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K-1420 TOWER FLUORINATION FACILITY TEST

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K-1420 TOWER FLUORINATION FACILITY TEST

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Introduction

In order to establish the material holdup and operating efficiency for material accountability of the tower fluorination facility in K-1420, a complete operating test simulating normal operating conditions using urano-uranic oxide (U_3O_8) was completed. The test consisted of four operational runs, two of which had feed rates of approximately 10 and 20 pounds of oxide fed per hour and two with approximate feed rates of 34 pounds of oxide fed per hour. A run consisted of continuous operation of the facility until the pressure drop (ΔP) across the cold trap indicated that the trap was full of uranium hexafluoride. Material balances were made around the entire test and each of the four operating runs in an attempt to determine an average holdup of material. These are presented in tables I through V. After the operational part of the test was completed, the fluorination facility was cleaned up to determine the overall operating efficiency for material accountability.

Conclusion

1. The material balance around the entire test operation of the conversion facility resulted in a net gain of 4,507 grams or uranium and 738 grams of uranium-235. The assay of every container of material generated from the test operation was higher than the assay of the oxide material used for the test. The gain of material was obviously due to a residual holdup of material in the system with a higher assay than the (1.25% uranium-235) material fed.

2. The results of a material balance around the test operations, combined with the results from monitoring the vent stack and surveys made by Health Physics indicate that the facility can be operated under these conditions without any appreciable loss of material. In order to establish a material processing loss rate for this facility, it would be necessary to run another test with the system clean before and subsequent to the test operations.

3. Since the cleanup of the system resulted in a recovery of slightly over 10 kilograms of uranium, it is concluded that, for inventory purposes, this quantity of material is representative of the material holdup for oxides having characteristics similar to that processed.

4. Fluorination efficiency of each run indicates that the optimum feed rate was established in run No. 1, and that the higher the feed rate (pounds of oxide fed per hour), the lower fluorination efficiency.

5. The test revealed that the quantity of uranium hexafluoride held up in the trapping system will vary per run, and is dependent upon the operating conditions that prevail during that particular run.

Discussion

In keeping with the operating procedure used for the test, it is believed that this facility could operate more effectively and efficiently if certain administrative and operating conditions, as well as certain equipment alterations enumerated below, were prescribed as Standard Operating Procedure.

1. The nature of the operations indicates that there is definite need for constant and close supervision in the facility.

2. Since operating experience of the pneumatic feed system produced a source of material loss and holdup, it is recommended that consideration be given to a redesigned system to minimize this operating difficulty, possibly a feed hopper system such as is being used in K-1131 feed plant facility.

3. A better design of equipment associated with, or used in, the clean-out of the oxide feed hopper would minimize another source of loss of material (air-borne) and floor contamination of the tower room.

Preparation Procedure

1. A total of approximately 1,200 pounds of Y-12 urano-uranic oxide material with tap densities ranging from 3.3 g/cc to 3.83 g/cc was utilized in the test. This material was contained in six drums, and was reasonably consistent in purity and assay.

2. Each drum of the urano-uranic oxide (U_3O_8) utilized in this test was multiple thief sampled (three separate samples), and the samples transferred to the Works Laboratory where duplicate analyses for uranium were obtained on each by the potentiometric titration method of analysis. In addition, each of the samples obtained were analyzed for tap density and particle size (including submicron).

3. After sampling, the drum of oxide was weighed to the nearest 0.25 pound by the Coded Chemicals Department.

4. The U_3O_8 was then transferred to K-1420 on an Intraplant SS Material Transfer (WCX-703) and stored in "H" area in readiness for the test.

5. Prior to startup, all operating equipment in K-1420 conversion area was conditioned in the normal manner.

6. All scales in the conversion area were calibrated prior to the start of the test.

7. Portable platform-type scales were provided for use in feeding the oxide to the fluorine tower feed hopper.

8. A portable decontamination table was utilized for the specific purpose of decontaminating failed equipment during the test, and cleanup operations after the test.

9. The solutions obtained from decontamination of the failed equipment and from cleanup operations after the test had been completed, were collected in pre-tared polyethylene containers (5" I.D.).

10. All containers used in the test were tare weighed to the nearest 20 grams (UF_6 cylinders, condensers, ash receivers, etc.).

