RL-114 R[illegible]
AEC-GE RICHL[illegible] WASH.

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DOCUMENT NO. HAN-99597
Rpt 5 May 1968

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RL-337 (REV. 7-67)
AEC-RL RICHLAND, WASH.

U. S. ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE

PROCESSING STATISTICS

HAN-9[redacted]
Rpt #5
May 1968

TO: O. J. Elgert
DIRECTOR, CHEMICAL PROCESSING DIVISION

FROM: J. T. Christy
CHIEF, CHEMICAL OPERATIONS BRANCH

SUBJECT: 200 AREA MONTHLY REPORT

FOR May 1968

DATE: [redacted]

DC:AWL:MR:MJR

PRODUCTION

PLANT	PRODUCT	AMOUNT	PERCENT OF FORECAST	PERCENT EFFICIENCY OP	PERCENT EFFICIENCY MECH	PERCENT WASTE LOSSES PU	PERCENT WASTE LOSSES U	ATM RELEASE CI/ DAY
PUREX	Normal U	270.3 TONS	62	61	81	0.35	0.31	0.010
	- U	- TONS	-					
	NEPTUNIUM	3145 KG	220					
UO_3	Normal U	414.3 TONS	95	-	-			
	- U	- TONS						
234-5	PU-DEFENSE	~~488~~ KG	122	51	90	-		
	PU-NONDEFENSE	~~488~~ KG	-					
RECOVERY	PLUTONIUM	~~75.8~~ KG						
	AMERICIUM	~~10.1~~ G						

INVENTORIES

PRODUCTS

PRODUCT	TYPE	AMOUNT
UNH	Normal	45.8 TONS U
	Enriched	119.7 TONS U
UO_3	Normal	2002.4 TONS U
	-	- TONS U
PU METAL	DEFENSE	171.2 KG
	NONDEFENSE	1952 KG
PU NITRATE	DEFENSE	- KG PU
	NONDEFENSE	464* KG PU

PLUTONIUM SCRAP

PROGRAM	MO. RECEIPT-KG	TOTAL KG
TOTAL RL PROGRAM		674
OFF-SITE INVENTORY		124
RL BACKLOG		550.1
PU PROCESSING		89.1
FABRICATION		56.2
COMBUSTIBLES		37.7
INCINERATOR ASH		140.2
LABORATORIES		
SUPPORTING		34.2
BNW	0	144.2
GENERATED OFF-SITE	0	48.4
RECOVERY PROGRAM		
CONTRACTED		0
FUTURE CONTRACTS	Non-02-03	241
RL-PU RECL. FAC.	02-03	433

SPECIAL PROGRAMS

PLANT	PROGRAM	PRODUCT	SCHEDULED	PRODUCED	SHIPPED	INVENTORY
~~234-5~~	~~ZPPR~~	~~Pu~~	~~100 kg~~	~~214 kg~~	~~159.1 kg~~	~~708 kg~~

*Includes 81 kg oxide and 13 kg scrap

HANFORD CODE C-65

[redacted]

Operation

Processing of normal uranium containing nondefense plutonium, under way at the beginning of the month, continued at 16.7 TU/D until May 14. The plant was shut down for a turnaround to natural uranium containing defense plutonium. Processing resumed on May 27 at 25 TU/D through month end except for a 20-hour outage to segregate sulfate-free waste and to regasket the F6 waste concentrator tube bundle.

Uranium and plutonium products were within specification during the month.

month. At month end,
Rework of the out-of-specification nondefense plutonium inventory was completed before the end of the nondefense run. One cask of sulfate-free waste from the April batch was shipped to BNW. The remaining waste from the April batch was discarded because of impurities.

Maintenance

Major canyon work included replacement of the B dissolver tower, scrubber, and scrubber catch tank with modified units; replacement of jumpers on the 1WF and No. 2 solvent systems and on the HS Column; testing concentrator tube bundles for leaks and replacing tube bundles on F6 and H4 concentrators; regasketing an F6 tube bundle; replacing the F2 off-gas heater; regenerating all four silver reactors; and overhauling the 10-10 hoist on the west crane. Other miscellaneous accomplishments were: examination of the chemical sewer and installation of a temporary replacement of a failed portion; repairs to sampler pits for acid waste transfer systems and on the HAP and 2BP samplers; replacing the L13 Pu loadout tank; overhauling the pumps on the two UNH trailers; and installing a prototype neptunium sampling system.

