CLASSIFICATION REVIEW FOR
DECLASSIFICATION BUT LEFT
UNCHANGED

DECLASSIFIED

HW 72890

This document consists of
47 pages.

By J.P. AR

Date 5/15/73

U.S. AEC Division of Classification

**CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR**

FEBRUARY, 1962

HW--72890

DE93 008452

DECLASSIFIED

By Authority of CG-PR-2

R.M. Iten 8-10-92

TL Phillips 8-11-92

By K. K. K. 8-12-92

Compiled By
OPERATION MANAGERS

March 21, 1962

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Work performed under Contract No. AT(45-1)-1350 between
the Atomic Energy Commission and General Electric Company.

Route To:	P.R. No.	Location	Files Route Date	Signature and Date
<u>JE Travis DEC-1100</u>				

MASTER

DISTRIBUTION RESTRICTED TO U.S. ONLY

DECLASSIFIED

NOV 1 1992

DECLASSIFIEDDISTRIBUTIONCopy Number

1	W. E. Johnson
2	H. M. Parker
3	H. D. Tibbals
4	J. H. Warren
5	W. S. Frank
6	K. G. Grimm
7	C. T. Groswith
8	T. G. LaFollette
9	P. R. McMurray
10	W. J. Gartin
11	H. P. Shaw
12	C. R. Bergdahl
13	General Electric Company, Palo Alto, California Attention: F. E. Crever, Manager Advance Planning Operation
14, 15, 16	Atomic Energy Commission, Hanford Operations Office Attention: J. E. Travis, Manager
17, 18, 19	Atomic Energy Commission, Washington 25, D. C. Attention: F. P. Baranowski, Director Production Division
20	Extra
21	300 Files
22	Record Files

TABLE OF CONTENTS

Distribution	2
Table of Contents	3
Staff	4
I. Summary	5-6
II. Achievements	
A. Production Operation	A-1 Through A-2
B. Purex Operation	B-1 Through B-3
C. Special Separation Processing and Auxiliaries Operation	C-1 Through C-4
D. Finished Products Operation	D-1 Through D-2
E. Power and General Maintenance Operation	E-1 Through E-3
F. Facilities Engineering Operation	F-1 Through F-5
G. Research and Engineering Operation	G-1 Through G-11
H. Financial Operation	H-1 Through H-2
III. Personnel Activities	J-1 Through J-5
IV. Safety and Security	K-1
V. Reports Issued	L-1 Through L-2
VI. Patent Summary	M-1

DECLASSIFIED

DECLASSIFIED

STAFF

General Manager, Atomic Products Division	L. R. Fink
General Manager, Hanford Atomic Products Operation	W. E. Johnson
General Manager, Chemical Processing Department	P. H. Reinker
Manager, Production	J. H. Warren
Manager, Purex	P. R. McMurray
Manager, Special Separation Processing and Auxiliaries	C. T. Groswith
Manager, Finished Products	W. J. Gartin
Manager, Power and General Maintenance	T. G. LaFollette
Manager, Facilities Engineering	H. P. Shaw
Manager, Research and Engineering	W. S. Frank
Manager, Finance	K. G. Grimm
Manager, Employee Relations	R. B. Britton

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

I. SUMMARY

Production through February, as compared with the January 25, 1962, HAPO Production Forecast (HW-72354), is summarized below:

	<u>Percent of Forecast Achieved</u>	
	<u>February</u>	<u>Fiscal Year To Date</u>
Separated plutonium nitrate	45.6	92.9
Separated uranium nitrate	48.3	93.5
Uranium oxide	78.7	97.7
Plutonium metal buttons	40.1	112.2
Fabricated parts	113.4	98.8

February production was below that forecasted because of mechanical and process difficulties in the Purex plant. Although a Purex shutdown of about ten days was imminent because of feed shortage, equipment failures plus process instability at startup effectively doubled the shutdown period.

The Purex Final Uranium Cycle performance continued to be substandard. For the second consecutive month, this condition has not only caused higher-than-normal uranium losses but has also limited the operating rate. Major attention is being given to resolution of the problem.

The HAPO-II-1 Cask was loaded with 110,000 curies of strontium-90 carbonate for shipment. Additional buffer insulation was added to keep the rubber shock mounts warm and resilient enough for effective protection during transit.

Redox chemical costs were reduced \$6 per ton of uranium processed by decreasing the quantity of caustic used for neutralizing salt waste solutions prior to underground tank storage. Laboratory analyses confirmed that neutralization and chemical stability of the wastes were both satisfactory with the lesser amount of caustic.

Fourteen boxes of waste were processed through the 234-5 Building incinerator during February. Based upon the input values previously determined by neutron count, recovery of plutonium was excellent.

The installation was completed for facilities in the 234-5 Development Laboratory in which plutonium can be purified and concentrated for the Plutonium Recycle Test Reactor and for critical mass studies. Equipment is adequately shielded for handling plutonium containing up to 20 percent Pu-240.

DECLASSIFIED

DECLASSIFIED

HW-72890

Directive No. AEC-204 authorized \$175,000 for Title I and II work on Project CAC-945, "New Waste Storage Tank - Purex".

J. A. Jones was given an interim authorization to begin initial field work and procurement on Project CGC-930, "Secondary Containment of Dissolver Off-Gases - Redox and Purex".

AEC Directive No. HW-534 authorized \$40,000 for Project CGC-953, "Personnel Protection, Storage Hood Shielding - 234-5 Building".

Preliminary process design drawings of new sectionalized concentrators proposed for Purex were completed. The new design, which makes use of a standard re-boiler section plus a tower section that can be separately installed by the remote crane, extends the sectionalized concentrator concept to include uranium and waste backcycle services.

P. H. Linker

General Manager
Chemical Processing Department

DECLASSIFIED

HW-72890

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS**A. PRODUCTION OPERATION**

<u>1. Production Statistics</u>	<u>February</u>	<u>Fiscal Year to Date</u>
a. <u>Percent of Forecast</u> ⁽¹⁾ <u>Achieved</u>		
Separated plutonium nitrate	45.6	92.9
Separated uranium nitrate	48.3	93.5
Uranium oxide	78.7	97.7
Plutonium metal buttons	40.1	112.2
Fabricated parts	113.4	98.8
b. <u>Purex</u>	<u>February</u>	<u>January</u>
Uranium nitrate produced (tons)	144.79	313.29
Average production rate during operation (T/D)	14.6	21.05
Total waste loss (%)		
Plutonium	0.57	0.44
Uranium	0.61	0.27
On-line efficiency (%)	35.4	70.5
c. <u>Redox</u>		
Uranium nitrate produced (tons)	137.56	152.52
Average production rate during operation (T/D)	9.0	8.2
Total waste loss (%)		
Plutonium	0.26	0.17
Uranium	0.17	0.11
On-line efficiency (%)	79.6	90.2
d. <u>Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	205.98	338.06
Enriched UO ₃ loaded	128.74	93.87
Normal UO ₃ approved for shipment	247.69	350.19
Enriched UO ₃ approved for shipment	142.72	93.52
Normal UO ₃ shipped	297.93	399.58
Enriched UO ₃ shipped	187.32	95.66
Normal UNH backlog	153	215
Enriched UNH backlog	118	115

(1) HW-72354, HAP0 PRODUCTION FORECAST, dated January 25, 1962

e. <u>Plutonium Metal Processing</u>	<u>February</u>	<u>January</u>
Input to Task I (batches)	173	264
Reduction yield (%)	95.6	96.3
Product recovery output (Kgs)	109.44	139.46
Product recovery backlog (Kgs)	720.46	639.2
Waste disposal (grams)	1099	1288
f. <u>Power</u>	<u>200 East</u>	<u>200 West</u>
Raw water pumped (gpm)	6 875	4 101
Filtered water pumped (gpm)	896	735
Maximum steam generated (lbs./hr.)	284 000	210 000
Average steam generated (lbs./hr.)	145 000	116 000
Total steam generated (M lbs.)	97 982	78 053
Coal consumed (est. tons)	5 330	4 206

February production was below that forecasted because of mechanical and process difficulties in the Purex plant. Although a Purex shutdown of about ten days was imminent because of feed shortage, equipment failures plus process instability at startup effectively doubled the shutdown period.

for *VR Chapman*
Manager - Production

DECLASSIFIED

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

The plant was shut down abruptly on 2-1-62 when a leak was detected in the High Activity Waste Concentrator (F-11). Processing was resumed on 2-19-62. Initial operations were at a throughput rate of 25.0 tons per day but this was reduced to 22.4 tons per day shortly after startup. The plant operated at this rate for the remainder of the month except for an outage of seven hours on 2-21-62 to replace the Waste Concentrator Feed Pump (F-7). High gamma activity, caused by the crash shutdown on 2-1-62, necessitated the use of cold feed during the first day of operation.

