

CONSERVATIVE FLUIDS AND LUBRICANTS BASED ON TURBINE OIL, NITRO, AMIDO AND PARAFFIN WAX

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ABSTRACT

To create conservation fluids and lubricants based on the oil acids and polyethylene polyamine (PEPA) synthesized amidoamines, and based on α -olefins (C12, C14 and C16-C18) and the nitric acids-nitro compounds. Using of amido, nitro and solid n-paraffins in the turbine oil T-30 (Standard 32-74) formulated lubricants and conservation fluid which are tested under different conditions. It is shown that in comparison with the preservative fluid, the preservative lubrication more effective.

Indexing terms/Keywords

corrosion inhibitor, conserving fluid, lubricants, nitro- amido products, turbine oil, petroleum acid, polyethylene polyamine, α -olefin, a solid n-paraffin.

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Mineral acids oil is used for protection of various metal products against atmospheric corrosion to be prolonged storage. However, the use of oil only slightly affects the rate of corrosion, so as the oil film formed on the metal surface even with large thickness transmits vaporized water in sufficient amounts to intensify the corrosion process. Therefore, to improve the anticorrosive properties of oils it is administered to use substances having inhibitory properties. By adding oil-soluble corrosion inhibitors created a number of conservation of liquids [1-3].

In this regard, the development of new chemical complex with protective actions today is virtually an urgent task.

In this work, the results of creation composite conservation of fluids and lubricates based on turbine oil, synthetic corrosion inhibitors (nitro and amido) and solid n-paraffins.

Previously, we investigated anti-corrosion compositions based on the waste turbine oil [4].

For this study, as component-solvent is taken for the un worked turbine oil (T-30) with appropriate regulatory requirements.

For the corrosion inhibitor, the following compounds have been used: -nitro compound synthesized based on α -olefins (C12, C14, and C16-C18 mixture), and nitric acid are readily soluble in the turbine oil (T-30) - Amidoamines synthesized on the basis of oil acids (TNCs) and polyethylene polyamine (PEPA), were taken in different molar ratios (1:1 ÷ 5:1, respectively).

The protective properties of the prepared conserved compositions were evaluated by a set of methods for simulating the effect of the corrosive environments on the protected surface, high humidity (98-100%) and the temperature in the periodic condensation of moisture in the sea water and 0.001% solution of sulfuric acid.

The criterion for evaluating the protective properties of the conserved fluid and lubrications is the time (in days) of corrosion damages the surface plates of steel (CT-3) (%).

Comparative data characterizing the efficiency of compositions based on nitro compounds of various molecular weights and amidoamines synthesized based on oil acids and PEPA taken at different molar ratios, are shown in Table 1.

When tested with the corrosion inhibitor, the fluid content was varied from 3 to 10%.

As shown, the addition of amidoamines conservative liquid, significantly improves the corrosion resistance of conservation liquids. For example, turbine oil, without inhibitor the plate in hydrochamber corroded after 30 days (experiment 1), the oil content of the nitro compound (10%) the corrosion process occurs only after 108 days (experiment 2). In the presence of amidoamines conservative liquids with anticorrosive properties the corrosion resistance is significantly increased and the plates are protected against corrosion up to 234 days (Fig. 1). It should be noted that the presence of amido conservative liquid increases effectiveness more than two times. Apparently the reason for the high result is a synergistic action between the nitro molecules and the amidoamine compounds.

From the data shown in Table 1, it was observed that the best result is achieved when the concentration of inhibitor 7-10% (experiment 11 and 12).

In the sulfuric acid and seawater solution, the maximum protective action of the prepared compositions is obtained at 120 and 105 days, respectively.

The corrosion protective effect is also affected by the number of carbon atoms in the nitro molecules. The best results are achieved by C14. Therefore, further studies were conducted with nitro compounds based on the obtained α -olefin C14. With further study of the composition of the conservative fluid injected amido the molar ratio of the nitro compounds was 1:1.

Later, in the composition of the conservative fluid was added 10% paraffin wax and tasted as conserving lubrication.

Tests were carried out in two ways. The first (I) method - lubricant is heated to a liquid state. At first the plate was tested for 5 min and maintained by dipping in a liquid. The second (II) method, the surface of plates is coated by thin layers of lubricants (1-2mm). The test results are shown in Table 2.

From the comparative results shown in Tables 1 and 2 it can be observed that the conservative lubricants show better results. These differences are particularly noticeable when the surface of plates is coated by thin layers of lubricants.

Thus, the use of compositions in the form of conservation lubricant is more effective than conservative fluid.



Table 1: The protective properties of conservative fluids based on nitro compounds and amidoamine compositions.

