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September 19, 1949

100 AREAS TECHNICAL ACTIVITIES REPORT - PHYSICS

AUGUST, 1949

PILE PHYSICS GROUP - A. B. Carson

Neutron Thermopile Measurements

It has been requested that 105-H pile be started up with neutron thermopiles installed in the octant monitoring holes instead of ionization chambers. For this reason a check was made of the operating characteristics of the thermopile presently installed in F experimental hole at 105-F. A study of the thermopile response during two 10 minute shutdowns from 275 MW, and one 50 minute rise to power showed a sensitivity comparable to that of the present F. C. installation, a reasonably linear response, and no detectable lag. The fact that the installation is still serviceable after several years of pile operation is a good indication of its ability to withstand irradiation.

Radiography

Five Al-Li billets fabricated by the P-10A group were radiographed during the month, using an exposed slug as a gamma ray source. The slug had been cut of the pile for 17 months, and thus had decayed to an activity of about 200 mr/hr at 42". The reduction in intensity through one of the six inch billets indicated an energy for the gamma ray of about 1.1 - 1.3 Mev. An exposure of about 2 hours was made with type K industrial x-ray film which is the most sensitive film for this energy of radiation that is readily available. After normal developing procedure the film was examined with a Densitometer, and no evidence of voids was found. It was estimated that it would require a 5% variation in density to be discernable, even with the Densitometer. It is suggested that for material of this type, a considerably softer gamma or x-ray source be used to increase the variation in film exposure with target density.

B Hole at D Pile

Efforts have been made during the past several shutdowns at D pile to clear out the B facility in order to reduce the retrieving equipment contamination encountered during both charging and discharging of B hole samples.

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attempt to remove the contaminating material by means of a vacuum line were not successful, since the material seemed to be too moist. A scrubbing procedure was finally devised which reduced the contamination adequately. This involved the use of tight fitting rums soaked in alcohol, followed by dry rums. A total of four to six insertions were required to clean each of the holes of the facility. The contamination removed by the first swab in each hole was generally of the order of 10 rep at six inches. This reading has been reduced to about 100 mrep in all the holes except #6, which seems to show a much more moist or oily deposit than the others. This is expected to be completed during the next shutdown.

CO₂ Addition at B Pile P.T. 105-168-P

The CO₂ concentration at 105-B was raised gradually from 40% to 60% between August 8 and August 15. The central graphite temperature showed the expected increase of about 1°C/% CO₂ added. The reactivity gain was also as predicted - about 1 ih/% CO₂ added.

Reactivity Balance

The pile reactivity status for the month is given below.

	B		D		F	
	July 27	August 31	July 29	August 31	July 31	August 31
Peds	75	53	65	70	66	66
Fenon	473	472	498	499	466	466
Special Requests	408	409	373	377	431	431
"P" Columns	0	0	0	0	0	0
Bismuth	114	112	114	109	84	84
Plant Assistant	0	0	23	20	0	0
Bunny columns	1	0	24	20	32	32
Correction for Co	-180(40% CO ₂)	-200(60% CO ₂)	-201	-225	-235	-235
Cold, clean reactivity	891	846	898	870	844	844

B pile shows a net loss in reactivity during the month of 45 ih. This appears to have occurred during the shutdowns of August 2 and August 17, and is probably evidence improperly accounted for SR-65 loading changes. D pile shows a loss in hot reactivity of 4 ih which might be the result of a minor SR-65 loading change. The loss of 23 ih in cold reactivity indicated by the figures above reflects a change in the figures used for C₀ contribution, which has been altered to conform to currently observed differences between hot and cold reactivity. There were no loading changes during the month at F pile. A net gain of 20 inhours in cold clean reactivity was observed, distributed over the month's operation.

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EXPERIMENTAL GRAPHITE GROUP - L. H. Montgomery

Graphite Testing

A - Non-Expendable

The results of routine tests on purified graphite during August are summarized in Table I.

TABLE I

PURIFIED GRAPHITE SUMMARY

Type	Number of Tests	Ave. Δ H (Purity)	Effective Δ H			Density gms./c.c.		
			Ave.	Max.	Min.	Ave.	Max.	Min.
GNF	178	0.953	0.968	1.09	0.72	1.547	1.683	1.517

(High values are due to 1016K)

The tests during this month indicate a larger fluctuation in purity than might be expected. The reason for this has not been determined as yet.

B - Experimental 1016K

The final tests on heat 1016K have been completed. Some doubt obscured the disappointing results. The high density and purity expected from the triple pitch impregnated bars materialized in less than half the bars. Five bars were triple impregnated and were tested singly in 305. The result of these tests are given in Table II.

TABLE II

Bar No.	Density	Δ H (Purity)
1 D	1.700	1.01
1 T*	1.707	0.80
2 B	1.570	1.04
2 T	1.709	0.95
3 B	1.710	0.63
3 T	1.701	0.67
4 B	1.711	0.97
4 T	1.589	0.78
5 B	1.735	0.92
5 D	1.593	0.85
5 B	1.591	0.91
5 T	1.598	0.82
Average	1.701	0.87

* The notation B & T refers to the better or top positioning in the test.

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A comparison of the doubly impregnated bars with the triply impregnated bars is given in Table III.

TABLE III

Type	No. Bars	Ave. Δ ih (Purity)	Ave. Density	Effective Δ ih
Doubly GWF	11	1.07	1.685	1.09
Triply GWF	12	0.87	1.706	0.92

The cause of the lower Δ ih figures of the triple pitch impregnation is being investigated. These bars will be re-tested in 305. It is significant that all the bars of this group of twelve varied considerably with regard to density as well as Δ ih.

Test Pile

A check of test pile standardization reveals a serious drop in the precision of measurements during April and May. No mechanical causes have been observed which could cause this. Several of the rules put into effect in 1946 and 1947 are no longer being followed as rigidly as they should be. A re-education of operating personnel seems to be indicated as the turn-over in personnel has been large since 1947.

Exponential Pile Project

As yet, no directive has been received from the A.E.C. to commence this project. At present three aspects of this work are being planned. The details of the actual installation at 101, the theoretical work to be done and the instrumentation to be used are only partially outlined at present.

Paul F. Gault
PILE TECHNOLOGY DIVISION

W. Gault, Jr.

**DATE
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8/12/94

END