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TITLE

KER-3 OPERATING REPORT
TEST K-3-16
PT IP-477-A

ISSUING FILE

AUTHOR

H. T. Quinn

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KER-3 OPERATING REPORT

TEST K-3-16

PT IP-477-A

IRRADIATION OF N REACTOR FUEL ELEMENTS IN KER LOOPS 3 AND 4

Objective

The objective of this production test was to evaluate the irradiation behavior of N Reactor fuel elements at conditions equivalent to or more severe than those expected in N Reactor

Test Description

The thermocouple train consisted of eleven 23-inch NAE1 elements (replicas of an N Reactor fuel element) plus five 16-inch tubular perfs. The elements were enriched to 0.947 per cent. They were coextruded Zircaloy-2 jacketed self-supported uranium tubes concentrically nested one within the other to provide an element with four heat transfer surfaces and three coolant channels. For specific dimensions, refer to Production Test IP-477-A.

Charge Order

The tube was charged from rear to front in the following manner:

<u>Position From Downstream End</u>	<u>Number Of Pieces</u>	<u>Description</u>
1	1	15-foot thermocouple train
2-12	11	23-inch NAE1 elements
13-17	5	16-inch tubular perfs

Mock-up Tube Charge

The tube was charged on March 5, 1962; position 2 through 12 consisted of 12-inch and 24-inch rod holders which contained zirconium, carbon steel and stainless steel coupons. Positions 1 and 13 were charged on March 30, 1962 and both were carbon steel coupons. All samples were discharged on July 10, 1962. The tube was recharged on July 10, 1962 with the following (from downstream end):

- Position 1 - triangular perf
- 2 - 24-inch stainless steel rod holder
- 3 - 24-inch stainless steel rod holder
- 4 - 24-inch carbon steel rod holder

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November 20, 1962

- Position 5 - 24-inch stainless steel rod holder
6 - 12-inch stainless steel rod holder
7 - 24-inch carbon steel rod holder
8 - 12-inch carbon steel rod holder
9 - 12-inch aluminum rod holder
10 - 12-inch aluminum rod holder

Specified Conditions of the Test

Flow: 80,000 lb/hr

Effluent Pressure: 1555 psig

Effluent Temperature: 285 C (Refer to temperature graph.)

pH: 10.0 $\pm$ 0.1 (Refer to pH graph.)

Loop Operating Conditions

Loop operating conditions during the test were as follows:

Recirculating with Reactor Operating: 652 hours

Recirculating at Desired Run Conditions: 408 hours

Recirculating with Reactor Not Operating: 115 hours

Single-pass Operation with Reactor Operating: 1006 hours

Single-pass Operation with Reactor Not Operating: 235 hours

Single-pass operation during reactor operation was due to loop primary pump failures.

Water Quality

The pH of the water was controlled by routing a small portion of the flow through an XE-154 ion exchange column or an XE-150 column. An alternate method was to bomb the loop using LiOH. (Refer to graphs for pH, oxygen, total solids and silica.)

Maintenance

The normal amount of maintenance was performed, such as valve repacking. A check valve in the process water back-up line in the Ball 3-x room was replaced on August 7, 1962.

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November 20, 1962

The primary pump located in position 2 of cell 3 was removed from service on June 6, 1962. The top bearing had been running approximately 25 F hotter than the top bearing of the other pump for about two weeks.

Disassembly of the pump showed that the thermal barrier was cracked, and the thrust bearing at the top of the motor section indicated some signs of wear. The seal weld had been poorly fused and probably cracked under thermal stress. The thrust disc and shoes were replaced. The impeller end of the pump shaft appeared to have some stains on it. After closer examination, it was found that the chromium plating was lost.

The loop was operated at lower than normal temperature due to the above problem. The loop has been on single-pass since July 28, 1962. It is not to resume in-reactor recirculation before the middle of December, 1962.

Discharge

The tube was tray discharged on September 6, 1962. No difficulty was experienced in pushing the charge.

H.T. Quinn
Technician, Coolant Testing

HT Quinn:pb

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K-3

TEST NO. 16

INLET & OUTLET TEMP.

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Page 5

November 20, 1962

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K-3

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HW-75414

Page 6

November 20, 1962

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Page 7

November 20, 1962

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HW-75414
Page 8

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