11. The UF_6 cold traps (10" I.D. and 5" I.D.) were utilized in their normal operating manner for below 5.0% uranium-235 operations.

12. For the beginning of the test the alumina traps contained clean alumina, and were dumped upon completion of each test run.

Operating Procedure

1. All windows of the oxide conversion area ("E" area) and the oxide storage area ("H" area) were closed before the test started and remained closed for the duration of the test. The doors of these two areas were kept closed, except for normal operating entries and exits to the area, during the test.

2. The Health Physics Department ran a count index of the area before the test began, immediately after each run was completed, and upon completion of the test.

3. The drum of oxide to be used in each run was placed upon the portable platform-type scales and remained there until its contents were completely fed to the system.

4. The feed oxide was fed from the drum in "H" area by the existing pneumatic conveying system to the oxide feed hopper.

5. After the complete conditioning of the operating equipment, the feed screw was started for the running of the first phase of the test, and operated at a feed rate of approximately 10 pounds per hour (referred to as Run No. 1), maintaining as near as possible a fixed rate (approximately 20%) of excess fluorine for the run.

6. During the test, the conversion area vent lines (low temperature traps and alumina traps) were sampled periodically by the Process Control Laboratory.

7. When the pressure drop (P) across the 10-inch cold trap indicated that the trap was full of UF_6, all conversion equipment was shut down.

8. Upon completion of each test run, the equipment was cleaned as far as practical, or as near inventory conditions as possible.

9. After each run, all partially full UF_6 cylinders and condensers were disconnected and weighed by Chemical Operations, and all full UF_6 cylinders and condensers were transferred to the Coded Chemicals Department for weighing and sampling. Multiple samples were taken from each 10" I.D. UF_6 container. These samples were sent to the Works Laboratory for duplicate analyses.

10. After each run was completed, and before "screwing-down" tower oxide, the tower ash receiver was removed, capped, weighed, and placed in storage in "H" area. The tower oxide was screwed into a clean, tared ash receiver.

11. Upon completion of the test, each ash receiver that contained ash produced by individual runs, was rod-milled by Chemical Operations personnel, and transferred to Coded Chemicals for weighing and sampling.

12. Steps 5, 6, 7, 8, 9, and 10 were repeated at an oxide feed rate of approximately 20 pounds per hour, and two times at a feed rate of 34 pounds per hour (referred to as Run No. 2, Run No. 3, and Run No. 4, respectively).

13. Upon completion of the test runs, the conversion facility equipment was decontaminated in place by wet decontamination process.

14. All solutions accumulated were placed into pre-tared polyethylene containers and transferred to K-601 by Coded Chemicals Department.

15. The unused oxide was returned to the Coded Chemicals Department for weighing.

Discussion of Operations

Run No. 1

Operational Run No. 1 had a feed rate of 7.4 pounds of oxide per hour. The flow rate of fluorine was 2.8 pounds per hour, with an excess fluorine rate of 19.67 percent. The total operating time for this run was 26.25 hours. The average vent sample result was 3.258 ppm U as UF_6, which resulted in a vent stack loss of 2.0 grams uranium and 0.0 grams uranium-235 for this run. A total of 74,512 grams uranium as urano-uranic oxide (U_3O_8) was charged to the system for this run, which produced 64,530 grams uranium as uranium hexafluoride, 7,150 grams uranium as ash, and 2,628 grams uranium as alumina trap recovery. The resultant operating deficiency, or hold-up, for this run was a loss of 204 grams uranium and a gain of 117 grams uranium-235. This apparent gain of uranium-235 for this run was felt to be due to the residual hold-up of higher assay material in the system. This operating run was completed without any particularly irregular operating difficulties. Tables II and IX present operating data for this run.

Run No. 2

Operational Run No. 2 had a feed rate of 19.17 pounds of oxide per hour during a period of 18.4 hours. The flow rate of fluorine was 8.4 pounds per hour, with an excess fluorine rate of 18.95%. The average bent stack sample result was 4.395 ppm U as UF_6, which resulted in a vent stack loss of 5.0 grams uranium and 0.0 grams uranium-235 for this run. A total of 135,313 grams uranium as urano-uranic oxide (U_3O_8) was charged to the system for this run, which produced 97,146 grams uranium as uranium hexafluoride, 15,706 grams uranium as ash, and 359 grams uranium as alumina trap recovery. The hold-up for this run was 22,102 grams uranium and 217 grams uranium-235. The apparent loss of material for this run was felt to be attributed to two operational difficulties experienced during the run as follows: (1) Plugged pigtail to the product drain cylinder which resulted in a small loss of material to the atmosphere and a hold-up of material in the cold trap to be later recovered in Run No. 4; (2) An ash material plug in the tower to the extent of 25 pounds which was not properly apportioned to this run. Tables III and IX present an operating summary of this run.

