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April 17, 1947

HANFORD ENGINEER WORKS
TECHNICAL PROGRESS LETTER NO. 145

April 6 through April 12

FILE TECHNOLOGY - C. W. J. WENDE

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Experimental exposure of expanded graphite in the piles in an oxygen atmosphere has produced significant changes in properties. Roughly one-third of the expansion was recovered after an exposure of 102 MD/AT in a pure oxygen atmosphere, and partial annealing of the thermal and electrical resistance changes was also observed. Control samples which had received no previous exposure showed no dimensional change but did show increases in thermal and electrical resistivity. Control samples also showed no stored energy which was releasable up to 500°C., while a sample with a previous exposure of 1182 MD/AT released stored energy at 325°C. In the absence of oxygen this latter result would indicate that the temperature of exposure was not over 250°C.

Analysis of the startup data of the D Pile after the shutdown of April 6 showed that the new No. 2 Rod may be roughly 15% more effective than the old rod.

A coefficient test at the D Pile on April 1 confirmed the previously reported flattening of the "A" Rod calibration curve in the region between 18 and 75 inches out, in general agreement with the flattening observed in the "A" Rod of the F Pile.

A coefficient test at the F Pile on April 2 gave the following average results: $C_m = -0.20$ ih/MW; $C_g = 0.66$ ih/MW; $C_o = 0.46$ ih/MW, and relaxation period = 83 minutes. The overall coefficient, C_o , is larger than the value of 0.40 ih/MW obtained in December 1946, but follows previously indicated trends within the limits of accuracy of the test. The increase in the relaxation period is difficult to explain because it should represent a decrease in thermal conductivity which would also produce an increase in the operating temperature of the graphite. No such increase in graphite temperature has been observed.

The regular monthly foil test at the B Pile indicated a thermal ng of 105.4 and 105.2 neutrons/cm² sec. This indicates no change in reactivity.

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ENGINEERING - W. K. Woods

Difficulty was encountered with the discharge of Tubes 3396-D and 1252-F on April 6. Both of these tubes were normal production tubes which were located in the smallest (0.140-inch) orifice zone and were being discharged for the first time. Examination of the pieces from Tube 3396-D disclosed 3 unblistered, 29 slightly blistered, 1 moderately blistered, and 1 extensively blistered slug. The extensively blistered slug had large swollen areas in the central region between the ends, had a pronounced bond in the vicinity of these areas, and was quite severely scratched on one side. This scratched region, which had apparently been in contact with the tube during operation, was dark in color, indicative of a high metal surface temperature. The moderately blistered piece showed enough warp so that it could possibly have caused some binding, and one of the slightly blistered pieces showed some warp. The contents of Tube 1252-F included 6 unblistered pieces, 25 slightly blistered pieces, and one piece which was only moderately blistered on the surface but which had a uniform warp over its entire length. This piece was so severely scratched over such a wide area that surface discoloration was not evident.

Five production slugs, characterized by low reactivity and loaded uniformly along the length of a normal production tube, were unblistered in two cases and slightly blistered in three cases. Comparable results were obtained from ten high density production slugs loaded in two tubes.

On April 6 two tubes were charged with 4-inch slugs of "A" diameter (Production Test 105-75-P, Supplement A) and three tubes were charged with slugs which had been annealed after canning (Production Test 105-95-P).

A thermocouple assembly which essentially duplicates the assembly in Tube 1367-F was loaded into Tube 2679-F on April 6. The power outputs of these two tubes are very nearly equal and the temperatures of the two thermocouples agree to within 3°C, the newer couple reading a little low. This confirms the observation that slug temperatures are considerably lower than anticipated but no explanation of the phenomenon has been obtained. Experiments utilizing the thermal wave principle indicate that there is no significant difference in the thermal conductivity of uranium samples cut parallel and transverse to the axis of the slug.

Measurements on April 6 indicated that the vertical clearance between the graphite track and the top of the No. 2 Thimble of the D Pile was within 0.03 inches, the same as the vertical clearance of the B Thimble in the D Pile. Work is continuing on the cause of operating difficulty with the No. 6 Thimble of the F Pile. On April 6 a light was inserted 25 feet into the thimble and the thimble was examined with a telescope. No irregularities in the track were noted.

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