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OBTAINING CORROSION INHIBITORS FOR GAS CONDENSATE WELLS BASED ON THE PROCESSING OF ORGANOCHLORINE MIXTURES.

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Abstract. This article provides information on corrosion in metal structures in the oil and gas industry, measures to prevent it, and analysis methods.

ПОЛУЧЕНИЕ ИНГИБИТОРОВ КОРРОЗИИ ДЛЯ ГАЗОКОНДЕНСАТНЫХ СКВАЖИН НА ОСНОВЕ ПЕРЕРАБОТКИ ХЛОРОРГАНИЧЕСКИХ СМЕСЕЙ.

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Ключевые слова. Коррозия, нефть, газ, конденсат, азот, сера.

Аннотация. В статье приведены сведения о коррозии металлических конструкций в нефтегазовой отрасли, мерах по ее предотвращению и методах анализа.

Introduction. In the production of organochlorine products, a large amount of secondary products is formed, which must first be neutralized, which are chlorine-containing wastes. These are multicomponent, difficult-to-separate mixtures that pose a threat to the environment. Protecting the environment from man-made pollution is a global environmental problem. Reducing these problems can only be achieved through an integrated approach, using environmental waste or waste as secondary raw materials [1].

The neutralization of organochlorine wastes poses a number of difficulties due to their high chemical stability and toxicity, as well as the complexity of technical equipment and the low cost-effectiveness of creating special plants for their neutralization. Therefore, the economic efficiency of organochlorine synthesis plants is considered to be lower than that of conventional organic waste neutralization, depending on the amount and properties of waste, from 5% to 30%. Typically, methods such as regeneration, oxidation, incineration, chemical and plasma-chemical processing, electrocracking, and burial in special wells are used to neutralize organochlorine waste. The most useful method of disposal is regeneration. However, this process can only be used for waste extraction and mixtures based on volatile

organochlorine solvents (trichloroethylene, tetrachloroethylene, etc.) [2]. Organochlorine compounds are widely used in production and in various sectors of the national economy. In particular, they are widely used in the medical, agricultural, and construction sectors, as well as in the production of rubber, pharmaceuticals, metallurgy, paints, and various chemical solvents in industrial sectors. Organochlorine compounds are also considered the most important organic monomers in the polymer industry.

Our PF-1 brand inhibitor, obtained based on the processing of organochlorine waste, was tested in a liquid hydrocarbon environment. The testing procedures were carried out in accordance with GOST 9-506-87. The inhibitory properties and mechanisms of action of the obtained PF-1 brand inhibitor were studied at different temperatures and concentrations.

The dependence of the synthesized corrosion inhibitors PF-1, PF-2, and PF-3 on the product yield at different temperatures was studied.

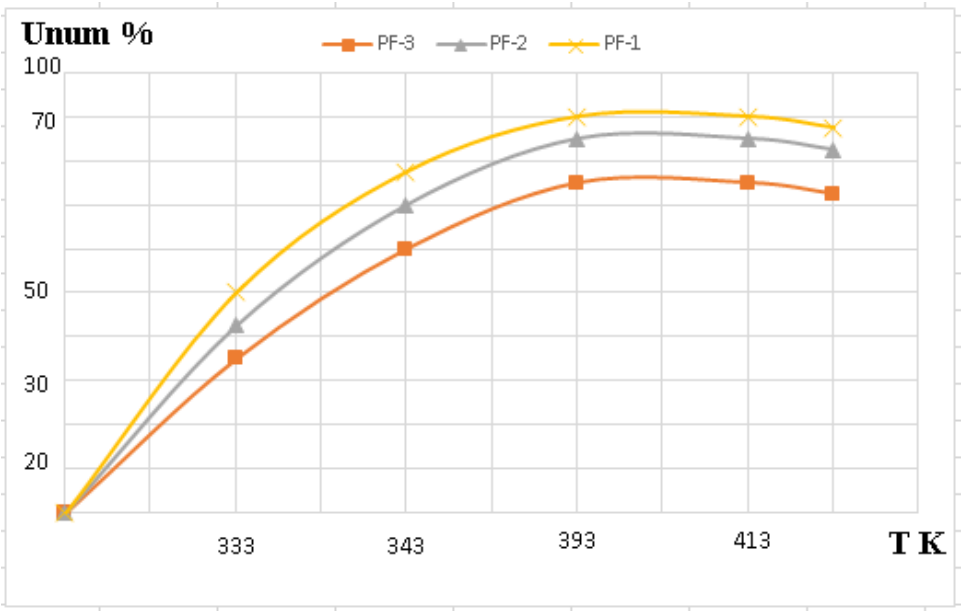

Figure 1. Temperature dependence of the yield of PF-1, PF-2, PF-3 inhibitors obtained as a result of the processing of organochlorine waste.

