



ADVANCEMENT OF CORROSION AND SALT DEPOSITION INHIBITOR FOR PROTECTION OF HEAT EXCHANGE EQUIPMENT OF OIL REFINERIES

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Abstract

Results of researches on development of inhibitors of corrosion and salt sedimentations of ГПИМЦ and ОЭДФК for industrial water of the LLC Fergana oil refinery are given in article. At a concentration of 50 mg/l, the inhibition efficiency against salt deposition reached 91,76%, and the inhibition efficiency against corrosion was 68,71%. It has been proven that inhibitors created from local raw materials can replace an imported inhibitor.

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Introduction

Salt build-up in water systems in industrial and manufacturing enterprises is a problem in all developed countries and developing countries. Scientists are working on new reagents that can slow down the processes of corrosion, salt accumulation, and bioavailability.

The water supply systems in the oil refineries in the Republic of Uzbekistan use low-carbon steel, which is susceptible to electrochemical, biological corrosion, and accumulation of residues. This type of corrosion is common in the destruction of metals and other materials.

In water supply systems, salt and other residues can build up on the surfaces of heat transfer equipment, which causes problems with how these machines work and the environment. This happens millions of dollars a year in the world.

Methods of research

The concentration of chemicals that influence the organoleptic properties of water found in normal waters or included to water amid its preparing ought to not surpass the measures in understanding with the "Hygienic criteria of the centralized framework of financial and drinking water supply of the populace of Uzbekistan and the control of their quality" No. 0211-06 of 01.06.2006.

Table 1. Concentration of chemicals

№	Designation of indicator	norms	Test style
1	Hydrogen indicator, pH	6,0-9,0	The measurement error is measured in the pH meter of any model with a glass electrode no more than 0.1 pH
2	Iron (Fe), mg/dm ³ , no more	0,3	By GOST 4011
3	Total hardness, mg/dm ³ , no more	7,0	By GOST 4151
4	Manganese (Mn), mg/dm ³ , no more	0,1	By GOST 4974
5	Copper (Cu ²⁺), mg/dm ³ , no more	1,0	By GOST 4388
6	Polyphosphate residue PO ³⁻ ₄ , mg/dm ³ , no more	3,5	By GOST 18309
7	Sulphates (SO ₄ ⁻), mg/dm ³ , no more	500	By GOST 4389
8	Dry residue, mg/dm ³ , no more	1000	By GOST 18164
9	Chlorides (Cl ⁻), mg/dm ³ , no more	350	By GOST 4245
10	Zinc (Zn ²⁺), mg/dm ³ , no more	5,0	By GOST 18293

The issue of ensuring materials from erosion and salt amassing is most important in ranges that require a parcel of materials, such as transport, mechanical building and development. In a few cases, this driven to the nature of the introduction of the fabric within the report, based on important cases, conjointly centered on the quirks of the erosion and anti-corrosion security of materials utilized in these zones, whereas the issues of diminishing the forms of salt aggregation on the surface of warm exchange equipment were considered independently. In this respect, the most focus is to get it the pith of the forms that happen within the handle of annihilation of materials amid erosion and salt aggregation.

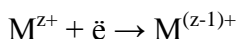
Having come over the word “corrosion” within the logical and specialized writing, we relate it with metal as usual. The reason is obvious: for numerous centuries it may be a metal that serves as the most building fabric and is still considered in “metal science” as a scientific discipline. Most textbooks and instructional exercises on this subject pay small consideration to non-metallic materials. In any case, at display, one of the most patterns within the advancement of innovation is the substitution of metal within the components of subtle elements and machines with multi-responsible errands with a more chemically safe, lightweight and prudent plastic mass, ceramics and other non-metallic materials.

In spite of the self-evident preferences of these materials and they fall flat over time, being crushed by forceful natural variables [10]. In expansion, in numerous cases there's a total likeness to the forms that happen amid the erosion annihilation of metals. With this in intellect, the ponder of the common instruments of marvels emerging on the premise of forms of characteristic and man-made annihilation of different materials and the alter within the course of the proficiency of the work of warm exchange hardware.

The depiction of the erosion handle depends on the particles display within the destructive environment. In this case, the most impact on erosion is carried out by anions, and less frequently by cations. The particles contained within the arrangement are isolated into activators and inhibitors.

Activator anions Cl⁻, Br⁻, I⁻ and others can disturb the detached state of the metal or avoid its arrangement by pulverizing the oxide stage film or by compressing adsorbed oxygen from the metal surface.

Activator cations are metal particles with variable valence, such as press and trivalent press particles, and monolence and bivalent copper. Tall valence particles can take an interest within the cathode prepare by tolerating electrons:



and moo valence particles can connected with the depolarizer, for illustration, with oxygen:



Since the solvency of metal particles is higher than that of oxygen, these particles can essentially quicken the cathode handle.

Anion-inhibitors CrO_4^{2-} , $Cr_2O_7^{2-}$, NO_2^- , NO_3^- , MnO_4^- are able to moderate the anode prepare and exchange the metal to a inactive state.

OH^- , CO_3^{2-} , PO_4^{3-} , SiO_3^{2-} anions can associated with metal particles that have passed into arrangement to create low-soluble compounds that frame movies on the metal surface that avoid ionization and entrance of the depolarizer into the metal.

Cation-inhibitors shape troublesome solvent hydroxides with hydroxyl particles Fe^{2+} , Mg^{2+} , Ca^{2+} , CO^{2+} , Zn^{2+} and others (for press, these are Zn^{2+} , Mn^{4+} , CO^{2+} particles). In case salt particles don't have an enacting or diminishing impact, at that point with an increment in salt concentration, the erosion rate at first increments by expanding the electrical conductivity of the solution and after that diminishes due to a diminish in oxygen dissolvability [9; 12].

