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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

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NOVEMBER, 1964

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OPERATION MANAGERS

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CLASSIFICATION REVIEW FOR
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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Date 3/15/73
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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1964

I. SUMMARY

November production, as a percent of the HAPO Production Forecast (RL-GEN-2), is summarized below:

	<u>November</u>	<u>Fiscal Year</u> <u>To Date</u>
Separated plutonium nitrate	103	107
Separated uranium nitrate	99	105
Uranium oxide	100	102
Plutonium metal buttons	95	108
Fabricated parts	96	105

November production was satisfactory for all products even though the output of plutonium metal buttons and fabricated parts was slightly below forecasted quantities. FY 1965 production continues to exceed forecasted quantities for all products.

The Purex plant operated continuously except for one brief outage of five hours to replace a jumper. After removing one dissolver from normal service so that it could be prepared for thorium dissolution, the processing rate was ultimately decreased to 23 tons per day to accommodate the reduced dissolver capacity. Product quality was generally satisfactory although three batches of plutonium product had to be reworked.

Purex ventilation air flow was marginal all month. The lowest air flow recorded was 70,200 cfm and the corresponding differential pressure across the filter was 6.4 inches of water. Average values for the month were approximately 71,800 and 6.0, respectively.

Tank 103-AX, one of four new waste storage tanks for Purex, is being pre-heated prior to introducing self-heating wastes.

E-metal processing was resumed in the Redox plant on November 6, following the scheduled shutdown reported last month. Although operating continuity was subsequently interrupted on six occasions because of equipment failures, "on-stream" performance was highly effective. Forecasted production was exceeded by almost eight percent.

Shipment of non-defense plutonium included 30 kilograms for the Saxton Test Reactor and 108 kilograms for the Southwest Experimental Fast Oxide Reactor (SEFOR Program).

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Operation of the Plutonium Reclamation's slag and crucible dissolver continued to be handicapped by the accumulation of solids. A second dissolver is being installed, after having been successfully tested in the laboratory. Major differences from the first unit are a larger diameter processing area plus either gas or steam nozzles to fluidize solids in otherwise stagnant zones.

A new type of "skull" dissolver, which will minimize vapor-phase corrosion, has been designed for the Miscellaneous Treatment part of Plutonium Reclamation facility.

General Manager
Chemical Processing Department

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

a. <u>Percent of Forecast(1) Achieved</u>	<u>November</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate	103	107
Separated uranium nitrate	99	105
Uranium Oxide	100	102
Plutonium metal buttons	95	108
Fabricated parts	96	105
b. <u>Purex</u>	<u>November</u>	<u>October</u>
Uranium nitrate produced (tons)	606	843
Average production rate during operation (T/D)	24	30
Total waste loss (%)		
Plutonium	0.35	0.32
Uranium	0.22	0.27
On-line efficiency (%)	99	94
c. <u>Redox</u>		
Uranium nitrate produced (tons)	172	97
Average production rate during operation (T/D)	9	8
Total waste loss (%)		
Plutonium	0.26	0.39
Uranium	0.26	0.20
On-line efficiency (%)	68	37
d. <u>Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	557	693
Enriched UO ₃ loaded	154	177
Normal UO ₃ approved for storage	557	693
Enriched UO ₃ approved for shipment	154	153
Normal UO ₃ shipped	0	0
Enriched UO ₃ shipped	154	101
Normal UNH backlog	477	454
Enriched UNH backlog	143	145

(1) RL-GEN-2, HAPO PRODUCTION FORECAST

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e. Plutonium Metal Processing

	<u>November</u>	<u>October</u>
Reduction yield (%)	95	97
Product recovery output (Kgs)	135	210
Product recovery backlog (Kgs)	1 239	1 220
Waste disposal (grams)	1 510	885

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	9 861	5 662
Filtered water pumped (gpm)	1 137	1 182
Maximum steam generated (lbs./hr.)	219 000	149 000
Average steam generated (lbs./hr.)	196 293	112 608
Total steam generated (M lbs.)	141 331	81 078
Coal consumed (tons)	7 466	4 399

November production was satisfactory for all products even though the output of plutonium metal buttons and fabricated parts was slightly below forecasted quantities. FY 1965 production continues to exceed forecasted quantities for all products.

Acting Manager, Production

2. FISSION PRODUCT DATA (In Kilocuries)

	PUREX RECOVERY	244-CR INVENTORY	B-CANYON INVENTORY	SEMIWORKS			PRODUCT IN CASK	PRODUCT SHIPPED	CUSTOMER REMARKS
				IN-PROCESS INVENTORY	PRODUCT INVENTORY				
Sr-90	110	770	1500	---	2220		--	--	
Cs-137									
Ce-144									
Pm-147		2250	5040					70*	
Aged Pm-147		200			360				

* On consignment to Separations Chemistry, CPD, on 11-9-64.

