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TITLE

PRODUCTION TEST - IP-485-A
FUEL ELEMENT FILM FORMATION STUDIES

AUTHOR

R. G. Geier

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OBJECTIVE

- © The objectives of this test are to determine the inventory of radionuclides in the films on standard production reactor fuel elements and the corrosion of these fuel elements as a function of position in the reactor.

JUSTIFICATION

© A research and development program has been undertaken by the Irradiation Processing Department and the Hanford Laboratories Operation to obtain a large reduction in the biologically significant radionuclides occurring in reactor effluent. A major portion of the program is directed toward determining the mechanisms and kinetics involved in the formation and removal of the radioisotope forming films on in-reactor tube and fuel element surfaces. This particular test will permit the determination of radionuclide inventories in the films on a column of fuel elements and associated dummies irradiated under standard conditions to a normal exposure.

Corrosion measurements will also be made during this testing. Weighed pieces will be used in these charges. Penetration will be determined from preweights and analytical data from film removing solutions. Special handling of all pieces in this test will be required at discharge.

DESCRIPTION OF TESTA. Facilities Required

A central zone KE Reactor ribbed, aluminum tube at least two lattice units away from control rods, poison, splines or enrichment will be used for this test. The specific tube to be used will be selected by the process engineer at the initiation of this test.

B. Charge

A normal central zone KE Reactor charging pattern will be followed. The charge will consist of:

1. Standard upstream dummies.
2. Numbered and weighed KIVN fuel elements (38 pieces).
3. Numbered and weighed downstream dummies.

C. Water Quality

© The water supplied to this tube will be normal 105-KE process water. ©

D. Exposure

Exposures will be based on the variable goal limit normally used for production metal.

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E. Discharge

At discharge the fuel elements and downstream dummies will be pushed onto a catch tray and then loaded into the basin. The tray will be that used for similar discharges from the KER loops. A detailed description of the equipment and procedure will be furnished by Coolant Testing Unit.

F. Fuel Element Disposition

Following discharge, the fuel elements and downstream dummies will be stored in a bucket for from six to eight days. After this cooling period, eight selected fuel elements and four dummies will be loaded into two Hanford J casks for shipment to 300 Area. The remaining fuel elements may be disposed of in the normal manner. The dummies will be saved for future study.

G. Test Duration

The weighed fuel elements and dummies will be charged during the first outage subsequent to the approval of this test. It is anticipated that three successive charges into the identical tube will be required. If sufficient information is obtained from the first or second charge, the test will be terminated at that time. In any case this test will be terminated in 18 months.

HAZARDS

The hazards introduced by this test are limited to those associated with tray discharge. Specifically overheating of fuel elements by prolonged exposure to air should be avoided. Air exposure time versus fuel element temperature will be defined by the Process Engineer at the time of tube discharge.

COSTS

A. Outage Time

The tray discharge will require four hours each time.

B. Cost Code

XXXX-5R25-XXX.71

RESPONSIBILITIES

IRRADIATION PROCESSING DEPARTMENT

KE Processing Operation:

1. Operational safety of the reactor.
2. Production continuity.

3. Charge-discharge of the tube.
4. Loading fuel elements into cask.

Research and Engineering Operation

Process and Reactor Development Operation:

1. Termination of test.
2. Issuing the final report.

Process Technology:

1. Selection of process tube location.
2. Defining air exposure time versus fuel element temperature.

Coolant Testing Unit:

1. Scheduling for tray discharge.
2. Observation of discharge.
3. Supplying discharge procedure.

HANFORD LABORATORIES OPERATION

Reactor and Fuels Development Operation

Coolant Systems Development Operation:

1. Supplying downstream dummies.
2. Observation of discharge.
3. Selection of fuel elements to be shipped.
4. Analyzing corrosion data radioactive data, and issuing the final report.

Chemical Research and Development Operation

Radiological Chemistry Operation

1. Analyzing data pertinent to effluent activity and issuing technical reports.

R. G. Geier

Process and Reactor Development Operation
Research and Engineering

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APPROVALS

J. H. Brown
J. H. Brown, Manager
Process and Reactor Development Operation
Research and Engineering

R. W. Reid
R. W. Reid, Manager
Process Technology Operation
Research and Engineering

C. G. Lewis
C. G. Lewis, Manager
Testing Operation
Research and Engineering

O. H. Greager
O. H. Greager, Manager
Research and Engineering

S. L. Nelson
S. L. Nelson, Manager
KE Processing Operation
Manufacturing Section

R. S. Bell
R. S. Bell, Manager
KE-KW Reactor Operation
Manufacturing Section

E. R. Astley for
E. R. Astley, Manager
Applied Reactor Engineering Operation
Manufacturing Section

C. A. Priole
C. A. Priole, Manager
Production Operation
Manufacturing Section

O. C. Schroeder
O. C. Schroeder, Manager
Manufacturing Operation

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