CARBIDE AND CARBON CHEMICALS CORPORATION

PROCESS DIVISION

PROCESS DESIGN AND DEVELOPMENT DEPARTMENTS

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MINUTES OF CORROSION MEETING -- OCTOBER 21, 1946

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Minutes of Corrosion Meeting -- October 21, 1946

Present:

J. J. Barton
J. J. Byrnes
R. B. Clarke
G. L. Flint
E. C. Kirstowsky
H. V. Klaus
R. B. Korsmeyer
R. Lafferty
J. R. Largey

F. A. Lehmann
W. C. Moore
H. S. Rogers
C. Schmitt
D. H. Seeds
M. P. Seyfried
S. H. Smiley
R. H. Wiswall

Introduction:

This meeting was called by Mr. S. H. Smiley in order to review progress made on the corrosion problem since the last meeting on September 5th, and to devise a definite program on the specific problem of the corrosion of the coolant coolers.

The minutes of the last meeting were reviewed briefly and it was pointed out that neither the corrosion of the water piping nor the hot water tanks presented any immediate concern. The chief concern then is with the excessive pitting of the cooler shells as disclosed in E.T.&I's reports on those coolers which were removed for inspection.

Results:

1. Heat Transfer of Coolant Coolers.

At the last meeting it was reported that new coolers in K-27 were operating with the water control valve more closed, and the water was leaving the coolers at a higher temperature than adjacent coolers which had never been removed from service. This, coupled with the fact that the K-27 coolers which were inspected apparently contained more sludge deposit than those of K-25, gave cause for concern regarding the cooler efficiency of K-27 coolers. Results of tests by the water plant and Chemical Development Section showed that deposits in K-27 coolers could be removed by acid treatment of the water. Mr. J. Byrnes is continuing work along these lines at the K-27 water plant, and results of tests at the 1401 bldg. will indicate how long it will take to remove the tube deposits. The tube deposits at K-27 were shown to consist predominately of calcium, magnesium and phosphorous, whereas the deposits

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of K-25 were analyzed as predominately clay and mud. It is apparent that the deposits in K-25 coolers could not be removed in this manner should it become necessary to do so at some future date.

2. Coolant Cooler Inspection.

Three coolers were to be removed from each of the six locations, as outlined in the minutes of the last meeting, September 5. Pit depths were to be measured and shell thicknesses obtained, and the data presented at this meeting. E.T.&I. reported that twelve coolers had been removed to date, and that data was available for nine of these at this meeting. Of the other three, two had recently been removed and had not been inspected, and the third one was being used in a special test set up. Six more are to be removed to keep this original request for removal of eighteen coolers.

The data on the nine coolers were summarized and no correlation was apparent from a comparison of those coolers taken from different locations. It was suggested that the six location program be abandoned and coolers be secured from Process at random so as to enable a better statistical evaluation of the data being presented. Apparently the data does indicate a trend towards deeper pitting with increasing service, but this will have to be substantiated by further measurements. It is not known whether or not a total of 18 cooler inspections will give this within any reasonable certainty. The following tabulates the data on the inspected coolers.

<u>Location</u>	<u>Max. Pit Depth</u>	<u>Length of Service</u>
309-1.3	.065	14 mos.
309-1.1	.145 Seam .122 Shell	15 mos.
311-1.7	.070	16 mos.
402-8.8	Negligible	7 mos.
306-2.13	.055	13 mos.
302-5.5	.150 Seam .130 Shell	18 mos.
305-1.10	.047	9 mos.
310-3.7	.075	18 mos.
312-2 Position 2	.080	12 mos.

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Program:

Mr. H. Klaus was appointed as overall coordinator of the water corrosion program and it is to be his job to see that the program as reached at this meeting is carried out. Progress reports from the various departments with definite assignments are to be written him each Thursday, and all information will then be compiled, and an overall picture of the progress presented.

The following outlines the program which will be followed in an effort to correct or minimize coolant cooler corrosion. Considerable work has been done to date on some of these.

I. Cathodic Protection

Mr. Lehmann and Mr. Rogers of the Electrical Engineering Section have been working on methods of cathodic protection and will continue their efforts along this line. The opinion was expressed that if a suitable current were applied, corrosion due to galvanic action would be arrested as well as any corrosion due to dissolved oxygen. It was thought that the intensity of the current would be governed by economical considerations and not from any fear that selective plating would be encountered. Dr. Wiswall was asked to assist in selecting a proper electrode and to aid in devising a method of applying a uniform current density.

II. Deactivation of Water

Since dissolved oxygen is known to be a major contributor to many forms of corrosion it was decided to try to determine its effect on coolant cooler corrosion. Accordingly, Mr. Vanstrum of the Design and Development Department is to initiate a test using scrap iron to remove the oxygen from the water before it enters a test cooler.

III. Zinc Strips

Zinc strips are to be installed in a test cooler and data obtained at the start and after several months' service. The necessary zinc has been located in Stores, and E.T.&I. is to handle this installation. The test will determine the effect of introducing a metal which is more active than either copper or iron.

IV. Plastic Coating

Two coolers have been obtained from spare parts for coating of the shell. The brass baffles will be buffed and chamfered and a tacky lubricant such as cable dressing applied in an attempt to avoid breaking the painted surface. This is to be initiated by the Chemical Development Section.

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V. Thickness Measurements

Two 3/4" holes are to be drilled in the shells of replacement coolers so that measurements of shell thickness may be made in place by means of a "key hole mike". E.T.&I. are to initiate these tests and obtain periodic measurements. These drilled coolers will also be used for the insertion of electrodes by the Electrical Engineering Section.

It was also requested of E.T.&I. that pit depth and thickness measurements be made on as many coolers as possible so that when these coolers were installed at some future date the data would be available.

VI. Consulting Service

Dr. Lafferty is to look into the details of securing the service of a suitable consultant on this problem, so that one may be called in if necessary when sufficient corrosion data has been obtained.

VII. Dichromate Water Treatment.

The feasibility of using a dichromate water treatment was discussed, and the opinion was expressed that this method would be uneconomical. However, in view of the controversy raised on the question, the Design and Development Department is taking the liberty of requesting that an investigation be made of the possibility of using this method if the corrosion of the coolers is found to be chemical. Accordingly, it is requested that Dr. Wiswall submit a cost estimate for dichromate treatment which will combat any chemical corrosion in the K-25 and K-27 water plants.

Of the above it appears that deactivation of the water and/or cathodic protection provides the most economical prospective protection. If these methods do not work it will probably be advisable to remove a cooler only when a hole develops, plug the hole, and treat the cooler according to the best method found from these other tests and then return the cooler to service.

H. V. Klaus
H. V. Klaus

S. H. Smiley
S. H. Smiley
Chemical Development Section

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