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HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

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2 pages,

October 16, 1958

J. F. Music, Manager
Process Technology Operation

RECOMMENDATION FOR FUEL ELEMENT CHANGE - C REACTOR

It is recommended that the following described I & E fuel element pair be evaluated for rupture rate improvement, and if significantly improved, recommended for C Reactor usage.

	<u>Natural (CIIIN)</u>	<u>Enriched (CIIIE)</u>
Canned O.D.	1.445 in.	1.440 in.
I.D.	0.355	0.360
Length	8.965	6.640
Core O.D.	1.357	1.356
I.D.	0.461	0.466
Length	8.325	6.000

This geometry of element has been calculated to permit operation at the following approximate Bulk Outlet Temperatures if the reactor is operating at a total flow of 100,000 gpm, ETC of 1590, and EFT of 1870.

<u>Inlet Temperature</u>	<u>Bulk (Approximate)</u>	<u>Tube Power</u>	<u>File Level</u>
0°C	89°C	1470 KW	2530 MW
10°C	92	1360	2160
20°C	95	1235	1960

and should be limited by uniform corrosion rates in the interior coolant passage; provided other considerations do not restrict levels below that point.

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By Authority of C. A. PR-2,

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By J. M. Mally, 4-21-94.

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Listed below are the predicted operating characteristics for the CIII elements:

	<u>CIIIN</u>	<u>CIIIE</u>
R_{Top}	1.21	1.15
R_{Hole}	1.07	1.07
$F_{annulus}$	0.735	.735
Q_{Hole}	0.715	.715

where: R = top annular temperature balance

F = Flow ratio

Q = Heat ratio

It has been estimated that a total flow increase of approximately 4% should occur as a result of this change. Reactor Physics Operation has estimated that a full reactor loading of CIII elements should be approximately 300 ih less reactive than a solid fuel loading; which is approximately the same as the current CII loading.

The following assumptions were made regarding column loading with the CIII elements and are recommended for initial charging.

- a) CIIIN - Charged as full length (32 pieces) columns down to a corrosion index of approximately 10. In tubes with less than 10 mils removed the charge is to be progressively shortened enough to prevent top annular temperatures from limiting.
- b) CIIIE - Charged as 38 piece columns centered in the reactor in tubes with corrosion index greater than 10.

Verification of the predicted operating characteristics is to proceed on a laboratory and production test basis; however confidence in the calculational methods is sufficient to justify initiation of the fuel element design change. Prior to actual component order placement data from the preliminary tests should be available, and will form the basis for this change. It is anticipated that these data will be available about January 1, 1959. Approximately a ten months supply of CIIIN components is currently on hand.

R. L. Dickeman
Manager, Process and Reactor Development

RL Dickeman:REH:bs

DATE

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END