Radiation

One cask of high activity BNW waste was unloaded in the 212A facility. A small amount of solution escaped from the cask during unloading, and the building was out of service two weeks for decontamination.

A box of failed canyon equipment was buried during the month with good contamination control.

[redacted]

[redacted]

PUREX (continued)

Radiation (continued)

Iodine emission:

Total for month	0.316 Ci
Average daily	0.010 Ci
Maximum daily	0.022 Ci

[redacted]

PLUTONIUM FINISHING--234-5

Total plutonium processed in the button line was 122% of forecast.

Defense Grade Plutonium

No defense grade plutonium was processed through the button line during May.

Product (kg)

Beginning Inventory	
Production	0
Diversion	0
Ending Inventory	

Nondefense Plutonium

Nondefense plutonium was processed through the button line until May 23; 487 kg of metal were produced. Hood 9A was started up on May 27; it produced, from Dresden plutonium nitrate, 31.3 kg of oxide having a Pu-240 content of 16-21%. Oxide production was completed May 31, and part of the oxide was transferred to the button line in preparation for reduction to metal.

The button line operated 54% of the available time on a 3-shift, 5-day week. The average rate while operating was 2.00 kg Pu/hr. Average impurities in the buttons was 762 ppm. Metal density averaged 19.34 g/cm^3.

Thirty-four kilograms of plutonium are being held in storage for the SEFOR Program, awaiting a request for shipment.

One bulk shipment of plutonium nitrate was made to GE-Vallecitos.

High-fired plutonium oxide scrap was received from Oak Ridge. The material was purported to be of stoichiometric purity; however, measurements by neutron counter cast doubt on the amount of plutonium present in the material. The OR value for Pu has not been accepted. The discrepancy still remains to be resolved.

Blending and ingoting of plutonium metal for ZPPR continued with the production of 70 melts. Net production was 214 kg of metal for a fiscal year total of 1716 kg.

Shipment No. 23, consisting of 9 bottles containing 15.64 kg of plutonium, was received from NFS, West Valley plant.

[redacted]

PLUTONIUM FINISHING--234-5 (continued)

Nondefense Plutonium (continued)

Product

Receipts

Form	Quantity (gm)	From - Remarks
Oxide (scrap)	1,922	ORNL - 18 bottles
Oxide	3,728	Westinghouse - 7 containers
ZPPR ingot	3,122	NUMEC - Z-27-12-132
ZPPR B samples	40	NUMEC - 4 samples
Nitrate	15,640	NFS - Shipment #23
Nitrate	4,893	BNW
Oxide		
Nitrate		
Total		

Removals

Letter No.	Form	Quantity (gm)	To
156	Nitrate	475	GE
164	Ingots & samples	158,600	
Total		159,075	

The following material available in the ARHCO-CPD plants includes all material processed for the ZPPR and SEFOR Programs. Differences in the quantities presented and those reported by Nuclear Materials Management may occur as a result of different cutoff and book transfer dates.

Inventory Summary (kg)

Wt % Pu-240	Breakdown				Total
	Metal	Nitrate	Oxide	Scrap	
7-10					
10-15					
15-20					
> 20					

[redacted]

Nondefense Plutonium (continued)

Product (continued)

	Wt % Pu-240	Inventory (kg) Quantity Total	Each	Identity*	Form
Miscellaneous Requirements					
	< 7	< 1		1% Pu-240	Scrap
	8- 9	34	34	P-S	Nitrate
ZPPR					
	9-10	210	210	P-NY-S & Rec	Buttons
Euratom					
	10-11		45	P-NY	Oxide
ZPPR			214	P-NY-Rec	Buttons
					Billets
	11-12				Billets
			11	P	Nitrate
			703	ZPPR	Ingots
			10	ZPPR	Scrap
			17	Rec	Nitrate
	12-13				Billets
			30	NY	Nitrate
	13-14		52	NY	Nitrate
					Billets
Pu Burning					
	15-16				Billets
	16-17		24	ND	Nitrate
			1	NV	Nitrate
					Billets
	17-18		22	ND	Nitrate
			4	ND	Oxide
					Billets
	18-19	15	13	ND	Oxide
			1	ND	Scrap
			1	ND	Oxide