EXP. №	Component	The composition of conservative fluid, %	The total concentration of inhibitor in the fluid, %	Protective properties under test conditions (in days)		
				hydrchamber «H-4»	0.001% H ₂ SO ₄	Seawater
1.	Turbine oil (T-30)	100	-	30	15	9
2.	Turbine oil (T-30) Nitro compound (C12)	90 10	10	92	21	47
3.	Turbine oil (T-30) Nitro compound (C14)	90 10	10	108	45	75
4.	Turbine oil (T-30) Nitro compound (C16-C18)	90 10	10	65	35	43
5.	Turbine oil (T-30) Amidoamines (2:1)	97 3	3	31	16	12
6.	Turbine oil (T-30) Amidoamines (2:1)	95 5	5	34	18	15
7.	Turbine oil (T-30) Amidoamines (2:1)	93 7	7	37	26	19
8.	Turbine oil (T-30) Amidoamines (2:1)	90 10	10	45	31	28
9.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1)	97 1,5 1,5	3	170	63	47
10.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1)	93 2,5 2,5	5	190	70	53
11.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1)	93 3,5 3,5	7	202	120	105
12.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1)	90 5 5	10	234	160	135
13.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (1:1)	90 5 5	10	115	78	61
14.	Turbine oil (T-30) Nitro compound (C14) Amidoamines (3:1)	90 5 5	10	205	90	51
15.	Turbine oil (T-30) Nitro compound (C14)	90 5	10	182	70	38



	Amidoamines (4:1)	5				
16.	Turbine oil (T-30)	90	10	161	65	38
	Nitro compound (C14)	5				
	Amidoamines (5:1)	5				
17.	Turbine oil (T-30)	90	10	223	134	107
	Nitro compound (C14)	5				
	Amidoamines (2:1)	5				
15.	Turbine oil (T-30)	90	10	226	137	109
	Nitro compound (C16 -18)	5				
	Amidoamines (2:1)	5				

Note: the values in the brackets (1:1), (2:1), (3:1), (4:1), (5:1) are the molar ratio TOA: PEPA used in the synthesis process of amidoamines.

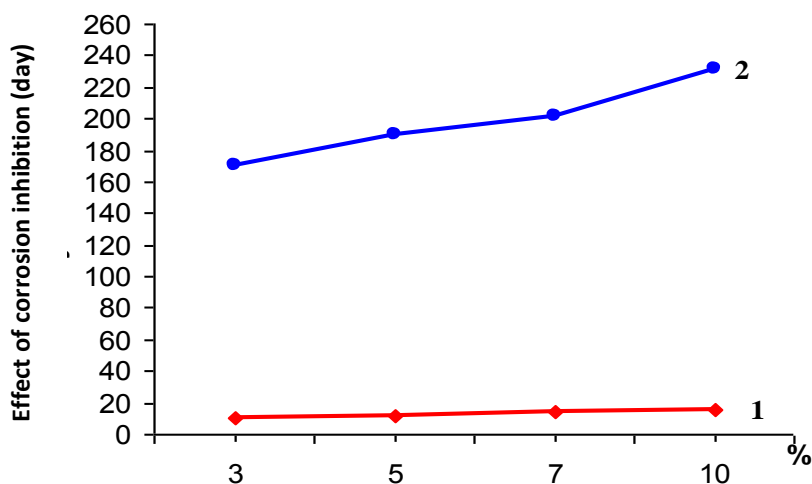


Figure 1: The dependence of the protective effect of the conservative composition of liquids in wet conditions.

- 1 - Turbine Oil T 30 + amido (2:1)
- 2 - Turbine Oil T-30 + nitro compounds (C₁₄) + Amidoamine

Table 2: The protective properties of conservation-based lubricants, turbine oil, nitro, amido and paraffin wax

EX P. №	Component	The composition of conservative lubricants, %	The total concentration of inhibitor in the lubricants, %	Test conditions					
				hydrchamber «H-4»		0.001% H ₂ SO ₄		Seawater	
				Met.I	Met.II	Met.I	Met.II	Met.I	Met.II
1	Turbine oil (T-30)	80	10	191	197	81	86	44	53
	Nitro compound (C14)	5							
	Amidoamines (1:1)	5							
	Paraffin	10							
2	Turbine oil (T-30)	80	10	203	221	93	107	84	101
	Nitro compound (C14)	5							



	Amidoamines (2:1) Parrafin	5 10							
3	Turbine oil (T-30) Nitro compound (C14) Amidoamines (3:1) Parrafin	80 5 5 10	10	178	189	79	104	81	99
4	Turbine oil (T-30) Nitro compound (C14) Amidoamines (4:1) Parrafin	80 5 5 10	10	163	171	41	52	39	51
5	Turbine oil (T-30) Nitro compound (C14) Amidoamines (5:1) Parrafin	80 5 5 10	10	156	164	47	53	38	44
6	Turbine oil (T-30) Nitro compound (C12) Amidoamines (2:1) Parrafin	80 5 5 10	10	64	76	57	61	41	55
7	Turbine oil (T-30) Nitro compound (C16-C18) Amidoamines (2:1) Parrafin	80 5 5 10	10	71	77	56	64	39	52
8	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1) Parrafin	80 5 5 10	10	189	204	79	83	68	72
9	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1) Parrafin	80 5 5 10	10	224	231	103	112	98	105
10	Turbine oil (T-30) Nitro compound (C14) Amidoamines (2:1) Parrafin	80 5 5 10	10	237	239	126	133	114	121

CONCLUSION

Thus, the results of these studies on creation of the technical fluids and lubricants for the conservation of metal parts and assemblies of mechanisms exploited in corrosive conditions found that the compounds based on turbine oil, nitro higher, linear olefins (C14), amidoamines and paraffin wax may be prepared by highly reagents. The introduction of the turbine oil into the above components allows increasing the conservation term to 7-8 times under conditions of high temperature, humidity and 3-4 times in acidic medium and seawater.

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