Continued sub-standard performance in the Second Uranium Stripping Column (2E) has resulted in high losses of uranium to the Second Organic Wash System. Uranium bearing solutions from the organic washing operation are being partially recycled to reduce these losses. All other product losses have been normal and all material produced has been within specifications.

2. Processing Operation

During the shutdown period a test run was made to determine the feasibility of using single stage, rather than two-stage, concentration of high activity wastes (IWW).

In an effort to overcome the poor performance of the Second Uranium Cycle columns, sanitary water was substituted for demineralized water on a test basis. This change had no marked effect on column operation.

Approximately 119 kilocuries of semi-refined strontium were recovered in E Cell and transferred to the 003 CR vault tank. Following this, about 700 kilocuries were transferred from 003 to 002 CR tank to maintain segregation of aged material.

Two 500-gallon casks containing miscellaneous waste material from the 300 Area High Level Cells were unloaded and transferred to underground storage. Approximately 59,000 gallons were transferred from C to BY Tank Farm to make room for Purex coating waste.

3. Mechanical Experience

Exterior insulation was added to the HAPO II-1 cask to keep the rubber buffers pliable during cold weather.

A sample of sludge was obtained from the bottom of underground storage tank 103-A. It was sent to 300 Area for laboratory analysis.

The High Activity Waste Concentrator (F-11) developed a leak in the bottom of the west tube bundle section. The concentrator was removed after extensive flushing and placed in the burial tunnel. It was replaced with a new unit.

The Waste Concentrator Feed Pump (F-7) failed as a result of mechanical seizure on 2-21-62.

The Backcycle Concentrator Feed Pump (F-10) was replaced with a new unit when upper seal leakage became excessive.

An electrically operated Jamesbury valve was installed in the Plutonium Loadout Station (PR Hood) to reduce the radiation exposure of operating personnel.

Installation of a prototype photometer to measure uranium concentration in the waste stream from the Second Uranium Decontamination column (2D) was completed.

The Plutonium Scrub column (IBS) pulser which failed in February, 1961 was decontaminated successfully and overhauled.

Repairs to the chemical sewer were completed. These consisted of replacing 120 feet of vitrified clay pipe with stainless steel.

Eight replacement jumpers were installed during the month.

4. Radiation Experience

Contamination of the railroad tunnel, the cut, and several cars and spacers occurred during burial of the failed waste concentrator. The initial source of contamination was a small jet of steam which was emitted from one of the tube bundle openings of the concentrator when it was tipped for placement in the burial box. Ruthenium vapors leaking around the water-filled door between the burial and railway tunnels after the concentrator was buried added to the contamination. Decontamination efforts over several days reduced activity levels sufficiently to allow sealing the water-filled door. When this airborne contamination was stopped the tunnel and other equipment were cleaned and returned to normal service.

Total radio-iodine 131 emission for the period was 0.39 curies with a maximum seven-day emission of 0.31 curies. There were ten cases of skin contamination during the month.

5. Analytical Experience

Development of an internal quality control system for Fission Product Recovery Program analyses was completed and the system was put into effect.

DECLASSIFIED

DECLASSIFIED

HW-72890

Cesium-137 values are now being used to estimate strontium-90 content of the concentrated waste stream (IWW) after centrifugation and of sulfate waste samples.

Manager-Purex

PR McMurray:RDP:gt

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

The Redox Plant performed well throughout the month and the scheduled production was achieved on February 23. At this time the backlog of aged enriched metal had also been reduced to almost zero. Advantage of this situation was taken and the facility was shutdown for the balance of the month to perform necessary maintenance work, including preparatory work for the installation of continuous facilities for the separation of neptunium.

2. Processing Operations

Except for the normal week-end shutdowns, E-metal processing was continuous until 2-23-62. On this date operations were suspended for the balance of the month in order to make some equipment installations in the 233-S Concentration Building for parallel neptunium processing. The mechanical efficiency for the month was 100 percent, there being no equipment failures that affected production continuity.

An intermittent loss of uranium product decontamination was experienced throughout the month and approximately fifteen batches of UNH exceeded shipping specifications. This material is presently being reozonated and blended to meet specifications. The cause of the high gamma ratios is not presently known, however, some improvement was noted at mid-month, after the hexone extractant inventory was washed with sodium hydroxide to remove nitroso impurities.

The organic still pot (G-3) operated poorly during the first part of the month, apparently caused by scale accumulation on the heat exchangers which limited the steam flow and pot vacuum to less than 50 percent capacity. Full capacity was restored by the addition of 1,000 gallons of 5 percent nitric acid to the still over a 16 hour period, during normal plant operation.

The silver nitrate reactor on the B-2 multipurpose dissolver was regenerated on 2-10-62. A total of 208 tons of uranium metal had been processed through the dissolver since the reactor was last regenerated.

To determine the effectiveness of silver nitrate as a suppressor of I-131 emissions, silver nitrate was added to the Redox dissolver during ten consecutive metal dissolution cuts. However, no

improvement in I-131 emission was detected and the test was terminated. Mercuric nitrate additions, which were discontinued during the test, were resumed.

Two charges of special ratio test metal, from the 100-H Reactor, were processed this month. In addition to the numerous metal solution samples taken, removal of the dissolver metal heel was required both before and after dissolution of each charge.

A forty percent nitric acid flush of the processing vessels in the 233-S Concentration Building was made on 2-24-62. Only 160 grams of plutonium was recovered, indicating good process control since the last flush which was completed during December, 1961.

3. Mechanical Experience

The major maintenance activity this month was directed toward equipment installations in the 233-S Concentration Building related to the continuous neptunium recovery project (CGC-913). During the early part of the month the anion exchange unit was installed in the new hood addition which was attached to the existing process enclosure in January. During the month-end shutdown, an existing instrument panel was relocated and the new control panel for the anion exchange column was installed. Considerable progress was also made in preparing the building for the major shutdown starting about March 23 for final installations and tie-ins. Air locks to the building and to the operating greenhouse were installed, and entry was made into the greenhouse proper to take measurements for fabricating tie-in piping. Efforts will be made to prefabricate as much piping as possible prior to the March 23 shutdown.

A leak which developed at the west tube bundle flange in the G-3 organic still was corrected by replacing the gasket and gauge ring on 2-3-62.

On 2-8-62, a leak developed in the east tube bundle of the D-12 waste concentrator. However, because of questionable welding the replacement helical type exchanger, which arrived from the vendor on 2-19-62, was not installed. The Facilities Engineering Operation is currently conducting tests to establish the integrity of the welds. In the meantime, operation of the concentrator has continued with only one tube bundle in service.

Five jumpers were installed in the 202-S Canyon during the month. Four were new jumpers for continuous neptunium processing and one was a replacement for a leaking let-down valve jumper.

4. Waste Handling and Decontamination

The contract for drilling 49 vertical monitoring wells within the SX Tank Farm was awarded to the Hayden Well Drilling Company.

DECLASSIFIED

Active field work was started on 1-29-62 and as of 2-27-62 eleven wells had been completed. Soil contamination encountered to date has been negligible, the maximum being 150 c/m.

Equipment valued at \$107,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at approximately \$21,000 was returned to the processing plants, and equipment valued at approximately \$40,000 was reclaimed for CPD projects. This work represents a savings of approximately \$45,000 over the cost of new replacement equipment. In addition, a savings of approximately \$3,000 was realized on work for HLO and IPD.

A total of 498 manhours was charged to the decontamination and/or repair of railroad, automotive and heavy equipment. The following is a breakdown of the major items decontaminated.

<u>Item</u>	<u>Operation Charged</u>
Well Cars No. 44 and 99	CPD
Flatcars No. 19030, 3622, CPD 27A	Purex
Flatcar No. 3626	Redox
Lowboy No. 64-720	IPD
Compressor 13-16262	P&GM
Weed Sprayer and Tractor	P&GM
Lima Crane	Minor Construction
Ladder Truck	Electrical Distribution
Power Wagon	HLO
Jeep Sedan	Patrol
Pickup No. 1C-162	FPO
Pickup No. 1C-169	Purex
Clam Shell	IPD
Aluminum Pigtails	IPD
Connector Heads (50)	Project CGC-897
Process Tanks (3)	Project CGC-945

5. Radiation Experience

Two skin contamination cases (maximum 15,000 c/m) and two radiation occurrences were recorded during the month. All skin contamination was readily reduced to non-detectable. The two radiation occurrences were of a minor nature, neither representing any serious lapse of radiation control.

The total I-131 emission from the 291-S stack during the period January 31 thru February 28 was 6.183 curies -- an average of 1.55 curies per week. Although slightly lower than the January weekly average of 1.87 curies, the desired weekly limit of 0.8 curies has not been attained. The new activated charcoal cartridge, which was installed in the H-4 metal solution oxidizer vent system during December, 1961 has been ineffective in removing I-131 from the gas stream. I-131 removal efficiency has not exceeded 88%, and since caustic scrubbing is more efficient, no further testing of this charcoal bed is planned. A redesigned unit is to be installed and tested at a later date.