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II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

The Purex Plant operated continuously except for a five-hour outage for a jumper change on November 25, 1964. The processing rate was reduced to a 3.0 capacity factor on November 2, 1964 and to a 2.75 capacity factor on November 23, 1964 to accommodate reduced dissolver capacity. C3 dissolver flushes in preparation for thorium dissolution started on November 2, 1964 and continued throughout the month.

Neptunium runs 23 (865 grams) and 24 (1025 grams) were completed and two shipments (893 grams total) were made during the month. Run 23 contained Redox material.

Four strontium recovery runs were completed at the Purex Head End during November. The Purex Head End equipment was committed to the Thorium Process Test on November 11, 1964.

Seventy kilocuries of semi-refined promethium-147 were loaded into a 40-gallon cask at the Strontium Semiworks and transferred to Separations Chemistry for purification.

After the flushing of the Strontium Semiworks A Cell vessels was completed, 6000 gallons of aged promethium crude solution (containing 400 kilocuries of promethium-147) were transferred from the 002-CR Vault to the Strontium Semiworks and concentrated to 1700 gallons. The initial solvent extraction step, to remove iron and lead, accomplished in the HA and HC extraction columns, resulted in rare earth recovery of less than 50 percent due to slow kinetics of the DTPA-complexed (Sodium diethylene triamine penta-acetate) feed or to solids formation. Rework of the HA column waste solution was equally unsuccessful. Due to delays encountered in the initial column processing and the HA column waste recycles the DTPA-complexant in the HA column feed underwent decomposition forming appreciable solids which scavenged up to 90 percent of the rare earths. The material containing the solids was acidified and digested after which batch contacting resulted in fair success.

Four thousand gallons of the least-aged cerium-rare earth product solution in Tank 6-2 at B Plant were thermally concentrated to 1500 gallons and combined with similar aged material in Tank 7-1.

A crude lead removal process was demonstrated when about 450 pounds of lead were dissolved out of the concentrator with a water boildown flush.

Sludge removal from Tank 103-A continued on a three-shift basis until November 17, 1964 when a periscope was installed in the tank for observing the residual sludge levels and the condition of the circulators and the tank.

2. Processing Operation

Uranium met specifications but three batches of plutonium failed to meet specifications as a result of excess 3WB flow (waste backcycle) to the co-decontamination cycle. The plutonium has been reworked.

3. Equipment Experience

Marginal ventilation air flow was maintained in the Purex canyon during November. The lowest air flow recorded was 70,200 cfm and the corresponding differential pressure across the filter was 6.4 inches of water.

The right hand optic on the Purex east canyon crane became inoperative when the mechanical drive to extend and retract failed. Complete repairs were made by installing new bearings, gears, and a drive shaft. The unit was aligned and returned to service.

The lead cable on the 40-ton hoist to the Purex east canyon crane was replaced this report period. The need for replacement was determined through a comprehensive hoist inspection. The old lead cable has been in service approximately two years.

The two-ton rotating hook on the Purex west canyon crane became inoperative and was replaced with a reconditioned hot spare.

The feed pump to the Purex neptunium recovery package failed this month when the pumping rate would no longer meet the requirements of the process. The replacement pump was a reconditioned hot spare.

The agitator in the Purex Tank F-16 (waste denitration and neutralization) was replaced this month with a new slow speed (285 r.p.m.) longer shaft agitator to improve agitation within the process vessel.

The agitator in the Purex Tank G8 (organic wash waste collection) failed when an open circuit developed in the electric drive motor. Replacement was made with a new agitator from Spare Equipment.

The control valve jumper in the Purex 3 WF stream (backcycled waste) developed a severe leak and was replaced on November 25, 1964.

The control valve in the HA column waste stream at the Strontium Semiworks failed to respond during pre-startup checks. Flushing and alternately applying pressure and vacuum to opposite sides of the diaphragm restored the valve to service.

Installation was completed on an alternate effluent return route from the 801-C Cesium Loadout Building to Tank 103-C.

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The blocks from Cell 13 in the B Plant canyon were removed and guard rails installed, permitting construction forces to begin cell modification work in conjunction with Phase II construction.

Heating of Tank 103-AX continued during the month. Liquid temperature was up to 64°C at month's end.

The No. 1 exhaust fan, 291-B Building, failed this report period due to a defective outboard bearing. Complete repairs were made and the unit was returned to service.

