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K REACTOR DICHROMATE TEST RESULTS

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K REACTOR DICHROMATE TEST RESULTS

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P. A. Carlson

July 29, 1970

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DATE July 29, 1970

TO AE Engler

FROM PA Carlson *pse*

SUBJECT K REACTOR DICHROMATE TEST RESULTS

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Reference: (1) Letter, PA Carlson to AR Maguire, "Dichromate Test at KW Reactor," September 29, 1969.

(2) DUN-5764, "PTA-176, Half Plant Low Dichromate Evaluation at KW Reactor," AP Larrick, April 30, 1969. (Secret)

(3) DUN-6463, "Dichromate Evaluation," PA Carlson, November 4, 1969. (Secret)

The analysis of the KW Reactor low dichromate test has been completed and a draft of the final report prepared. However, it will be some time before the report is issued because of our substantial clerical backlog and because Al Larrick was reassigned to work outside Reactor Materials Subsection in July. The specifications provided in Reference 3 require that the dichromate concentration be increased to 1.0 ppm when bulk outlet coolant temperature exceeds 90 C. The test results show that this specification may be modified and since KE Reactor has reached a bulk outlet of 90 C the need for a more relaxed specification, if warranted, is obvious. The PTA-176 data show that the corrosion occurring at exposures of 66 operating days or less and with clad temperatures above 120 C would not seriously limit fuel integrity at 0.5 ppm inhibitor, but extensive pitting corrosion at these conditions occurs for exposures of 105 operating days. Corrosion during operation at cladding temperatures above 120 C and exposures of 105 operating days was substantially reduced, but not completely eliminated, by increasing the dichromate concentration to 1.0 ppm. Little effect of dichromate concentration was noted on pitting corrosion on fuel exposed to 0.5 and 1.0 ppm dichromate at exposures to 105 days as long as the cladding temperature was below 120 C.

Based on these data, we recommend that the sodium dichromate concentration should be controlled as follows:

1. A dichromate concentration of 0.5 ppm is specified for all operations which result in a maximum fuel element surface temperature below 120 C in the highest powered tube in the reactor, regardless of the exposure time or for operation in which fuel cladding temperatures are above 120 C but exposure periods are less than 70 operating days.

2. A dichromate concentration of 1.0 ppm is specified for all operations which result in fuel cladding surface temperatures exceeding 120 C and exposure periods exceeding 70 operating days.

Implementing these specifications and evaluating the operating conditions to determine when dichromate concentration changes should be made are normally the responsibility of Process Control; therefore, we wish to present these recommendations to you in the form of this letter instead of waiting for the final report to be issued in order for their timely consideration for the next few months when cladding temperatures are expected to exceed 120 C.

In your analyses of when the dichromate concentration should be increased from 0.5 to 1.0 ppm, you may wish to consider that the risk of fuel failure with less than ten tubes exceeding the limits in Recommendation 2 appears to be small; perhaps the tradeoff is the cost of a single failure against the cost of the increased amount of dichromate.

It should be noted that a pH reduction is also effective in reducing fuel corrosion failures and could be applied in lieu of the increase in dichromate concentration. However, we do not have available any quantitative information on the amount of corrosion reduction to be expected with small (0.1 to 0.2) pH unit reductions in pH, although we do believe that operation last year at pH 6.5 at KE Reactor did decrease the number of fuel failures as compared to the previous two months duration when the pH was at 6.7.

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