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DESIGNABLE GOAL EXPOSURE PLANS FOR PRODUCTION TYPE FUEL ELEMENTS

AUTHOR

R. R. Bloomstrand

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HW-65971

July 6, 1960

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July 6, 1960

T. Prudich, Manager
Production Forecasting & Scheduling
Manufacturing Section

VARIABLE GOAL EXPOSURE PLANS
FOR PRODUCTION TYPE FUEL ELEMENTS

- Ref: (1) HW-62597, Bloomstrand, RR, "Variable Goal Exposure Plans for C-II-N, C-II-E, K-III-N, K-III-E, O-II-N, and O-II-E Material," 4/21/60, (Secret).
- (2) HW-61579, Music, JF, et al, "Reactor Process Optimization," 8/17/59, (Secret-Red Label).
- (3) HW-64754, Turner, RL and CF Poor, "Process Optimization 709 Program," 4/6/60, (Secret).
- (4) HW-61879, Turner, RL, "Maximizing Net Return at Limited Throughput," 10/7/59, (Secret-Red Label).
- (5) HW-65550, Bloomstrand, RR, "Use of Control Charts for Analysis of Plant Rupture Experience," 6/9/60, (Secret).
- (6) HW-60443, Bloomstrand, RR, "Summary of Recommended Variable Goal Exposure Plans for C-II-N, C-II-E, K-II-N, K-II-E, K-III-N, K-III-E, O-II-N, and O-III-E Material," 8/5/59, (Secret).

Introduction

The purpose of this memorandum is to transmit revisions to the goal exposure plans of reference (1). The plans, herein, supersede the previous recommendations. Similar to the plans of reference (1), the exposures calculated from these plans are designed to maximize plant return on the basis that the only restraint on metal usage is that imposed by the economics of the plutonium production process and associated uranium cycle, as described and defined in references (2) and (3). When metal throughput is limited by ex-reactor physical capabilities to a level lower than the unrestrained requirements, exposures higher than those recommended in this document would be indicated, as explained in reference (4). In essence then, these plans represent minimum economical exposures for current production fuel types, on the basis of attempting to maximize plant returns. The adjustments recommended herein, stem solely from revised estimates of the metal performance level indices (Gr values) of the various metal types.

Discussion

Using the control chart method discussed in reference (5), the performance levels of O-II-N and K-III-N materials have improved, and an upward revision of 15 units to the k constants for these types is in order.

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Studies of the performance levels of enriched material indicated that the current plans for C-II-E and O-II-E material need not be revised, at this time. For K-III-E material, however, an upward revision to the k constant is in order. While the performance level of K-III-E material is not very precisely known (only two ruptures have been incurred in nearly one year's irradiation experience) a conservatively high estimate of the metal performance level index (C_R value) based on this experience indicates that an increase in the k constant of 100 units is warranted.

Constants for the variable goal equation as defined in reference (6) are in Table I attached. Values for all production type fuel elements (including those where no changes have been made) are included.

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TABLE I
CONSTANTS FOR VARIABLE GOAL EQUATIONS

Type Metal & Loading	a	b	c	k	Range of Applicable Conditions			Maximum Exposure
					P	F	T	
38 pieces K-III-N 1.460 x .385	-5.2	+8.4	-1075	+1458	Up to 1.5	Up to 64	Up to 23	860
46 pieces K-III-E 1.454 x .400	-8.4	+12.0	-1803	+2222	Up to 1.5	Up to 70	Up to 23	1500
32 pieces C-II-N 1.460 x .375	-7.2	+14.5	-1483	+1430	Up to 1.25	Up to 55	Up to 23	850
34 pieces C-II-E 1.454 x .375	-9.4	+14.2	-1869	+2052	Up to 1.25	Up to 59	Up to 23	1500
32 or 34 pieces O-L-N 1.445 x .310	-5.5	+11.0	-1220	+1415	Up to 1.25	Up to 50	Up to 23	850
34 pieces O-II-E 1.440 x .310	-8.2	+17.0	-2180	+2250	Up to 1.25	Up to 55	Up to 23	1700

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