4. Radiation Experience

Several hundred gallons of condensed vapors from the 241-A waste storage tanks were pumped out of a stub on the west side of the 417-A jumper pit due to the installation of a jumper to the wrong nozzle by construction forces. The condensate flow resulted in a ground area being contaminated to 50 mrad/s at the surface. The construction forces backfilled the area to cover this contamination.

A ton of copper sulfate was slowly added to the water going to the Gable Mountain Swamp to kill algae.

Sterilization of the ground over the covered ditches at the B and Gable Mountain Swamps to prevent the growth of possibly contaminated vegetation was completed on November 23, 1964.

Radiiodine emission was higher than normal, averaging from 3 to 4 curies per week.

Burial of a box of failed canyon jumpers was successfully conducted on November 13, 1964.

5. Analytical Experience

Analytical support was provided for the processing of crude rare earth material at the Strontium Semiworks. Analyses proved extremely difficult due to undesirable sample characteristics.

Training progressed on the various analytical methods which will be used in support of the Thorium Process Test.

Manager-Purex

WM Harty:MLM:gt

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

C. REDOX OPERATION

1. Operating Continuity

The Redox plant was shut down the first week of the month to complete the quarterly acid flush of processing equipment to satisfy the periodic inventory and nuclear criticality control requirements. E-metal processing was resumed on November 5 and continued for the balance of the month. Processing continuity was interrupted on six occasions due to equipment failures and shutdown periods totaling seven days. On-line processing performance for the 18 days of operation was extremely effective and the scheduled production for November was met.

The Uranium Oxide plant operated satisfactorily throughout the month and the production of both depleted and enriched uranium oxide exceeded that expected.

2. Processing Operations

a. Redox Processing

The 57 percent nitric acid flush of the process equipment was completed during the first week of the month. Only 450 grams of plutonium was recovered throughout the system, indicating no significant disposition of plutonium at any point in the process.

Virgin E-metal processing was resumed on November 5. Equipment failures during the first seven days of operation were experienced, with pump and process jumpers in E-cell. These failures resulted in shutdown periods totaling approximately 120 hours.

Processing operations from November 12 through the end of the month were continuous except for two relatively short interruptions to replace the D-14 backcycle waste pump and the G-1 organic receiver pump. On-line performance of the process during this 18-day period was extremely effective. Rates were sustained at an average of 10.2 tons per operating day and for prolonged periods, at an instantaneous rate of 11.5 tons per day. Both rates represent a record performance for the Redox Operation through a single precycle extraction column.

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b. Uranium Oxide Processing

Processing operations were satisfactory throughout the month and the expected production of both depleted and enriched uranium oxide was exceeded by 11 and 39 percent, respectively.

Car E-113, which was thought to be out of specifications with respect to sulfur content, and shipped on a waiver to the customer during October, was subsequently determined to be well within specifications. All powder produced this month was within specifications.

A large amount of enriched uranium oxide "fines" was generated when H-calcliner was returned to service on November 23. This resulted from high air flow in the powder transfer system during the initial start-up, but was quickly remedied. It is not believed that any discrete layering of the "fines" in the shipping containers resulted.

3. Maintenance Experience

a. Redox Plant

Equipment failures were encountered this month which reduced the mechanical efficiency to approximately 75 percent. The major equipment pieces which failed and required replacement were: 1) the E-13 ozonator pump; 2) the 3A column feed tank pump (E-1); 3) the G-1 organic surge tank pump; 4) the F-8 precycle feed pump; 5) the D-14 backcycle waste pump which required two replacements before satisfactory operation was obtained. In addition, process shutdowns were taken to replace: 1) the jumper between the 2E and 1C columns; 2) the E-13 vent jet steam supply jumper; 3) the E-13 discharge jumper to the uranium product storage area.

The pumps which failed in three of the positions noted above (namely, the E-1, E-13 and G-1) had given good performance and had a long life. The G-1 had been in service since 2-29-56, the E-13 since 9-1-62, and the E-1 since 10-29-63.

During the repair work in E-cell, it was found that the carbon steel pipe connector assembly tie-rods were either badly corroded or broken and that valve stems were in an advanced state of corrosion. Possibly oxidation by the ozone, used in the E-cell process to remove ruthenium, is adding to the corrosion normally caused by acid fumes. The problem is under study and ways to improve the system, which removes the spent ozone to the ventilation tunnel, are under investigation.

