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PHYSICO-CHEMICAL INDICATORS OF HYDROGELS INCREASING THE INTENSITY OF OIL WELLS AND THEIR ECONOMIC EFFICIENCY

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Abstract
In this article, the physicochemical parameters of hydrogels that increase the efficiency of oil wells and the technology of their application are studied.

Keywords: hydrogel, oil, degree of swelling, toxicological index, polyacrylonitrile, density.

INTRODUCTION

It is known that no country, without energy reserves, cannot imagine its future. For this reason, from the first years after the independence of our Republic, finding and operating new oil and gas fields was defined as one of the priority tasks. But the reserves of oil in any oil field are limited. As a result of long-term oil extraction, the amount of oil in the fields decreases and the amount of water increases. As a result, the volume fraction of water in the oil liquid extracted from wells increases to 90-95%, and the volume fraction of oil decreases to 10-5%. Due to the cost of separating and treating water and oil, many wells are not economically viable despite sufficient oil. At the moment, the above situation is observed in our oil wells that have been put into operation for more than 25-30 years. There is oil, you just need to find cost-effective ways to extract it[1-3].

Various methods are used to increase the share of oil by blocking the water path in the productive layer of oil wells. One of them is the application of hydrogels, a synthetic polymer that is highly absorbent in water. A number of practical experiments were carried out in order to block the water path in the layer using Hydrogels, which absorb a large amount of water and, if necessary, release the absorbed water into the external environment [4-7].

Initially, the environment of the liquid coming out of the oil fields, the amount of oil and water, the chemical composition and proportions of dissolved mineral salts, and the physical and chemical parameters such as pressure, temperature, porosity and permeability of the underground rocks in each oil well were determined and organized[8-10]. Also, hydrogels that can work under these conditions and meet the following requirements were synthesized (Table 1)

First of all, it should not be affected by oil.

The ability to absorb water in a mixture of oil and water (HYDROGEL

that the surface is not covered with oil.)

Non-hydrolyzable at pH 6-8.

At a temperature of up to 1500 C, the form of ozon after baking and

does not lose its hardness.

200-360 atm. Water does not lose its properties under pressure and high temperature to win. Separated from the soil layer at a pressure of 50-80 atm. inside the well does not stick to oil (stickiness).

The size of the hydrogel particles in the solid state is 1.5-2 mm. from not to exceed. The main thing is that the extremely high concentration of mineral salts is able to absorb water and hydrolyze as little as possible.

Table 1 Main indicators of synthesized hydrogels for increasing the intensity of oil wells

Main indicators of hydrogel	
Chemical content	Partially hydrolyzed polyacrylonitrile.
State of aggregate	Dry, fine powder or granules from 0.1 mm to 2 mm
External appearance	White and pale yellow in colour
percentage of the main substancei	Not less than 97-98%
Soluble salts (Sulphates)	1-1,5 %
Humidity	0,2-0,3 %
Density	1-1,2 g/cm^3
pH	7-8
Solubility	It does not dissolve in any solvents. Forms a gel in an aqueous environment.
Effects on chemicals	Under the influence of electrolytes, soaking decreases.
Maximum soaking rate	Toza suvda 300-350 g/g. Tuzli suvlarda 100-200 g/g.
Expiry date	The dry state is not limited. 2-5 years after the start of operation, depending on the soil and water content
Effect of temperature	From -200C to 1000C in dry state, does not lose its properties in water from 0C* to 1500C. (*-cannot swallow frozen water)
Toxicological indicators	No toxic effects. Environmentally safe.
Unique features	It is impossible to store it in the open - it attracts moisture from the air.
	If hydrochloric acid is applied to the swollen hydrogel, the reverse process is observed - it expels the water in it.
	As the temperature increases, so does the rate of soaking.

Synthesized hydrogels have the following advantages.

1. Product cost. The cost of hydrogels of this type in the world market is $22-50. The offered hydrogels are much cheaper - $9-10 (January 2022) as they are synthesized from local raw materials.
2. Produced hydrogels are environmentally friendly.
3. Kinetics. In clean water.

2-jadval.

The diameter of the particles	Time	Soaking rate
< 0,2 mm	30 min	350
0,2-1 mm	50 min	350
> 1 mm	1 hour	320

3. The application process does not require complex technologies.
4. It is much cheaper than other methods aimed at increasing the amount of oil.

At the same time, it has the following disadvantages.
1. If the concentration of dissolved salts in water is too high, the degree of hydrogel absorption will decrease sharply. 1 g in a 10% solution. hydrogel absorbed 50-60 g of water.
2. In clean water and soil, hydrogel works effectively for 3-5 years without losing its properties. As the concentration of mineral salts increases, this indicator may drop to 1.5-2 years.

Possibilities of using hydrogels in oil wells.
Using hydrogels synthesized as a result of studies, it has been found that it is possible to increase the amount and share of oil produced with high productivity by sealing the water path in the productive layer of oil wells when the average physico-chemical parameters of the oil wells and the fluid coming out of them are as follows.
The pH of the liquid coming out of the wells is 6-8
Volume fraction of oil in liquid -3-10%
Volume fraction of water -90-97%
Underground temperature in wells is 50-1500C
Underground pressure is 50-80 atm.
The pressure supplied to wells from outside is 200-360 atm.
The porosity of the productive layer of wells is 0.1-3 mm.
The permeability of the productive layer of wells (in water) is 80-110 atm.
The amount of salts in the liquid differ sharply from each other.
At a high concentration of salts to the synthesized hydrogels
is very important in ensuring the optimal level of care.
M: 5-65 g/g when tested in water taken from 20 wells. The soaking rate is found to be 5-40 g/h.
Types of hydrogels that meet the above requirements have been created and tested in oil fields.

