AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

DECLASSIFIED

- 1 -

7-4147

#1 R. M. Evans
#2 R. M. Evans
#3 Area Engineer
#4 Area Engineer
#5 Area Engineer
#6 Area Engineer
Att: Patent Group
#7 N. Hilberry
#8 N. Hilberry
#9 N. Hilberry

#10 D.A. Miller-T.N. Stapleton-700 File
#11 M. H. Smith
#12 W. C. Kay
#13 300 File
#14 Pink Copy
#15 Yellow Copy
#16 W. E. Jordan
#17 C. P. Kidder
#18 C. N. Gross

COPY 1 OF 1, [REDACTED]
This Document consists of
Page No. [REDACTED] of
Copies, Series [REDACTED]

May 31, 1946

100 AREAS

May 21 through May 27
(For Technical Progress Letter No. 99)

Physics

B Pile

The neutron background of the shut-down B Pile has been resolved into two components: (a) a component which is decaying with a half-life of 12.5 days and is ascribed to the production of neutrons by the reaction of the 2.3 Mev gamma of lanthanum on the deuterium in the water; and (b) a constant component due to spontaneous fission which corresponds approximately to a flux density of 95 neutrons/cm² sec. or to a sub-critical condition of 1.6% k with all rods out.

The xenon transients observed during the final runs of the B Pile at 150 and 0.5 MW have been fitted by equations which are corrected for the flattening effect of the xenon and include an empirical correction ascribed to the change in xenon effectiveness which is produced as the rods move in to compensate for xenon decay. The constants of this newly fitted xenon equation differ considerably from those previously employed and lead to an equilibrium xenon value of about 505 inhours in comparison to the value of 464 inhours given by the standard xenon equations. Analysis of these data is continuing.

D Pile

The D Pile was shut down for a period of about 19 hours on May 21 for the purpose of discharging 50 regular tubes, 4 overaged pressure drop tubes, and two B columns. During this shutdown, measurements were made to determine the vertical bowing of Tubes 0174 and 4674 for the graphite expansion study.

About 2-1/2 hours after returning to rated operating level, a scram occurred as the result of downward creeping of Vertical Safety Rod No. 34. Following this scram the pile was down for about 2-1/2 hours. During this time, there were four scrams caused by power surges in the BPA system, and another scram caused by slipping of the same vertical safety rod. The first difficulty with Rod 34 was experienced about 15 minutes after a routine check of the vertical rods. These tests have been discontinued until the cause of the trouble can be determined and corrected.

During operation after the shutdown and scrams, it was necessary to operate at 10 MW below rated level for about one hour, and 5 MW below rated level for about 1-1/2 hours because of limitations on tube temperature rises.

DECLASSIFIED MASTER
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Classification Cancelled and Changed To

DECLASSIFIED

By Authority of CG-DR-2
C/A Bureau 7-12-91
By PM Erik 5-5-94
Verified By JH/11/11/94 5:55 PM

DECLASSIFIED

- 2 -

7-4147

A review of reactivity gains independent of the metal indicates a realized gain of about 190 inhours up to the present time and a maximum expected gain of 250 inhours. On the basis of analyses of the boron content of the graphite, it was estimated that complete burn up of the boron impurity would result in a reactivity gain of 555 inhours in the unflattened D Pile. Allowance for 300 inhours of flattening reduces this predicted figure to 416 inhours, which is still not in agreement with current observations. It is not yet possible to determine whether the disagreement is due to errors in the boron content or to other effects.

F Pile

The unit was operated at 50 MW below rated level throughout the week. There was a scheduled shutdown on May 21 for the discharge of metal. A scram, due to an electrical power surge, occurred in the early morning of May 22. During the shutdown some grooved dummies were removed from the charging end of Tube 4674. This tube has been maintained without water or heavy metal for the purpose of making periodic bowing measurements. After the unit was restarted, a radiation beam was discovered coming from this tube. The unit was shut down at about noon on May 22 to replace the grooved dummies. From the time of starting down until full power was restored, slightly more than 3 hours had elapsed. This prompt restarting was made possible by the large excess reactivity available, because the unit had been shut down the previous day.

A check of the total reactivity gains of the unit, similar to that described above for D, reveals that from the initial startup to date the net cold gains have been approximately 220 ih. All of the metal in the unit has been exposed less than 200 Mw-days/ton and therefore the gains in it lie between -20 ih and +80ih. Since all the metal is neither at the lowest gain point nor at the highest, it may be assumed that the effect of all the metal in the pile is between -15 ih and 50 ih. The gains attributed to graphite must accordingly lie between 170 ih and 235 ih. This is considerably below the 380 ih gain predicted from the analyses of the boron content of the graphite. This difference in graphite gains is capable of accounting for most of the difference between the metal gains predicted from the early operation of 100-F and those observed when metal is discharged.

A Production Test to determine the present values of the reactivity coefficients was carried out on May 27. Analysis of the data is not yet complete.

