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215 MWD/TON BATCH SIZE LIMITS AND CONTROL IN THE
BISMUTH PHOSPHATE PLANT

Determination of Batch Size Limit

With the inauguration of the 215 MWD/Ton program in the Bismuth Phosphate Plant a batch size limit of 300 units or a maximum Pu T₀ of 2.15×10^{13} has been established for the 6-3 batch make-up tank by the Nuclear Safety Committee. This maximum batch size is specified in Document No. 31143, "Nuclear Safety for 200 MWD/Ton Pu", by G. M. Muller, dated 5-5-54.

Batch Size Limit Control

In order that normal process variations will not make it necessary to split charges, the size of the charge transferred to the 6-3 batch make-up tank has been established at 90% of the maximum batch size, i.e., 270 units or a Pu T₀ of 1.93×10^{13} . The americium-curium analysis will be considered in making up the maximum batch in 6-3 tank.

The maximum plutonium T₀ of 2.15×10^{13} units is considered the maximum plutonium in all subsequent process tanks. Starting with the 7-4 and 8-4 tanks the following limits have been established:

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May 24, 1954

<u>Sample Code</u>	<u>TC Limit x 10¹³</u>
6-3-MS or MR	2.15
7-4-P	2.26
8-4-P	2.26
12-7-F or 12-7-O	2.26
12-8-P or 12-8-O	2.26
14-4-F	2.44
17-4-P	2.44
19-4-P	2.44
D-1-O	2.31
F-10-P	2.44

It is the responsibility of the operating supervisor, or chief operator delegated, in the 221 and 224 Buildings to guard against exceeding the maximum product limits as noted above.

Batch Size Limits on 19-4-P, D-1-O and F-10-P Solutions

The maximum batch limits on the 19-4-P and F-10-P solutions are the same, namely 2.44×10^{13} TC, whereas the D-1-O limit is 2.31×10^{13} TC based on the criticality of the lanthanum fluoride product cake in E or B cells. For this reason the D-1-O should be tailored to the maximum batch limit of 2.31×10^{13} TC in D-1. This of necessity means that the D-1-O analysis should be known before moving from the D-3 product effluent tank to the E-1 or B-1 lanthanum fluoride precipitating tank. In case the D-1-O solution is over batch size a jet back can then be made from the D-3 to the D-1 tank for subsequent pick up by the following run.

In case the 19-4-P solution is over batch size (2.44×10^{13} TC) the run should be adjusted in the A-3 product effluent tank. Leaving the heel in the A-3 tank rather than the C-4 oxidation tank is preferable because of the larger volume of solution and subsequently more accurate control of the product heel left behind in the A-3 tank. The A-3 tank is also preferred in that in case of a high by-product waste the A-3 product effluent would not be significantly under batch size.

Recycle Storage Tank Batch Control Limits

Under the 215 MWD/Ton program the E-4 and B-6 recycle storage tank batch size limits have been revised as follows:

<u>Recycle Tank</u>	<u>Maximum TC x 10¹³</u>	<u>Maximum Pu Grams</u>
E-4	3.46	482
B-6 (When D-1 Tank is Empty)	2.31	322
B-6 (When adding to Runs in D-1 Tank)	1.73	241

* Based on the intent of Document HW-30224. In actual practice the recycle additions to the E-4 tank are calculated to obtain a maximum of 2.80×10^{13} T.C. in the tank.

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Under present processing conditions transfers from the E-4 recycle storage tank can only go to the B-6 recycle tank, and then from the B-6 tank to the D-1 lanthanum fluoride by-product precipitator tank.

The presence of two maximum batch limits on the B-6 tank is based on the possibility of accidentally adding all the recycle from the B-6 tank to a full run in the D-1 precipitator tank. When recycle solution is being added to a Run in the D-1 tank, the D-6 tank must not contain more than 1.73×10^{13} TC (241 units). However, to maintain operational flexibility in the make up of Master Recycle Runs, a second product limit has been established for adding recycle solution to an empty D-1 tank. In this case the B-6 recycle tank may contain and transfer a maximum of 2.31×10^{13} TC (322 units).

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