NOTICE

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

DECLASSIFIED

HW--25252

DE92 008719

1. W. C. Bailor
2. V. R. Chapman
3. V. R. Cooper
4. E. A. Foskett
5. M. K. Harmon
6. F. A. Hollenbach
7. E. R. Irish
8. J. O. Ludlow
9. W. N. Mobley
10. R. B. Richards
11. C. A. Rohrmann
12. O. C. Schroeder
13. G. Sege
14. R. E. Smith
15. J. T. Stringer
16. M. J. Szulinski
17. R. E. Tomlinson
18. W. B. Webster
19. N. G. Wittenbrock
20. F. W. Woodfield
21. 300 Files

Classification Called (Change to)

By Authority of

RV

22

23. Pink
24. Yellow
25. DATA

August 5, 1952

DATA
This document consists of
4 pages, No. of
Series, Ser

This document consists of
4 pages, No. of
Series, Ser

To: File

From: R. E. Tomlinson
Chemical Development, Separations Technology

DISSOLVER PRODUCTION TESTS

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

PNL-1-92

300 AREA
CLASSIFIED FILES

In order to obtain data for the development and design of the Purax dissolvers and to demonstrate to Manufacturing and Technical personnel the feasibility of increasing the size of dissolver cuts at BiPO₄ and Redox, a dissolver production test program in a BiPO₄ dissolver is requested. These tests are expected to supplement the program already initiated on the 321 Bldg. dissolver, explaining dissolver behavior to the extent that existing dissolvers can be operated under more nearly optimum conditions and that new dissolvers can be designed with accuracy.

Table I summarizes the tests desired on the BiPO₄ dissolver. The first few runs are primarily directed towards an evaluation of the effect of the amount of uranium present, the condition of the slug surface, and the nitrate ion concentration on dissolution rates. In the first run, 2670 pounds of irradiated uranium are charged to an empty dissolver and completely dissolved in one cut. In the second run, 8010 pounds of uranium are charged and completely dissolved in three equal cuts of 2670 pounds each. In run 3, 10680 pounds of uranium are charged and three equal cuts of 2670 pounds taken, leaving a final heel of 2670 pounds. The initial charge for run 4 is also 10680 pounds,

SPECIAL RE-REVIEW

FINAL DETERMINATION

DECLASSIFICATION CONFIRMED

BY SP-1 DATE 5-19-81

BY SP-1 DATE 5-19-81

DECLASSIFIED

DISTRIBUTION RESTRICTED TO U.S. ONLY

MASTER

DECLASSIFIED

HW-25252

- 2 -

consisting this time of the 2670 pound heel from run 3 and 8010 pounds of fresh uranium. The first cut of 2670 pounds is removed with 60% acid to compare with the first cut of run 3.

In order to determine the effect of initial acid strength on dissolver kinetics, 45% HNO_3 is charged to the dissolver in cut 4-2 and a 2670 pound cut removed. Comparison of cut 4-2 with cut 3-2 will permit an evaluation of the kinetics of dissolution when starting with 45% acid. The information on 45% HNO_3 is desired because the currently proposed design for the Purex dissolvers includes acid regeneration facilities so that the acid consumption is reduced to about 3 moles HNO_3 per mole uranium dissolved. One manner of operating an acid regeneration dissolver would be to charge the HNO_3 as 45% acid, the dissolution progressing to about the same specific gravity endpoint as in present operations. It is possible, however, that 321 Bldg. dissolver information on the use of 45% acid will indicate the more optimum use of another strength acid. This information will be transmitted when it is available.

The remainder of the tests listed in Table I from cut 4-3 to cut 7-2 are intended to demonstrate the feasibility of taking large cuts. The cut size is progressively increased from 3100 pounds to 4000 pounds, and the total amount of metal in the dissolver at the start of the cut, from 5340 pounds to 10680 pounds. Run 7 represents a desirable dissolver operation in that more optimum use is made of the slug transportation and dissolver facilities. 6 casks of slugs (ca. 8000 pounds) are charged to the dissolver upon a 2700 pound metal heel and dissolved in two-4000 pound cuts. This operation appears reasonable and safe and is expected to be demonstrated in run 7.