6. Analytical Experience

Analytical assistance to the Coolant Systems Development Operation, in conjunction with their studies on test loop decontamination, continued this month. Utilization of the X-ray fluorescent spectrometer, which is currently being tested by Process Chemistry, proved to be most useful in the analysis of unique samples.

Preparation of a laboratory manual for the 100-North Area water control analyses was started this month. To date, procedures and methods have been established for approximately 50 percent of the analyses anticipated for this work.

Modification of a shorter analytical procedure, to include an additional acid wash of the organic phase, permitted utilization of the procedure for the determination of Np^{237} in dissolver and head end samples from the Redox Plant. A 50 percent reduction in analytical time, as well as a reduction in radiation exposure to personnel, was realized.

Performance checks on the Sharp Low Beta Counter were completed this month. By taking advantage of the low level beta counting characteristics of this instrument, it has been possible to reduce the preparation time for crib, pond, and condensate samples by eliminating the concentration step. The omission of the "boil-down step" also reduces the possibility of ruthenium volatilization and reduces the amount of solids mounted on the counting discs, which absorbs low energy beta from emitters such as strontium⁹⁰, technetium⁹⁹, and promethium¹⁴⁷, thus possibly preventing their detection.

7. Events Influencing Costs

The Redox Plant did not operate on Lincoln's Birthday, February 12, 1962. Consequently, the holiday was observed and only those people necessary to carry out miscellaneous assignments were scheduled to work.

Chas. S. Drowith

Manager - Special Separation
Processing and Auxiliaries

DECLASSIFIED

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Continuity of operation in the Fabrication facilities was interrupted by feed shortages with approximately thirty per cent of the foundry operating time lost for this reason. Production of unfabricated plutonium was curtailed at mid-month because of lack of feed. Plutonium recovery operations were normal for the first half of the month but were curtailed for cleanup and maintenance work during the balance of the period. The uranium reduction plant output of normal UO_3 was reduced for lack of feed and also because of the presence of organic material in the UNH. Production of enriched UO_3 was normal.

2. Processing Operations

a. Plant Fabrication

Information on plutonium fabrication is presented in Document HW-72945 entitled "Chemical Processing Department, Finished Products Operation, Z Plant Monthly Report, February, 1962," which is classified "Secret, Atomic Weapon Data, Production Rate and Stockpile Quantity Information."

b. Plutonium Processing

The production of unfabricated plutonium was normal and at high rates until the feed supply was exhausted at mid-month. Control of isotopic content continued to be a problem with feed showing wide variation in the amount of Pu^{240} in the various batches. Blending resulted in an average Pu^{240} content of 6.12 per cent for February.

The Recovery facilities operated normally for the first two weeks of the month, after which, piping leaks and the sump waste inventory necessitated a curtailment of processing. The columns continued to operate to process aqueous recycle from the button line and sump waste from the recovery hood floors. Cleanout of the solvent extraction hood and replacement of corroded piping is in progress at month end.

Operation of the incinerator on a shakedown basis continued during the month. Results were satisfactory.

c. Uranium Reduction

The output of the Uranium Reduction facilities was curtailed because of feed shortages and the reduction of steam pressure to the UNH concentrators necessitated by organic material in the feed. This change in concentrator operation lowered plant capacity by over fifty per cent and was in effect from February 12 through month end.

3. Mechanical Performance

The plutonium fabrication equipment required only routine maintenance and minor repairs during the month.

The continuous fluorinator in the plutonium preparation equipment failed during February. The platinum liner had separated from the Hastelloy tube. The assembly (tube and liner) was replaced with a spare.

The recovery equipment required an excessive amount of maintenance effort again this month. At the end of the period one of the panels on the solvent extraction hood was removed to permit cleanout and more extensive repair of corroded piping as well as repair and replacement of structural members supporting equipment.

The uranium reduction equipment functioned satisfactorily during the month.

4. Radiation Experience

Radiation and contamination control statistics indicate control to be normal and satisfactory.

5. Analytical Experience

	<u>January</u>	<u>February</u>
Number of Samples Received	1,695	1,710
Number of Determinations	17,093	12,794*
Total Metallic Impurities, Buttons	923 ppm	1,131 ppm
Total Carbon Content, Buttons	390 ppm	585 ppm
Buttons Rejected	6.5%	7.8%
Pu ²⁴⁰ , NRF (by neutron count)	7.04%	---
Pu ²⁴⁰ , Regular (by neutron count)	6.19%	6.12%

* The reduction in work load reflected the curtailment in recovery activity and the lack of feed for the plutonium preparation facilities. Increased service to the Research and Engineering programs compensated partially for this situation.

DECLASSIFIED

W. J. Gartin
 Manager
 Finished Products

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

There were no outages of steam, water or emergency electrical services that affected continuity of operations during the period covered by this report.

2. Inspection, Maintenance and Repair

Fabrication of the H-44 hood was completed and the unit delivered to the Finished Products Operation. This is a complex of three hoods for dissolving, burning and fusion of scrap Pu at the Recuplex Facility.

Inspection of spare tube bundle #42 for the Purex Concentrator revealed the remote nozzles to be out of tolerance. Representatives from the fabricating company inspected the unit to confirm the error. The piece of equipment will be returned to the vendor for corrective alterations.

Special emphasis was placed on expediting the fabrication and erection of a burial rack and drip pan on a railroad flatcar, in order to facilitate burial of the failed F-11 waste concentrator at Purex. The remaining spare concentrator was leak checked and made ready for service.

A zebra-type cartridge (plastic and stainless-steel plates) was built for the K-2 Uranium Decontamination Column at the Purex Facility. Experience with the all-stainless-steel cartridge was not completely successful; consequently, the decision was made to convert back to the standard zebra-type cartridge.

A Flo-Turn Lathe is undergoing extensive modifications in the 272-W Tool and Die Shop, prior to its removal to the Finished Products Operation for experimentation in the spinning of Pu shapes. Included in the work is the conversion of the drive mechanism from electric to hydraulic, and fabrication of a hood to house the entire unit.

Progress continued on piping the Purex J-Cell Package for continuous Palm recovery. The work was approximately 55% complete at month's end.

Pipe fabrication and installation work on the Purex Pipe and Operating Gallery phase of the Palm Project is an estimated 75% complete. The slow delivery of some engineered items (i.e., rotometers, etc.) has

been the cause of some concern; however the scheduled completion date remains May 31, 1962.

Equipment installation on the aqueous make-up phase of the Purex Brandy Project showed good progress during the month. Installation of four new tanks and associated piping is essentially complete, and revisions to three existing tanks are nearing completion. Delivery dates on some electrical and instrumentation materials are behind schedule; however the overall status of the work is approximately 95% complete at this time.

Favorable progress was reflected in the installation of the three samplers for the Purex Palm Project during the month. All cold tie-ins have been completed and piping to the J-3 Sampler revised. Concrete repair work and repainting is currently underway. Estimated completion was 80% at month's end.

The HAPO-I cerium fission product cask was leak tested upon its initial return to Hanford. The tests disclosed no leaks. The cask had been loaded with cold cerium at HAPO and shipped to ORNL to check their unloading facilities.

A spare condenser for the Purex-type concentrators was made ready for service and placed in standby status.

A special 440-volt power supply was installed in Hanford Laboratories Operation's 231-Z Facility. The installation was required to provide isolated electrical current to certain research and development equipment that must have a constantly balanced voltage supply.

Twenty-nine pipe jumpers were fabricated, as indicated below, to meet plant maintenance requirements and in support of current projects.

Palm Project, CGC-821	3
Birch Project, CGC-913	9
Purex Replacements	14
Redox Replacements	<u>3</u>
Total	29

Coal shipments for the month were below consumption requirements, which necessitated reclaiming coal from the storage pits. At month's end, the 200-East storage-pit inventory was 27,385 tons, and in the 200-West Area, 22,355 tons.

During burial of the failed F-11 waste concentrator at Purex, negative pressure on the canyon side of the waterfilled door permitted the spread of air-borne contamination through the tunnel. Corrective measures taken consisted of calking and sealing all openings around the door. The work was done on an emergency call-in basis on a weekend. Exposure rates were as high as 100 mr per hour, and exposure to maintenance personnel ranged as high as 200 mr.

DECLASSIFIED

[REDACTED]

A sludge sample was taken from the 103 tank, 241-A Tank Farm. The tank bottom was located by inserting into the tank a water lance which indicated the tank bottom to be within three inches of the elevation shown on the original drawing. Procurement of the sludge sample necessitated lowering into the tank a 55-foot drill string with core drill attached. Radiation readings were 300 rad per hour at the tip of the core drill.

