Waste of cleaning emulsion sewage as inhibitors of steel corrosion

D D Fazullin¹, G V Mavrin¹ and I G Shaikhiev²

¹ Kazan Federal University, Naberezhnye Chelny Institute, Pr. Mira 68/19, Naberezhnye Chelny, Republic of Tatarstan, Russia, 423812
² National Research Technological University, Kazan. 420015, 68, Karl Marx street, , the Republic of Tatarstan, Russia

E-mail: denr3@yandex.ru

Abstract. The article describes the corrosion test of steel of the brand 20 in the stratal water. To increase corrosion resistance as a corrosion inhibitor the concentrate waste emulsion of the mark "Incam- 1" was provided. The article presents studies of the corrosion rate with different dosages of corrosion inhibitor in the stratal water. Based on these research results are revealed that the degree of protection of steel is 27% at a dosage of 3.8 g / dm³.

The problem of corrosion protection of the equipment and facilities of the oil industry has been of paramount importance and highly requires practical solution now.

One of the most common ways to reduce the corrosive effect is the use of corrosion inhibitors. In practice, agents were started to use water-soluble more often, so they are able to create a thin film on the inner surface of the pipeline, to eliminate excessive oiling, do not affect the chemical composition of the oil.

Corrosion inhibitors are divided into inorganic (5% of total amount) and organic (95% of total). Organic corrosion inhibitors are surface-active agents, which are divided into natural and artificial.

Nowadays these corrosion inhibitors as "Amfikor", "SNPCH-1004." are used. These reagents are considered positive, but the disadvantage is the high cost of the reagents. The new chemical agents need to be developed that are not inferior to modern protective properties of corrosion inhibitors and with a low cost.

Exhausted coolants are 3-10% solutions of soluble, which include industrial oils, asidol, ethylene glycol, sodium nitrite, and other substances [1-3]. Both coolants with a short service life and sufficiently resistant to the use within a few months are used in the machine-building enterprises. Coolant of the brand "Incam-1" is the most popular in the Kama region of the Republic Tatarstan. In this case, the emulsion of the brand "Incam 1" as the research object is selected.
The emulsion of the brand "Incam-1" is a system comprising a mineral oil, emulsifiers, corrosion inhibitors, bactericides and water. The test of cleaning of exhausted emulsion of the brand "Incam-1" is carried out by technological scheme based on membrane method at work [4-6].

Emulsion concentrate obtained after the membrane separation is proposed to use as a corrosion inhibitor.

The speed and extent of the corrosion protection of metals were determined in accordance to National Standard 9.506-97 by gravimetric method. Metal plates rectangular size 70x35x0.5 mm of steel "Steel 20" as the metal samples were used, from which pipes for the oil industry are made. Simulated formation water for test was prepared by composition that is described in [7]: NaCl - 48 g/dm³; Ca – 7.4 g/dm³; Na₂CO₃ – 2.65 g / dm³; Na₂SO₄ - 0.5 g / dm³; Na₃S – 0.8 g / dm³ (corrosive environment №1). Model of saline formation water was prepared in accordance with National Standard 9.506-97 by the following composition: CaCl₂ • 6H₂O - 34 g / dm³; MgCl₂ • 6H₂O - 17 g / dm³; NaCl - 163 g / dm³; CaSO₄ • 2H₂O – 0.14 g / dm³ (corrosive environment №2). Concentrate of waste emulsion "Incam-1" as corrosion inhibitors was added.

### Table 1. Results of tests in corrosive conditions №1

| Corrosive environment | Dosage corrosion inhibitors | The average corrosion rate mm/year | Degree of protection, % |
|-----------------------|-----------------------------|-----------------------------------|------------------------|
| Produced water without additives | - | 0.628 | - |
| + 0.2 sm³ conc. Incam-1 | 1.5 g/dm³ | 0.515 | 22.0 |
| + 0.5 sm³ conc. Incam-1 | 3.8 g/dm³ | 0.493 | 27.3 |
| + 1 sm³ conc. Incam-1 | 7.7 g/dm³ | 0.501 | 25.3 |
| + 5 sm³ conc. Incam-1 | 38 g/dm³ | 0.559 | 12.4 |

The results of research have shown that by using the exhausted emulsion concentrate "Incam 1" as corrosion inhibitors (IC) corrosion rate decreases. The optimum concentration of corrosion inhibitors (IC) at which the maximum degree of protection at 27.3%, is determined by the concentration of 3.8 g/dm³.

### Table 2. Results of tests in corrosive conditions №2

| Corrosive environment | Dosage corrosion inhibitors | The average corrosion rate mm/year | Degree of protection, % |
|-----------------------|-----------------------------|-----------------------------------|------------------------|
| Produced water without additives | - | 0.1210 | - |
| + 0.2 sm³ conc. Incam-1 | 1.5 g/dm³ | 0.0974 | 24.2 |
| + 0.5 sm³ conc. Incam-1 | 3.8 g/dm³ | 0.0933 | 29.7 |
| + 1 sm³ conc. Incam-1 | 7.7 g/dm³ | 0.0940 | 28.7 |
| + 5 sm³ conc. Incam-1 | 38 g/dm³ | 0.1014 | 19.3 |

According to the results of tests in a corrosive environment №2 the optimal concentration of IC is in the range 3.8-7.7 g / dm³ of concentration of the waste emulsion "Incam-1". The average corrosion rate in a simulated formation water №1 is 5 times higher than in the water reservoir №2.

Due to the positive test results the waste emulsion concentrate "Incam-1" can be used as corrosion inhibitors (IC) obtained after membrane separation.
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