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By Authority of CG-PR-2

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By PM Eck 5-5-94

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18 Copies, Series 1

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June 7, 1946

100 AREAS

May 28 through June 3
(For Technical Progress Letter No. 100)



Physics

D File

The D File was operated at rated level except for a shutdown of about 21 hours on May 28. Special Request samples 9-1 and 13 were discharged from Tube 3574. This tube was charged with lead pieces to supplement the poison pattern. The poisoning effect of the lead column was expected to be two or three inhours less than for the charge containing the Special Requests. Observed effects are in agreement with this estimate.

Tube 2692 was charged with lead in preparation for borescoping on June 4. This tube was difficult to push when discharged on May 4 and was found to have contained a bowed piece.

Only 66 of the 79 tubes scheduled for discharge were discharged. Postponement of discharge of the remaining thirteen tubes was considered advisable because of limitations on the length of shutdown time imposed by the fact that number 9 horizontal rod is still inoperative.

F File

Except for a scheduled shutdown on May 29, the unit was operated throughout the week at 50 MW below rated level.

Before the shutdown, Rod A held 50 ih; after xenon had returned to saturation following the shutdown, it held 35 ih. No other rods were in the unit at either time. The known losses occurring during the shutdown are:

Loss due to metal discharge	2.3 ih
Loss due to discharging 3 peripheral tubes and filling 1 dry tube with water	2.4 ih
	<u>4.7 ih</u>

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This leaves approximately 10 ih of unexplained reactivity loss. The following items have been checked, all with negative results, in an effort to discover the source of this loss:

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- 1) Power level, as indicated by temperature of exit water in the process sewer and at the entrance to the retention basin; flow meters were also checked.
- 2) Purity of helium, especially moisture content.
- 3) Condition of cooling system in B Test Hole.
- 4) Level of solution in third safety tanks.
- 5) Test Pile results on special cast slugs charged into three tubes during shutdown.
- 6) Tube outlet temperatures of entire unit and especially those tubes which were discharged during the shutdown.

No unusual condition was discovered in the entire investigation. At the end of the report period, an investigation of the test pile results on the regular metal loaded during the shutdown is in progress.

Analysis of the coefficient test run on May 27 has revealed a discrepancy between rod motion after the power was restored to normal and the calculated xenon. The observed reactivity peak was sharper and occurred 6-1/2 hours sooner than the calculated peak. A change in rod calibration will not resolve this difficulty. The values of the coefficients, as obtained from the drop in power, are:

$$\begin{aligned}C_m &= -0.23 \text{ ih/MW} \\C_o &= 0.39 \\C_g &= 0.62 \\ \text{Period} &= 48 \text{ minutes}\end{aligned}$$

The return to normal level gave $C_m = -0.22 \text{ ih/MW}$. Values for the graphite coefficient and period could not be obtained from the latter half of the test because of the difficulty cited above.

General

Graphite which had received 1007 Mw-days/CT in the B Test Hole of the D Pile showed a thermal conductivity ratio $K_o/K = 35.5$ and an electrical resistivity ratio $R/R_o = 5.3$. These results indicate that both of these ratios are still increasing.

Chicago has reported an unexpectedly low value of stored energy in a 30-inch cylinder of graphite from the D test hole of the D Pile. To assist in selecting the most highly exposed pieces of such material, apparatus was assembled to make resistivity measurements on the remainder of the available cylinders.

Underwater radiation measurements on the samples of Requests 9-1 and 13, which had been discharged from the D Pile on May 28, indicated that on June 3 the hard gamma component of the radiation from the light metal oxide slugs produced an effective dosage rate of approximately 900 mr/hr at one foot with no shield; the mixed oxide slugs produced dosage rates of 160,000 to 300,000 mr/hr under the same conditions. The Request 13 slugs produced a dosage rate of approximately 200 mr/hr.

Water, Corrosion and Engineering

Process Water Control and Pressure Drop Studies

The iron content of the process water averaged 0.045, 0.009 and 0.020 ppm at B, D and F Areas, respectively. This value for D is the lowest it has been for several weeks, probably due to good coagulation of the water prior to filtration.

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Since May 20, half of the filter plant at D has operated with 30 ppm coagulant added while the other half of the plant has operated with 35 ppm coagulant. To date no significant difference has been noted in the quality of the water produced under these conditions.

The rates of pressure drop increase for D and F Areas were 0.0 and 0.26 lbs./sq.in.(day). These rates, particularly for D, are lower than they have been for the past few weeks due to the lower iron content in the process water.

Purging Studies

The D Pile was purged with 100 ppm of Super Gel for about one hour on May 28. The pressure drop reduction in the 0.240 inch orifice zone, based on Sample Room B data, was from 12.4 to 2.8 lbs./sq.in. There was no evidence of any cross-header screen plugging.

Corrosion

The downstream Van Stone flanges of Tubes 2474 and 2451, and the upstream flanges of Tubes 4674 and 0174 were examined at F on May 29. Both downstream flanges showed areas of localized etch or broad shallow pits. The largest of these was approximately 1/8 x 1/4 inch in area and about 0.01 inch deep. Corrosion products covered these areas. The upstream flange of 4674 was found to be in excellent condition while that of 0174 was pitted slightly. It appears that the corrosion of the downstream Van Stone flanges is becoming progressively worse and that these flanges are the portion of the process tubes which show the most corrosion.

Tubes 1178 and 1762 at D and Tubes 1379, 1564 and 1683 at F were charged with cast material on May 28 and May 29, respectively. These slugs will be examined when they have been discharged to note corrosion effects and blistering tendencies.

Graphite Expansion

Representatives of the Instrument and Technical Departments visited the Boeing Plant in Seattle on May 28 to discuss the use of strain gages.

Tubes 2451 and 2496 at D and F were traversed on May 29 and 30, using the transit and moving target to measure horizontal bowing. Tubes 0174 and 4674 at F were traversed for vertical bowing on May 30, using the water-filled equipment. In contrast to the situation at B and D it was found that the gun barrels of Tube 4674 at F sloped upward, largely eliminating the sharp curvature detected near the end of the gun barrels at the other areas. These tubes have been charged with lead dummies in preparation for future bowing measurements.

Beam formula indicate that the deflection of the gun barrels caused by the weight of the thermal shield blocks should not be more than about 1/64 inch. An unexplained sag of about 1/8 inch was frequently observed in gun barrels at B Area.

Additional work has been performed with the 1500 lb. jack on replaced tube 3671 at the B Pile. Further refinements of the slide type movement gages have been made and have improved the reproducibility of the data obtained.

Moving the aluminum tube and gun barrels back and forth as a unit, it was found that a 1500 lb. force was necessary to move it to the limit of travel in each direction. However, it was indicated that this limit of travel did not represent seating of the gunbarrels against the steel washer contacting the graphite,

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but rather, contact of the gunbarrel keys with the inside surface of the bellows flanges.

Jacking the front gunbarrel alone, disconnected from the aluminum tube, demonstrated a tendency to bind progressively tighter with repeated movement. After repeated jacking at successively higher forces, it now has become stuck in the seated position and cannot be withdrawn with a 1500 lb. force.

Additional test work to establish the causes and extent of this binding is being outlined.

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