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To: P. E. Collins
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RM Line Equipment Problems Associated With A
Proposed Increase In Batch Size

The effect made on the RM Line equipment by an increase in the plant batch size from ca. 300 grams to ca. 375 grams has been studied. Using the process as determined by Production Test 234-3, the volumes for a 300 gram batch were measured to be as shown in Column 1 of the table. Scaled up to 375 grams, the batch volumes would be as listed in Column 2. The difficulties encountered with 375 gram batches are discussed below.

Table I

Material	1 (300 gram)	2 (375 gram)
Volume of plutonium peroxide (alcohol washed, filtered)	1275 cc.	1593 cc.
Volume of plutonium tetrafluoride (as produced)	617.7 cc.	772 cc.
Volume of reduction charge (tamped)	511 cc.	638 cc.

1. RM Boat Volume

The volume of the RM Line Task II boat is approximately 1600 cc. as calculated from the drawing (See Fig. 1 attached). This is too small to accommodate the volumes of plutonium peroxide that would result from a 375 gram batch (1593 cc. calculated), if batch variation continues to be as large in the future as it has in the past. Also there should be from 1/4 to 1/2 inch freeboard in the boat.

It is desirable to increase the plant batch size, the costly and time consuming task of reworking the platinum lined boats should be included in the overall feasibility study.

2. 231 Building Filter Assembly

The filter assembly which is to be installed in the 231 Building for loading Task II boats has a flat cover that clamps down on top of the boat. Inside the cover,

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and extending $3/4$ inch down into the boat, is a spray line - a small pipe formed into an oval ring. This pipe subtracts from the boat volume and reduces the quantity of material that can be contained in the boat to $1/2$ to $3/4$ of the theoretical boat volume.

We are recommending to the "S" Division that the lid design be changed so that the spray line does not extend into the boat. This should be done even if the batch size is not increased to facilitate handling the present size run. In redesigning this lid, it should be checked that no interference is encountered with other hood equipment when the lid is raised.

3. Reduction Crucible Volume

The reduction crucible will hold 655 cc. (9" depth) but it is recommended that it not be filled beyond 580 cc. (8" depth), leaving 1 inch freeboard. The reduction charge volume of the proposed batch size would exceed this loading (638 cc vs. 580 cc. or $8-3/4$ " vs. 8" depth) even if no turnings were added to the charge. Recycle will increase the reduction charge volume a minimum of 100 cc., and probably more depending on the amount of packing void.

It may be concluded that in order to process 375 gram lots a larger crucible will be required. There are only two crucibles made that are used for reductions: The S-1 which is presently used; and the A-331, a thin-walled slip-cast crucible. These two crucibles have the same volume and outside diameter. The thin wall crucible has a larger inside diameter but is shorter than the S-1 crucible.

If all other limiting problems are solved, work could then be initiated in the 234-5 Building Crucible Shop to develop a slip-type crucible to fit the equipment and of adequate size to handle the desired volume.

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Figure I

RM Boat Volume Calculation

Ref: H-2-22806

Volume A

$$A = 2.1250 \times 10.625 \times 1.875 =$$

42.334 cu.in.

Volume 2B

$$2B = 10.625 \times 2.09375 \times 1.875 =$$

41.711 cu.in.

Volume 2C

$$2C = 2.125 \times 1.53125 \times 1.875 =$$

6.101 cu.in.

Volume 4D

$$4D = \frac{4.1875 \times 3.0625 \times 1.875}{3} =$$

8.015 cu.in.

Total Volume

98.161 cu.in.

$$\text{Total Volume} = 98.161 \times 16.3872 =$$

1608.56 c.c.

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