[redacted]

PLUTONIUM FINISHING--234-5 (continued)

Nondefense Plutonium (continued)

Product (continued)

Wt % Pu-240	Inventory (kg) Quantity Total	Each	Identity*	Form
Pu Burning				
20-21	10	10	ND	Oxide
21-22	5	4	ND	Oxide
Miscellaneous Requirements				
		1	ND	Metal
		2	ND	Scrap
Subtotal				
NPR - ZPPR				
11-12	472	447	PN-P	Buttons
Miscellaneous		2	NW	Oxide
Requirements		23	NY-NN	Nitrate
12-13	86	63	NN	Nitrate
		21	P-NN-NY-Rec	Buttons
		2	P-NN-NY	Oxide
Subtotal				

[redacted]

[redacted]

PLUTONIUM FINISHING--234-5 (continued)

Nondefense Plutonium (continued)

Product (continued)

In Process

% Pu-240	Quantity	Identity*	Location	Form
11 - 12	93	P	PR cans at Purex	Nitrate
Subtotal	93			
TOTAL				

---

*Identity Code

P - Purex Conventional Reactors
PN - Purex-NPR
NN - NFS-NPR
NY - NFS-Yankee
ND - NFS-Dresden
NU - NUMEC
S - SEFOR

Rec - Plutonium Reclamation

[redacted]

Nondefense Plutonium (continued)

Product (continued)

Program Summary (kg)

Program	Requirements	Production (net) Month	Production (net) FY-68	Production (net) To Date	Shipments (net) Month	Shipments (net) FY-68	Shipments (net) To Date	Available
SEFOR	560	-	-	-	-	442	526	34
ZPPR	3742**	211	1714	3046				
ANL						5.5	5.5	
NUMEC	___	___	___	___	158.6	1190.5	1190.5	
TOTAL	3742	211	1714	3046	158.6			* 708

*Includes 9.4 kg of processed NUMEC returns.
** 3742 ingots @ 11.5 thru FY-69
600 Oxide @ 11.5 thru FY-69
215 Oxide @ 27.0 thru FY-70

4557 Total program

[redacted]

PLUTONIUM RECLAMATION

Processing during May was devoted to nondefense material; 75.8 kg were recovered, including 25.3 kg ZPPR scrap. On May 24, plant cleanout was begun in preparation for month-end inventory and changeover to defense plutonium processing. The plant was started on defense Pu May 31.

Plutonium Reclamation Facility

Feed to the PRF was composed of plutonium scrap, but uranium remaining in the system from the April process test resulted in uranium in the product. It was necessary to waiver most of the May production because of high uranium.

Slag and crucible dissolution performed satisfactorily with the 08 dissolver throughout the month (22 operating days). During the month, 375 cans, containing approximately 3.0 kg Pu, were dissolved. The 04 dissolver was repaired and installed for service at month end; the 06 unit is undergoing repair. Four pumps failed. One Chempump was beyond repair and was buried; three Deanline pumps were repaired and returned to service.

Centrifugation of the aqueous waste stream was limited to less than one percent of the operating time due to equipment failures. The solids problem is still not resolved.

Incinerator Building

Ninety waste boxes, resulting in 0.6 kg of plutonium in leach solutions and 7.7 kg in incinerator ashes, were processed. Fifty-four boxes were received during the month, and the month-end inventory was at a new low of 177 boxes.

Performance of the incinerator equipment has been excellent since the off-gas scrubber equipment was adjusted on May 10. By controlling the off-gas flow at the design rate of 100 cfm, particulate matter is prevented from being carried into the heater and onto the off-gas filter.