A periscope and light-bar were installed in the 113 tank, 241-SX Tank Farm, to assist the Waste Handling and Decontamination Operation in determining the extent of damages to the tank pump. The pump shaft housing is bent to such an extent that it cannot be withdrawn through the tank nozzle in the conventional manner. No conclusion had been reached at month-end as to how the problem will be resolved.

Progress continued on the decontamination of the 275-EA Building. To date, 8600 sq. ft. of floor space has been released from regulated status and is being utilized for essential-material storage. Air-borne contamination had rendered the building unusable as a material-storage facility since mid-summer of 1961.

The Department's air balance personnel assisted the Irradiation Processing Department by initiating final acceptance tests on air condition systems at Buildings 105-F and 105-KE. The work was in connection with the Reactor Confinement Program, Project CGI-791.

T. S. LaFollette

Manager
Power and General Maintenance

TGL:ap

DECLASSIFIED

HW-72890

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design Engineering

Preliminary process design drawings, covering the 241-AX Waste Tank Farm, were completed and issued for comment. The geometry of the tank bottom section and the structural aspects of the tank design are being studied further. Observations from concurrent testing of waste tank models have indicated that the preferable tank design should include (1) steeply sloping side walls near the bottom; (2) a flat tank bottom zone wherein the circulators would be concentrated; and (3) utilizing both available forces, gravity and circulators, to maintain the solids in suspension. Alternate tank designs have been prepared for estimates for comparative cost.

Investigations have been initiated to determine the sensitivity of carbon steel ASTM 201, currently considered for use in the new 241-AX Tank Farm, to nitrate stress corrosion cracking, and of the feasibility of stress relieving the carbon steel tank liners.

Inspection of Failed Concentrator

A closed-circuit TV inspection was attempted of the Purex F-11 Concentrator which failed last month after only 18 months of service. Inspection was limited to the left tube bundle well in which intense radiation exposure to the TV camera was estimated to be in the order of 1×10^5 R/hour. No definite hole was observed; however, the welds around the bottom and at the crossover joint showed some evidence of corrosion. Further inspection was prohibited by darkening of the light and camera lenses from radiation and by necessity for burying the failed concentrator.

Purex Concentrators

Preliminary process design drawings of the proposed new sectionalized concentrators for Purex were completed. The new design, which makes use of a standard reboiler section plus a remote tower section, extends the sectionalized concentrator concept, reported in September, 1961, to include uranium waste backcycle services. Specific requirements for equipment in each Purex service have been defined.

During a recent Purex shutdown, a test was conducted in which IWW bottoms from F-11 were added to increments from F-6 to simulate the single cycle acid recovery process. During at least

DECLASSIFIED

HW-72890

half of the 5-day test, activity of recovered acid was below 10,000 millicuries per gallon; however, during the remainder of the run, two gamma bursts occurred with activity up to 50,000 millicuries per gallon.

These bursts are believed due to inadvertent over-concentration of bottoms solution, since the specific gravity and bottoms temperature were considerably above flowsheet levels. The chief contaminant in recovered acid was ruthenium, which indicates ruthenium volatilization at high bottoms concentration. The test, which had to be terminated before completion owing to scheduled production, lends decided optimism to the success of the single cycle process.

b. Project Engineering

CAC-945 - New Waste Storage Tank - Purex

Directive No. AEC-204, dated February 27, 1962, authorized \$175,000 for Title I and II work. A Work Authorization to the General Electric Company is being prepared.

c. Manufacturing Engineering

Loading STT Cesium Casks

A film was prepared to record the six phases involved with the load-out of cesium. The film is to be used for obtaining procedural improvements and as a training aid.

2. Special Separations Processing

a. Process Design Engineering

293-S Iodine Monitor

The single channel transistorized gamma analyzer has been re-installed and has been set up as a gross monitor rather than an energy analyzer. The monitor is working satisfactorily at the present time.

J5A Vent System Iodine Monitor

New low iodine (I^{131}) emission requirements have led to further attempts to account for I^{131} in the Redox process. It has been determined that there is a high amount of I^{131} in the J5A vent system; however, it is not known at what time or during what part of the process that the I^{131} comes off, since this system is sampled at 24-hour intervals.

A temporary installation has been made in order to monitor the J5A vent stream with the analyzer set for I^{131} gamma energy only. Thus, the time that the excess I^{131} comes off can then be related to the process. The system is functioning, but shielding around the detector is being increased to reduce background readings and permit more accurate determinations.

DEC

DECLASSIFIEDb. Project EngineeringCAC-928 - Leak Detection - High-level Waste Tanks -
241-AX and 241-SX

The contractor has completed 18 of 88 vertical monitoring wells. Drilling is ahead of schedule.

A contract has been let with the Bore-Tun Company, Houston, Texas, for drilling one horizontal lateral in the existing caisson at the 241-SX Farm. Cost of the initial contract is \$18,872.

CGC-930 - Secondary Containment of Dissolver Off-Gases -
Redox and Purex

J. A. Jones Company was given an interim authorization this month to begin initial field work and procurement.

3. Finished Productsa. Process Design EngineeringIncinerator Controls

An inert gas system, to blanket the inlet to the combustion chamber with nitrogen, has been designed and installed to control backfire on the incinerator feed belt. Two boxes of feed have been processed since installation and successful control of backfire has been maintained with a flow of approximately forty (40) SCFH of nitrogen. Inspection of the ash indicated that this amount of inert gas flowing through the furnace has no objectionable effects on combustion.

RMC Fabrication Line

Detail design has been started on a system for transferring solvents from the machining complex to Recuplex by pumps rather than vacuum. Comment drawings have been issued on the modification and installation of the R and E Environmental Chamber in HI-64-G.

Design of a novel and elaborate "outside diameter gage" for final inspection of the 1251 parts has been completed. A similar type "inside diameter gage" will be designed.

The new "Rounding Clamp" for the Sheffield rotary contour gage has been tested and found highly satisfactory. Checked for roundness at more than 100 points throughout its range of adjustment, all readings were correct within 0.0001 and more than 80 percent within 0.00005 inch.

RMA Fabrication Line

The Floturn machine is being modified in local shops, and it

should be ready for demonstration by the vendor on March 15. Prototype blanks for shape forming are being fabricated. Studies are in progress to find a suitable seal for perchloroethylene for use in the proposed Special Casting Facility. It appears that perchloroethylene coolant is practical and will be as good as gas coolant for nuclear safety. The cost of the perchlor system as compared to a gas system should be \$8,000 to \$10,000 less.

b. Project Engineering

CGC-953 - Personnel Protection, Storage, Hood Shielding -
234-5 Building

Directive No. HW-534, dated February 28, 1962, was issued to General Electric Company, authorizing \$40,000 to manage the project, perform design and Title III services, and fabricate the small mold wash hood. The CPFF construction service contractor will perform all other work.

4. General

a. Process Design Engineering

Emergency Duty Shelter Study

Work has been completed to define the scope of facilities required to meet the emergency duty shelter requirements. The study is described in document HW-72665.

Emergency facilities for surveillance and control have been specified for the plants and areas which must continue in operation. Also, locations have been specified for the four emergency control centers required in CPD. The cost of these new facilities has been estimated to total \$2,200,000; design and construction could be completed 18 months after authorization to proceed.

Liquid Level Detection Systems

The Varec System is operational and installed in the 112-T Tank. Operation is still faulty in cold weather. No further product improvement is planned for the system unless it is found desirable for some special purpose.

The Data Gage System has been operating in 118-TX Tank for 5,000 hours since the initial testing was started in August, 1961. This system has been interrogated an average of 20 times per day. No electronic malfunctions have occurred, and the mechanical problems are being resolved as they are discovered. The vendor is conducting a temperature testing program, and the local temperature tests will be initiated soon. This is the final phase of the test program.

DECLASSIFIED

DECLASSIFIEDb. Project Engineering

Project Cost Information as of 2/18/62:

Total Authorized Funds - 14 active projects	\$ 11,358,000
Total Cost-to-date	6,910,000
Commitments and Open Work Releases	1,190,000
Unencumbered Balance	3,258,000
Costs Charged to Above Projects - 1/21/62 to 2/18/62	388,885

c. Manufacturing EngineeringWork Simplification Film

A color, sound film was made to depict Work Simplification in CPD Shops. In addition to local use, the film has been entered in the annual Work Simplification Contest sponsored by the Company.

Manager - Facilities Engineering

HPShaw/WWC/alr

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology

a. Fission Product Recovery

Routine strontium recovery continued during the month whenever high activity waste concentrate was available for processing. One batch of processed waste, previously used during a waste evaporation test, behaved abnormally in that the sulfate cake was lost from the centrifuge during the metathesis step. No explanation was found for this unusual behavior.