Run No. 3

Run No. 3 had a feed rate of 33.24 pounds of oxide per hour during an operating period of 10.25 hours. The flow rate of fluorine was 14.0 pounds per hour, with an excess fluorine rate of 21.30 percent. The average vent stack sample result was 8.250 ppm U as UF_6, which resulted in a vent stack loss of 9.0 grams uranium and 0.0 grams uranium-235 for this run. A total of 131,052 grams uranium as urano-uranic oxide (U_3O_8) was charged to the system for this run, which produced 114,250 grams uranium as uranium hexafluoride, 19,712 grams uranium as ash, and 646 grams uranium as alumina trap recovery. This run resulted in a gain of 3,556 grams uranium and 74 grams uranium-235. This gain possibly could be attributed to Run No. 2 for reasons previously discussed. Another factor which might have influenced this deficiency was the initial blow-back of the sintered tube filters with air (located between the cold traps and the tower); although Run No. 1 and Run No. 2 did not indicate the necessity for this operation, its purpose was to blow-back to an ash receiver material (solids) that had adhered to the filter tubes themselves. This operation did reduce the ΔP across this filter after the PI had indicated evidence of a slight plug on the filter tubes. Although this operation reduced the ΔP across these filters, any material that may have passed through these filters would have been trapped out in one of the seven traps used, and the solids would have dropped into the ash receivers on the bottom of these filters. This is a normal operating procedure, and is performed during the routine operations of this facility. Tables IV and IX present operating data for this run.

Run No. 4

Run No. 4 had a feed rate of 34.00 pounds of oxide per hour during an operating period of 9.2 hours. The flow rate of fluorine was 16.8 pounds per hour, with an excess fluorine rate of 28.17 percent. The average vent stack sample result was 11.890 ppm U as UF_6, which resulted in a vent stack loss of 11.00 grams uranium and 0.0 grams uranium-235 for this run. A total of 119,790 grams uranium as urano-uranic oxide (U_3O_8) was charged to the system for this run, which produced 105,512 grams uranium as uranium hexafluoride, 11,457 grams uranium as ash, and 1,123 grams uranium as alumina trap recovery. The resultant hold-up for this run totaled 1,637 grams uranium and 27 grams uranium-235. This operating run was completed without any particularly irregular operating difficulties. Tables V and IX present operating data for this run.

Operational Summary for the Test

This summary includes that material which may be accounted for by the three basic divisions of this test.

(1) Operational Run Nos. 1, 2, 3, and 4.
(2) Clean-up operations not broken down by run.
(3) Final clean-up operations (the detail of this operation will be contained in another section).

The summation of all these operations is included below.

The average feed rate during the test was 15.85 pounds of oxide per hour over a period of 64 hours. The average flow rate of fluorine was 8.2 pounds per hour, with an excess fluorine rate of 20.94 percent. The average vent stack sample result was 4.270 ppm U as UF_6, which resulted in a vent stack loss of 27.0 grams uranium and 0.0 grams uranium-235 for the test. A total of 460,666 grams uranium as urano-uranic oxide (U_3O_8) was charged to the system for this test, which produced 383,659 grams uranium as uranium hexafluoride, 64,687 grams uranium as ash, 4,950 grams uranium recovered from the alumina traps, and 1,797 grams uranium recovered as vacuum cleanings. The cleanup operations, which will be discussed in detail in another section, resulted in a recovery of 10,053 grams uranium 525 grams uranium-235. The overall accountability for this test reflected a gain of 4,507 grams uranium and 738 grams uranium-235. The tables contained herein present a breakdown of this operating test.

During the test operation of the Conversion Facility, the Health Physics Group had continuous air monitors located adjacent to the west end of Cold Trap F-20-A in "E" area and adjacent to the Feed System in "H" area. Audit surveys of the floor surfaces in each area were made by personnel from the Health Physics Group. They also determined the contamination indices prior to start-up of the test operation and subsequent to each test run. Table X represents a summary of the estimated quantity of uranium material air-borne and on the floor in the area of the conversion facility as reported[1] by the Health Physics Group.