Waste Treatment Facility

Processing of 86,174 liters of aqueous waste resulted in the recovery of 331 grams of plutonium and 10.1 grams of americium-241.

Miscellaneous Recovery

Processing of chloride scrap and polystyrene was curtailed during the month due to lack of manpower. Now that the vacation period has begun, these jobs will be performed on a fill-in basis as personnel become available.

[redacted]

[redacted]

U03

Processing of normal depleted uranium continued with three calciners in operation through May 24 when the feed was exhausted.

Total production was 414.3 tons normal uranium oxide which was 69% of forecast. All powder produced met specification.

Shipments to Fernald were 274 tons (U) coproduct oxide representing the remainder of material produced from the first campaign and three carloads of thorium nitrate containing 33.6 tons of thorium. Shipment of the thorium from the 1966 campaign is approximately 75% complete.

Maintenance work completed during the month included removing and cleaning pipe elbows in the off-gas system, repacking calciner shafts, and replacing filters and filter bags.

[redacted]

Purex Process

Zirconium Cladding Fires

Further studies of the cladding fires as experienced at NFS have identified a possible cause. During the shearing process, a feather edge which can be readily ignited when the uranium is leached out is created on the zirconium cladding. We can assume that this problem will not occur until or unless RL installs a mechanical head-end process in the separations plant.

Coproduct Processing

The solvent extraction processing of the blended coproduct uranium realized an over-all decontamination factor (DF) of 5×10^7 when the HSP saturation was held at 68% and 2.5×10^7 at 87%. While the DF was better at lower saturation, it also resulted in reducing the neptunium loss to the HAW stream. Neptunium losses averaged about 2% at lower saturation compared to the 4 to 8% loss at the higher saturation.

Recycle of Acid Absorber Condensate

Recycle of about 65% of the AAD has resulted in an 85% reduction of activity discharged to the environs. The recycle did cause a moderate increase in activity in the recovered acid stream, but it has had no significant effects on the process or on product quality.

Use of Hydrazine Stabilized Ferrous Nitrate in the Second Uranium Cycle

Additional tests using ferrous nitrate as a reductant in the final uranium cycle were favorable. The reductant was introduced into the process in the 2D Column instead of the 2DF tank. Satisfactory operation was maintained over a ten-day period

Purex Process Condensate Recycle

Scouting studies show that the condensate from the H4, J8, and K4 concentrators can be used in the ratio expected during normal operation with no influence on uranium losses. However, when the individual condensates were used, there was a 1.5 to 5-fold increase in uranium loss. In addition, the J8 condensate lowered the maximum stable operating pulse frequency by about 12%.

[redacted]

Characterization of Plutonium Oxide

Users of nondefense plutonium oxide frequently inquire as to the characteristics of the material available. In response to this need, twelve samples of plutonium oxide were collected from the plutonium oxalate precipitate calciner outlet for characterization. Eight of the samples were collected from Hood 9B which was operated under conditions normally used for production of plutonium metal. The other four samples were collected from Hood 9A under conditions which were designed to produce plutonium oxide having a plutonium content greater than 85 percent. Results are tabulated below.

Processing Conditions	Regular Production Range	Controlled Production Range
Precipitator		
Feed rate, grams/hr.	1148 - 1431	780 - 925
Residence time, min.	8 - 9	14 - 15
Calciner		
Temperature, °C	400	475
Residence time, min.	20 - 40	66

Characteristics	Average	Range	Average	Range
Bulk density, g/cc	1.32	1.25 - 1.42	1.54	1.39 - 1.65
Tap density, g/cc	1.62	1.53 - 1.72	1.99	1.84 - 2.07
Median size, μ	16.0	14.4 -18.0	12.4	11.8 -13.4
Surface area, m^3/g	48.8	42.2 -51.8	37.8	28.3 -47.4
% Volatiles	9.58	6.68 -12.2	2.87	2.82 - 2.91
% Moisture	3.10	2.60 - 3.30	1.68	1.51 - 1.76
% Plutonium	81.5	79.4 -83.5	87.6	87.4 -87.9
Carbon, ppm	-	17,000->4%	732	640 - 800
Nitrogen, ppm	167	92-230	32	14 -54
Fluorine, ppm	3756	634-5117	<10	<10
Chlorine, ppm	19	< 10- 34	<10	<10