The HAPO-II-1 Cask, loaded with 110,000 curies of Sr 90 carbonate last month, was readied for shipment by replacing a failed vent valve, performing temperature and pressure tests, and increasing the buffer insulation. A temperature gradient of 27° C was found to exist between the cask interior and ambient air, and the rate of pressure buildup was measured at 0.5 psi per day.

b. Solvent Extraction

Startup of the solvent extraction equipment, after an eighteen day shutdown, was very unstable. Flooding occurred in all the A-type columns plus the HS Column, possibly due in part to the crash shutdown of the plant on February 1. The emergency-type shutdown, caused by failure of the high activity waste concentrator, did not permit use of normal shutdown procedures, so that solvent remained in contact with highly radioactive aqueous solutions in the first columns during the shutdown period. Once the effects of the gamma activity burst and the initial flooding had passed, intercycle activity levels decreased markedly due to 142 day average metal cooling times and excellent decontamination performance of the First and Final Plutonium Cycles. Final plutonium product analyzed 6×10^{-12} Zr-Nb/AT at month end.

The Final Uranium Cycle operation continued to be substandard. After the initial high uranium product gamma ratios, 2D Column scrubbing performance improved to the point where the solvent extraction uranium product approached the gamma ratio specification of ≤ 2.0 at month end. Stripping performance of the 2E Column remained very poor however, with uranium losses to the 2E Column organic $10 - 100$ times the normal 0.002 per cent. Preliminary semiworks tests indicate that demineralized water quality may be the cause of the difficulty.

c. Solvent Treatment

During the shutdown period used, stored solvent (composed of TBP and Shell E-2342) was used to replenish the No. 1 Solvent System inventory. Prestartup treatment of the solvent reduced its gamma activity to 500 uc/gal but during startup the gamma activity increased rapidly to 54,000 uc/gal. After two days of operation the solvent gamma activity dropped sharply and remained in the 1000 to 1500 uc/gal range for the remainder of the month.

d. Waste Treatment and Acid Recovery

The feasibility of using single-stage evaporation (vice two-stage evaporation) for the recovery of nitric acid from the high activity waste was tested during the shutdown. The test consisted of boiling No. 2 Waste Evaporator bottoms and adding concentrated high activity waste (IWW) until the bottoms reached approximately 75 per cent of the IWW radioactivity concentration. The major portion of the recovered acid was recycled to control the increase of radioactivity in the concentrator bottoms. Although a sharp gamma activity burst (about 50,000 uc/gal) occurred in the recovered nitric acid at the start of the test, subsequent acid gamma activities ranged from 5,000 to 15,000 uc/gal while the radioactivity concentration in the concentrator bottoms was $\approx$ 20 per cent IWW. This compared favorably with the normal current analysis of about 1000 uc/gal. However, when the concentrator bottoms fission product activity was increased to 75 per cent IWW just prior to termination of the test, the gamma activity of the recovered acid increased rapidly to about 40,000 uc/gal. Scheduled plant startup required termination of the test before 100 per cent IWW gamma activity was attained in the concentrator bottoms. Despite the addition of sodium nitrite and small amounts of solvent to the concentrator, ruthenium constituted 85 to 95 per cent of the radioactivity in the recovered acid. Preparation for additional tests, to be conducted under normal plant operating conditions, are currently underway.

The core drill assembly, designed to sample sludge in the underground storage tanks, was used as a water lance to verify the location of the bottom in Tank 241-A-103. A 28-inch long, (1-inch diameter) sample was subsequently cored from the sludge layer on the bottom. No analyses have been performed on the sample as yet.

DECLASSIFIED

2. Redox Process Technology

a. Solvent Extraction

Control of the acid content of the HABS backcycle stream, essential for efficient extraction of plutonium, uranium and neptunium in the pre-cycle column (HA) without excessive extraction of radio-ruthenium, is now being done by a prototype pH monitor installed in September, 1961. Previously the acid content of this stream was controlled by adjusting the nitric acid addition rate according to periodic acid analysis of the backcycle concentrator (D-14) stream. The pH monitor, installed in the first cycle decontamination column raffinate stream (1AW), downstream of the nitric acid addition point, automatically regulates the nitric acid addition to the stream. Mechanical problems, inherent in the monitor as originally installed, have been corrected. Some additional development work is in progress to improve the signal stability, the buffering facilities and the mechanics of pH element replacement; however, the acid content of the HABS backcycle stream is now controlled within a much narrower range than previously possible.

Plutonium deposition in the first cycle column (1A) was indicated during the past month by abnormal product losses to the HABS backcycle stream and a loss of uranium product decontamination. The cause of the poor 1A Column performance is not known; however, product losses and uranium decontamination were somewhat improved at mid-month, after the extractant inventory was washed with sodium hydroxide solution to remove the nitroso impurities. Three 10 percent nitric acid flushes of the 1A Column, completed during the month, removed approximately 550 grams of plutonium. A 57 percent nitric acid flush of the extraction columns, overflow lines and associated vessels will be done next month.

The heat transfer capacity of the organic still pot (G-3) decreased until the solvent distillation rate limited the processing rate during August and November, 1961. In each case full capacity was restored during a plant shutdown, after several hours of boiling 10 percent nitric acid in the organic still pot. During February a recurrence of decreased heat transfer capacity was alleviated by the addition of 1000 gallons of 5 percent nitric acid to the still over a 16-hour period, during normal plant operation. Although the cause of the heat transfer loss has not been determined, plant shutdowns will no longer be necessary for correction.

Laboratory studies have indicated that the amount of caustic used for salt waste neutralization could be substantially reduced without adversely affecting the chemical stability of the neutralized waste. Caustic addition to the salt waste neutralizer tank (D-8) was reduced by 18 percent, on a test basis, during the month. Analysis of a series of neutralized waste samples, taken during the test showed that waste neutralization and chemical stability were adequate. As a result of this test, the standard caustic addition for salt waste neutralization was reduced by 18 percent; chemical costs were reduced \$6 per ton of uranium processed at month-end.

b. I-131 Control

A jumper containing a 3-square-foot by 8-inch-deep bed of activated charcoal was installed in the metal solution oxidizer off-gas system (J-3) during December, 1961. This charcoal bed has been ineffective in removing I-131 from the gas stream. Condensation of water vapor in the gas stream has nearly plugged the bed on several occasions and may be responsible for the poor performance. A system for bleeding hot air into the off-gas stream, upstream of the charcoal bed, has substantially reduced water vapor condensation in the bed. However the I-131 removal efficiency of the bed did not exceed 88 percent. Since caustic scrubbing of the metal solution oxidizer off-gas is more efficient, no further testing of this charcoal bed is planned. A re-designed unit will be tested at a later date.

During solution transfer by jet, I-131 is volatilized from dissolved uranium solution and emitted to the vessel vent off-gas system. The addition of mercuric nitrate to the metal solution, to form a less volatile mercury-iodine complex, has been done for several months, but has not reduced the I-131 emission from this source to desired low levels. Silver nitrate, which reacts with iodine to form an insoluble silver iodide precipitate, was added to the dissolved metal solution to give a concentration of 2×10^{-5} M on a test basis, during the month. The test was discontinued after five days (and eight dissolver "cuts") when the I-131 emission from the plant showed no improvement. Addition of mercuric nitrate to a concentration of 5×10^{-4} M in the dissolved uranium solution was resumed.

DECLASSIFIED

3. Finished Products Chemical Technology -

a. Metal Finishing Operation

1. Task I, II, and III

A process test to determine the feasibility of recycling selected dissolved scrap directly to the oxalate precipitation step is in progress. The analyzed composition of scrap metals, skulls, and certain powders, indicates that these materials are likely acceptable as a feed; however, the effects of contaminants added during dissolution and of the presence of hydrofluoric acid during precipitation require evaluation under processing conditions.

A process test to determine the possibility of reducing the carbon content of buttons through process manipulations is also in progress. It is expected that conditions leading to maximum decomposition of the oxalate, without formation of carbonaceous residues, will result in minimum carbon content of the metal. The search for these conditions is being made in the laboratory, and the plant process test will complement the laboratory work. Conclusive data from these tests are not available at this time.

2. Recuplex

The prototype teflon-lined plutonium oxide dissolver has been in operation for two months without failure. (The service life of the stainless steel dissolvers has varied from one to six months.) Excessive cooling periods, due to reduced heat transfer rates through the teflon liner, have been avoided by eliminating the usual heating and cooling cycle following the addition of aluminum nitrate solution used for HF complexing. Although a shorter dissolution cycle has been effected, a decrease in the total amount of plutonium dissolved each run has resulted in overall rates essentially equal to those of the stainless steel dissolvers.