When we studied the temperature dependence of the product yield of the synthesized corrosion inhibitors, it was found that the best product yield was found in the PF-1 brand corrosion inhibitor with a yield of 72.2% at a temperature of 393 K.

The IR spectrum of the PF-1 corrosion inhibitor we synthesized and used in the test was provided to investigate its composition and structure.

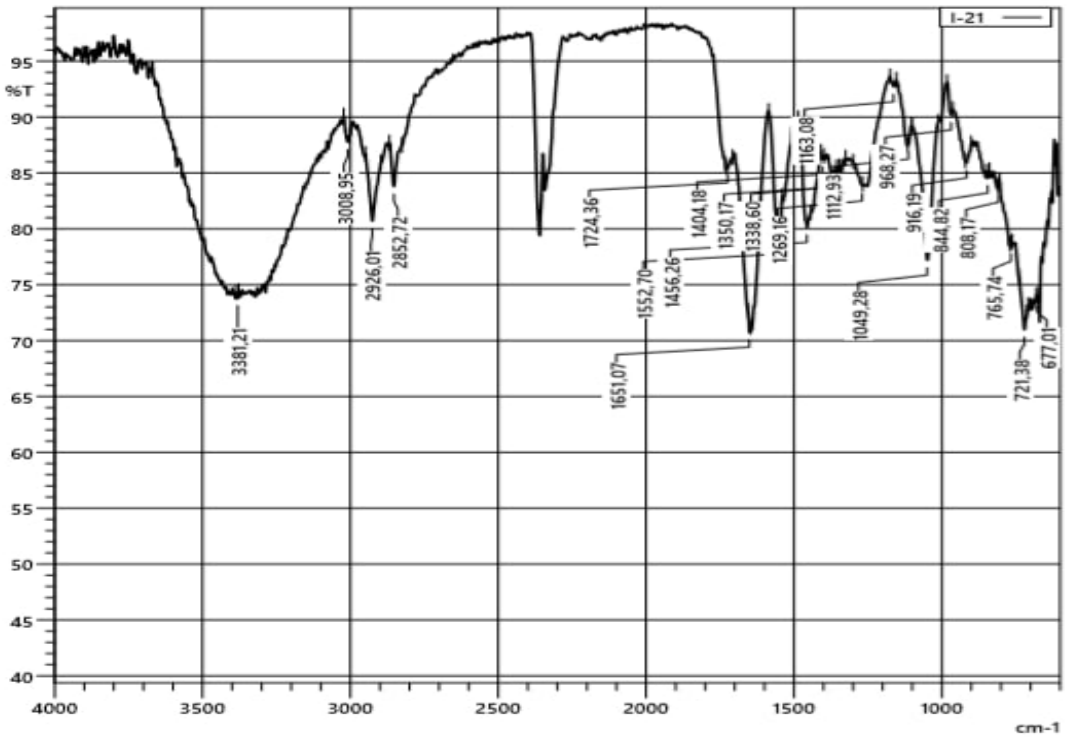

Figure 2. IR spectrum of PF-1 brand corrosion inhibitor

The composition and structure of the PF-1 corrosion inhibitor were studied using IR spectrometer technology (IK-Fure, SHIMADZU, Japan) in the range up to 4000 cm-1. In the IR spectroscopy of the inhibitor used for corrosion protection of the PF-1 brand, asymmetric and symmetric valence vibrations of CH2 groups were observed in the regions 2926-2852 cm-1. In the region 1456 cm-1, we can see asymmetric deformation vibrations of CH2 groups. One of the most characteristic absorption regions for the product was the symmetric valence vibrations of (N-C) at 1112 cm-1. Absorption lines corresponding to the valence vibrations of the C=O group are observed in the IR spectrum range 1650-1820 cm-1. The intensity of the absorption line corresponding to this vibration is greater than that of other absorption lines in the IR spectrum. According to the results of this analysis, the corrosion inhibitor we tested contains nitrogen, which has anti-corrosion properties.