Summary of Application Technology

Initially, in order to remove water from the oil well, dry oil is sent. After that, a special mixture prepared by mixing 0.2 - 0.5 m3 of anhydrous oil is sent. The well is filled with oil again so that the mixture is injected into the subsoil layer. The amount of oil sent depends on the depth of the well and the diameter of the pipe.

Hydrogels were synthesized initially in the laboratory

Oil 38 in the Garbi Tasli field belonging to "Shortanneftgaz" UShK

test in the well has been cancelled.

As a result, at the end of the test work, it has been noted that the amount of product in the liquid extracted from the well in 1 day will be as follows (Table 3).

Table 3 Recorded results in oil wells where experimental work was carried out

			Volume, m^3			Density g/cm^3	Mass, ton	S,%
			Total liquid	Water	Oil	Oil	Oil	Oil
Pre-test result			6	5.4	0.6	0.890	0.52	10
Post-test result	A day	6	4.8	4.1	0.7	0.890	0.62	14,5
		13	4.8	4.1	0.7	0.890	0.62	14,5
		23	4.8	4.1	0.7	0.890	0.62	14,5
Result	Increased		-	-	0.1	-	0.1	4,5
	Decreased		1.2	1.3		-		-

Measurements have been made before the cancellation of the experiment and on the 6th, 13th and 23rd days after the experiment. The results showed that the amount of water in the extracted fluid decreased from 5.4 m3 to 4.1 m3, and its percentage decreased from 90% to 85.5%, and the daily amount of oil decreased from 0.6 m3 to 0.7 m3, and its percentage decreased from 10% increased to 14.5% (by 45% compared to the initial one). Due to the reduction of water, the total liquid volume decreased from 6 m3 to 4.8 m3.

In conclusion, it can be said that as a result of the synthesis of superabsorbents obtained on the basis of local raw materials and their use in the process of oil extraction: the percentage of oil in the oil liquid increases, the amount and percentage of associated water decreases sharply, the costs of oil extraction, transportation, cleaning and processing are reduced in practical terms. proved. Also, the scientific results obtained in the initial stages of the research work and the expected economic significance were recognized by "Uzneftgazgazchikarish" JSC. (Reference No. 04/17-119j dated March 2, 2018 of Uzneftgazgazchikarish JSC). A long-term contract was signed with OJSC "Neftgazinnovation" on joint research work and implementation (Contract No. UI-01 of OJSC "Neftgazinnovation" dated June 19, 2018). This research work is included in the list of researches that will be introduced into practice - production in the future in the field of oil and gas.

References

1. Ширинов Ш.Д., Джалилов А.Т. Исследование кинетики набухания синтезированных гидрогелей на основе гидролизованного полиакрилонитрила // Universum: химия и биология: электрон. научн. журн. 2018. № 3(45) URL: http://7universum.com/ru/nature/archive/item/5601

2. Ширинов Ш.Д., Б.А.Холназаров, Х.Х.Тураев, А.Т.Джалилов. «Синтез суперабсорбентного гидрогеля на основе крахмала, акриловой кислоты и монтмориллонита» URL:http:// Universum: Технические науки : электрон. научн. журн. 2019. № 8(65). URL: http://7universum.com/ru/tech/archive/item/7699

3. Раззоков, Х. К., Назаров, С. И., Назаров, Н. И., & Ортиков, Ш. Ш. У. (2020). Способ получения шлихтующих ингредиентов на основе природных и синтетических полимеров и их применение. Universum: химия и биология, (2 (68)), 41-45.

4. Назаров, С. И., Ниёзов, Э. Д., Ширинов, Г. К., & Остонов, Ф. И. У. (2020). Исследование и разработка загущающих композиций на основе модифицированного крахмала. Universum: химия и биология, (3-1 (69)), 42-45.

5. Amonov, M. R., Nazarov, S. I., Jumaev, J. K., & Abdullaeva, D. U. (2015). Physico-chemical properties of compositions based on natural and synthetic polymers. Technical Sciences.

6. Соттикулов, Э. С., Назаров, С. И., Усмонов, Ж. У. У., & Омонов, У. Ч. (2023). Изучение синтеза комплексной добавки для бетона на основе гидролизованного полиакрилонитрила. Universum: технические науки, (2-4 (107)), 35-38.

7. Назаров, С. И. (2016). Получение крахмалофосфата и загусток на его основе. Ученый XXI века, (2-3), 15.

8. Рахматов, Ш. Б., Амонов, М. Р., Назаров, С. И., & Остонова, Н. Б. (2014). Исследование свойств госиполовой смолы, модифицированной лигнином и гексаметилентетрамином. Новый университет. Серия: Технические науки, (12), 22-24.

9. Назаров, С. И., Амонов, М. Р., Шарипова, Л. О., & Амонова, М. М. (2014). Эффективный композиционный химический реагент для стабилизации буровых растворов. Новый университет. Серия: Технические науки, (12), 19-21.

10. Файзиев, Ж. Б., Назаров, С. И., Назаров, Н. И., & Ходжиева, Д. К. (2022). Термический анализ сульфированного фталоцианина меди. Universum: химия и биология, (10-2 (100)), 41-44.