The prototype air pressure actuated pulser on the first solvent extraction column (H-1) operated successfully. Minor equipment changes during the early period of operation resulted in trouble-free performance of the system during the month. Automatic control of the pulser air pressure, based on column static pressure, was tested and put into service. This control system maintains a more uniform pulse amplitude during changes in column static pressure and minimizes the possibility of a self-propagating flooding condition when the static pressure is decreasing. Abnormal conditions, due to the excessive amounts of floor-collected material processed, have precluded determination of the effect of the modified pulse shape on HTU values.

Continued solvent extraction difficulties, due to the necessity for processing excessive amounts of floor-collected materials, led to the decision to discontinue processing new scrap (except for Task I filtrates) until the hoods were cleaned up. Flushing and clean-up procedures have been devised. A high acid flow-sheet is being used for processing the flush solutions.

3. Incineration

The incinerator was operated for 28.5 hours, burning contaminated cardboard, plastic, and rags. Rubber gloves and non-combustibles were processed through the leaching hood. A total of 14 waste boxes was handled.

The incinerator off-gas scrubber solution (10% NaOH), containing approximately 5% of the plutonium processed through the incinerator, was discarded five times during the month. The pressure drop across the off-gas filter increased from 0.75 to 0.85 inch of water during the burning period.

Recovery of plutonium, based on the input values, has continued to be excellent, with approximately 60 percent of the recovery taking place in the leaching hood.

b. Uranium Reduction Operation

A process test aimed at improving the reactivity of UO_3 to hydrofluorination at the customer site is in progress. The initial test, lowered calcination temperature to achieve a higher volatile water and nitrate content and a subsequent increase in particle porosity, has been completed. Currently, the uranium concentration of the feed has been increased to approximately $11\frac{1}{2}$ pounds uranium per gallon from 10.8 pounds uranium per gallon, to test the observation made at other processing sites that UO_3 produced from a molten uranyl nitrate trihydrate feed is more reactive than that produced from molten hexahydrate (UNH) feed. The current concentration is the first step in the approach to a molten trihydrate feed. ($12\frac{1}{2}$ pounds uranium per gallon). No difficulty in handling the $11\frac{1}{2}$ pounds uranium per gallon material, due to the higher freezing point, has been observed. These tests are being performed with E-metal due to the smaller inventory of that system.

Evaluation of the test lots will be made at the customer's plant at Paducah, Kentucky.

DECLASSIFIED

4. Process Chemistrya. Purex Process Assistance

Considerable progress on the characterization of the Purex sludge sample was accomplished with the following data produced.

<u>Sludge constituent</u>	<u>Content/g sludge</u>	<u>Content in H₂O extract</u>
CePr ¹⁴⁴	$5.6 \times 10^3 \mu\text{c}$	
Ru ¹⁰⁶	$8.8 \times 10^2 \mu\text{c}$	4% of original
Sb ¹²⁵	$1.4 \times 10^2 \mu\text{c}$	
Cs ¹³⁷	$2.85 \times 10^2 \mu\text{c}$	90% of original
ZrNb ⁹⁵	95 μc	50% of original
U	$6.7 \times 10^{-3} \text{ g}$	84% of original
Pu	$2 \times 10^{-5} \text{ g}$	34% of original
Np	$2.8 \times 10^{-6} \text{ g}$	67% of original

The effect of temperature, hydrogen ions, mercurous ion, and mercuric ion on I¹³¹ emission from air-sparged 2 M UNH solution was investigated within applicable parameters during the month. Iodine emission appeared to be linear over a one hour period. Iodine emission increased by a factor of 10 in going from 25 C to 80 C. Iodine emission increased by a factor of 4 in going from 0.5 M H⁺ to 1.0 M.

Mercuric ion at 0.0001 M and 0.01 M decreased the emission by a factor of 2 and 30, respectively. Mercurous ion appears to be five times more effective than the mercuric ion.

Studies continued on possible methods of introducing hydrazine stabilized aqueous U(IV) solution to the 1BX partitioning column as a substitute for ferrous sulfamate. Introduction of the material to the top or bottom of the column has previously been ruled out due to distribution character. During the month the U(IV) was tested in the laboratory as an additive to the column feed stream (Tk J-3) under appropriate flowsheet conditions. The results on batch contacts were discouraging since only unsatisfactorily low Pu extraction was experienced. Results indicate that much higher U(IV) concentrations or much higher L/V ratios would be required than can be tolerated.

The feasibility of using ascorbic acid with hydrazine in neptunium ion exchange purification as a replacement for ferrous sulfamate was evaluated with the conclusion that the kinetics of the reduction with plutonium are too slow for the plutonium removal step.

b. Redox - URO Process Assistance

The distribution ratio of silver for the Redox extraction columns was found to be 0.03. Hence, if used in the head-end, it would not be expected to interfere with the process.

Excellent iodine retention was found to be a property of Tygon (plasticized polyvinyl chloride copolymerized with vinyl acetate). An invention report, HW-72539, was issued covering the possible use of this material as an iodine absorber. The use of Tygon tubing in iodine sampling equipment is incompatible with accurate results.

Three kilograms of enriched UNH (93% U-235) were converted to UO_3 in our facility as a service to HLO.

c. Hot Semi-Works Process Assistance

Extraction, scrub, and strip pH's and distribution ratios (E_a^0) for strontium, cerium, and manganese were determined on simulated Hot Semi-Works feed. No significant difference was noted between the use of laboratory and Hot Semi-Works solvent.

Two flowsheets were evaluated with the following results.

<u>HAS Composition</u>	<u>Flow Rate</u>	<u>E_a^0</u>
(1) 0.6 M citric, 0.03 M DTPA pH 3	18	Ce(ext) 1.4 Ce _{scrub} 40 Sr _{scrub} 2
(2) 0.16 M citric, 0.05 M DTPA pH 3.5	40	Ce(ext) 0.4 Ce _{scrub} 3.7 Sr _{scrub} 35

d. Laboratory Assistance

Thermobalance studies on the reaction rates of plutonium dioxide and hydrated plutonium oxalate were completed and a report letter issued covering the results.

The Coulter counter is being calibrated with 68% zinc chloride solution as a medium for use in the determination of particle size distribution of dense particles such as UO_3 .

A new equation has been derived for calculating the uranium concentration of uranyl nitrate solutions as a function of the specific gravity, with corrections for a constant intercept and the nitric acid concentration. In comparison to the old equation, which only gave accurate values between 3.9 and 4.3 pounds per gallon uranium, the new calculation is valid from 3.5 to 4.5 pounds per gallon; with a standard deviation of $\pm 0.12\%$. Nitric acid concentrations varied from -0.1 to +0.6 pounds per gallon over the range of uranium values, thus verifying the utility of the calculation and the validity of this correction. The general effect of this equation will be to raise

DECLASSIFIED

uranium measurements by 0.1% at high concentrations (4.3 - 4.5 pounds per gallon) and reduce the measurement an equal amount at low values (3.5 - 3.7 pounds per gallon).

A method developed for sodium borate in uranyl nitrate solutions, using cation exchange separation followed by caustic titration, was accurate to $\pm 0.8\%$ down to 0.05 M concentrations. The mineral acid was titrated to a methyl purple endpoint after which mannitol was added and the titration was continued to a phenolphthalein-methyl purple endpoint (bright green to dull blue). A constant blank correction was used.

The nitric acid correction for plutonium by X-ray photometer has been compiled for the 202-A instrument. A table of corrections was established which covers the nitric acid concentration range from zero to five Normal. The corrections are entirely different in magnitude and variability from those determined for the 222-S instrument. The corrections are in no way interchangeable.

The Sharps Beta Counter is displacing the BGO counter at the 222-S laboratory. It has a better counting geometry and a greater sensitivity for low energy beta particles. The window thickness of the Sharps detector is 0.8 mg/cm² compared to approximately 25 mg/cm² for the BGO.

The increased sensitivity is particularly notable in samples from ponds, sumps, etc., where it was previously necessary to concentrate as much as 200 milliliters to obtain a countable sample. With the Sharps instrument, direct mounts of less than one milliliter are possible and the resulting counts are not decreased due to self-absorption in the accumulated salts. Also, beta counts determined by the Sharps counter will be higher than the BGO counts due to the increased sensitivity for low energy beta particles. Determination of strontium-90 level in these waste streams will not be affected, since composites of these samples are analyzed specifically for Sr-90 and the Sharps beta counter will show a corresponding increase in sensitivity for this isotope.

A letter is being prepared by SSP&AO, Analytical Control laboratory, to advise all interested parties of the change in counting instruments and its ramifications.

5. 234-5 Development -a. Direct Recycle Of Dissolved Metal

Flow sheets for continuous plutonium metal dissolution and direct processing of the solution in Task I have been completed. These flow sheets are based on the results of small-scale dissolution and precipitation tests. Document HW-72662, "Flow Sheets For Continuous Dissolution Of Plutonium Metal For Task I Processing", was issued.

