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MEMORANDUM TO FILE

FROM: W. B. WATKINS WBW.

COATING OF 221F DISSOLVER OFF GAS REACTOR PACKING WITH SILVER NITRATE

References:
(1) Halpin, T. A., to D. A. Miller-R. R. Messick, letter, "Hanford Procedure for Coating Berl Saddles for Silver Reactor", 2/16/54.
(2) Watkins, W. B. to R. G. Barnes, Hanford Works, Telephone Conversation, 3/8/54.
(3) Rion, W. C. to J. L. Myers (Construction Div.) letter, 3/2/54, transmitted by W. B. Watkins, Memorandum 3/5/54.
(4) Specification 221-341.86-S1 (prepared by Blaw-Knox)
(5) Messick, R. R. to J. H. Hershey, letter, "Coating of Berl Saddles", 3/9/54.

INTRODUCTION

This memorandum describes the procedure used by Construction Division in coating the berl saddles for the F Area iodine reactors and reports pertinent data obtained during the coating operation. The procedure employed by Construction is outlined in references 3, 4, and 5, and was compiled from experience gained at Hanford and ORNL.

SUMMARY

A total of 130 cubic feet of berl saddles have been satisfactorily coated with silver nitrate by Construction Division. This quantity of saddles represents the packing for both F Area iodine reactors and one spare unit (extra machinery). All of the dried, finished saddles were inspected and found entirely acceptable. No significant discoloration was noted. Random tests of the finished saddles with salt solution indicated thorough coating.

Data indicated that the weight gain of the saddles on coating was about 3.1 lbs/cu. ft. The finished saddles have been stored in light proof, air tight containers awaiting charging to the reactors.

Approximately 130 cubic feet of saddles for the H Area and extra machinery reactor remain to be treated. No decision has been reached as to when the coating should be completed.

It is understood that the coating equipment used by Construction Division will ultimately be acquired by Operations for future use in preparation of iodine reactor packing.

DISCUSSION

A. Equipment and Solution Preparation

The equipment used in coating the saddles consisted of:

(1) Stainless steel dipping tank, 18 inches in diameter and approximately 30 inches high, equipped with "pancake" type steam coil and temperature indicator.

(2) Four stainless steel baskets designed to fit into the dip tank. Each basket would hold about 3 cu. ft. of saddles if filled to capacity.

(3) Four stainless drain tanks equal in size to the dip tank. These tanks were equipped with handles for mobility and were used for draining the freshly dipped saddles.

(4) Four stainless steel drying trays, approximately 8 ft. long, 3 ft. wide and 9 inches deep. Each tray would conveniently hold about 20 cu. ft. of treated saddles.

(5) A steam heated oven (pipe annealing oven) for drying the saddles at 200°F.

(6) A hand-operated shaker screen for removing dirt and trash from the untreated saddles.

The 20 molal solution to be used in coating the saddles was prepared by adding 3.4 lbs. of $AgNO_3$ per pound of water used. Volume increase on addition of the $AgNO_3$ to water was found to be 77%. Specific gravity of the final solution at 180°F was 2.2, which confirms the value established in the literature. No difficulty was encountered in getting the crystalline $AgNO_3$ into solution.

TREATING OF SADDLES

Treatment of saddles included dipping, draining, dumping into drying pan, drying, and packaging. One cubic foot of saddles constituted a convenient quantity in the dipping and draining operation and approximately 20 cu. feet constituted a batch for drying. The saddles were dipped for three minutes, drained for three minutes and dried for a minimum of 6 hours at 200°F. The temperature of the dipping bath ranged from 180 to 200° F during the coating operation. Since no means of concentration control was used during the operation, some over-concentration of $AgNO_3$ batch occurred due to evaporation. While the over concentration did not appear to influence the finished product, over-concentration should be avoided in the future by the use of a hydrometer. Considerable trash and dirt was found in the saddles, but a shaker screen was devised and built to remove the major portion of the foreign matter. No dirt

was found on the finished saddles. Loss of silver nitrate solution during the coating operation was negligible.

DRYING AND STORAGE OF COATED SADDLES

The dipped, drained saddles were dumped into open trays and dried in the Central Shops pipe annealing oven at 200°F for a minimum of 6 hours. The oven temperature was controlled at 200°F and maintained at this temperature by steam coils embedded in the oven walls. The furnace was not oil fired for fear that sulphurous fumes would ruin the coated saddles. No significant change in color was noted in the color of the saddles on drying. A very slight pink tinge was noted on the top saddles of several charges but the change did not appear of importance.

After the saddles were dried they were removed from the furnace and packaged. Packaging consisted of carefully shoveling the saddles into canvas bags, sealing the canvas bags in polythene bags, and then storing a number of polythene units in sealed fiber drums. This procedure provided air tight, light proof storage for the saddles until a convenient time for charging to the reactors. The saddles are to be charged to the iodine reactors from the canvas bags.

SAFETY

Considerable precaution was taken by Construction to avoid personnel burns from silver nitrate solution or inhalation of silver nitrate dust. The precautionary measures used in handling the solution included:

(1) Complete protective clothing - face shield, gloves, coveralls, overshoes and caps.

(2) A NaCl solution for rinsing skin affected by $AgNO_3$ solution. The salt solution prevented burns from sustained contact with $AgNO_3$.

(3) Blotter paper on all floor space around the coating operation to absorb drippage and spills.

In addition to the above precautions, cannister type air masks were required and worn when handling dry $AgNO_3$ (solution preparation and dried, treated saddles).

MISCELLANEOUS

Weight Gain of Saddles on Treating

A random sample of untreated saddles (air dry) was selected, dipped, drained, and dried by the same procedure used for treating all saddles. The sample exhibited a weight gain of 3.1 lb/cu ft. of saddles. Weight gain based on total saddles dipped (130 cu. ft.)

and total $AgNO_3$ consumed (400 lbs.) averaged 3.1 lb/cu. ft.

DETERMINATION OF VOID VOLUME OF BERL SADDLES

Two cubic feet of 1/2 inch berl saddles were submerged in water and the actual volume of the saddles determined from total volume change. The results indicated that the true or occupied volume of the saddles was 30% of the superficial volume.

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LCP