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August 1, 1960

L. V. Barker
Supervisor, Coolant Testing
TESTING SUBSECTION

KER-1 OPERATING REPORT
TEST K-1-7
PT-IP-314-A

A REPORT ON THE IRRADIATION OF A THERMOCOUPLE TRAIN FOR MEASUREMENT OF
FUEL ELEMENT TEMPERATURE CHANGES AS THE RESULT OF FILM DEPOSITION

A. Test Objective

The objective of this test was to measure the effect of crud film deposition on fuel element temperatures during irradiation in high pH water.

B. Test Charge

The charge consisted of the assembled thermocouple train only. The train was made up of the nozzle insert downstream, 21, eight-inch perfs or spacers, one 36-inch tubular heater element, two, eight-inch perfs, one 36-inch tubular heater element, two, eight-inch perfs, and the 12-inch thermocouple element upstream.

C. Test History

The test started on May 14, 1960 and ran for a period of 54 days. On July 7, 1960, the delayed neutron monitor and loop activity readings increased and initiated a reactor scram. Rupture indications were confirmed by radio-analysis of water samples taken at the time of the scram.²

The tube was discharged and visual examination of the elements at the 105-KE viewing pit did not reveal the rupture nor any abnormalities.

An attempt to recharge a similar thermocouple train failed when one of the 36-inch heater elements stuck when the charge was approximately 16 feet into the tube, damaging the supports on the heater element. The thermocouple train was recovered and the tube was charged with dummies.

D. Equipment Experience

During the run period, the following equipment failures occurred:

1. The loop was dumped to single-pass during an outage when routine calibration of the Barton "Low-Low Flow Switch" actuated the dump valve.
2. The north corridor strainer blow down valve leaked through and had to be replaced.

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3. The clean-up system cooling heat exchanger heads leaked considerably during a routine pressure test. Location of the bolts made it impossible to take them up and new bolts have been ordered to replace the existing bolts.
4. The boiling point suppression Bristol failed and a loose soldered connection was discovered on the plug-in unit.
5. Process water back-up check valves (2) started leaking loop water into the back-up water system to the extent that operating temperature had to be reduced to minimum.
6. Loop make-up pump check valve developed a leak of loop water into the make-up water.

E. Operating Conditions

The following data were collected for the operating period:

1. Hours on process water, 113.

Hours on recirculation, @	< 100C	208
@	100C-150C	448
@	150C-200C	33
@	200C-300C	495

2. The average ΔT during the run was 30C* and the average indicated flow was 50 gpm.
3. A total of 161 bombs of 50 gm/liter of LiOH solution was added for a total of 11,270 cc of dilute stock solution to maintain the loop pH.
4. The average degas flow through the pressurizer was 0.33 gpm and the average clean-up flow through three cubic feet of XE-154 resin was 1.8 gpm.
5. The maximum cell background, just before the end of the test, was 8 mr/hr with the average during the period being 6 mr/hr.
6. The average water quality analysis recorded during the run were:

pH	10.04
Cl ⁻	< 0.05 ppm
SO ₄ ⁻⁻	< 1.0 ppm
PO ₄ ⁻⁻⁻	
Special Resin	45,700 ohms/cm
Total Solids	8.07 ppm (average)
H ₂ O ₂	< 0.1 ppm
O ₂	0.144 ppm
SiO ₂	0.067 ppm

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*The ΔT was determined for the period from May 16, 1960 through June 5, 1960 only, as the remainder of the run was at minimum temperature and the inlet temperature was below 100C (minimum indicated on RTD).

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References

1. Rupture Report, R-60-5, W. A. Oldham to L. V. Barker, July 11, 1960, Unclassified.
2. 1706-KER and 1706-KE Weekly Status Report No. 81, R. J. Lobsinger and D. R. Dickinson, dated July 13, 1960, Unclassified.

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