Flow sheets in which turnings are fed continuously to a dissolver are attractive for rates up to a kilogram per hour. The dissolver can be operated with less than 100 g plutonium metal holdup. Using 5 M HNO_3 -1 M HF , a solution of 240 g/l Pu may be obtained. This solution may be blended in 1:1 ratio with Purex plutonium nitrate and fed to the oxalate precipitation step.

Massive metal disks can be processed at 256 g/hr, but a 2000 g metal holdup is required to maintain the necessary surface area. The solution may be blended 1:1 or processed directly.

High dissolution rates of massive metal can be achieved using 5 M HNO_3 -0.5 M HF provided a final solution concentration of 10 g/l is acceptable. Recycling to solvent extraction for concentration is the best way of handling this solution.

b. Solubility Of Plutonium Dioxide In Incinerator Scrubber Solution

The solubility of plutonium dioxide in 10 percent caustic (without CO_2 purge) was 3×10^{-6} g/l. The test solutions were purged with carbon dioxide to simulate incinerator off-gas conditions. Each test was at room temperature and for a duration of 24 hours. Solubility in test solutions was as follows:

<u>Test Solution</u>	<u>Concentration Of PuO_2 Charged - mg/l</u>	<u>Plutonium Solubility - mg/l</u>
10% NaOH	3	0.1
10% NaOH + 0.5 M HCl	3	0.6
10% NaOH + 0.8 M HCl	3	1.5
10% NaOH + 0.8 M HCl	10	2.4
10% NaOH + 0.8 M HCl	20	3.8

The soluble plutonium increases with the increase of plutonium dioxide charged to the system. This effect may be due to the length of time required to attain equilibrium (greater than 24 hours).

c. Concentration And Purification Of Plutonium For PRTR and Critical Mass Studies

The facilities in Room 179-B are now installed and the equipment is

DECLASSIFIED

DECLASSIFIED

HW-72890

undergoing cold testing.

The facility is completely shielded for plutonium of composition up to 20 percent Pu²⁴⁰. Solutions can be received, stored, purified by anion exchange, concentrated, and processed to the oxide by the oxalate process. A hood for recovery of plastic compacts permits burning the compacts and recovering oxide.

Manager
Research and Engineering

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

II. ACHIEVEMENTS (Continued)

H. FINANCIAL OPERATION

1. Production Cost

Manpower, overtime and equipment budgets for FY 1963 and FY 1964 were forwarded to Contract and Accounting Operation for consolidation. Material has been prepared from the FY 1963-64 budget currently under preparation for presentation by P. H. Reinker at Mr. W. E. Johnson's budget review on March 26.

A study was completed this month relative to the development of ratios suitable for measurement of maintenance efficiency.

Operating reports for February will reflect the release of \$753,000 in O2 Production funds to the AEC in connection with the pension credit adjustment, together with changes in sponsored R&D and Process Technology.

CPD's investment in inventories at January 31, 1962 compared with budgeted balances at that date is shown as follows:

	<u>Balance</u> <u>1-31-62</u>	<u>Control</u> <u>Allocation</u>	<u>Surplus</u> <u>(Deficit)</u>
<u>Inventories</u>			
Essential Materials	\$ 734	\$ 880	\$ 146
Spare Parts & Standby	1 971	1 778	(193)
Special Materials	<u>269</u>	<u>268</u>	<u>(1)</u>
Gross Inventories	<u>2 974</u>	<u>2 926</u>	<u>(48)</u>
<u>Reserves</u>			
Essential Materials	(56)	(58)	2
Spare Parts & Standby	(450)	(440)	(10)
Special Materials	<u>(150)</u>	<u>(153)</u>	<u>3</u>
Total Reserves	<u>(656)</u>	<u>(651)</u>	<u>(5)</u>
<u>Net Investment</u>	<u>\$2 318</u>	<u>\$2 275</u>	<u>\$ (43)</u>

2. General Accounting

As of January 31, 1962, 14 active projects had incurred costs of \$6,626,258 against authorized funds of \$11,358,400. Outstanding commitments totaled \$1,065,909.

During February, Directive No. HW-534 was received from the AEC, Project CGC-953 - Personnel Protection, Storage Hood Shielding - 234-5 Building, total authorization \$40,000.

Five Appropriation Requests totaling \$72,615 were approved in February, as follows:

26039	(2) Universal Iron Workers	P&GM	\$21 300
26040	Hexone Monitoring Equipment	R&EO	6 000
26035	Receiving and Feed Fac., Recuplex	FPO	40 000
26036	Portable Air Monitor	Purex	1 615
26037	Oscilloscope	FEO	3 700

Total			<u>\$72 615</u>
-------	--	--	-----------------

3. Personnel Accounting

The annual salary review for CY 1962 was completed in February and section managers were informed by letter that the Department General Manager had signified his acceptance.

4. Procedures

A review of the department records management program was conducted by the Commission this month. An oral report to the Manager - Finance indicated that record flow schedules were in excellent shape and that a good organization was in place for records management work. The review disclosed that improvements were in order in the utilization of file cabinets and that inactive material should be disposed of more readily than is current practice.

5. Auditing

During the month test check observations of late arrivals and early departures were made in the 200 East and 200 West areas. Generally, conditions were satisfactory. However, it was necessary to obtain corrected time cards in several instances of late arrivals. Tests are being continued during the month of March.

A study was made of departmental assignment and utilization of vehicles. The study indicates that a reassignment of vehicles within the department should be considered.

An audit of departmental utilization and cost of laundry was started.

In cooperation with CE&UO, passenger counts are being made on busses to and from the 200 areas on a test check basis.

DECLASSIFIED

Manager - Finance

DECLASSIFIED

HW-72890

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962III. PERSONNEL ACTIVITIESA. FORCE SUMMARY

<u>Operation</u>	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>1-31-62</u>	<u>2-28-62</u>	<u>1-31-62</u>	<u>2-28-62</u>	<u>1-31-62</u>	<u>2-28-62</u>
General Manager's Group	10	10	1	1	11	11
Financial	14	14	15	15	29	29
Research & Engineering	68	68	27	27	95	95
Facilities Engineering	62	63	21	20	83	83
Power & General Maintenance	39	39	243	240	282	279
Production	5	5	4	4	9	9
Special Separation Processing and Auxiliaries	47	47	209	206	256	253
Purex	64	65	241	242	305	307
Finished Products	<u>56</u>	<u>54</u>	<u>263</u>	<u>263</u>	<u>319</u>	<u>317</u>
Total	<u>365</u>	<u>356</u>	<u>1 024</u>	<u>1 018</u>	<u>1 389</u>	<u>1 383</u>

B. PERSONNEL CHANGES

Mr. W. S. Frank arrived in CPD the latter part of January to fill the existing vacancy of Manager - Research & Engineering. Concurrent with the filling of the above position, the following employees were returned to former assignments held prior to Mr. Tomlinson's temporary appointment as Acting Manager - Research & Engineering: R. E. Tomlinson, Manager - Advance Process Development; M. K. Harmon, Manager - Redox Technology; and R. G. Barnes, Senior Engineer - Redox Technology.

C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
P. R. McMurray	New York, N.Y.	Manufacturing Services. (2/5-6/62)
K. G. Grimm	Schenectady, N.Y.	Financial matters (2/5/62)
J. E. McDonald	New York, N.Y.	" " (2/6/62)
P. H. Reinker	Palo Alto, Calif.	Atomic Activities Seminar. (2/8-9/62).
D. D. Wodrich	Detroit, Mich. Erie, Penna.	Isostatic pressure equipment. (2/26-27/62).
G. L. Gurwell	Schenectady, N.Y.	Computer workshop. (2/26-28/62)
P. R. McMurray	Schenectady, N.Y.	Manufacturing & Engineering Services. (2/26-28).
<u>To AEC and Other AEC Contractors</u>		
P. R. McMurray	Germantown, Md.	Fission product scheduling. (2/1/62)
R. E. Smith		
K. G. Grimm	duPont Savannah River	Financial matters.
J. E. McDonald	Plant, Aiken, S.C.	(2/7-8/62)
	Dow Chemical Co.	Plant tour. (2/9/62)
	Rocky Flats, Colo.	
H. P. Shaw	duPont Savannah River	Shipping metallics.
	Plant, Aiken, S.C.	(2/6-8/62).
O. F. Beaulieu	Oak Ridge Nat. Lab.	Discuss fission product
A. J. Waligura	Union Carbide Nuclear	chemistry.
J. Mishima	Co., Oak Ridge, Tenn.	(2/12-16/62)
F. W. Gates	Dow Chemical Co.	Equipment management.
R. E. Olson	Rocky Flats, Colo.	(2/12-13/62)
P. B. Fisk	Dow Chemical Co.	Component inspection.
	Rocky Flats, Colo.	(2/11-15/62)
H.H.Hopkins, Jr.	Dow Chemical Co.	Plutonium electrodeposition.
M. H. Curtis	Rocky Flats Plant	(2/14-15/62)
	Denver, Colo.	