1/ Letter from A. F. Becher to J. A. Parsons, "K-1420 Fluorination Facility Tests, January 30 through February 3, 1961," February 23, 1961.

Clean-up Activity

The entire comversion system was completely and thoroughly cleaned in-place by wet decontamination after completion of the test. A sampling test was made on the solutions recovered from these clean-up operations. This test was made to verify the representativeness of samples taken from the solutions accumulated during this test. The results of the test gave conclusive evidence that the sample methods used produced representative samples of the material (solutions) recovered.

Table XI presents a breakdown of material recovered from the basic divisions of the system in the clean-up activity.

Acknowledgements

The authors wish to acknowledge the excellent cooperation received from all of the plant groups participating in the different phases of the test operation. The Chemical Division personnel aided in the development of the test, operated and cleaned up the system after the test. The Coded Chemicals Department performed the material handling, sampling and weighing of all uranium bearing materials for the test. The Process Control Laboratory performed all vent line and process control sampling for the test. The Health Physics Group conducted surveys for air-borne and surface contamination before, during and after the completion of the test. The Works Laboratory performed the analytical work on samples required for the test.

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TABLE I

OPERATIONAL SUMMARY FOR THE TEST

	Uranium Grams	Uranium-235 Grams
Total Oxide Charged	460,666	5,746
UF_6 Recovered	383,659	4,977
Ash	64,687	833
Alumina	4,950	99
Vacuum Cleanings	1,797	50
Vent Stack Loss	27	0
Total Accounted For	455,120	5,959
Total Operating Deficiency	5,546	-213
Recovery from Clean-up Operations	-10,053	-525
Total Deficiency	-4,507	-738

TABLE II

OPERATIONAL MATERIAL BALANCE

FOR RUN NO. 1

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Oxide Charged	12-3	88,145.00	.84533	1.2437	74,512	927
UF_6 Recovered	2900	210.45#	.67600	1.3693	64,530	884
Ash	AS-1	9,821.00	.72800	1.3500	7,150	97
Alumina	R-1 - B-1	21.40#	.13500	2.1030	1,310	28
	R-1 - B-2	21.06#	.13800	2.6710	1,318	35
otal Hold-Up					204	-117

TABLE III

OPERATIONAL MATERIAL BALANCE

FOR RUN NO. 2

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Oxide Charged	12-3	12,927.00	.84533	1.2437	10,928	136
	12-4	101,544.00	.84473	1.2435	85,777	1,067
	12-2	45,576.00	.84712	1.2502	38,608	483
Total Charged		160,047.00			135,313	1,686
UF_6 Recovered	2843	303.15#	.67583	1.2940	92,931	1,203
	3099	13.75#	.67583	1.2940	4,215	55
		316.90#			97,146	1,258
Ash	AS-2	19,881.50	.79000	1.2940	15,706	203
Alumina	R-2 B-3	18,144.00	.01980	2.1520	359	8
Total Hold-up					22,102	217

TABLE IV

OPERATIONAL MATERIAL BALANCE

FOR RUN NO. 3

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Oxide Charged	12-2	59,420.00	.84712	1.2502	50,336	629
	12-5	93,541.00	.84848	1.2438	79,368	987
	12-1	1,588.00	.84865	1.2532	1,348	17
Total Charged		154,549			131,052	1,633
UF_6 Recovered	2990	305.15#	.67573	1.2650	93,530	1,183
	3044	54.90#	.67573	1.2650	16,827	213
	2681	12.70#	.67573	1.2650	3,893	49
		372.75#			114,250	1,445
Ash	AS-3	16,109.00	.79100	1.2780	12,742	163
	AS - 3A	9,052.50	.77000	1.2760	6,970	89
		25,161.50			19,712	252
Alumina	R-3 B-4	37.10#	.03840	1.5520	646	10
Total Hold-Up					-3,556	-74

