the methods we use for cleaning. To prevent this, it is important to soften them. The process of softening by Na-cationization method is the most effective way to prevent scum that occurs during the sweetening of mineral waters. The purpose of our research is to select the technological scheme of the Na-cationization unit of mineral waters, and to determine the ion exchange capacity of the KU-2 cationite used for the purpose of softening . Change of salt consumption depending on time during regeneration is carried out according to the consumption meter indicator. During regeneration and softening, the water velocity is 8 m/h.

Simulated seawater is used as a working solution during research. NaCl, MgSO $_4$ and CaCl salts are used to prepare the solution.

NaCl with a hardness of 8-12% is used as a regeneration product. During the experiments, the effect of seawater percolation speed on the residual hardness of softened water and the effect of KU-2 cationite on the working ion exchange capacity are studied./5/.

The experiment is carried out in the given device (Fig. 1). The physical model of the Na cationite filter (1) is considered the main element of the device. The process was carried out in

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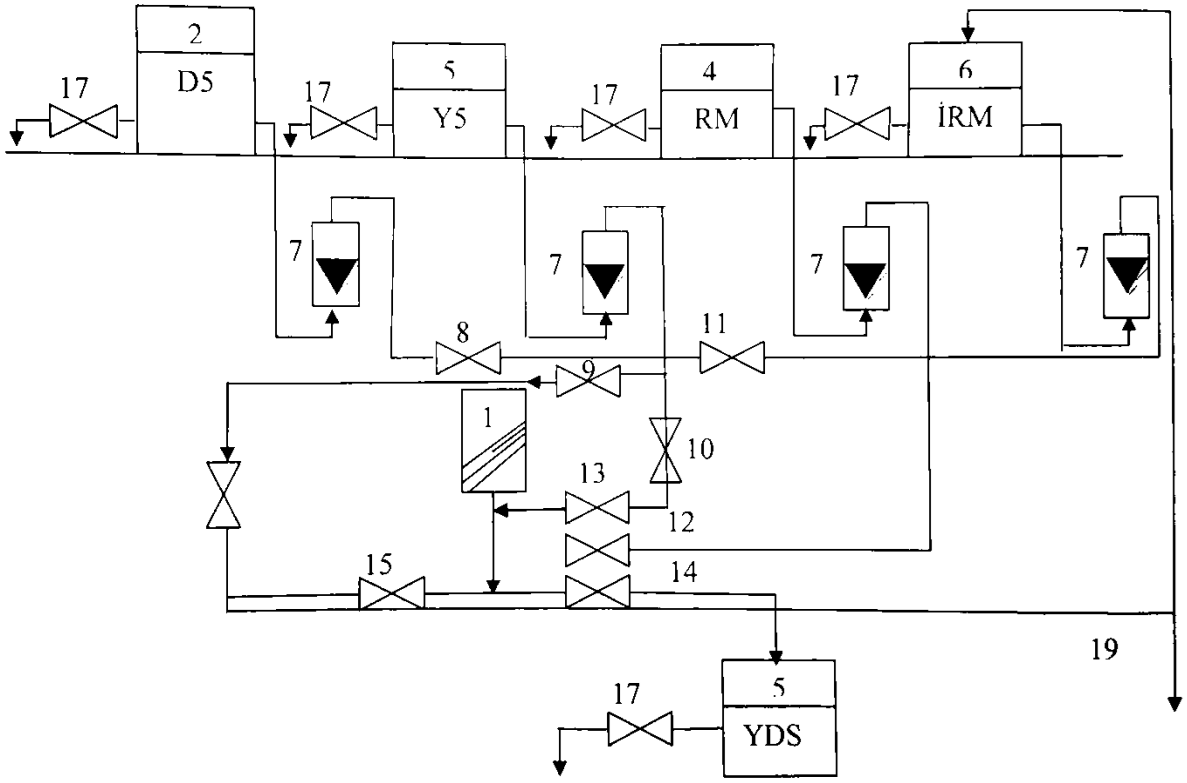
a glass tube, which is considered a model of Na cationite filter. The cross-sectional area of a pipe with an inner diameter of 25 cm is 410.3 mm ^{2} . The volume of the cationite layer is 0.363 mm ^{3} , and its height is 90 cm.

In addition to the Na cation filter model, the stand includes a seawater container (2), a wash water container (3), a regeneration container (4), a softened seawater container (5), a spent regeneration solution container (6), a flow meter (7)), drawers (8-17) and communication lines were given. In this device, it is possible to apply both straight and reverse flow mode of operation.

Na-kationlaşdırma qurğusu



-Except for drawers number 8 and 14, the remaining drawers in the device are closed. Liquid consumption is regulated by one of the drawers and a flow meter. Softened water is collected in container (5);

- Drawers 10, 13, 16 are kept open and the remaining drawers closed in order to suspend the cation before regeneration. This process is carried out by sea;

- Regeneration is carried out with HCl solution prepared in vessel (4). In straight-flow regeneration, drawers 11 and 15 are opened and the spent regeneration solution (6) is collected in the container;

- In reverse flow regeneration, drawers number 12 and 16 are open;

- Cationite washing is carried out with sea water in container (3).

