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**Pacific Northwest Laboratory
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100 AREAS:

May 7 through May 13

(For Technical Progress Letter No. 97)

May 17, 1946

COPY 1 OF 1

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4 Pages No. 44 of
12 Copies Series 1

Physics

D Pile

The D Pile was shut down for about 18 hours on May 7. It operated at normal level throughout the remainder of this report period.

During the shutdown of May 7 vertical thimbles 13, 16, and 35 were re-treated with air at 90 pounds pressure. All vertical thimbles in the D Pile are now considered to be in good condition.

The orifices on eleven tubes containing poison or bismuth were changed to 0.100 inch. Three others were similarly changed during the shutdown of April 30, so that all of these tubes are now equipped with this size orifice.

Two refrigeration units were placed in service on May 7. This produced a reduction of about 0.7°C in the inlet water temperature.

Analysis of the readings of six centrally located thermocouples indicates that the apparent thermal conductivity of central graphite, which has now received an exposure of 1040 MW-days/C.T., is 1/31 of its original value and is decreasing at a rate of 4% per month at the present operating level. Since start-up, the values of thermal conductivity determined in this may have been slightly greater than those determined by laboratory measurements on graphite samples exposed in the water-cooled test holes of the B and D Piles, and have been considerably smaller than those determined by laboratory measurements on samples exposed in the uncooled test hole of the F Pile.

F Pile

With the exception of a scheduled shutdown on May 9 the unit was operated at 50 MW below rated level throughout the week.

During the shutdown special cast pieces were loaded into 8 tubes. There are now 27 tubes containing either cast or specially extruded material. It had been planned

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to load 9 tubes with cast material during the shutdown but the charge for one of the tubes was damaged prior to loading and was not charged.

The reactivity at start-up was checked against predictions to determine whether effects similar to those observed at the B shutdown are present in the F unit. The factors contributing to the reactivity change are listed in the following table:

Xenon change, including amount in discharged metal	126.4 ih
Samarium	-2.0
Product buildup	3.7
Loss due to 2.7% effective fraction of metal pushed	-2.2
Overall coefficient	-60.0
Net increase expected in reactivity	65.9 ih
Increase in amount absorbed by rods	27.2
Period of rise at start-up, 1.8 minutes	26.4
Net observed increase	53.6 ih
Unexplained loss of reactivity	12.3 ih

This is of the same order of magnitude as the unexpected loss observed when the B Pile was shut down. The predictions were of course made on the basis of the presently accepted values of the xenon constants and rod calibrations derived from them; however, the unusually short shutdown resulted in having the most accurately calibrated rods in at start-up.

Net reactivity gains during the week were 4 ih.

General Physics

After the two remaining graphite capsules were cut from their slugs in the storage area of the B Pile, it was found that the abrasive wheel had cut into the heavy metal of one slug which carried an undersized capsule. Surveys are in progress to evaluate the degree of contamination of the equipment and basin.

Measurements of slug decay with the underwater chamber indicate that the dosage rate produced by the penetrating component of the radiation from a single slug is related to the power at which the slug operated in the pile and to the time of decay as follows:

Time after shutdown	4 hrs.	1 day	6 days	14 days	35 days
Dosage rate, r/hr at one foot with no absorber, produced by a slug which operated at 1 MW/ton	10,400	5330	3510	2510	1410

The effective energy of the penetrating component decreased from 1.75 Mev at two days' decay to 1.53 Mev at 35-days decay.

The status of the Special Requests program is unchanged since the last report with the exception that Sample HDMD-3, which is to be irradiated as part of Request 9-2, has been returned to the Metallurgical Laboratory for sealing.

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Water, Corrosion, and Engineering

Process Water Control and Pressure Drop Studies

The iron content in the process water averaged 0.028, 0.020 and 0.020 ppm at B, D and F Areas, respectively. These values for D and F are about twice the normal value. Attempts to determine the reason for these higher values have been unsuccessful. It may be that these higher iron values are a result of the increased turbidity of the raw water at the present higher river flow rate. The rates of pressure drop increase for D and F Areas were 0.25 and 0.04 lbs./sq.in.(day). Colloidal mobility measurements made using the slit ultramicroscope indicate that the mobility increase resulting from silicate addition is not as great as that formerly realized and laboratory additions of silicate will be made to further study this point.

Purging Studies

The D Pipe was purged with 100 ppm Super Cel for about one hour on May 7. The pressure drop in the 0.240-inch orifice zone decreased from 14.6 to 2.8 lbs./sq.in. and in the 0.140-inch orifice zone from 67 to 40 lbs./sq.in. Panellit pressure drop data indicate that the residual film left after a purge is gradually increasing in the 0.140-inch orifice zone at both D and F Areas.

Corrosion

Tube 1889 at F was found to be difficult to discharge on April 18 and inspection of fifteen of the pieces discharged from this tube revealed that one piece was blistered and showed evidence of abrasion. Tube 2692 at D was found to be difficult to discharge on May 7 and inspection of the pieces from this tube revealed one piece which was bowed sufficiently to be scratched by the tube ribs in the center of the length of the piece and to show abrasion at both ends on the opposite side of the piece. This slug also showed blistering. Most of the other pieces from this tube showed deeper than normal rib scratches, indicating that the tube ribs were somewhat damaged. The tube at F had an accumulated power of 25.5 MW-days and that at D had an accumulated power of 26.4 MW-days.

Control Rod No. 2 at F was found to be difficult to insert under power on May 2. This rod and thimble were examined on May 9. Borescope examination of the thimble revealed considerable abrasion on the top and one side for the first four feet of the thimble and a fairly heavy deposit of white-colored material about 5 to 7 feet from the open end of the thimble. The remaining portion of the thimble examined showed no unusual abrasion or other unusual properties. The rod, which was examined visually, showed scratches on its top surface for practically the entire length of the rod. In preparing the rod and thimble for examination, a foreign piece of steel (probably a set screw) was found flattened out in the rod gear track. It was concluded that this foreign particle was responsible for the difficulty experienced with this rod on May 2 and that the rod and thimble abrasion probably resulted from some other foreign particle. Following the examinations, the rod was inserted into the thimble by hand without any difficulty. The remaining horizontal rods are scheduled to be examined for abrasion on May 15.

Graphite Expansion - Gun Barrel Clearance

In order to make a more complete investigation of bending of gun barrels and aluminum tubes, adapters are being fabricated to permit measurement of movement of

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either gun barrel or aluminum tube separately. A new type of gage for measuring gun barrel movement is also being made up. Design of a tube jack is under way which would have capacity to work up to the ultimate strength of the aluminum tubes.

CO₂ System for Horizontal Rod Thimbles at F Area

The use of CO₂ for purging the horizontal rod thimbles at 100 F Area has been discontinued pending the design and installation of gas seals.

W. E. Jordan

W. E. Jordan, Chief Supervisor
100-300 Technical

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