TABLE V

OPERATIONAL MATERIAL BALANCE

FOR RUN NO.4

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Oxide Charged	12-1	103,112.00	.84865	1.2532	87,506	1,097
	12-3	38,045.00	.84857	1.2472	32,284	403
Total Charged		141,257.00			119,790	1,500
UF_6 Recovered	3091	91.20#	.67587	1.2620	27,959	353
	3073	253.10#	.67553	1.2617	77,553	978
					105,512	1,331
Ash	AS-4	15,358.00	.75000	1.1000	11,457	144
Alumina	R-4 B-5	18.75#	.05280	1.2640	449	6
	R-4 B-6	19.50#	.07620	1.2620	674	9
					1,123	15
			Accounted For		118,092	1,490
			Total Hold-Up		1,698	10

TABLE VI

CLEAN-UP MATERIAL NOT BROKEN DOWN BY RUN

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
UF_6 Recovered	P-386*	16,025.00	.0268	2.742	429	12
	P-860*	15,025.00	.0616	2.554	926	24
	P-692*	14,950.00	.0575	2.638	860	23
	P-857*	14,080.00	.0004	8.759	6	0
					2,221	59
Ash	AS-5	14,085.00	.7500	1.277	10,662	137
Alumina	B-7	37.70#	.0102	1.338	174	2
	B-8	37.10#	.0012	4.027	20	1
					194	3
Vacuum Cleanings	AS-6	2,499.00	.7190	2.810	1,797	50
					14,874	249

* Pertains to cylinders used in the freeze-out, low temperature, and vent trap positions (2392, 377, 371, 1570, 3881, 0220, and 1845)

TABLE VII

BREAKDOWN OF MATERIALS ASSOCIATED WITH THE TEST

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235	Tap Density (g/cc)
Oxide Charged	12-1	104,700.00	.84865	1.2532	88,854	1,114	3.83
	12-2	104,996.00	.84712	1.2502	88,944	1,112	3.83
	12-3	101,072.00	.84533	1.2437	85,439	1,063	3.53
	12-4	101,544.00	.84473	1.2435	85,777	1,067	3.30
	12-5	93,541.00	.84848	1.2438	79,368	987	3.50
	13-2	38,045.00	.84857	1.2472	32,284	403	3.50
Total Charged			.84697*	1.2473*	460,666	5,746	3.58*
UF_6 Recovered	2900	210.45#	.67600	1.3693	64,530	884	
	2843	303.15#	.67583	1.2940	92,931	1,203	
	3099	13.75#	.67583	1.2940	4,215	55	
	2990	305.15#	.67573	1.2650	93,530	1,183	
	3044	54.90#	.67573	1.2650	16,827	213	
	2681	12.70#	.67573	1.2650	3,893	49	
	3091	91.20#	.67587	1.2620	27,959	353	
	3073	253.10#	.67553	1.2617	77,553	978	
		1,244.40#	.67577*	1.2893*	381,438	4,918	
Solution (UF_6)	P-386	16,025.00	.02680	2.7420	429	12	
	P-860	15,025.00	.06160	2.5540	926	24	
	P-692	14,950.00	.05750	2.6380	860	23	
	P-857	14,080.00	.00040	8.7590	6	0	
					2,221	59	
Total UF_6					383,659	4,977	
Ash Produced	AS-1	9,821.00	.72800	1.3500	7,150	97	
	AS-2	19,881.50	.79000	1.2940	15,706	203	
	AS-3	16,109.00	.79100	1.2780	12,742	163	
	AS-3A	9,052.50	.77000	1.2760	6,970	89	
	AS-4	15,358.00	.74600	1.2580	11,457	144	
	AS-5	14,085.00	.75700	1.2880	10,662	137	
Total Ash			.76728*	1.2877*	64,687	833	

* Average

TABLE VII (Contd.)

	Container Number	Net Wt.	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Alumina	R-1 B-1	21.40#	.13500	2.1030	1,310	28
	R-1 B-2	21.06#	.13800	2.6700	1,318	35
	R-2 B-3	18,144.00g.	.0198	2.1520	359	8
	R-3 B-4	37.10#	.03840	1.5520	646	10
	R-4 B-5	18.75#	.05280	1.2640	449	6
	R-4 B-6	19.50#	.07620	1.2620	674	9
	R-4 B-7	37.70#	.01020	1.3380	174	2
	R-4 B-8	37.10#	.00120	4.0270	20	1
Total Alumina					4,950	99
Vacuum Cleanings	AS-6	2,499.00g.	.71900	2.8100	1,797	50
Total Recovered				1.3094*	455,093	5,959
Deficiency					5,573	-211

