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- #7 - N. Hilberry
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CA SAUMAN 7-12-41

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100 AREAS
April 16 through April 22

April 26, 1946

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COM 1 OF 1

Physics

B Pile

Analysis of the poison transient test, which was run after the shutdown of the B Pile, has continued. Curves have been fitted to the reactivity data which are free of temperature transients for the periods when the pile was operating at 150 MW and at 0.5 MW respectively. Extrapolation of these curves to zero time gives the following values of power coefficients and graphite period:

Power Level, MW	Power Coefficients, 1h/MW			Graphite Period, Min.
	C _G	C _M	C _O	
150	+0.65	-0.29	+0.36	59
0.5	+0.77	-0.37	+0.40	56

The curves were fitted to give good period data within the experimental error. The coefficients are larger than previously reported partly because the calibration of Rod A by periods gives it an effectiveness 1.18 times greater than that given by previous calibrations based upon the xenon equation.

The rod calibration curves which were obtained by period measurements and adjusted to yield a smooth time variation of reactivity show the following values of rod effectiveness:

Rods in	1h
A	67
A, 9	103.5
A, 9, 2	169
A, 9, 2, 7	235.5
A, 9, 2, 7, 6	265
A, 9, 2, 7, 6, 4	305.5
A, 9, 2, 7, 6, 4, 5	353.5
A, 9, 2, 7, 6, 4, 5, B	378.5

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One significant difficulty encountered in this analysis was the impossibility of fitting the whole reactivity curve of the operation at 0.5 MW with a combination

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of exponential terms involving accepted disintegration constants. The reactivity data approach 474 ih, while the equation which satisfies the early part of the curve approaches 570 ih. Evaluation of the small samarium effect is therefore difficult. No definite evidence for an effect due to illinium has been found.

D Pile

D Pile was operated at rated level except for a shutdown of about 16 hours on April 16, during which seventy-nine tubes of irradiated metal were discharged. Tight wires were installed in the inner rod room and at the 0' level on the far side of the pile.

During operation after the shutdown the level was cut back to 10 MW below rated level for 3-3/4 hours and 5 MW below rated level for 1/2 hour because of high graphite temperature in the region toward the front far side, and high tube temperatures in the top of the 0.175-inch orifice zone. Both of these conditions can be attributed to the substitution of Rod 8 for Rod 9 in the rod withdrawal and insertion order. This substitution was necessitated by the previously reported difficulty with Rod 9 thimble.

Present tube temperature data are compared in the following table with similar data for the week prior to the change in poison pattern on April 9.

	<u>Present</u>	<u>April 2-8</u>
Av. 10 hottest tubes 0.240 zone, °C	45.3	45.1
Av. inlet water temp., °C	8.7	7.7
Temperature rise, 10 hottest, °C	36.6	37.4
Av. flow in central tubes, gal./min.	20.4	20.3

Since the shutdown of April 9 the temperature of the graphite samples in B hole has risen from 54 to 59°C, probably due to a shift in the power distribution resulting from the poison pattern change of that shutdown.

F Pile

The unit was operated at 50 MW below rated level except for a scheduled shutdown on April 18. The installation of the revised carbon dioxide purging system for the horizontal rod thimbles was completed during the shutdown. Approximately 4000 cubic feet of carbon dioxide were used in the first 3-1/2 days of operation of this system. The rods were more active than normal since those days constituted a start-up period.

The installation of the gas supply system to "B" sample hole was also completed during the shutdown but a connection in the Purification Building must be changed before gas can be supplied to the hole.

Special Request Samples No. 8 and No. 15 were discharged from Tube 3378 and Samples No. 12B and No. 16-2 were loaded into the tube. This change of samples resulted in a gain of approximately 2 ih. This gain is presumably due to the removal of the strongly absorbing No. 15 samples. Tubes 3378 and 3282 now contain special loads which are equivalent in absorbing power to tubes containing all lead dummies. When these two tubes were loaded on April 2 they were found to take up 14 ih. The removal of the No. 15 samples and the attendant gain of 2 ih thus indicates an absorption of 12 ih for the two special columns or 6 ih each. This compares with the 5 ih expected according to present methods of computing P column strengths.

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The 2 ih gain was balanced by a similar loss due to the discharge of metal.

Net loss of reactivity during the week was 3 ih, 2ih due to the push and 1 ih occurring as a decline of reactivity after start-up.