The corrosion rate and protection levels of the inhibitors were determined using the test results. The protection levels in the environment with 1%, 3%, and 6% of the PF-1 brand inhibitor were 81.1%, 89%, and 98.5%, respectively.

Table 1.

Test results of PF-1 corrosion inhibitor according to GOST-9-506-87

Examples	Sample Surface S,m^2	Sample mass before testing	Sample mass after testing	Sample mass loss, M1-	Vn. i Corrosion rate in an inhibitor-	Vi Corrosion rate in an inhibitor	rotection level

		M_1,g	M_2,g	M_2,g	free environment,g/ m^2*s	y environment, g/ m^2*s	Z)%
Unrestrained	0,005	0,41243	0,38412	0,02831	0,07863	-	
200 mg/l	0,005	0,40389	0,39853	0,00536	-	0,0148	1,1
400 mg/l	0,005	0,43408	0,4312	0,00288	-	0,0103	9,8
600 mg/l	0,005	0,41933	0,4181	0,00123	-	0,00034	8,6

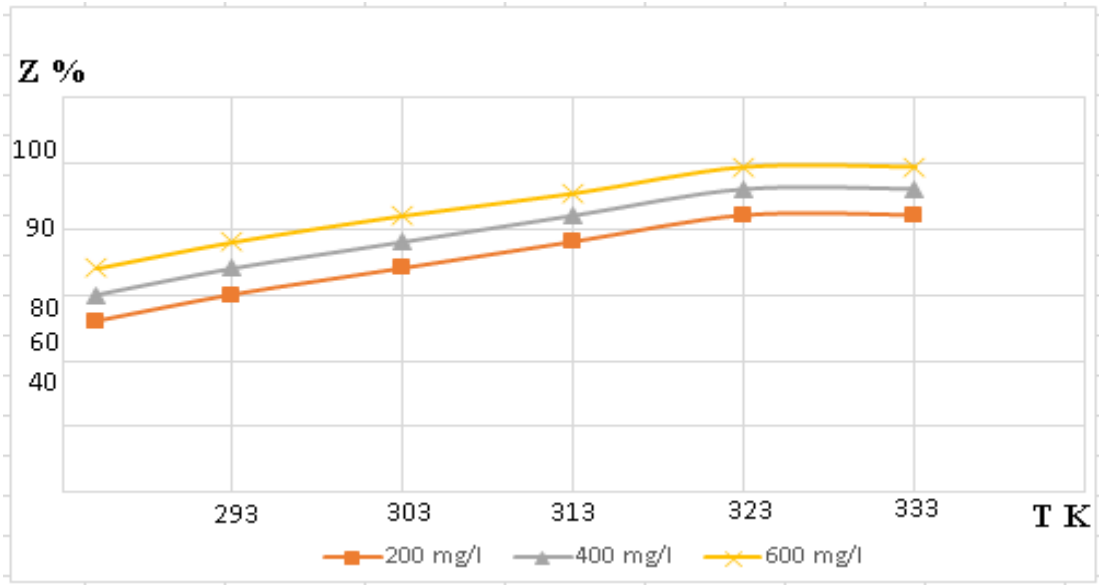

Figure 3. Temperature dependence of the level of protection of the PF-1 brand corrosion inhibitor.

As a result of these analyses, the protection levels of the PF-1 brand corrosion inhibitor at concentrations of 200 mg/l, 400 mg/l, and 600 mg/l were studied at different temperatures. We can see that the optimal temperature for the inhibitor is 323 K.

Conclusion.

According to the test results of this method, a series of tests were conducted with a change in concentration from low to high to determine the optimal

concentration of the inhibitor by the inhibitor concentration test program. The concentration of the inhibitor at which the protection level was achieved was considered optimal. After adding PF-1 brand corrosion inhibitor with a nitrogen content of 200, 400, 600 mg/l to the oil product, the protection levels of the metal sample were 81.1%; 89.6%; 98.6%, respectively. These nitrogen-containing PF-1 brand inhibitors are widely used in gas and gas condensate wells, in the process of drilling wells, and in the production of oil and fatty acids.

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