* Average

TABLE VIII

BREAKDOWN OF CLEAN-UP MATERIAL

	Container Number	Net Wt. (grams)	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
Oxide Recovered From Tower Filter and Feed Line	621	5,296	0.7963	3.693	4,217	156
	Sample 101		0.7820	5.508	79	4
Decontamination Solution	P-399	7,130	0.0036	1.954	26	1
	P-822	8,145	0.0374	14.780	305	45
	P-266	10,566	0.0033	2.211	35	1
	P-859	9,305	0.0115	3.119	107	3
	P-855	10,730	0.0056	1.570	60	1
	P-887	14,790	0.0026	5.267	38	2
	P-880	14,460	0.0154	3.575	223	8
	P-884	14,060	0.0046	4.596	65	3
	P-885	9,900	0.0011	5.569	11	1
	P-888	14,770	0.0025	2.318	37	1
	P-883	14,228	0.0033	2.766	47	1
	P-891	13,820	0.0027	4.212	37	2
	P-886	15,215	0.0190	5.091	289	15
	P-889	15,635	0.0146	5.390	228	12
	P-777	16,195	0.0002	3.868	3	-
	P-858	15,305	0.0001	2.207	2	-
	P-881	14,945	0.0004	2.005	6	-
	P-893	14,435	0.0064	1.499	92	1
	P-882	14,048	0.0019	1.545	27	-
	P-890	14,585	0.0103	2.945	150	4
	P-671	14,510	0.0002	2.337	3	-
	P-879	13,950	0.0017	1.623	24	-
	P-892	13,520	0.0003	2.224	4	-
	P-918	14,005	0.0003	1.443	4	-
	P-910	14,155	0.0017	1.390	24	-
	P-953	14,535	0.0003	1.398	4	-
	P-919	14,018	0.0021	1.413	29	-
	P-923	13,982	0.0003	1.434	4	-
	P-915	14,155	0.0021	1.456	30	-
	P-947	14,300	0.0014	14.890	20	3
	P-913	14,225	0.0003	1.650	4	-
	P-952	14,385	0.0003	1.425	4	-
	P-909	13,850	0.0003	1.402	4	-
	P-914	14,076	0.0003	1.421	4	-
	P-921	13,975	0.0008	1.377	11	-
	P-943	14,185	0.0343	24.230	487	118
	P-950	14,180	0.0057	23.300	81	19

TABLE VIII (Contd.)

Container Numbers	Net Wt. (grams)	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
P-956	14,130	0.0003	1.490	4	-
P-957	13,965	0.0005	1.395	7	-
P-955	14,665	0.0003	1.418	4	-
P-951	13,970	0.0044	24.060	61	15
P-531	14,655	0.0016	1.971	23	-
P-917	14,700	0.0020	1.396	29	-
P-932	14,090	0.0011	3.237	15	1
P-929	14,630	0.0061	1.418	89	1
P-931	14,265	0.0048	1.403	68	1
P-930	13,920	0.0006	1.424	8	-
P-941	14,780	0.0006	1.417	9	-
P-936	13,865	0.0050	1.372	69	1
P-940	14,190	0.0007	1.455	10	-
P-922	14,330	0.0020	1.395	29	-
P-911	14,647	0.0022	1.454	32	-
P-920	14,980	0.0020	1.399	30	-
P-937	14,240	0.0049	1.371	70	1
P-916	14,275	0.0020	1.403	29	-
P-944	14,890	0.0033	24.700	49	12
P-924	14,755	0.0060	1.384	89	1
P-963	14,435	0.0037	13.800	53	7
P-928	14,100	0.0056	1.404	79	1
P-935	14,105	0.0049	1.363	69	1
P-946	14,750	0.0014	17.600	21	4
P-945	13,690	0.0002	1.726	3	-
P-925	14,210	0.0068	1.380	97	1
P-912	14,750	0.0021	1.612	31	-
P-934	13,905	0.0160	1.484	222	3
P-926	14,000	0.0052	1.393	73	1
P-939	14,700	0.0021	1.462	31	-
P-927	14,685	0.0061	1.403	90	1
P-938	14,470	0.0034	1.420	49	1
P-933	14,080	0.0051	1.368	72	1
P-949	14,935	0.0011	18.960	16	3
P-966	14,670	0.0003	12.190	4	1
P-967	14,550	0.0004	12.250	6	1
P-960	13,960	0.0023	11.600	32	4
P-948	15,015	0.0040	13.250	60	8
P-959	14,465	0.0009	12.300	13	2
P-958	14,015	0.0023	11.750	32	4
P-964	13,680	0.0025	12.020	34	4
P-968	14,830	0.0009	8.148	13	1
P-942	14,490	0.0025	1.428	36	1

TABLE VIII (Contd.)

