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October 7, 1959

SUPPLEMENT A, PRODUCTION TEST IP-262-A-11-FP,
EVALUATION OF PROJECTION FUEL ELEMENTS FOR
USE IN RIBBED PROCESS TUBES - DEMONSTRATION LOADING

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Page 2

SUPPLEMENT A, PRODUCTION TEST IP-262-A-11-FP,
EVALUATION OF PROJECTION FUEL ELEMENTS FOR
USE IN RIBBED PROCESS TUBES - DEMONSTRATION LOADING

OBJECTIVE

The objective of this supplement is to authorize charging of one reactor's portion of the basic test⁽¹⁾ as a repeat of an inconclusive test at KW⁽²⁾ to evaluate reduction in hot-spot incidence achieved, and to pilot the remainder of the demonstration loadings authorized.

SUMMARY

This supplement authorizes charging of 20 columns of bumper fuel elements and twenty columns of control elements into D reactor for irradiation to exposures up to 1200 MWD/T, with post irradiation evaluation of hot-spot incidence.

BASIS AND JUSTIFICATION

The basic test⁽¹⁾ authorizes a 20 tube test with controls of fuel fabricated with projections which maintain a free annular area of at least 15 mils in an attempt to eliminate hot-spot fuel failures. Justification for this test is based on the premise that a hot-spot can only occur if annular flow is severely restricted over a portion of the fuel surface by a flow anomaly resulting from misalignment. The basic test was designed as a sequel to PT-IP-183-A which had the following results:

1. No hot-spots or flow patterns were observed on the bumper fuel elements irradiated in KW reactor; however the 2% incidence predicted for the control material was not achieved and as a result, the test was inconclusive when evaluated statistically.
2. No charging or discharging problems were encountered as a result of either warp or fuel growth; nor were any problems encountered as a result of tube distortion.
3. No corrosion problems were encountered as a result of the presence of the projections.
4. Flow to the tubes was as predicted from laboratory data.
5. It was probable that reduction in top annular temperatures occurred as a result of flow mixing; however the data for KIII elements was not definitive enough to positively confirm this effect.

These results, though encouraging, do not provide the desired basis for execution of the entire test; however it is felt that a one reactor loading will demonstrate, if present, the reduction in hot-spot incidence. Reasons for this confidence are:

- a) Hot-spot incidence has been higher at the older reactors than at K Plant.

- (1) HW-60444-C, "Production Test IP-262-A-11-FP, Evaluation of Projection Fuel Elements for Use in Ribbed Process Tubes - Demonstration Loadings", R.E. Hall, 5/25/59.
- (2) HW-56525-C, "PT-IP-183-A-98-FP, Evaluation of Projection Fuel Elements for Use in K Process Tubes", R. E. Hall, 11/5/58.

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Page 3

- b) The one reactor portion will be irradiated to exposures up to 1200 MWD/T instead of 800 MWD/T,
- c) Surface conditions will be more severe for a test in an older reactor than they were at KW,
- d) The test size has been doubled from that utilized at KW to further improve the probability of having a good sampling.

Since it is immaterial which of the older reactors be chosen for this test from a technical standpoint, D Reactor has been chosen in an attempt to equalize total CY 1960 outage time requirements for Category I fuel testing.

All provisions of the basic test, not excepted in this supplement remain effective.

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HW-60444-D
Page 4

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