The foremost common dynamic fixings in salt collection inhibitors incorporate non-ionic polyphosphates, sulfonic corrosive subordinates, natural subsidiaries of phosphonic and phosphoric acids, moo atomic weight polycarboxylic acids, polymers, sopolimers of acids such as acrylic and malein, as well as different compositions of these compounds. Inhibitors based on phosphonic acids and polymers are broadly utilized.

The advantage of natural phosphorus inhibitors is their tall effectiveness at moo costs compared to them. Salt collection inhibitors are common and utilize oxyethylidendiphosphonic corrosive (ОЭДФК) as the premise of the composition. It ought to be famous that acid-based inhibitors regularly contribute to the event of erosion forms in petroleum gadgets.

The composition of erosion inhibitors utilized within the oil and gas industry incorporates, as a run the show, natural compounds, aqueous-alcohol or hydrocarbon solvents that show their inhibitor properties, as well as different added substances that permit the control of the properties of reagents. Tall and moo atomic amines, imidosalines, greasy acids, phosphoric compounds and other natural acids are utilized as dynamic fixings.

The comes about of the ingestion of ПИМИЦ and ОЭДФК reagents against salt collection in collector water (II-Water Piece, Framework 3) within the “ISO-1 salt collection indicator” device are appeared within the table underneath.

Table 2. The ISO-1 gadget employments the reagents “ПИМИЦ”, and “ОЭДФК” to imagine salt amassing with a comparable proficiency and erosion diminishing proficiency

Ingibitor	Inhibitor concentration, mg/l	Trilon - B titrated volume of solution (0,025 N), ml	The amount of accumulations in the electrode, (CaCO ₃), mg	Efficiency of salt accumulation thinning, (Eiso), %	Corrosion rate V _k , g/m ² clock	Degree of corrosion protection, %
no inhibitor	–	8,5	10,625	–	–	–
ПИМИЦ	20	0,8	1	90	–	–
	40	0,75	0,9375	91,17	–	–
	50	0,7	0,875	91,76	0,0000064287	68,71

ОЭДФК	20	0,6	0,75	92,94	–	–
	40	0,6	0,75	92,94	–	–
	50	0,5	0,625	94,11	0,0007720368	0

Conclusion / recommendations

We'll consider the issues of the impact of water substance on erosion when utilizing cooling water in warm trade hardware. An examination of the surface security of warm trade gear was carried out utilizing an inhibitor against erosion and salt amassing. Tests were carried out in generation conditions with test clusters of their inhibitors against erosion and salt amassing in research facility conditions of LLC "Fergana oil refinery" [6; 7]. The comes about gotten appear that the hostile to – salt amassing inhibitors - "ТИМШ" inhibitors-are viable, which, on the off chance that put away in collector water (II-Water Piece, Framework 3) of the "foreign oil handling plant" LLC within the extend of 40-50 mg/l, have a diminishing effectiveness of 85 and 94%, individually, and they stand up to the collection of imported ОЭДФК salt, which comes to 94% in May be competitive with inhibitors [1].

The chemical composition of the water utilized within the IIA-system, II-water square of "Fergana oil refinery" LLC is displayed in Table 3 and 4.

Table 3. Chemical composition of water utilized in water supply frameworks of "Fergana oil refinery" LLC (spring and summer months)

Designation	pH	Hardness mg-ekv/l	Ca ⁺⁺ mg-ekv/l	Mg ⁺⁺ mg-ekv/l	Alkalinity mg-ekv/l	Cl mg-l	PO ₄ mg/l
II – water block							
I - cold	7,95	12,08	7,8	4,28	3,99	38,31	1,38
II - cold	7,95	27,9	20,2	7,7	5,46	73,9	1,92
Ia system	7,88	27,9	20,2	7,7	5,46	73,9	1,92
III system	8,22	15,2	11,72	3,48	5,36	45,45	0,88
Additional	8,16	12,55	9,15	3,4	5,17	42,34	1,41

Table 4. Chemical composition of water utilized in water supply frameworks of "Fergana oil refinery" LLC (autumn and winter months)

Designation	pH	Hardness mg-ekv/l	Ca ⁺⁺ mg-ekv/l	Mg ⁺⁺ mg-ekv/l	Alkalinity mg-ekv/l	Cl mg-l	PO ₄ mg/l
I – water block							
I – cold water	8,21	12,05	7,75	4,3	4,59	35	0,35
III - system	-	-	-	-	-	-	-
Ia – water block							
I – system	8,31	13,53	11,03	2,5	5,61	38,99	0,62
II – cold water	8,16	12,18	8,33	3,85	4,92	32,99	0,73
II – water block							
I – cold water	7,82	14,38	9,1	5,28	4,46	38,13	1,09
II – cold water	7,82	14,38	9,1	5,28	4,46	38,13	1,09
II a – system	8,49	18,35	12,95	5,4	6	20,75	0,2

III – system	-	-	-	-	-	-	-
Additional	7,54	13,1	9,68	3,42	5,56	33	1,01

Corrosion and salt build-up inhibitors ГПИМЦ and ОЭДФК (oxyethylidenediphosphonic corrosive) were compared with imported salt build-up inhibitors [14]. A gravimetric strategy was utilized to decide the degree of erosion hindrance utilizing the ISO-1 gadget strategy for salt aggregation. The gotten comes about are displayed in Table 2.

The gotten comes about appear that ГПИМЦ inhibitor is the foremost viable against erosion and salt build-up, with a salt build-up hindrance esteem of 91,76% and a erosion assurance productivity of 68,71%, and it can be suggested as a arrangement to the issue of purport substitution.

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