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February 25, 1966

TITLE

FUEL FAILURE LOT KY-928-Q -
D REACTOR

AUTHOR

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Page 2

DISTRIBUTION:

DATE February 25, 1966

TO A. K. Hardin, Acting Manager, Process Technology

FROM L. J. Newell, Process Analysis

SUBJECT FUEL FAILURE LOT KY-928-Q - D REACTOR

On February 13, D Reactor sustained a bumpered enriched fuel element failure in process tube 3289. The element failed in the twenty-first position from the rear of the charge and was from lot KY-928-Q. Visual examination of the failed element indicated the failure mechanism to be cleavage of the uranium core. This conclusion was substantiated in part by the appearance of "worm tracks" in the aluminum jacket. The fuel failure was detected approximately three hours after the reactor had resumed operation from a minimum outage. Examination of reactor operation during the three-hour period revealed no evidence of a power transient which might account for the failure mechanism.

As a result of a previous meeting between the management of Process Technology Subsection and Production Fuels Subsection, verbal information was received from PFS which possibly explains the failure mechanism experienced with this lot. An agreement reached in the meeting was that PFS would provide Process Analysis with fuel lot canning history for evaluating continued irradiation of fuel failure lots with questionable quality integrity. Under this agreement, the following canning information pertinent to lot KY-928-Q was provided by PFS:

1. The lot consisted of production fuel rejects which required chemical dissolving of the aluminum component before recanning. They are commonly referred to as recovered core lots.
2. The visual examination test for surface imperfections (striations and cracks) of uranium cores revealed a reject rate of 1.1 percent (43 pieces) for lot KY-928-Q.
3. Examination of the canning history for recovered core lots over the last six months disclosed an average reject rate of 1.67 percent for surface imperfections. The reject rate distribution ranged from 3.37 to 0.18 percent and the lot size varied from 597 to 3900 pieces.
4. The total bond count and weld reject rates for lot KY-928-Q were not considered to be significantly different than the reject rates for other recovered core lots.
5. Surface imperfection reject rates for virgin cores (not recycled) are about two to three elements out of 7000.
6. It was the opinion of E. A. Weakley in PFS that the large difference in reject rates between virgin and recovered cores is not significant. His experience indicates the imperfections actually exist in the virgin cores but are very difficult to detect due to the machined surface of the elements. However, the surface imperfections become exposed after the virgin cores have been through the aluminum component stripping process.

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7. The lot was one of many processed in an effort to cut down on inventory before contract turnover between GE and DUN. While this effort may have some bearing on how stringently the 100 percent surface imperfection test was adhered to, it is difficult to assess.
8. Twenty-two percent of lot KY-928-Q were cores recovered from failure-prone lot KY-796-Q. This lot incurred a fuel failure caused from a fuel fabrication defect.

Based on the information received from PFS, no immediate action was taken with regard to failure-prone classification or low goaling of lot KY-928-Q.

A summary of fuel failures since January 1, 1962 which were classified as uranium core cleavage induced is shown below:

<u>Tube</u> <u>Number</u>	<u>Date</u> <u>Failed</u>	<u>Lot</u> <u>Number</u>	<u>Type</u> <u>Material</u>	<u>Remarks</u>
2371-D	1-30-62	VZ-032-D	I&E NB	Dingot core - No radiomet examination
3775-D	2-18-62	CZ-806-E	I&E NB	Ingot core - Radiomet report did not disclose cause of split core
3062-C	4-16-62	IP-381-A	Overbore	Three failures in tube - Radiomet reported cores were split - did not disclose cause
3162-C	8-29-62	IP-381-A	Overbore	No radiomet examination
2969-C	9-6-62	IP-381-A	Overbore	No radiomet examination
2473-DR	1-30-63	Unknown	I&E NB	Mixer piece failed - no radiomet examination
3584-C	2-10-63	CF-812-D	I&E NS	Radiomet unable to determine cause of core splits
0678-H	3-31-63	KY-889-E	I&E EB	Recovered core lot - Radiomet unable to find defect in cladding or closures to explain core split
3977-KE	8-5-63	CF-014-B	I&E N	Radiomet examination revealed porosity of AlSi bond and corrosion caused penetration of cladding and subsequent splitting of core
3289-D	2-11-66	KY-928-Q	I&E EB	Recovered core lot - no immediate radiomet examination scheduled

L. J. Newell, Process Analysis

LJN:bmr

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9 / 28 / 94

END