General

A sample of transverse graphite was found to have expanded 0.60% after a test hole exposure of 1007 Mw-days/CT. The expansion appears to be very nearly linear with respect to exposure; there is no definite evidence that the expansion effect is approaching saturation. A Chicago report on the x-ray examination of test hole material exposed 836 Mw-days/CT likewise indicates an approximately linear increase in the ag spacing up to that exposure.

A difference in response to annealing for five days at 100°C was observed between 120 Mw-days/CT material, which recovered 17% in thermal conductivity, and 836 Mw-days/CT material, which showed zero recovery.

The possibility that oxidation of graphite, with consequent introduction of acid groups, occurs to any significant extent during irradiation was eliminated by experiments in which aqueous extracts of exposed and unexposed graphite were found to have essentially the same pH.

DECLASSIFIED

DECLASSIFIED

- 3 -

7-4147

A disc of exposed heavy metal, weighing approximately 36 grams, was cut from the end of the capsule which was previously reported as having been improperly cut. The new lathe for capsules and casings is functioning satisfactorily and the samples removed from the B Pile are in process of machining. To eliminate further difficulty with undersized capsules, attempts are being made to develop a radioautographic method for measuring the actual length of capsules after discharge and prior to cutting. It is planned to have capsules loaded into the piles in the future attached to their slugs by a threaded stud to facilitate removal.

Water, Corrosion and Engineering

Process Water Control and Pressure Drop Studies

The iron content of the process water averaged 0.034, 0.025 and 0.024 ppm at B, D and F Areas, respectively. In view of the higher than normal iron content of the process water, the sodium silicate feed rate was increased during the week at D and F Areas from about 6 ppm to about 8 ppm in an effort to reduce the rate of film formation. Preliminary studies on the laboratory addition of silicate to raw water indicate that a greater amount of silicate is necessary to protect against film formation than was necessary when the river flow rate was lower. These studies will be continued with silicate additions made in the laboratory on filtered water.

The rates of pressure drop increase for D and F Areas were 0.96 and 0.26 lbs./sq.in.)(day), respectively. These figures are to be compared with about 0.14 and 0.20, respectively, for the six month period before the recent rise in river level.

Two refrigerating units were started at D and F on May 23 and May 21, respectively. Four of the six refrigerating units are now in operation at D and all four of the units at F are in operation.

Purging Studies

The F Pile was purged with 100 ppm Super Col for about one hour on May 21. The pressure drop reduction in the 0.240 inch orifice zone, based on Sample Room B data, was from 7.8 to -2.0 lbs./sq.in. There was no evidence of any cross-header screen plugging.

Corrosion

Corrosion Tubes 2375 and 2575 were discharged at D on May 21. Slugs from those tubes will be examined shortly.

Graphite Expansion

Tube 4674 at D, previously traversed on February 26, was traversed again on May 21, using the water-filled equipment. This is the first tube which had been traversed twice. The maximum difference in elevation between high and low points was 2 inches; this represents an increase of 0.4 inches during the three month interval. Tube 0174 at D was found to be very straight.

On May 27 an attempt was made to traverse the graphite bore of the opening in which Vertical Thimble No. 27 of B is normally installed. Difficulty in equalizing air pressures was not satisfactorily overcome and the resultant escape of gas out of the opening may have interfered with the plumb bob operation. Preliminary analysis of the data indicates that the bottom of the opening through the top shield is located within 1/8 inch directly below the top of the opening, but that the

DECLASSIFIED

DECLASSIFIED

- 4 -

7-4147

centerline of the opening in the graphite is displaced outward about $1/4$ inch with respect to the centerline of the hole through the shield. At the approximate level of the 40 tube row the outward bowing is about $5/8$ inch as indicated by the plumb bob, whereas transit measurements on Tube 4091 at B indicates that the outward bowing is about $7/8$ inch.

Operating instructions for the 1500 lb. tube jack and special adapters to permit separate movement of the gunbarrels and the aluminum tube, were prepared. Additional test work on replaced Tube 3671 is continuing.

The design of a high-force jack has progressed sufficiently that fabrication can be started next week. A number of design problems have been encountered in trying to get structural members of adequate strength in the limited space available. The jack will clamp onto the flanges of the front gunbarrel and nozzle. Feet of the jack will transmit the jacking force to the centering flanges welded to the tie straps of the biological shield. In bolting these feet to the centering flanges, both bolt holes of the centering flange of the tube being tested will be used; also the near bolt holes of the two adjacent flanges will be used. The arch of these feet must span the Panellit tubing passing between these adjacent tubes. Even by using high-tensile strength steel bolts in all four of these positions, it is not possible to go beyond a three ton inward jacking force. These and similar structural limitations will restrict the jack to 3 ton maximum force in each direction. The jack may not be adaptable to the lower part of the unit due to Panellit tubing interferences. Also, special arrangements will be necessary if the jack is to be used on about 20% of the tubes in the upper half, where the centering flange bolt holes are used to hold supports for the 4-inch horizontal headers. However, it is anticipated that the jack will be adequate to test to destruction a number of selected tubes in the top part of the unit.

W. E. JORDAN, CHIEF SUPERVISOR
100 - 300 TECHNICAL

WEJ:jd

DECLASSIFIED

DATE

FILMED

7/21/94

END