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SUPPLEMENT A TO PRODUCTION TEST IP-123-A,
IRRADIATION OF ENRICHED STAINLESS STEEL JACKET
SEVEN-ROD CLUSTER ELEMENTS TO HIGH EXPOSURE

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October 20, 1958

SUPPLEMENT A TO PRODUCTION TEST IP-123-A, IRRADIATION OF ENRICHED STAINLESS STEEL JACKETED SEVEN-ROD CLUSTER ELEMENTS TO HIGH EXPOSURE

OBJECTIVE

The objective of this supplement to PT-IP-123-A¹ is to extend the goal exposure of the seven-rod cluster elements from 2500 MWD/T to 3500 MWD/T.

1. HW-53359, PT-IP-125-A, "Irradiation of Enriched Stainless Steel Jacketed Seven-Rod Cluster Elements to High Exposure", WK Kratzer, January 3, 1958.

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BASIS AND JUSTIFICATION

Four 1.3% enriched stainless steel jacketed seven-rod cluster elements are being irradiated in the 3674 KE front-to-rear test hole to measure the thermal conductance across the jacket-uranium interface and to determine the effects of irradiation to high exposure on uranium in the form of half-inch rods. The interface conductance is determined from measurements of the central uranium temperature of two of the rods and of the local water temperature. During the five months this test has been irradiated there has been a gradual decrease in fuel element power because of burn-up and a gradual increase in the jacket-uranium interface conductance, probably as a result of the rods shortening and increasing in diameter. The central uranium temperature (400-425°C) is probably too low for appreciable uranium swelling to have occurred, although this will be checked by density measurements.

Extension of the goal exposure of these fuel elements from 2500 to 3500 MWD/T will permit continued observation of the interface conductance to see if the conductance continues to increase or if it reaches a steady value. In addition, the test will provide samples of uranium for macroscopic and microscopic examination which have been irradiated in the form of half-inch rod to exposures higher than have previously been obtained. Initial data from the test have been reported by Claudson in HW-56233².

TEST DETAILS

The test details of the original production test will be unchanged except for the goal exposure increase from 2500 MWD/T to 3500 MWD/T.

HAZARDS

The increase in probability of failure by increasing the exposure of the fuel elements in this production test from 2500 to 3500 MWD/T is slight. The corrosion of the 0.030-inch stainless steel jackets should be negligible. The exposure and reactor cycling to which the fuel elements have been subjected should have caused some internal cracking in the uranium; however, neither the initial nor the continued internal fragmentation of the uranium should lead to failure when the uranium is contained without bonding in a strong jacket.

2. HW-56233, "Irradiation Data - 1.3% Enriched Seven-Rod Cluster Fuel Elements", TT Claudson, June 17, 1958.

W. K. Kratzer
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