The steam turbine which drives the 202-S Canyon Building emergency exhaust fan, located at the 291-S fan platform, failed on 11-22-64. It was replaced with the turbine and fan from the 291-U Area. The replacement was put in service on 11-26-64 and to date has operated very satisfactorily.

b. Uranium Oxide Plant

H-calcliner was shut down shortly after start-up on 10-26-64, when one of the agitator blades sheared off. Inspection revealed three other blades were badly bent and 12 blades nicked. These 16 blades were replaced and the unit placed back on-line on 11-9-64. During heat up of the unit, one of the shell temperature thermocouples failed. When the thermocouple was removed, the sleeve was also found to have failed and came out with the thermocouple. It was subsequently necessary to drop the fire box to replace the sleeve. Inspection at this point revealed that two sections of the fire box lining were out of line (toed-in). Repairs were completed, including installation of two new sections of fire-brick lining, and the unit returned to service on 11-23-64. Operation to date has been satisfactory.

4. Waste Handling and Decontamination

The radioactivity detected in two of the three horizontal laterals beneath the 108-SX waste storage tank during August, has now increased from a maximum of 150,000 c/m during August to a reading of 720,000 c/m at November month-end. Radiation readings in one (No. 29) of the six vertical test wells surrounding the tank have increased from 5,000 c/m to 10,000 c/m. Although inventory figures on the tank contents indicate no loss of material, tank seepage is suspected. The lateral and vertical test well readings are being continued on a daily basis. If a significant and continuous leak is confirmed, for example, by wide spread of radiation readings in other monitoring stations, or by an otherwise unexplained and sizeable reduction of waste volume in active inventory (as indicated by liquid level and specific gravity determinations), the tank contents will be pumped out. A suitable water injection pump is on hand and the 115-SX tank is available to receive the 108-SX contents. Pumping can be started within 24 hours.

5. Radiation Experience

Failure of the 291-S steam turbine emergency exhaust fan on November 22 apparently contributed to a general spread of low-level contamination in both sample galleries of the 202-S Canyon Building. Greater than normal contamination was also found on cask cars in the railroad tunnel during this period. Both conditions were apparently caused by the tunnel door being open when the steam turbine went out of service. By month-end all areas had been restored to their original status.

6. Analytical Experience

In addition to the usual analytical support provided the Redox and Uranium Oxide plants, the Redox Analytical Laboratory provided analytical services for numerous outside customers. This included, but was not limited to: 1) Manganese-54 analyses for the Reactor

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Fuels Laboratory to provide information for determining power levels in the various HAPO reactors; 2) particle size determinations of uranium and plutonium oxides for the Nuclear Fuels Operation, IPD, to supply data which could lead to the manufacture of more efficient fuel elements; 3) uranium, plutonium, americium and strontium analyses to assist the Materials and Process Chemistry Laboratory, Hanford Laboratories, in a feasibility study for the recovery of these elements from process waste solutions; 4) multi-channel analyses for fluorine-18 and manganese-54 in water samples to permit the N Reactor Department to determine the "leak-rate" of water between their primary and secondary heat exchangers.

for *CS Foster*
Manager - Redox

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

D. WEAPONS MANUFACTURING OPERATION

1. Operating Continuity

The fabrication of Model 1807 weapon components and Model 74-C weapon components was without significant interruption during the month. The production of unfabricated plutonium was limited by mechanical failures in the button line. Recovery operations were satisfactory except for dissolution of slag and crucible material. Operation of the incinerator, the waste treatment facility and the americium recovery equipment was without significant interruption.

2. Processing Operations

a. Plutonium Fabrication

Information on plutonium fabrication activities is presented in Document RL-SEP-135 (Atomic Weapon Data).

b. Plutonium Reduction

All unfabricated plutonium produced during the month was weapons grade.

Shipments of non-defense plutonium metal for several larger orders commenced in November. Included were 30 kilograms for the Saxton Test Reactor and 108 kilograms for the Zero Test Reactor (APR) of the SEFOR (Southwest Experimental Fast Oxide Reactor) program. Except for seven kilograms sent to Hanford Laboratories, all the above material went to NUMEC (Nuclear Materials and Equipment Company, Apollo, Pennsylvania) for processing of fuel elements.

Modification of Vault 106, 234-5 Building, for additional plutonium metal storage was completed during the month. Fabrication of pedestals for plutonium metal storage in the vault of the 271-T Building is in progress at month-end.

c. Plutonium Reclamation

One hundred thirty-five (135) kilograms of plutonium were delivered to the button line from the recovery facilities during November.

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c. Plutonium Reclamation (Continued)

One hundred thirty-nine (139) boxes of waste and 26 packages of leachables were processed through the incinerator facility.

Operation of the 06 slag and crucible dissolver continued to be curtailed by solids accumulations. Process tests to study the solids buildup occupied this vessel during the first half of the month and piping modifications to permit the installation of the modified 04 dissolver kept it out of service during the latter part of the month.

