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June 28, 1951

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FROM: J. M. Frame and R. E. Tomlinson

JUL 30 1956

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300 AREA

CAPACITY SURVEY - SEPARATIONS DIVISION FILES

Introduction:

Recent tentative production forecasts indicate that as much as 96.6 Kg plutonium, associated with 190 tons uranium, may be produced each month. The ability of the Separations facilities to process these materials is herein summarized.

The fiscal 1952-53 budget includes many items which allow an increased capacity of the Separations facilities. These items include:

- 1) additional equipment at 200 N,
- 2) increased chemical storage in B and T areas,
- 3) increased capacity of 202-S, and
- 4) additional capacity of 231.

It is assumed that these changes are made as a requisite to the capacities noted in this report.

Summary and Conclusions:

The Redox Production Plant capacity has been reasonably predicted at about 112 tons uranium per month; this rate assumes only that critical mass control is achieved by the limitation of the possible volume accumulation at any point, and that the product concentration (PR cage) step has been modified to permit the greater capacity. At 600 MWD/T (522 g/t) then, the 112 tons uranium per month capacity limits the plutonium output of the plant to 58.5 Kg per month at 80% operating efficiency. The remaining 38 Kg plutonium per month may be processed in the B and T BiPO₄ plants at an operating efficiency of 89.5%; if this operating efficiency cannot be realized, the postulated production rate may be met by either an increased Redox efficiency or by accepting an increased plutonium waste loss of 1% on some portion of the BiPO₄ production.

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All other 200 area facilities have sufficient capacity to handle the projected production.

Discussion:

200 N

Budgeted items for the modification of 200 N area facilities include the reinforcement of the monorail system and the provision of additional yokes and trolleys. It is believed that these items, combined with the modifications budgeted for the 100 area slug handling facilities, will permit the temporary storage of the postulated uranium quantities for a sixty day cooling period.

B & T Areas

The "S" Division rates the combined "B" and "T" area capacity at 144 runs (42.5 Kg plutonium) per month when processing 600 MWD/T material at 100% operating efficiency. This capacity may be extended to 206 runs (60.7 Kg plutonium) per month if an increased waste loss of 1% plutonium is permitted.

Additional chemical storage is required at each plant to meet the two month minimum inventory established as a plant policy. These items are included in the 1952-53 budget.

202 S

The capacity of the Redox Production Plant, 202 S, has been the subject of considerable study. (1) (2) (3). The consensus of these studies is summarized in the following table. The bases of this table are identical with the latest evaluation by the Technical Divisions, (3), except that a continuous product concentration in the PR cage is assumed rather than the construction of a new, parallel PR cage. All of the changes of packing size called for in HW-20958 are being made except the 1B, 1S, 2D and 3D columns.

TABLE I

REDOX PRODUCTION CAPACITY
Assumed operating efficiency: 80%

Design Condition	Critical Mass Control	g/t level	Capacity/Mo TU	Kg Pu	Capacity limiting equipment
Present	Dilution	< 376 > 376	112	36-42	See note (a) PR cage; 2A, 2B
	(b) Volume	< 435 > 435	112	50	See note (a) PR cage
			See Figure I		
			See Figure II		
Revised PR cage	Dilution	< 376 > 376	112	42	See note (a) 2A, 2B
(Continuous Concentration)	(b) Volume	any > 300	112	100 (c)	See note (a) PR cage

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- (a) In the operating range of 112 to 127 tons uranium per month, the condensate evaporator and extraction columns 1A, 1B, 2A and 2B each become limiting. The heat transfer capacity of numerous heat exchangers becomes questionable.
- (b) This condition assumes that tanks 2AF, 3AF, 3BF Receiver & 3BP sampler are replaced with units of proper size for critical mass control at the g/t level being processed. When the revised PR cage is installed, the concentrator feed tanks must be included in this group.
- (c) This capacity is believed to be limited by PR can movements, assuming the 3BP may be removed from the canyon on the strength of ionization chamber readings or other quick analytical means.

It will be noted that under the conditions of critical mass control by tank volume and continuous concentration of plutonium in the PR cage, the capacity of the plant for plutonium is effectively limited only by its ability to process the uranium with which it is associated; in other words, the plutonium output of the plant is directly proportional to the g/t level of the slugs being processed with the uranium capacity remaining a constant factor in this determination.

In the range of 112 to 127 tons uranium per month, the capacity limiting factors which have been recognized are noted in Table I. However, in this approximate operating range, the heat transfer capacity of numerous heat exchangers becomes questionable. More precise information as to exchanger capacities must be determined by plant operation.

231

Budgeted items for the modification of the 231 building facilities include the conversion of cell 1 to a standard cell, and the conversion of cell 5 to a waste handling facility. These modifications will permit the 231 facilities to process plutonium at the projected rates.

234-5

The completion of the current projects in 234-5 will assure the projected capacity, provided the accumulation of material for rework is processed at a much reduced rate.

References:

- 1) HDC-1956, "Evaluation of Potential Capacity of Redox Production Plant - 202 S", R. E. Tomlinson, November 29, 1950.
- 2) HW-20222, "Increase in Redox Capacity, Part I - Increase in Column Packing Size", R. B. Richards, February 6, 1951.
- 3) HW-20958, "Increase in Redox Capacity (Part II - Additional PR Cage)", F. W. Woodfield, et al, May 3, 1951.

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Figure I & II. Capacity of Redox Plant as Currently Scoped.

Figure I. Critical Mass Control by ANH Dilution

Figure II. Critical Mass Control by Tank Volume

(1) (3) Curves based on reference documents as noted.

Note: Whenever the plant capacity is limited by the PR cage, some additional capacity (perhaps 5 to 10 Kg plutonium per month) may be realized if the final batch volume is allowed to increase to the capacity of the PR can.

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