Particle size distribution was relatively uniform for the feed rate used, 780 to 1431 grams/hour, resulting in an oxide product of which 95 percent of the particles produced would pass through a 400-mesh screen (35-micron opening). Decontamination factors for Cr, Fe, Ni, and Si were determined for the plutonium nitrate to oxide processing used on the plutonium oxide processed through Hood 9A (Dresden nitrate). The decontamination factors were: Cr, 175; Fe, 39; Ni, 38; and Si, 4.

[redacted]

Uranium Decontamination Through the Continuous Oxalate Precipitation Process

Process test BL-68-1, "Uranium Decontamination by Button Line Process," was used to evaluate the over-all uranium decontamination factor for plutonium nitrate feed batches containing greater than 5000 ppm uranium and which was processed to plutonium metal buttons. The nondefense grade plutonium nitrate was processed through the button line, which includes a plutonium-IV oxalate precipitation step where the uranium decontamination takes place. The decontamination factors were determined by comparing the uranium content in the plutonium nitrate to that found in the metal buttons. Results follow:

Uranium Decontamination
Nondefense Plutonium Nitrate to Metal

Batch No.	Uranium in Feed ppm	Uranium in Button ppm Average	Uranium in Button ppm Range	Decontamination Factor Average	Decontamination Factor Range
PN-2-13	15,650	863	743 - 1012	18	15 - 47
PN-2-14	14,500	582	420 - 716	25	20 - 34
CCP-4-1	7,500	250	230 - 264	30	28 - 33
CCP-5-5	12,300	368	321 - 486	34	25 - 38

Plutonium-Uranium Scrap Processing

Following termination of a process test on mixed plutonium-uranium scrap, the Plutonium Reclamation Facility returned to normal operation except with higher-than-normal uranium in the system. Minor alterations in the equipment had included packing approximately eight feet of the CC (stripping) column with 3/4" Kynar Raschig rings. This provided additional mixing, adding 2-3 new scrub stages to the column, whereas previously $1\frac{1}{2}$ stages were realized. This addition allowed an increased flow rate in the column and studies were made to optimize operating conditions. As a result pulse frequency was changed from 45 to 75 pulses per minute and pulse pressure from 28 to 42 psig.

Recovery of Plutonium from Polystyrene Cubes

The equipment for burning polystyrene for recovery of the contained PuO_2 was modified to facilitate testing and to reduce the possibility of filter pot fires. Thermowells were added to the inlet and outlet lines on the first filter and Raschig rings installed in place of wire mesh in two filters. Demonstration tests provided temperature information on the gas temperatures, and the soot collected was tested showing no tendency to burn or otherwise react at temperatures up to 500C. The data are being evaluated for inclusion in a safety review.

[redacted] PROCESS TECHNOLOGY (continued)

Incinerator Ash Dissolution

Another test of the dichromate treatment to destroy organic material in incinerator ash produced unsatisfactory results on a different batch of ash. Vigorous oxidation of the ash either by improved burning or refluxing with potassium permanganate solution appears essential before dissolving the ash for processing in the Plutonium Reclamation Facility.

[redacted]

[redacted]

PROJECT STATUS

IAP-605 - Purex Laboratory Modifications and Additions

Project completion is scheduled for June 30, 1968. Design is complete. Construction is 88% complete and on schedule. The storage section was accepted by the using contractor during the month. Installation of the fire sprinkler system has not yet started. Modifications for the new laboratory are nearing completion. Total funds of $220,000 were authorized from FY-1967 GPP.

IAP-615 - Fire Protection Facilities, Purex

Design has not started. The project was approved and the directive issued March 20, 1968. Total funds of $87,000 were authorized from FY-1968 GPP. The directive completion date is December 31, 1968. A request for clarification of scope of work and scope revisions has been submitted and is now being considered. Design will begin when the scope questions are resolved.

[redacted]