The waste treatment facility performed satisfactorily during the month. Ninety-six (96) grams of plutonium were returned to the main production stream from 53,000 liters of waste which were processed. Also, 10.4 grams of americium were recovered and stored for future processing.

3. Mechanical Performance

Performance of the equipment in fabrication and inspection was satisfactory. Repairs and modifications to the land diameter gage have resulted in increased reliability of this instrument.

The HC-24 hood (Gorton lathe hood recently moved from the "C" fabrication line to the "A" fabrication line) has been designated as HA-39. Relocation and installation was completed during the month. Modification and testing of the lathes was in progress at month-end.

Button line performance was curtailed by the failure of the calciner heaters on the continuous processing unit and by the failure of the hydraulic pumps which service the button line equipment.

Plutonium reclamation equipment, with the exception of the slag and crucible dissolver, performed satisfactorily during the month. Two Chempumps failed and were replaced. Two other Chempumps were removed from service for bearing replacement.

At month-end, the modified 04 dissolver was in place in the reclamation facility canyon and service piping to it and to the 06 dissolver was being modified by J. A. Jones forces.

The incinerator required rodding of the flues and replacement of the blades of the chopper.

4. Radiation Experience

Radiation and contamination control statistics for November revealed good control. There were no cases of plutonium deposition.

5. Analytical Experience

Number of Samples Received	3,086
Number of Determinations	20,708

Installation and testing of the new mass spectrometer was completed and the instrument was placed in service on November 23.

Considerable extra laboratory effort was required to provide analytical data for the SEFOR shipment.

WJ Gartin

Manager
Weapons Manufacturing

WJ Gartin:csj

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II. ACHIEVEMENTS (Continued)

E. FINANCIAL OPERATION

1. Production Cost Accounting

The final submission of the Midyear Budget Review was made to C&AO on November 23, 1964. The new budget numbers were used beginning with the November operating report.

2. Auditing

Audits of Personnel Accounting and the use and control of grain alcohol were completed during the month of November.

3. General Accounting

As of October 31, 1964, nineteen active projects had incurred costs of \$3,469,896 against authorized funds of \$6,026,424. Outstanding commitments totaled \$591,314.

During November one work authority was received from the AEC: Directive No. HW-548, Work Authority No. 3, Project CAC-981 - Fission Product Packaging Facility - B-Plant, increase of funds to new total of \$50,000.

There were seven Appropriation Requests approved during the month of November, 1964, authorizing expenditures as follows:

<u>AR</u> <u>Number</u>	<u>Description</u>	<u>Section</u>	<u>Amount</u>
56021	Wide Beta Counting System	Redox	\$18 000
56022	Anticoincidence Guard for Well Detector Unit	R&EO	4 000
56023	Plasmarc Burning Torch Guidance Mach- ine	FEO	3 000
56024	Neutron Monitor for "C" Column, 236-Z Bldg.	WMO	9 000
56025	Television Equipment for "A" Column, 236-Z Bldg.	WMO	2 400
56026	Conversion of Chemical Tank, 236-Z Bldg.	WMO	4 400
56027	Polor Chart Recorder	WMO	<u>1 250</u>
	Total		<u>\$42 050</u>

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4. Business Programs

The Fission Products Conversion and Encapsulation Facility cost estimates were completed and incorporated into the over-all study which was submitted to the AEC.

M J Smith

for Manager - Finance

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II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

Purex Process Controls

Design was completed for two (2) Purex Process Control Systems, both of which utilize magnetic flow meters. The first system was designed to control two diaphragm-operated valves in the Purex 3WB Stream. This system includes special jumpers and coaxial connectors for electrical heads, two of which are used for the magnetic flowmeters and the other two are intended for future use with neutron monitors. Fabrication is in progress, and installation is scheduled for completion by December 15. The second system was designed for control of a variable jet in the Purex 3WF Stream. In addition to better control, this system includes a means of air purging the steam line if a component should fail. The start of fabrication is planned for early January 1965.

Purex Canyon Crane Hook

The ten-ton rotating hook on the Purex Canyon crane is being modified by the installation of a clutch in the hook drive mechanism. This clutch will reduce sudden overloads and breaking of the gear train during heavy lifts, thus eliminating downtime because of crane hook failure.

Waste Tank Inspection

A "light bar" was fabricated in order to illuminate the interior of Waste Tank 103-A and to inspect it by use of a periscope. The light bar contains three (3) 1500 watt quartz lights, but vapors inside the tank interfere with good vision. A second light bar is being made for insertion in another riser.

