



## Preparation and testing results of a liquid hydrocarbon soluble corrosion inhibitor

**Avazov Mirjalol Shukhrat ugli**

Head of Department of Emergency Situations  
Administration of Surkhandarya Region

**Khalilov Jamshid Akmal ugli**

PhD student of the Tashkent Research Institute of  
Chemical Technology, 111116, Republic of Uzbekistan,  
Tashkent region, Tashkent district, p / o Shuro-bazaar  
e-mail: [jamshidxalilov885@gmail.com](mailto:jamshidxalilov885@gmail.com)

**Nurkulov Fayzulla Nurmuminovich**

Head of Department, Doctor of Technical Sciences,  
Prof., LLC "Tashkent Research Institute of  
Chemical Technology", 111116, Republic of Uzbekistan,  
Tashkent region, Tashkent district, p / o Shuro-bazaar

**Abstract:** The article examines the physical and chemical properties of corrosion inhibitors obtained on the basis of the processing of organochlorine waste for the oil and gas industry. Corrosion inhibitors of metals were obtained as a result of the synthesis and their level of protection was checked. The results of IR and NMR spectra were studied.

**Key words:** Corrosion inhibitors, nitrogen, organic compounds, fatty acids, gas-condensate well, temperature, mass, level of protection.

### Introduction.

In the global production of corrosion inhibitors composed of organic compounds, hydrocarbon-soluble inhibitors account for about 30% of the volume, the largest part of which (~70%) is used in oil refining. Corrosion of these metal-based materials has a large



economic impact. According to a recent study by NACE, the total economic loss to the environment due to corrosion is USD 2.5 trillion, which is equivalent to 3.4% of world GDP. [1].

In most cases, the recommended inhibitors are organic compounds of various classes containing heteroatoms: nitrogen, sulfur, oxygen, and phosphorus. The effectiveness of the inhibitory effect of substances increases in the series of heteroatoms:  $O \wedge N \wedge S \wedge P$ . However, since the toxicity of products also increases in this series, nitrogen-containing compounds are usually chosen for industrial use. Although it is less effective than compounds containing sulfur or phosphorus, they are a less toxic compound [2].

### **Material and Method**

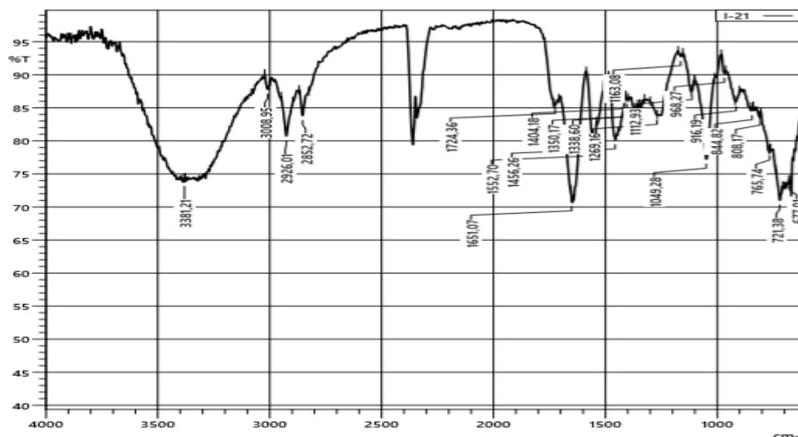
Our researched PF-1 brand corrosion inhibitor was tested by gravimetric method. This method is used to determine the corrosion rate for corrosion control purposes and to evaluate the protective ability of corrosion inhibitors. The gravimetric method is based on measuring the difference in the mass of control metal samples before and after exposure to a corrosive environment. A limitation of the use of this method is that it characterizes the average corrosion rate without taking into account the unevenness of the corrosion.

In general, when working, it is necessary to follow the current standard GOST 9.506-87 "Methods for determining the protective ability of metal corrosion inhibitors in water-oil environment".

According to it, the product based on amino compounds and fatty acids obtained from the treatment of organochlorine waste is first put into a three-necked flask equipped with a reflux condenser, a thermometer and a stirrer for interaction, and a homogeneous mass is formed. mix until Stirring was continued at a certain temperature for several hours. The obtained corrosion inhibitor was dissolved in gasoline, condensate, and motor oil media at concentrations of 1%, 3%, and 5%. Many studies have been conducted on the resulting solutions.



**Results and discussion.** IR spectrum and analysis of PF-1 brand corrosion inhibitor. The IR-spectrum was presented to study the composition and structure of the PF-1 corrosion protection inhibitor that we synthesized and used in the test (Fig. 3).



**Figure-3. IR spectrum of PF-1 brand corrosion inhibitor.**

The composition and structure of PF-1 corrosion inhibitor was studied using IR-spectrometer technology (IK-Fure, SHIMADZU, Japan) in the range up to 4000 cm-1. The spectrum of the  $-N=C<$  groups produces valence vibrations in the region of 1651.07 cm-1 and in addition 1552.7 cm-1  $-NH_2$  in the structure.  $>N-CH_2$  in 1350.17 cm-1 and valence fields 844.82 – 808.17 cm-1 contain absorption lines corresponding to  $-CH_2-CH_2-$  groups in the aromatic ring.

According to the results of this analysis, our researched corrosion inhibitor contains nitrogen, which shows that it has anti-corrosion properties.

From this table, we can see that the highest level of corrosion protection of the metal surface was applied at a concentration of 6%.

**Table 1**

Mass ratios P:F	Corrosion rate	Protection level	$\theta$
1:1	0,065	72,31	0,7231
1:2	0,08	89	0,89
1:3	0,071	78,98	0,7898
2:1	0,058	64,5	0,645
3:1	0,051	56,7	0,567



**Table 1.** Corrosion rates, protection levels and surface coverage coefficient values at different mass ratios of PF-1 brand corrosion inhibitor.

As a result of the test research, we can see with the help of table 1 that the best mass ratio of amine compounds and fatty acid is 1:2, and the level of protection in it is 89%.

**Conclusion.** The physicochemical properties of the PF-1 brand corrosion inhibitor synthesized by us and the analysis of the IR and NMR spectrum of the synthesized product were obtained. As a result of the analysis, it was found that this inhibitor contains nitrogen. These compounds have been found to be the most effective against corrosion.

Also, the obtained inhibitor was tested in different environments, at different mass ratios and temperatures. The PF-1 brand corrosion inhibitor, obtained as a result of the processing of organochlorine waste, containing nitrogen, was carried out in a condensate medium with a concentration of 1%, 3%, and 6%. As a result of the tests, the level of protection was 83.3, 90.6, 98.6 percent, respectively.

Our researched and tested PF-1 corrosion inhibitor can be used in various pipelines in the oil and gas industry in various aggressive environments.

#### **References:**

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