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PREVENTION OF CORROSION

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The present invention is directed to a method for suppressing corrosion of ferrous metals in processes in which hydrocarbons are contacted in vapor phase at high temperatures with such metals.

There are many refinery operations in which hydrocarbons are contacted in vapor phase at high temperatures with ferrous metals. For example, the heating and reaction coils in which such hydrocarbons are processed are usually made of iron alloys. An alloy commonly used is one containing 18% chromium, 8% nickel and 74% iron. This alloy is possessed of many properties which render its use in such refinery operations desirable, but it has been found to be subject to corrosion by hydrocarbons at high temperatures. As an example of a process in which such corrosion reaches serious proportions may be mentioned the thermal cracking of petroleum fractions boiling betwen 200° F. and 400° F. in the vapor phase at a temperature between about 1300° F. and 1650° F. for the production of diolefins.

According to the present invention corrosion of ferrous metals by hydrocarbon vapors at elevated temperatures is suppressed by incorporating in the hydrocarbon vapors a small quantity of a low boiling non-acidic oxygenated organic compound. Examples of compounds suitable for this purpose are the low boiling alcohols such as methyl, ethyl, propyl, butyl and amyl, the corresponding ketones and aldehydes and esters of such alcohols with low boiling acids such as formic and acetic, as for example, methyl formate, methyl acetate, ethyl formate, ethyl acetate, etc. The oxygenated compound should be employed in an amount ranging between 0.5 and 10% by weight of the hydrocarbon feed. The preferred amount of the addition agent within the limits specified will vary with the particular agent. For example, ethyl alcohol is preferably used in an amount ranging from 0.5 to 5% by weight of the hydrocarbon feed stock, methyl alcohol between 1 and 5% and acetone between 1 and 10%.

The mechanism by which the oxygenated organic compound suppresses corrosion in an operation of this type is not at all understood. One reason for this is that there is no certain knowledge as to what causes the corrosion in the first

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instance. Accordingly, the discovery that this corrosion could be suppressed by inclusion of an oxygenated organic compound in the feed stock was entirely empirical in nature.

In order to illustrate the beneficial effects of the present invention a hydrocarbon fraction boiling between about 200° and 400° F. (from Refugio and Smackover crudes) was heated to a temperature of 1450° F. and passed in the vapor phase through a reaction tube, the inner wall of which was composed of an 18–8 chromium-nickel alloy steel. During about 20 hours of operation at the specified temperature, the alloy had undergone corrosion at a rate in the order of 1 to 2 inches penetration per year. When it is remembered that the metal wall in an apparatus of this type is usually only a fraction of an inch thick, it can be understood that corrosion at this rate would cause quick destruction of the apparatus. As a matter of fact, prior to the present invention, a plant in which an operation of the above described type was being carried out repeatedly shut down after from 100 to 400 hours of operation as a result of failure of tubes due to corrosion.

The operation just described was repeated in successive runs of the same duration, in the first of which 5% by weight of ethyl alcohol was incorporated in the feed stock, in the second of which 3% by weight of the methyl alcohol was incorporated in the feed stock, and in the third of which 5% by weight of acetone was incorporated in the feed stock. In all these runs, the ferrous metal showed no sign of corrosion after 20 hours operation.

The nature and objects of the present invention having been thus described and illustrated, what is claimed as new and useful and is desired to be secured by Letters Patent is:

1. In an operation in which petroleum distillate is contacted in vapor phase at a temperature between about 1300° and 1650° F. with an iron, chromium, and nickel alloy, the step of incorporating in the distillate during said operation a corrosion inhibiting amount of a low boiling, non-acidic oxygenated organic compound.

2. A method according to claim 1 in which the oxygenated organic compound constitutes between about 1 and 8% by weight of the hydrocarbon.

3. A method according to claim 1 in which the oxygenated compound is an aliphatic alcohol.

4. A method according to claim 1 in which the oxygenated compound is an aliphatic ketone.

5. A method according to claim 1 in which the oxygenated compound is an ester of an aliphatic alcohol and an aliphatic acid.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,143,509	Conover	Jan. 10, 1939
2,215,950	Young	Sept. 24, 1940
1,948,029	Fisher	Feb. 20, 1934
2,296,342	Gaylor	Sept. 22, 1942

FOREIGN PATENTS

Number	Country	Date
548,262	British	Oct. 2, 1942
433,410	British	Aug. 14, 1935
315,991	British	July 25, 1929