Pulse Generators

Two (2) short-stroke pulsing machines are being built by Olympic Welding of Seattle. Chemical Processing Department Shops have completed modifications to the pulse generator assembly, including the yoke, yoke arms, bushings, and eccentric piston shaft.

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Irradiated Thorium Processing

Shops have fabricated 50 s/s liners for thorium shipping containers to protect the aluminum outer container if the plastic product bottle should leak.

Purex 4.0 Capacity Factor Expansion

Preliminary review was started of major equipment items which may require replacement or modifications to meet 4.0 CF processing rates. Conceptual drawings are being prepared of larger concentrator tube bundles.

2. RedoxRedox Exhaust Fans

An emergency procedure has been prepared whereby the electrically-driven exhaust fans for Redox may be switched to the emergency electrical circuit if the interim steam turbine power should fail. Also, a portable air compressor was provided as a back-up on the instrument air system at 224-U Building, thus decreasing the demand on the 284-W Building generator during emergencies. These procedures were established to cover loss of emergency power while the steam turbine was being replaced.

Powder Handling "U" Area

An air purge system has been designed for installation at the X-3 bag filter outlet to prevent "powder fines" bridging across the outlet or clogging the star valve. Other items are being designed or are under study if the purge system does not solve the problem.

3. WeaponsPlutonium Reclamation

Design was completed for installation of the captive coolant canned pump (Integral). This unit is to be evaluated as potential replacement for Chempumps which are failing in service. Design was completed for a replacement skull dissolver (TK-61, 62, and 63) in the Miscellaneous Treatment Room (Glove Box 2) to minimize vapor phase corrosion.

Waste Treatment

The process test using hydrofluoric acid for stripping the W-2 CW Column was successfully completed with two (2) column volumes attaining about 90% removal. Design was completed for the installation of a parallel-operated product receiver (W-5A) to minimize downtime of the CW Column for product disposal.

Americium Recovery

Design was completed for a replacement W-14 cation exchange column to reduce cost and allow resin disposal; the present design required disposal of the column when the resin has become plugged or degraded.

Machining Hood HA-39

Installation of glove box HA-39 is complete. The lathes are being "tuned up" and given alignment checks and will be ready for operation before December 1. Initial operation will be with portable fire protection equipment in the hydraulic mezzanine pending installation of the permanent CO₂ system.

Model Change

Design and engineering work necessary to a model change were completed, and components for manufacturing have been secured. New tooling now being made includes a Gorton lathe chuck, chuck plate, and a "cookie slicer" for cutting plutonium scrap.

CAC-121 - Americium Recovery Facility - "Z" Plant

A project proposal, revision 2, to terminate the project without completing the americium purification, conversion, and packaging portions of the facilities at 242-Z Building is in the final CPD approval stage.

4. General

Vertical Well Cable Reels

It is believed that the cause of the excessive amount of cable breakage on the vertical well monitoring systems has been determined and corrected. The necessary modifications to provide spring tension in the cable drive were made, and the systems were put back in service on November 18, 1964.

Americium, Neptunium, and Plutonium Recovery

A preliminary flowsheet is available for recovery of Pu₂₃₉ and Np₂₃₇. Very preliminary equipment layouts and cost estimates are being prepared for installing these facilities in 221-B, 224-B, and a new process vault. Further evaluation of the more promising alternatives will then be made.

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Americium recovery may be conducted in the Hanford Isotope Plant with only minor changes being required in the proposed promethium recovery system. Cost estimates have been prepared covering these changes.

Weighted Priority System - Maintenance Work

The several years of work sampling measurements in CPD and elsewhere at HAPO have resulted in a reproducible measurement which has a high degree of precision and is also relatively free of observer bias. This measurement system enables a maintenance manager to compare time effectiveness of his personnel against results obtained elsewhere, with assurance that common measurements were used. On the basis of preliminary findings and of results obtained by some foreman groups, a program is being prepared to enable other foremen to improve crew efficiency performance. Target date for scope completion is mid-January 1965.

Power and Services Operation

There were no interruptions of steam, water, or electrical services that affected continuity of production operations. Ventilation balance crews assisted with installations in the new Purex filter building and with design changes to the 236-Z Building ventilation system. Coal inventories in the 200 Areas have been reduced to the desired level of 20,000 tons.

Project Data

Project Cost Information as of November 29, 1964:

Total authorized funds - 19 active projects	\$ 6 099 000
Total Cost-to-date	3 570 000
Committed and Open Work Releases	688 000
Unencumbered Balance	1 841 000
Costs charged to above projects (11-1-64 to 11-29-64)	100 000

CAC-981 - Fission Product Packaging Facility - B-Plant

Directive No. HW-548, Mod. #5, dated November 2, 1964, authorized total project funds in the amount of \$1,500,000. The directive completion date is April 1, 1966.

