NOTICE

**CERTAIN DATA
CONTAINED IN THIS
DOCUMENT MAY BE
DIFFICULT TO READ
IN MICROFICHE
PRODUCTS.**

GENERAL ELEC
COMPANY

DECLASSIFIED

HW--34216

DE92 004977

-1-

RICHLAND, WASHINGTON

HANFORD ATOMIC PRODUCTS OPERATION

Classification Cancelled (Change to

declassified

By Authority of

*CG-PR-2**Se Sydeson 11/15/91**Dr. Krooked 11/21/91**DN Eick 11-21-91*This document consists of
7 Pages, No. [redacted]

JAN 0 2 1922

REDOX DECONTAMINATION PERFORMANCE

by

E. R. Irish

Redox Process Unit
Plant Processes Sub-Section
Separations Technology Section

December 23, 1954

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Operated for the Atomic Energy Commission by the General
Electric Company under Contract # W-31-109-Eng.-52

Due to film deterioration,
portions of this document
may be illegible.

PNL-11-91

JUL 9 1956

300 AREA
CLASSIFIED FILES

MASTER

DECLASSIFIED

DISTRIBUTION RESTRICTED TO U.S. ONLY
COMMISSION

DECLASSIFIED

EW-34216

-2-

COPY NUMBER

DISTRIBUTION

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16-18
19
20

R. G. Barnes
O. F. Beaulieu
R. S. Bell
L. L. Burger
A. B. Greninger
M. K. Harmon
W. M. Harty - C. A. Rohrmann
O. F. Hill
E. R. Irish
R. T. Jessen
J. E. Maider - T. W. Hauff
W. H. Reas
R. B. Richards
R. E. Smith
F. W. Woodfield
Extra
300 File
Yellow File

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

INTRODUCTION

Since start-up of the Redox Plant, different types of decontamination difficulties have been experienced and corrective measures taken. Current decontamination performance is superior to that ever experienced before. However, with the apparent need for elimination of the permanganate Head-End process for IAF oxidation, several modifications to the plant flowsheet and equipment have been planned in order to obtain satisfactory overall decontamination without permanganate Head-End:

- (1) return to the use of sodium dichromate for oxidizing IAF;
- (2) adoption of the precycle flowsheet (to permit four plutonium decontamination cycles);
- (3) installation of equipment for volatilization of ruthenium from uranium product by ozonization; and
- (4) use of equipment and operating techniques for minimizing the deleterious effects of entrainment in the Uranium Cycles.

OBJECTIVES

The objectives of the memorandum are:

- (1) to summarize generally and briefly the decontamination experience of the Redox process operating on IAF oxidized by sodium dichromate;
- (2) to indicate the decontamination which probably can be obtained with the new Phase II equipment and its improved performance; and
- (3) to re-evaluate the timing and feasibility of the current approaches for solving the long-range Redox decontamination problems arising as a result of oxidation of IAF by sodium dichromate (vice potassium permanganate).

SUMMARY AND CONCLUSIONS

- (1) Improved decontamination performance is being achieved with the new Phase II Columns, operated with interfaces in the upper portion of the scrub section of decontamination columns. Other improvements are anticipated as a result of effective use of column interface jets and inter-cycle coalescing devices.

DECLASSIFIED

DECLASSIFIED

HW-34216

-4-

- (2) Additional testing of sodium-dichromate Head-End is warranted before a decision is made to install equipment for Tail-End ozonization of uranium. Such testing can reasonably be done at an early date without use of the precycle flowsheet because of the short duration of individual tests.
- (3) Testing of a low-acid 3A Column flowsheet should be done before final decision is made to use the precycle flowsheet for increasing plutonium decontamination.
- (4) Based on preliminary laboratory data, adequate (greater than a ten-fold increase) plutonium decontamination can be expected by use of the precycle flowsheet. Plutonium recovery should be greater than 98.5 per cent.

DISCUSSION

Comprehensive summaries^(1,2) of Redox Plant decontamination problems and performance have been issued, based on experience with both the dichromate and permanganate Head-End processes. In the latter report, decontamination factors for uranium and plutonium produced from dichromate-oxidized IAF were quoted as follows:

	<u>Gamma Decontamination Factors (dF)</u>	
	<u>Uranium</u>	<u>Plutonium</u>
Head-End	0.0	0.0
First Cycle	3.5	4.0
Second Cycle	2.1	1.7
Third Cycle	0.8	1.0
Overall	<u>6.4</u>	<u>6.7</u>

For uranium having an exposure of 600 MWD/T and "cooled" 90 days, the uranium product indicated by these decontamination factors would have a fission product gamma activity four times the natural uranium gamma activity, and the plutonium product gamma activity would be 0.8 microcuries per alpha count/minute. These products are approximately twice the desired maximum Redox shipping specifications. As the irradiation and "cooling" histories of the irradiated metal are varied, the product activities will vary. The anticipated variations in the ruthenium content of the feed and product solutions are

tabulated below:

Ruthenium Content of Redox Solutions-Dichromate Oxidized IAF
Without Precycle

"Cooling", days Metal Exposure (c)	Solutions					
	LAF (H-1)		3EU(E-12) ^(a)		3BP(E-3) ^(a,b)	
	60 Relative	90	60 Gamma	90 Ratio	60 G/AT x 10 ⁻⁹	90 uc/c/m
200 MWD/T	1.0	0.6	4.0	2.4	2.4	1.5
600 MWD/T	1.5	1.0	6.0	4.0	1.2	0.8
900 MWD/T	1.7	1.1	6.8	4.4	1.0	0.7

Notes:

- (a) Assuming product activities are 100% Ru, and Ru dF's⁽¹⁾ are constant for all dissolver solutions.
- (b) Recycle flowsheet should result in additional reduction of activity by greater than 10.⁽³⁾
- (c) Metal irradiated at an average flux of 3.25 MW/T.

It can be seen by study of the above table that the activities of uranium and plutonium product, based on previous decontamination performance factors with dichromate-oxidized IAF, would be approximately three to five times above the Redox shipping specifications. However, with the improved performance (greater than two-fold) currently being achieved with the new Phase II columns, additional plant testing and re-evaluation of current plans is warranted before decisions are made to install equipment for Tail-End ozonization and the precycle flowsheet.

Tests which should be done during the next one to two months' operating period are:

- (1) Lower 1A and 3A Column interfaces into the upper portion of the scrub section in order to determine the benefit which will result from reduced entrainment in the organic effluent from these columns. Instrumentation revisions for accomplishing this test are currently in progress.
- (2) Test a low-acid 3A Column flowsheet for plutonium recovery and decontamination improvement on permanganate-oxidized IAF product solutions.

DECLASSIFIED

DECLASSIFIED

HW-34216

-6-

- (3) Process additional IAF batches oxidized with sodium dichromate to evaluate low-acid 3A Column flowsheet decontamination on dichromate-oxidized IAF product solution. Such tests can be satisfactorily performed without the precycle flowsheet because of their short duration.

Long-range plans for additional decontamination include effective use of column interface jets and inter-cycle coalescing devices.

E. R. Irish.

EW-34216

-7-

References

- (1) EW-32164, "Review of Redox Plant Head-End Treatment,"
G. R. Kiel, June 17, 1954.
- (2) EW-33731, "Summary of Problems Related to Decontamination
of Uranium in the Redox Plant and Proposed
Corrective Measures," O. F. Hill, November 10, 1954.
- (3) Personal communication, M. K. Harmon to E. R. Irish,
December 17, 1954.

DECLASSIFIED

END

DATE
FILMED
2/10/92

I