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2 Pages

1. KD Coughren
2. DL Condotta
3. GE Wade
4. GF Bailey
5. Record Center
6. 300 Files

Classification Cancelled and Changed To

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November 12, 1962

By Authority of CG-PR-2

D.S. Lewis, 3-15-94

By Jerri Males, 4-4-94

Verified By J.E. Saurby, 4-15-94

K. D. Coughren
Reactor Design
Facilities Engineering
IRRADIATION PROCESSING DEPARTMENT

PHYSICS CONSIDERATIONS OF K REACTOR CHANNEL STRAIGHTENING

The effects of the high graphite temperatures associated with the change in channel geometry can be expected to have a significant effect upon production and product specification data in extreme cases. However, the effect is expected to be sufficiently masked by the preponderance of unmodified and slightly modified channels to cause only a slight total effect. Table 1 is a summary of pertinent physics data. This data is based upon graphite removal patterns supplied by K. D. Coughren, temperatures supplied by J. D. Agar, a natural uranium goal exposure of 700 MWD/T and a power level of 5000 MW. The major effect of the power level is manifested in the graphite temperatures, with only second-order effects in the production data. Three sub-cases in each of four cases was analyzed. The four cases considered were as follows:

- Case 1 - Maximum removal of graphite at one spot.
- Case 2 - Tube average for maximum graphite removal at every location.
- Case 3 - Average for top half of reactor. This includes essentially all the modified channels.
- Case 4 - Reactor average.

The three sub-cases considered the possible range of graphite temperatures. Thus, calculations for maximum, average, and minimum graphite temperatures were included.

It is evident from the table that the proposed changes will have only a very small effect upon the production of the K Reactors, and that likewise the goal exposure, which is dependent upon product specification, will also change only slightly.

J.F. Saurby
Reactor Design Analysis
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TABLE 1

SUMMARY OF PERTINENT PHYSICS DATA FOR NATURAL URANIUM

<u>Case</u>	<u>Temperature</u>	<u>Conversion Ratio</u>	<u>% Pu²⁴⁰</u>	<u>U²³⁵ Depletion GM/Ton</u>	<u>Pu Buildup GM/Ton</u>
Present*	Average	0.938	5.9	728	656
Reactor (4)	Maximum	0.935	6.1	726	654
	Average	0.936	6.0	727	655
	Minimum	0.937	6.0	727	655
Top (3)	Maximum	0.933	6.4	724	652
	Average	0.935	6.2	726	654
	Minimum	0.937	6.1	727	655
Tube (2)	Maximum	0.927	6.8	720	649
	Average	0.933	6.4	724	654
	Minimum	0.935	6.2	726	654
Spot (1)	Maximum	0.916	7.7	713	640
	Average	0.929	6.8	720	650
	Minimum	0.935	6.4	724	655

*"Present" case assumes a zirconium tube.

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