Manager - Facilities Engineering

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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Engineering

a. Thorium Process Test

The Purex Thorium Process Test is underway with segregation of uranium-bearing recovered acid in the plant and flushing of the C3 Dissolver and E-Cell centrifuge system. The required jumpers have been designed and fabricated, process specifications have been prepared for critical mass control, chemical hazards control, essential materials acceptance, and head-end dissolving and protactinium recovery flowsheet operations. Test procedures for the initial dissolving operations have been prepared.

b. AX Tank Farm Startup

Heating of the first AX Farm Tank (103-AX) scheduled to receive waste was initiated on November 6 while final construction efforts in the rest of the tank farm continued. About 600,000 gallons of water was added to the tank and steam sparging is slowly raising the solution temperature. Slow heating is required to avoid undue thermal stresses. Temperature differentials measured between pairs of thermocouples within the tank walls are being used to control the heating rate. Rates in excess of 4° F per day have been achieved while remaining well within established structural temperature differential limits of 30° F per foot of concrete.

c. In-Tank Solidification

Acceptance tests for the in-tank solidification unit were essentially complete at the end of the month. Final compressor modifications are being made prior to startup.

d. Fission Product Processing

Rare earth solution stored in TK-6-2 at B-Plant was thermally concentrated a factor of four to make room for additional stockpiling needs. A flush of the concentrator after the evaporation was completed picked up 200 kilocuries of cerium-144, 52 kilocuries of promethium-147, and 450 pounds of lead. A rework run employing a sodium hydroxide strike on the flush with a mol ratio of hydroxide to lead of 10 resulted in an apparent recovery of 99 per cent of the promethium and disposed of 95 per cent of the lead. However, overall material balances for rare earths and lead were 80 per cent.

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Redox Process Engineering

a. Solids in the Feed Solution

In order to eliminate the abrasive solids in the feed solution and thereby decrease the frequency of feed pump failures, the agitators in the H-8 and H-9 Metal Solution Storage Tanks were shut off last May and the tanks have since been used as settling tanks. During October the H-8 tank was visually inspected and the bottom of the tank was found to be completely covered with black granular solids.

An analysis of a sample of these solids showed that they are intermetallic compounds of uranium, aluminum and silicon with a specific gravity of 4.2 plus or minus 0.5. They are about 55 per cent uranium by weight, and have a plutonium to uranium ratio about four times higher than normal production. These solids may have originated at the bonding layer of the aluminum jacketed slugs during the jacketing operations.

The solids are not soluble in either 6.5M HNO_3 or 9.0M NaOH but dissolve rapidly and exothermically in 3.5M HNO_3 - 1.8M NH_4F . In the presence of an excess of fluoride, a uranium precipitate (UF_4) is formed; sodium dichromate may be used to oxidize the uranium to the hexavalent state and prevent the precipitation of UF_4 .

b. Acid Flush

A 57 per cent acid flush of the process vessels was completed during the first part of the month. A total of 450 grams of plutonium was picked up of which 100 grams were recovered from the 1A Partition Cycle Column and overflow line and 300 grams were recovered from the HA Precycle Column and D-14 Backcycle Concentrator.

The comparatively small quantity of plutonium pickup indicates that fair control over plutonium deposition has been maintained. However a more nearly neutral HA Column flowsheet has since been adopted in order to provide better control over deposition. The acid concentration of the combined HAF and HABS stream has been changed from -0.15M HNO_3 to -0.05M HNO_3 .

c. Capacity Increase

In order to increase processing rates, a more fully salted 3D Column (uranium extraction, final uranium cycle) flowsheet has been adopted in which the flows of 3DS solution (2.5M aluminum nitrate) have been increased from 16 to 24. This flowsheet change reduced the quantity of uranium backcycled via the 3DW stream from 20 per cent to 10 per cent, and permits an increase in processing rate from 10 tons per day to 11.5 tons per day. This change increases the cost for chemicals for operating the plant by about \$15 per ton of production and the cost for waste storage by about \$10 per ton of production.

3. Plutonium Process Engineering

a. Recovery

High waste losses and column flooding were experienced in the Plutonium Reclamation Facility which had been removed from the button line vacuum header. The processing difficulties were caused by the presence of organic materials (e.g. fabrication lard oil) in the vacuum header solutions. With frequent organic washing and replacement of the organic inventory the system gradually returned to normal.

