DECLASSIFIED

HW--31053

DE93 006708

Distribution

This document classified by

EW Botsford

- #1 RR Bloomstrand
- #2 CW Botsford
- #3 HA Carlberg
- #4 RG Clough
- #5 RL Dickeman - WL Bunch
- #6 RB Hamilton
- #7 TW Hauff
- #8 PC Jerman - JG Meyers
- #9 M Lewis
- #10 JE Maider
- #11 PH Reinker - HL Henry
- #12 RO Mehann
- #13 VD Nixon
- #14 JE Robb
- #15 OC Schroeder
- #16 FAR Stainken
- #17 P Thompson
- #18 JH Warren
- #19 700 Files
- #20 300 Files
- #21 Yellow Copy

Classification Canceled (Change to

DECLASSIFIED

By Authority of CG PR-2

DS Lewis 6-30-92

By PM Eick 10-27-92

J. H. Wells 10-27-92

COPY 1 OF 1. ~~Series~~

This document consists of
5 pages. No. ~~XX~~ of
21 copies. Series ~~4~~

March 5, 1954

**FINAL REPORT - PROCESS TEST MR-105-4
RADIATION EFFECTS OF THE REMOVAL OF FRONT
CAP SUPPORTED SHIELDING SLUGS**

- Ref: (1) HW-25705, "Process Test MR-105-4, Radiation Effects of the Removal of Front Cap Supported Shielding Slugs", by R. R. Bloomstrand
- (2) HW-26053 and HW-26870, respectively Supplements A and B to (1), by R. R. Bloomstrand

INTRODUCTION

Corrosion of aluminum front cap supported shielding slugs has been noted at all reactors except C Reactor which has galvanized shielding pieces. There has been a considerable amount of difficulty caused by sticking of the pieces. The difficulty is caused by the growth of corrosion products in the annulus around the shielding piece which effectively siezes it. As recently as June, 1953 the shielding pieces on nearly 50 per cent of a group of 40 tubes at B Reactor were corroded to the extent that a pipe wrench was required for their removal. Similar instances, to varying degrees, have occurred at all reactors except C.

MASTER

DECLASSIFIED

DISTRIBUTION RESTRICTED TO U.S. ONLY

DECLASSIFIED

-2-

HW-31053

The purpose of this test was to evaluate the radiation effects of removing the front shielding pieces as part of a program to eliminate the sticking problem.

SUMMARY

Front cap supported shielding slugs were removed from 225 front nozzles at the B Reactor to determine the radiation effects of a full scale shielding slug removal program. The results indicated this would effectively double the front face radiation levels during reactor operation, but have no significant effect on radiation levels during shutdown conditions as long as the front tube sections remain filled with water.

Examination of nozzles with the shielding pieces removed for approximately four and one half months indicated that undesirable corrosion problems might be created due to unrestricted growth of nozzle corrosion products. The mounds of corrosion product formed could cause significant nozzle diameter reduction and hinder future charging operations.

It was concluded that removal of front cap supported shielding slugs, though tolerable from radiation aspects, would not be feasible due to undesirable front nozzle corrosion problems.

DETAILS

The original test and its supplements A and B authorized the removal of 225 front cap supported shielding slugs from the B Reactor. Over a period of five months ending in March 1953 the shielding slugs were removed stepwise first from ten dispersed single tubes, then from a block of 36 tubes, and finally from a block of 225 tubes (see figure 1, page 4). The shielding pieces, which are approximately 13 inches long, were not completely removed, but were shortened to a length of about one inch since the cap supported slug also forms the front nozzle cap water seal.

Gamma radiation levels at the front nozzle cap were measured during reactor operation and during shutdown conditions at reduced water pressures as low as 20 inches of water. Film packs consisting of two personnel badge type films taped together side by side were mounted directly against the protruding stud of the nozzle cap and were exposed for a period of 24 hours. Measurements were made on representative process tubes with and without front cap supported shielding slugs.

RESULTS

The results of the test indicated that removal of the front cap supported shielding slugs from front nozzles would essentially double the present front face radiation level during reactor operation. Incremental increases of 5-8 mrep/hr were experienced at levels of the order of 600 MW. It was demonstrated that during shutdown conditions the front tube section when filled with water forms an effective shield with the shielding slug removed; therefore the piece is required only in the event that the tube becomes dry. The data are summarized in Table I, page 5.

DECLASSIFIED

DECLASSIFIED

-3-

HW-31053

Examination of nozzles which were equipped with short (one inch) shielding pieces revealed the presence of an undesirable corrosion problem. After about four and one half months on the reactor a moderately heavy amount of tuberculation (barnacle growth) was present. It was apparent that while in the past the shielding pieces had restricted the growth of the corrosion product deposition, removal of the shielding pieces had created a situation where barnacle growth might significantly reduce the nozzle diameter. It was found that 8 inch aluminum dummies could be inserted in the nozzles, but required slightly more force than required for nozzles with normal shielding pieces.

The extent of growth in nozzles with short shielding pieces is probably a function of time, and since the exposure of slugs in the reactor varies from a few months to a few years it is not unlikely that barnacle growth could hinder future charging operations or possibly cause slug damage during charging.

CONCLUSIONS

From a radiation standpoint the front cap supported shielding slugs can be removed from all process tubes. While the present front face radiation levels during reactor operation would be essentially doubled this could be tolerated, for levels of this order of magnitude (20 mrep/hr) would not significantly affect front face procedures or working conditions. Removal of the shielding pieces, however, would possibly create an undesirable corrosion problem where unrestricted growth of nozzle corrosion products might significantly reduce the nozzle diameter and hinder future charging operations.

Therefore, it is concluded that full scale removal of existing front cap supported shielding slugs is not desirable. It is recommended that the shielding pieces removed under provision of this test be replaced routinely as the tubes come up for discharge.

R. R. Bloomstrand

R. R. Bloomstrand
Reactor Operation Engineering
Process Sub-Section
REACTOR SECTION

RRB:wh

DECLASSIFIED

DECLASSIFIED

-4-
Figure 1

11-100-1

LOCATION OF PROCESS TYPES WITH
SHIPPING SLIP RECEIVED

- ☐ Removal Authorized by Original Text
- ☒ Removal Authorized by Supplement A
- ☐ Removal Authorized by Supplement B

DECLASSIFIED

DECLASSIFIED

Table 1

RADIATION EFFECTS OF THE REMOVAL
OF FRONT CAP SUPPORTED SHIELDING
SLUGS

Summary of the Data

Pattern of Tubes Without Shielding Slugs	10 Single Tubes	Block of 36	Block of 225
Reactor Level	575	585	600
Average Radiation Levels (mrep/hr)			
(1) Tubes Without Shielding Slugs	12.7	18.9	14.4
No. of Measurements	10	36	58
(2) Tubes with Shielding Slugs	~7*	11.0	9.6
No. of Measurements	2	4	13
(3) Increase in Radiation Level - (1) minus (2)	~5.7	7.9	4.8
(4) There was no significant increase in radiation level between tubes equipped with shielding slugs and tubes without shielding slugs when the reactor was shutdown as long as the front section of the tube was filled with water.			

* Calculated from TGM Readings. All other radiation levels computed from 24 hour exposure of film packs.

DECLASSIFIED

END

**DATE
FILMED**

3 / 19 / 93