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CORROSION INHIBITOR

Joseph F. Chittum, Whittier, Calif., assignor to California Research Corporation, San Francisco, Calif., a corporation of Delaware

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2 Claims. (Cl. 252—391)

This invention relates to a corrosion inhibiting com-

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Parallel compositions in which potassium sulfite, calcium sulfite and magnesium sulfite are substituted for the sodium sulfite are approximately equally effective. The alkali metal sulfites are preferred over the alkaline earth metal sulfites, especially if the water charged to the boiler has an appreciable carbonate or sulfate content. Data indicating the unusual effectiveness of the inhibitors of the invention are summarized in the following Table II. The inhibitors were introduced into the boiler water in amounts sufficient to give the boiler water an inhibitor content of 2000 parts per million. Iron coupons were suspended in the liquid phase in the boiler drum, in the steam line and in the condensate line. Corrosion rates are expressed in mils per year and were calculated from the weight loss of the coupons during the tests.

TABLE II
Corrosion rates mils/year inhibitors added to water in boiler drum at 2000 parts per million

	No Inhibitor	Thiourea	Diphenyl Thiourea	Sodium Sulfite	Equal Parts Thiourea and Sodium Sulfite	Equal Parts Diphenyl Thiourea and Sodium Sulfite	Equal Parts Thiourea and Diphenyl Thiourea	Equal Parts Thiourea, Diphenyl Thiourea and Sodium Sulfite
Condensate line and heat exchanger.....	11	4	3	6	2.5	8	2	0.5

position which is highly effective in inhibiting corrosion of ferrous metals in steam generation systems.

The usual steam generating systems comprise a boiler in which water is heated to temperatures ordinarily in the range from 250° F. to 500° F. to generate steam, a steam line to carry the steam from the boiler to the point of use, the heat exchangers, turbines etc. where the steam is condensed, and a condensate line to return condensed spent steam to the boiler drum. Steam generating systems are ordinarily constructed of iron or steel which corrodes in normal usage with the result that maintenance costs are increased and equipment life is shortened.

It has now been found that a corrosion inhibitor consisting essentially of thiourea, diphenylthiourea and an alkali metal sulfite or an alkaline earth metal sulfite effectively inhibits the corrosion of the boiler, steam lines and condensate lines of steam generation systems when introduced into the boiler water in small amounts, usually in the range from 0.001 to 0.2% by weight of the total water (liquid and vapor) in the steam generation system.

The three components of the corrosion inhibiting composition may be present in varying proportions such that the percent of each component in the total corrosion inhibitor composition lies in the range from 10 to 45% by weight. It is preferred to employ approximately equal weights of the three components in compounding the inhibitor compositions. Representative effective compositions are listed in the following Table I:

TABLE I

	Composition No.				
	1	2	3	4	5
Thiourea.....percent..	10	45	25	37.5	33
Diphenylthiourea.....do..	45	10	40	37.5	33
Sodium sulfite.....do....	45	45	35	25	33

From the foregoing data it is evident that the three-component inhibitor of the invention is markedly more effective than any of the individual components or any pair of individual components.

The inhibitors of the invention are prepared by melting the thiourea and diphenylthiourea and stirring the sulfite into the molten mixture. The mixing is ordinarily carried out at temperatures in the range from 150 to 200° C. After mixing is complete, the mixture is allowed to cool and the product is a solid having a softening point at about 150° C. and a yellowish color ranging from brownish yellow to light yellow, depending upon the proportions of the components employed. The manner in which the three components interact during the production of the solid inhibitor and under the conditions of use is not clear. It is observed, however, that under conditions of use a strong garlic-like odor is developed in the vapor phase in the boiler drum which cannot be attributable to any individual component.

The solid inhibitor can be cast into sticks or pellets which are introduced as such into the boiler drum of the steam generation system. If desired, the inhibitor may be dispersed in makeup water charged to the system and added as a concentrated dispersion.

I claim:

1. A cohesive solid corrosion inhibitor adapted to inhibit corrosion of ferrous metals in steam generating systems when employed in concentrations in the range about 0.001 to about 0.2% by weight consisting essentially of an intimate mixture of approximately equal parts by weight of thiourea, diphenylthiourea and an alkali metal sulfite, said inhibitor being prepared by dispersing the sulfite in a molten mixture of thiourea and diphenylthiourea.
2. The composition as defined in claim 1, wherein the sulfite is sodium sulfite.

References Cited in the file of this patent

UNITED STATES PATENTS

2,238,651	Keenan	Apr. 15, 1941
2,562,549	Hatch	July 31, 1951