Container Number	Net Wt. (grams)	Analysis (g U/g.)	Assay (% U-235)	Grams Uranium	Grams U-235
P-965	13,545	0.0028	11.750	38	4
P-954	14,315	0.0045	13.000	64	8
P-961	14,640	0.0022	4.613	32	1
P-970	15,045	0.0021	4.019	32	1
P-971	14,480	0.0031	3.769	45	2
P-969	13,910	0.0022	3.603	31	1
P-890	14,400	0.0001	5.879	1	-
P-886	14,010	0.0003	7.465	4	-
P-892	14,445	0.0002	7.921	3	-
P-879	13,775	0.0002	4.924	3	-
P-881	14,245	0.0011	4.536	16	1
P-951	15,680	0.0033	3.261	52	2
P-952	15,520	0.0131	2.058	203	4
P-774	15,832	0.0158	1.333	250	3
P-956	14,940	0.0284	1.412	424	6
P-889	14,070	0.0036	2.048	51	1
P-856	15,560	0.0031	3.749	48	2
P-1012	14,392	0.0039	5.969	56	3
P-962	14,770	0.0003	12.150	4	1
Sample	0.56 liter	19.0 gu/l.	6.876	11	1
Total Material recovered from Clean-up Activity				10,053	525

TABLE IX

VENT STACK SAMPLE DATA

	Operating Time (Hrs)	Feed Rate (Lbs/Hr)*	Fluorine Flow Rate (Lbs/Hr)*	Excess Fluorine (%)*	Vent Sample (PPM U)*	Vent Loss	
						Grams U	Grams U-235
Run No. 1	26.25	7.40	2.8	19.67	3.258	2	0
Run No. 2	18.41	19.17	8.4	18.95	4.395	5	0
Run No. 3	10.25	33.24	14.0	21.30	8.250	9	0
Run No. 4	9.16	34.00	16.8	28.17	11.890	11	0
Totals	64.07	15.85*	8.2*	20.94*	4.270*	27	0

*Average

TABLE X

SUMMARY OF CONVERSION AREA
AIR-BORNE AND FLOOR CONTAMINATION[2/]

Location	Estimated Uranium (Grams)		
	Air-Borne	On Floor	Total
"H" Area	39.3	282	321.3
"E" Area	98.5	34	132.5
Tower Room	-	28	28.0
Total	137.8	344	481.8

2/ Compiled from letter, A. F. Becher to J. A. Parsons, "K-1420 Fluorination Facility Tests, January 30 through February, 1961," February 23, 1961.

TABLE XI

MATERIAL RECOVERED IN CLEAN-UP ACTIVITY
BY BASIC DIVISIONS OF THE SYSTEM

	Uranium (Grams)	U-235 (Grams)	Assay (%) Average	Lowest	Highest
I. Feed System					
1. Sintered tube filters "H" Area	4,846	185	3.818	3.520	5.508
2. Vent line to Cambridge filter	14	1	6.250	1.726	6.876
Total Feed System	4,860	186			
II. F_2 Tower System					
1. F_2 Tower and Associated Lines	625	20	3.200	1.499	5.390
2. Sintered Tube filters "E" Area	84	2	2.381	2.318	2.766
Total Tower System	709	22			
III. UF_6 Trapping System					
1. 10" Cold Trap					
A- F-16A	1,114	14	1.407	1.363	1.484
B- F-16B	433	2	1.436	1.377	1.650
Total 10" Cold Traps	1,547	16			
2. 5" Cold Traps					
A- F-20A	390	52	13.333	11.600	18.960
B- F-20B	698	167	23.926	23.300	24.700
Total 5" Cold Traps	1,088	219			
Total UF_6 Trapping System	2,635	235			
IV. Vent System	223	9	4.036	3.603	7.921
V. Miscellaneous	1,626	73	4.490	1.333	14.780
Total for Clean-Up Activity	10,053	525			