IV. THE RETARDATION OF HYDROGEN SULFIDE CORROSION

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(Introduced by F. T. Gardner)

Hydrogen sulphide corrosion is a troublesome problem in the petroleum industry. The oil in the storage tanks is often almost saturated with hydrogen sulphide. Salt water which is itself corrosive in the presence of oxygen is usually present also. The corrosion takes place more rapidly in the vapor and salt water layers; localized, extremely severe corrosion is frequently encountered.

*Speller has shown that the rate of hydrogen sulphide corrosion is greatly reduced if no oxygen is present. Probably the same result would be obtained if the oxygen were kept from reacting.

Several compounds have been tried which others have found to slow oxidation reactions, and several others selected at random. These compounds have produced varying results. Due to lack of information on the subject, no one can predict with any accuracy the effect of certain compounds on oxidation.

In this work a five percent salt solution and a one percent solution of the catalyst where it is soluble to that extent has been used. The solutions have been saturated with hydrogen sulphide about once a week. Iron strips, long enough so that they are in contact with the vapor as well as the solution, have been employed.

As a rule the compounds have been selected with regard to solubility in water, solubility in oil, and an appreciable vapor tension. They must be soluble in oil and water so that they will retard the corrosion in those layers, and must have an appreciable vapor tension to retard corrosion in the vapor layer.

The method of judging the rate of corrosion has been a visual comparison with a control which contained no catalyst. The results are therefore only qualitative.

Some of the compounds have had practically no effect on corrosion, while others have greatly slowed the rate of corrosion, although they have not entirely prevented it. The retardation may be due to film formation rather than catalysis, but the result is the significant thing to the industry.

Three tests have been running for seven weeks. These contain analine, phenol, and pyradme. At first the corroison progressed rapidly in the pyradine and phenol, but at present the strip in the analine is more corroded than the other two. However, all three of these show a marked decrease over the control.

Another surprise is that camphor, although it is very slightly soluble in water, decreases the rate of corrosion.

A few compounds behaved well for a while, then the metal began to corrode rapidly, but in most cases changes were gradual. Compounds of similar nature do not necessarily act similarly. For instance p.-aminophenol and p.-nitrophenol had practically no effect while phenol greatly retarded the corrosion. Also analine and dimethyl analine retard corrosion, while m.-nitroanaline has no effect. The best results have been obtained as the table shows, with phenol, pyradine, acetamide, acetoanilide, camphor, and dimethyl analine. Pyradine probably is the best.

Only a beginning has been made on this experiment. Other materials to be tried are: anthronilic acid, sulphonilic acid, benzene sulphonic acid, oxalic acid, formic acid, salicylic acid, nitrochlorbenzene, dinitro benzene, p. dichlorobenzene, anthracene, napththlene, and turpentine. The compounds which behave best will be quantitatively tested with strips in contact with salt water, oil and vapor saturated with hydrogen sulphide.

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*Speller. Corrosion: Causes and Prevention.

Compound Tried	Quality as a Retarding Agent
Analine	Fair
Phenol	Good
Pyradine	Good
Benzaldehyde	Poor
Furfural	No effect
Acetamide	Good
Acetanilide	Good
Benzoic acid and ammonium benzoate	No effect
Anthraquinone	Poor
Benzene sulphonyl chloride	No effect
Camphor	Good
Dimethyl analine	Good
Heptylaldehyde	No effect
Ethyl phthlate	Fair
m. nitroanaline	No effect
p. nitrophenol	No effect
Quinoline	No effect*
Phenol pyradine (equal parts)	Good
Cresol	Good
Carbazole	No effect*
p. aminophenol	No effect

*To be checked