DECLASSIFIED

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To AEC and Other AEC Contractors (continued)</u>		
B. F. Judson	duPont Savannah River Plant, Aiken, S. C.	Consultation on Neptunium conversion and Purex separations programs. (2/26-28/62)

To General Industry

H. E. York	Tool Specialties Co. The Wetmore Tool Co. A-1 Carbide Tool Co. Los Angeles, Calif.	Carbide Tooling. (2/5-6/62)
A. W. Hildebrandt	Winslow Mfg. Co. Cleveland, Ohio	Test of clamping device. (2/19-20/62)
D. D. Wodrich	High Pressure Equipment Co., Erie, Pa. Willamette Iron & Steel Co., Portland, Oregon	Isostatic pressure equipment. (2/23/62) Isostatic pressure equipment. (3/1/62)

To Conventions and General Meetings

G. C. Oberg	American Institute of Chemical Engineers, Los Angeles, Calif.	Present paper at society national meeting. (2/5-7/62)
-------------	---	--

To Other Government Agencies

L. L. McGregor	National Bureau of Standards, Washington, D.C.	Attend meeting of Standards & Metrology Division, American Ordnance Assoc. (2/14-15/62)
----------------	--	--

To Foreign Governments and Agencies

R. L. Stevenson	Eurochemic Co. Mol, Belgium	Review nuclear safety and scope design for Eurochemic. (2/5-3/5/62)
-----------------	--------------------------------	---

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors</u>		
R. Vandergrift A. K. Williams	Dow Chemical Co. Rocky Flats Plant Denver, Colo.	Consultation on fabrication process development. Purex Ion Exchange Facility tour. (2/5/62)

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors (continued)</u>		
T. R. Workinger	U.S. - AEC Washington, D.C.	Fission Product Recovery program and Purex process flowsheet revisions. (2/7/62)
D. A. Orth	duPont Savannah River Plant, Aiken, S.C.	Purex Process. Special sep- arations processes. (2/8/62)
J. J. Urban J. K. Lower R. Folger J. Crawley	duPont Savannah River Plant, Aiken, S.C.	Recovery process and but- ton line discussions. (2/14/62)
Ken Overbury	Sandia Corp. Albuquerque, N.M.	Discussions on ALO Stds. Program. (2/6-7/62)
J. W. Anderson	Los Alamos Scientific Lab., Los Alamos, N.M.	Consultation on Plutonium Metallurgy. (2/7/62)
J.P.H. Kelley A. Schoer Dr. W. Doran A. Terge	U.S. - AEC Washington, D.C.	Operational Safety, Purex Plant Tour. (2/7/62)
E. J. Walko Luther Evans	Dow Chemical Co. Rocky Flats Plant Denver, Colo.	Fabrication process con- trol and inspection inter- pretation. (2/7-8/62)
Ron Hedl	Dow Chemical Co. Rocky Flats Plant Denver, Colo.	Fabrication process con- trol. (2/7-9/62)
G. White C. Barrick J. E. Byrne	Dow Chemical Co. Rocky Flats Plant Denver, Colo.	Analytical control. (2/7/62)
Chet Singleton	Lawrence Radiation Lab., Livermore, Calif.	MC-1251 fabrication. (2/8/62)
E. Patterson	U.S. - AEC Washington, D. C.	Component shipping. (2/14-15/62)

DECLASSIFIED

DECLASSIFIED

HW-72890

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From General Industry</u>		
W. A. Rodger	McLain Rodger Associates	Purex processing experience. (2/5/62)
P. H. Wormell	Consultant, Leawood, Kansas	Lathe developments. (2/20-21/62)

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY - 1962

IV. SAFETY AND SECURITY

<u>Operation</u>	<u>Facil. Eng.</u>	<u>Finance</u>	<u>Fin. Prod.</u>	<u>P&GM</u>	<u>Purex</u>	<u>SSP&AO</u>	<u>Prod.</u>	<u>Rel. Prac.</u>	<u>Res.& Eng.</u>	<u>Total CPD</u>	<u>Yr. To Date</u>
Disabling Injuries											2
Serious Accidents											
Medical Treatment											
Injuries	1										
Radiation Occur.			5	16	8	6			3	39	86
Contam. Wounds			9		6	2				17	42
Pu Depositions											
Fires			1*							1	2
Security Violations											2

* Failure of thermowell permitted escape of hot slag and reduction metal to hood. Burning reduction metal and molten slag impinging on panels caused penetration of one plastic panel.
Damage - \$300.00.

DECLASSIFIED

HW-72890

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

V. REPORTS

A. PREPARED AND ISSUED

- HW-71639 4 Secret AWD, "Plutonium Monthly Report - January 1962", dated February 14, 1962, by A. E. Smith
- HW-72420 Secret AWD, "Progress Report - Finished Products Fabrication Technology Operation - December 1961, January 1962", dated January 25, 1962, compiled by members of the FPFTO - Research and Engineering, Chemical Processing Department.
- HW-72513 Secret AWD, "Control of Plutonium-240 to Assure Meeting Tolerance Statement for 81-C Components", dated January 25, 1962, by R. E. Tomlinson.
- HW-72566 Secret, "Compositing Schedule for January, 1962, Special Dissolver Charges at SSP&AO", dated February 6, 1962, by W. H. Zimmer.
- HW-72625 Secret, "Chemical Processing Department Waste Status Summary - July 1, 1961, thru December 31, 1961", dated February 7, 1962, by R. E. Roberts.
- HW-72608 Unclassified, "An Evaluation of Standardization Modes for Ceric Sulfate Using An Improved Macro Burette", dated December 13, 1961, by P. F. Raney.
- HW-72620 Secret, "Purex Plant Production Schedule - February 1962", dated February 7, 1962, by D. McDonald.
- HW-72621 Secret, "Redox Plant Production Schedule - February 1962", dated February 7, 1962, by D. McDonald.
- HW-72622 Secret, "UO₃ Plant Production Schedule - February 1962", dated February 7, 1962, by D. McDonald.
- HW-72623 Secret, "234-5 Plant Production Schedule - February 1962, dated February 7, 1962, by D. McDonald.
- HW-72632 Secret, "Comparison of Weight Per Cent Determined by Neutron Counting and by Mass Spectrometry", dated February 7, 1962, by W. H. Zimmer.
- HW-72643 OUO, "Personnel Protection Storage Hood Shielding - 234-5 Building - CGC-953, dated February 13, 1962, by L. W. Finch.
- HW-72662 Secret, "Flow Sheets for Continuous Dissolution of Plutonium Metal for Task I Processing", dated February 19, 1962, by H. W. Crocker.

DECLASSIFIED

HW-72890

- HW-72665 Unclassified, "Disaster Control Facilities-Chemical Processing Department", dated February 15, 1962, by W. A. Graf and D. W. McKee.
- HW-72671 RD, Secret RD, "COWPT Meetings", dated February 13, 1962, by R. E. Tomlinson.
- HW-72684 Secret AWD, "Inspection Methods for Measurement of MC-1251 Parts While Confined in the Machining Fixture", dated February 14, 1962, by A. E. Smith.
- HW-72712 Secret, "Processing of Rich Plutonium Scrap", dated February 23, 1962, by J. H. Warren.
- HW-72786 Unclassified, "Trip Report - Visit to Savannah River Plant and Oak Ridge National Laboratory December 13 - 15, 1961", dated February 22, 1962, by T. R. McKenzie and H. C. Rathvon.
- HW-72794 Secret "Information for Project 880 Study", dated February 23, 1962, by J. H. Warren.
- HW-72052 Secret, "Invention Report: Increasing the Chemical Reactivity of Pu Oxide Powder by Addition of Sulfate", dated March 1, 1962, by M. J. Rasmussen and G. L. Stiffler.
- HW-SA-2290 Unclassified, "Continuous Anion Exchange Processing of Plutonium", dated October 3, 1961, by G. C. Oberg and W. H. Swift.

B. PREPARED FOR SIGNATURE AND ISSUANCE

- HW-72550 Secret, "Production - January, 1962", dated February 1, 1962 by W. E. Johnson.
- HW-72784 Secret, "Plutonium Scrap Recovery", dated March 1, 1962, by W. E. Johnson.

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1962

VI. PATENT SUMMARY

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>INVENTOR</u>	<u>TITLE</u>
F. S. Stong, Facilities Engineering	Magnetically Referenced Second Harmonic Converter
M. J. Rasmussen, Research and G. L. Stiffler Engineering	Increasing the Chemical Re- activity of Plutonium Oxide Powder by Addition of Sulfate

P. H. Reinher

General Manager
Chemical Processing Department

DECLASSIFIED

END

**DATE
FILMED**

4 / 28 / 93