If the regeneration was carried out correctly, then drawers 9 and 15 are opened. Drawers 10 and 15 are opened when regeneration is carried out countercurrently. The main factors in

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the Na cationization process are the working ion exchange capacity of the cationite and the residual acidity of the softened water. The mathematical model of Na cationization process was studied and reports were made based on this mathematical model.

This model is designed for a wide class of mineral waters and is universal/5/.

Analysis

Our main goal in this work is to compare the obtained experimental results with the results obtained in the mathematical model and to check the satisfaction of the proposed model. Na cationite regeneration process consisted of two stages. Regeneration was carried out in direct and reverse flow, and the codicity of the water leaving the filter was calculated.

$E_{work} = \sum_{i=1}^{n} 0{,}5 \cdot (C_{ds} - C_i) / W_k$; q-eq/m ^{3} (1)

Here C_{ds} is the hardness of sea water, C_{ds} = 76 mg-eq/l;

C_i - total cod in the samples taken for analysis; mg-eq/l

n – number of samples

W_k – volume of cationite, m ^{3} W_k = 0.4 l.

With this mathematical model, the working exchange capacity of the cationite is given as follows.

During straight-flow regeneration:

$$E_{work} = 0.5(76 - 3.8) + 0.5(76 - 3.9) + 0.5(76 - 3.7) + 0.5(76 - 3.9) + 0.5(76 - 3.7) + 0.5(76 - 3.38) + 0.5(76 - 4.25) + 0.5(76 - 4.6) + 0.5(76 - 5.4) + \frac{0.5(76-6.5)}{0.4} = 895.4$$

During reverse flow regeneration:

$$E_{work} = 0.5\,(76 - 0.4) + 0.5\,(76 - 0.5) + 0.5(76 - 0.3) + 0.5(76 - 0.4) + 0.5(76 - 0.2) + 0.5(76 - 0.4) + 0.5(76 - 0.3) + 0.5(76 - 0.1) + 0.5(76 - 3) + \frac{0.5(76-6.5)}{0.4} = 993$$

The result

The mathematical model of the Na-cationization process is considered useful enough for the report. Experiments were performed in straight and counterflow modes and different results were obtained. In cationite, the work exchange capacity is less in the straight-flow mode than in the counter-flow mode. This is explained by the high residual cod. The active ion exchange capacity is close to 900 g-equiv/m ^{3} · This shows that the results of the investigated mathematical model coincide with this price. The calculated value for E_{work} is 918 g-eq/m ^{3}.

Thus, we can say that the difference between the experimental results and the analytical results is 15 g-eq/m and 23 g-eq/m (1.63%, respectively).

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ABŞERONUN DƏNİZ LAY SULARININ KOMPLEKS EMAL ÜSULLARININ İŞLƏNMƏSİ

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Xülasə

Abşeron yarımadasının lay suları yüksək minerallığı ilə seçilir, çünki onların duz tərkibi müxtəlifdir. Bu lay sularına müxtəlif duzların və mineral maddələrin mənbəyi kimi baxa bilərik. Bu isə lay sularına şirinləşdirmə obyekti kimi yanaşmağımıza əsas verir. Əvvəllər dəniz suyunun şirinləşdirilməsi zamanı qalıq məhsullar yenidən dənizə qaytarılırdı. Bu isə həmin bölgənin bitki və heyvanat aləminə ciddi təsir göstərirdi. Kompleks emal baxımından lay suyu da dəniz suyu qədər əhəmiyyətli hesab olunur.

Lay sularının emal olunması müasir neft sənayesinin aktual problemlərindəndir.Bu problem Abşeron yarımadası üçün xarakterikdir. Çünki abşeron yarımadasının iki əsrdən çox neft tarixi var. Bu bölgədə sovet dövründən qalma sulaşmış quyulardan da çıxan lay sularının miqdarı yüksəkdir.

РАЗРАБОТКА КОМПЛЕКСНЫХ МЕТОДОВ ПЕРЕРАБОТКИ АБШЕРОНСКИХ МОРСКИХ ПЛАСТОВЫХ ВОД

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Резюме

Грунтовые воды Апшеронского полуострова характеризуются высокой минерализацией, поскольку содержание солей в них различно. Рассматриваются эти водоносные горизонты как источник различных солей и минералов. Это дает нам основание рассматривать пластовые воды как объект опреснения. Раньше после опреснения морской воды остатки продуктов возвращались в море. Это оказало серьезное влияние на флору и фауну этого региона. С точки зрения комплексной переработки пластовая вода считается столь же важной, как и морская вода.

Очистка пластовых вод – одна из актуальных проблем современной нефтяной промышленности. Эта проблема характерна для Апшеронского полуострова. Потому что Апшеронский полуостров имеет более чем двухвековую нефтяную историю. В этом регионе имеется большое количество пластовых вод, которые также добываются из колодцев, построенных еще в советские времена.

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