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Dr. Krisker 5/11/92
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SPECIAL RE-REVIEW

FINAL DETERMINATION

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BY *Jim Jordan 7-2-81*

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3 pages. No. *2* of *2*
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September 19, 1955

**INTERIM REPORT, PRODUCTION TEST MR-105-12
CROSSHEADER PURGE WITH CHROMIC ACID**

References:

1. HW-36021, "Production Test MR-105-12, Crossheader Purge with Chromic Acid."

INTRODUCTION

The primary purpose of this test was to demonstrate that the inside of a rear-cross-header, its nozzles and pigtails could be decontaminated by recirculating for 30 minutes, a 60° C, 0.3 pH chromic acid solution. Secondary purposes were, (1) to determine the magnitude of radiation increase in piping and acid equipment external to the reactor encountered during the test and (2) to obtain information as to the kind and amount of contaminants removed by the acid solution.

SUMMARY

The test was conducted at F Reactor on August 10, 1955. The reactor had been down eighty hours. The actual conditions of the test were, a 42 minute recirculation period with 0.4 pH chromic acid at a solution temperature of 52° C, the temperature of the solution was not as high as desired however,

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SUMMARY (Cont'd)

this was partially compensated for by extending the length of the test. All tubes were leak tested prior to the test and shown to be sound. A leak test after recirculation revealed tube C681 to have a Van Stone flange leak. Examination of two tubes on the header after the purge showed the tubes to be bright and film free. Examination of a nozzle and pigtail removed from the header showed the inside of the nozzle to be bright and film free, however the annulus of the pigtail still contained patches of film which were in the form of large flakes. Instrument surveys and a film pack survey of the test header, before and after recirculation did not indicate a reduction in radiation level of the header. No mechanical difficulties were experienced during the test. During the test the radiation level of the test tank increased to 3R, and the piping to 300 mr. Flushing with water for 45 minutes reduced the radiation level of the test equipment to 80 mr on the tank and 15 mr on the piping. On the basis of present data, the conclusion is made that no measurable reduction in radiation level of the rear header resulted from recirculation of the acid solution. Sufficient data is not available to state conclusively why the recirculation of acid did not reduce the radiation level of the header. A second film survey, analysis of the film from inside the pigtail and analysis of solution samples taken during the test are expected to aid in determining the effects of the test.

DISCUSSION

Operation of the Test

The test equipment was installed as described in reference one. Because of rupture removal work, the test was delayed until approximately eighty hours after shutdown. Recirculation of sodium dichromate and water was started at 9:24 p.m. After 15 minutes during which the solution temperature remained constant at 33° C, steam addition to the test tank was started. One hour of steam addition (80 psi-1" line) was required to raise the temperature of the solution to 45° C. Sulfuric acid was added at approximately 10:40 p.m. The temperature of the test solution rose immediately to 52° C. Recirculation of the acid solution continued for approximately 45 minutes. The maximum temperature attained was 55° C. Dilution of the solution with filtered water and simultaneous draining of the solution was started at 11:30 p.m. The test system was valved out of the reactor at 12:30 a.m. At the start of dichromate recirculation, the radiation level of the test tank was essentially zero. The level increase to 120 mr prior to adding acid. Upon addition of acid, the level increased to 3R. At the conclusion of the flushing cycle the test tank radiation level had been reduced to 80 mr. Piping to the test equipment reached a radiation level of 300 mr and was subsequently reduced to 15 mr after flushing.

Leak Test of Tubes on 6½ Header

All of the tubes on 6½ header were leak tested prior to the acid recirculation cycle and shown to be sound. After the acid recirculation a leak test revealed C681 to be a Van Stone flange leaker. Examination of the flange revealed three bad pits, one of which penetrated the tube wall. It is believed that the acid recirculation did not cause the penetration but probably removed the barnacles which clogged the hole and caused the tube to test as sound originally.

Examination of Nozzle, Pigtail, and Tubes on Test Header

The rear nozzle and pigtail from tube C681 on the test header was removed for examination. The inside of the nozzle barrel was clean and bright and indicated complete removal of film.

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Examination of Nozzle, Pigtail, and Tubes on Test Header (Cont'd)

The radiation level of the nozzle when compared with other nozzles had not been reduced. The radiation level of the nozzle has little significance in this case because C681 was directly below a recent ruptured slug tube from which considerable contamination had been spread. The pigtail from C681 showed only partial removal of film. The film remaining in the pigtail was in the form of large loosely held flakes. Examination of process tubes C653 and C753 on the test header showed the tubes to be film free. Additional verification of film removal from the process tubes was made during removal of tube C681. This tube at the hottest point read 250 mr. A normal tube upon removal will read at least 1 R. The radiation level of the splitter used on the tube was approximately 30 mr. Normally the splitter will read 300 mr. It appears from these observations that the acid recirculation was successful in removing film from aluminum surfaces but not from stainless steel surfaces. ○

Actual Test Conditions vs Optimum Test Conditions ○

The optimum conditions proscribed for this test were a 60° C solution temperature, a 0.3 pH chromic acid solution, and recirculation period of 30 minutes. Allowable deviations from these conditions were a pH range of 0.1 to 0.6 and a varying recirculation time dependent upon temperature. The actual conditions of the test were a 52° C solution temperature, a 0.4 pH and a 42 minute recirculation period. The actual temperature conditions were possibly not as high as required for successful operation of the test and may account for unsuccessful removal of the film from the stainless steel surfaces.

CONCLUSIONS

Pending final analysis of all data, a firm conclusion regarding the effects of the acid recirculation on decontamination of the rear piping cannot be made. However, it appears from analysis of present data that the test was unsuccessful in removing the contamination from the stainless steel header and pigtails. The method shows promise in reduction of radiation problems associated with tube removal.

FUTURE STUDIES

Future studies will include determination of why the acid did not remove the film from stainless steel surfaces. Laboratory studies of methods for removing film using other solvents under the same or different conditions and development of information to provide a practical method for decontamination of the inside of rear nozzles, pigtails and headers.

The applicability of chromic acid decontamination of process tubes, to aid in process tube removal work, will be explored.

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9/21/92