It should be noted that but four unusually long cuts are involved in the completion of the production test program as outlined in Table I. These are the cuts in dissolving the heel from the dissolver in preparation for run 1, in run 1, in cut 2-3, and cut 4-2 in which 45% HNO_3 is employed. The remainder of the dissolvings should not seriously interfere with normal plant scheduling although the larger cuts will probably require somewhat longer dissolving times.

Table II lists the data desired during each dissolver cut. The majority of these data are presently taken as a part of normal dissolver routine. The data desired during the course of each cut should preferably be taken from continuously recording instruments. Where this is impractical, a compromise consistent with the purpose of these tests should be affected. We shall be glad to discuss revisions to the list of required data in view of any limitations in the plant equipment.

In the operation of the dissolver for those tests, it is desirable that a minimum of coil cooling be used, and that the acid charge be heated to boiling as quickly as possible consistent with safe operation.

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.

DECLASSIFIED

TABLE I - SCHEDULE OF DESIRED PRODUCTION TESTS

Run	Cut	Fresh Uranium Charge, lb.	Heel From Previous Cut, lb.	Uranium Dissolved, lb.	HNO ₃ Charge, lb.	Max. Height Soln., in. **	Freeboard, in.
1	1	2670	0	2670	5900	26.0	56.4
2	1	8010	0	2670	5900	27.5	54.9
	2	0	5340	2670	5900	26.8	55.6
3	3	0	2670	2670	5900	26.0	56.4
	1	10680	0	2670	5900	28.2	54.2
	2	0	8010	2670	5900	27.5	54.9
	3	0	5340	2670	5900	26.8	55.6
4	1	8010	2670	2670	5900	28.2	54.2
	2*	0	8010	2670	7860	36.0	46.1
	3	0	5340	3100	6850	30.9	51.5
5	1	5340	2240	3580	7910	36.2	46.2
6	1	5340	4000	4000	8840	40.4	42.0
7	1	5340	5340	4000	8840	40.8	41.6
	2	0	6680	4000	8840	39.7	42.7

* Cut 4-2 may be revised for other than 15% HNO₃ in the light of 321 Bldg. Dissolver information and laboratory tests to preclude the possibility of excessive hydrogen formation. This information will be forthcoming at a later time.

** Slug crib height is 30 inches.

TABLE II - DESIRED DATAA. Initial Data

1. Fresh Uranium Charge, Pounds.
2. Heel from Previous Cut, Pounds.
3. Acid Charge, Pounds and Analysis.
4. Visual Observation of Height of Slugs in Crib (if possible)

B. Data as a Function of Time During Course of Cut (1)

1. Specific Gravity of Dissolver Solution.
2. Dissolver Weight Factor.
3. Dissolver Temperature.
4. Rate of Off-Gas From Column.
5. Temperature of Off-Gas From Column.
6. Gas Heater Power Consumption.
7. Dissolver Pressure.
8. Dissolver Column Pressure Drop.
9. Silver Reactor and Heater Pressure Drop.
10. Filter Pressure Drop.
11. Column Condenser Water Rate.
12. Inlet Water Temperature to Column Condenser and Coil.
13. Outlet Water Temperature from Column Condenser.
14. Dissolver Coil Cooling Water Rate.
15. Outlet Water Temperature from Dissolver Coil.
16. Steam Rate to Coil, Pounds per Hour; and Coil Pressure.

C. Final Data.

1. Uranium Dissolved During Cut, Pounds.
2. HNO_3 Consumed During Cut, Pounds.
3. A Doorstop sample of the dissolved Uranium from Cut 4-2 should be taken and delivered to M. K. Harmon, 222-S Bldg., to permit an evaluation of solvent extraction behavior on this material.

(1) This information is desired from continuously recording instruments. Please advise items for which this is impractical so that a suitable compromise can be reached.

DECLASSIFIED

END

**DATE
FILMED**

4 / 06 / 92