General Physics

The following describes the reactivity status of the operating piles at the end of the week:

<u>Reactivity Absorbed by</u>	<u>Reactivity, ih</u>	
	<u>D</u>	<u>F</u>
Xenon	497	434
Permanent poison columns	299	313
Bismuth	16	16
Rods	49	46
CoW	-70	-66
Special columns		12
Reactivity of cold, clean pile	<u>791</u>	<u>755</u>

The pneumatic test has now been applied to all vertical thimbles at all areas. Definite evidence of a thimble leak was observed only on the No. 27 thimble at B, which has been replaced as reported previously. The test was unsatisfactory because of leaks at the rod guide or for similar reasons on five thimbles at the B Pile, three at D, and four at F. Improvement of the means for sealing off these extraneous leaks is continuing.

The decay of the slugs pertaining to Requests Nos. 8 and 15 is being followed to provide data for the construction of shipping containers. A container was constructed for the slug of Request No. 18. All of these materials are scheduled for shipment on May 2.

Over the past three weeks, a steady decrease in the 2.6-hour manganese component of the water activity at the F Pile has occurred, so that the activity is now comparable to that observed at the D Pile. This decrease was masked to some extent by the drop in power level and the restoration to service of both sides of the retention basin.

Water, Corrosion and Engineering

Process Water Control and Pressure Drop Studies

The iron content in the process water averaged 0.021, 0.012 and 0.011 ppm at B, D and F Areas, respectively. This value at B, while higher than normal, is the lowest it has been since the water flow rate was reduced several weeks ago.

The rates of pressure drop increase for D and F Areas were 0.44 and 0.10 lbs./ (sq.in.)(day), respectively.

Purging Studies

The F Pile was purged with 100 ppm Super Cel for about one hour on April 18. The pressure drop in the pressure drop tubes was reduced from 10.7 to 0.1 lbs./sq.in. as a result of the purge.

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Removal of Process Tube B-3671

Tube No. 3671 was removed from B Pile on April 15. This tube was gouged by a warped slug during the discharge of December 24, 1945. It was then filled with lead slugs and the standard water flow continued until this more convenient time for replacement. Before removal the lead slugs were discharged and the tube left empty while tests were made with the pneumatic tube jack for gunbarrel clearance. It was found that a minimum force of 750 lbs. was required to move the tube and gunbarrels to the limit of the gunbarrel clearance. Some binding action was found at higher forces in that 1100 lbs. push and pull would not move the tube to the limit of its clearance. This caused doubt that the tube could be pushed out of the unit from the front face by hand but no difficulty was experienced in pushing the tube.

The nozzle flanges of both front and rear gunbarrels were supported by bolts fastened in the flanges which are welded to the tie straps. The front Van Stone joint was cut off with the standard tool, then the tube was pulled out about 6 inches from the rear face with a small screw operated tube puller. The force used was roughly estimated at 250 lbs. The remotely operated flame type tube cutter which was to be used for the first time was then fastened in place on the rear face. A short plug was fitted into the front end of the tube to which sections of 1/2 inch pipe were attached. The tube was pushed by three men from the front face. For the first two feet it was necessary to tap the tube, moving it 1 or 2 inches each time. After this it would be pushed directly using a force of less than 150 lbs. The tube was cut in sections 1 to 2 feet long as it was pushed out of the rear face. Each cut took about 5 seconds. The operation of the tube cutter was excellent except that the pieces of tube would hit the rear face as they fell to the water. The radiation from the center part of the tube was estimated at 10 mr./hr. at 10 feet per foot of tube. The beam from the tube in the unit was estimated at about 40 mr./hr.

After the tube was removed an examination of the hole in the pile was made using a borescope on April 16. The steel gun barrel at each end of the hole was found to be in excellent condition, showing no evidence of any corrosion. The graphite packing also appeared to be in very good condition. No evidence of any breaking or cracking of the graphite was noticed. A small amount of graphite dust was found on the bottom of the hole. No noticeable rub marks were found on the packing except a mark at the top of the hole for about four feet upstream of the downstream gun barrel. A few very thin pieces of loose material were noticed at the upstream end of the downstream gun barrel. It was impossible, by using the borescope, to determine if this material was aluminum or compressed graphite dust.

There was a total of seven joints between graphite blocks in this hole between the gun barrels. There were no appreciable gaps between the graphite blocks at the first and last joints but a gap estimated to be about 3/16 inch was found between the blocks at each of the middle five joints. It is believed that these gaps resulted from expansion of the graphite in the pile due to radiation exposure, the same effect that is causing the process tubes to bow.

After removal, sections of the ribbed tube were examined on April 16. The ends of these sections had been badly distorted during the tube removal process and it was impossible to determine the roundness of the tube. Scratches were found on the outside top of most sections and some sections showed scratches on the inside top

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with corresponding scratches on the outside. Other scattered scratches were found on the outside bottom and sides of the sections. There was no way of determining the location of the sections relative to the tube length.

A new tube was installed on April 17.

W. E. Jordan, C. P. N.
W. E. Jordan, Chief Supervisor
100-300 Technical

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