Because of the above difficulties the Fabrication Oil Prototype (CX Column), originally scheduled for operation next spring, was pressed into service on November 18 to process the remaining vacuum header solutions. In this column, plutonium is extracted into a nitric acid solution containing some fluorides from the various organic wastes generated in the building. Initial operation indicated that the basic process is adequate but that equipment modifications will be required to obtain a completely adequate system. Solutions processed first through the CX Column were handled satisfactorily through the main solvent extraction system.

Tests on the prototype slag and crucible dissolvers (TK-06) were curtailed during the month because of the above process difficulties. Two 30-can dissolution tests at conditions recommended by Plutonium Chemistry Laboratory (e.g., 23 liters of 10M HNO₃ - 0.15M ANN per can of slag and crucible) were completed. Inspection after the 30 can runs indicated some undissolved solids. Further tests are planned to determine whether these solids will continue to accumulate or will establish an equilibrium heel. Special chemical cleanout procedures are also being developed.

A second slag and crucible dissolver (TK-04) was installed during the month and initial "hot" runs are planned during December. This dissolver, also a thermal syphon recirculating dissolver, contains several improvements which should improve dissolution capability. A major change in this dissolver is the incorporation of several gas and/or steam nozzles designed to refluidize solids from otherwise stagnant zones.

b. Button Line

A process test was initiated to test the use of manganous nitrate vice potassium permanganate to kill the oxalic acid remaining in the plutonium oxalate precipitation filtrate. The purpose is to reduce or eliminate the manganese dioxide solids which occasionally form and accumulate in the filtrate evaporator in the Plutonium Reclamation Facility.

4. Separations Chemistry Laboratory

a. Hot Semiworks Diluent

A sample of the new diluent from the Hot Semiworks has been under study in the laboratory. The material, a normal paraffin hydrocarbon called NPH appears to have some advantages over Soltrol-120. The greatest difference between the two diluents detected so far is the viscosity which is 1.33 centipoises for NPH vs. 1.93 for the Soltrol.

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1. Purex Process Reductant

In the search for a better way to make U(IV) for potential use as a reductant in the Purex process, some uranium metal was dissolved in nitric acid in the presence of hydrazine. The dissolution rate was very low. The addition of HF increased the reaction rate but the reaction essentially reached completion at a uranium to fluoride mol ratio of one.

c. Laboratory Improvement

Acid Mixtures

An analytical method was developed for determining nitric acid and organic acids (primarily citric acid) in strontium product solution. Total hydrogen ion was found by routine acid coulometric titration. Organic acids were measured by reduction of ceric sulfate. Nitric acid was found by calculating the difference between the above two analyses. A series of synthetic standards showed recoveries within plus or minus 3 per cent for both components; however, with the large sample dilutions necessitated by high radioactivity, accuracy of the analysis should be about plus or minus 5 per cent.

Zirconium in Strontium Product

A method for determining the total zirconium content of strontium product solutions was developed by separating a zirconium fraction and measuring the zirconium-alizarin-red-S complex spectrophotometrically. A zirconium separation from strontium, yttrium, and iron was made by extraction into 0.1M tri-n-octylphosphine oxide (TOPO). The extractant was mixed with an equal volume of TOPO containing 0.15 per cent alizarin-red-S and contacted with dilute nitric acid. The resulting red complex in the organic could be measured spectrophotometrically at 550 mu. Citrate up to 2.0M in the sample did not interfere.

5. Plutonium Chemistry Laboratory

a. Recovery of Plutonium from Sump Solution

A laboratory-scale test run was made in which 610 column volumes of sump solution were processed for plutonium recovery by cation exchange to test flowsheet conditions. The feed solution contained 2.1 mg/l Pu and 0.014M F⁻. This solution was adjusted to a pH of 1.2. Valence adjustment was accomplished by making the solution 0.05M Na₂SO₃, and the solution was made 0.01M Al⁺³ to complex fluoride. The column was loaded at room temperature using a residence time of four minutes. A waste loss of 19 per cent occurred, which is a generally favorable result in view of the great excess of aluminum. Ninety-six per cent elution was obtained with four bed volumes of 6M HNO₃-0.3M NH₂SO₃H.

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When the same sump solution was processed using the same flowsheet in the plant, high plutonium losses were sustained. The most probable cause of poor performance was the technical grade sodium sulfite used for valence adjustment. It analyzed only 20 w/o SO_3^- , whereas reagent grade material analyses 62.9 w/o SO_3^- . Apparently a large fraction of the sulfite had been converted to sulfate which complexed the plutonium.

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R. E. Tomlinson

Manager
Research and Engineering

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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Operation</u>	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>11-1-64</u>	<u>11-29-64</u>	<u>11-1-64</u>	<u>11-29-64</u>	<u>11-1-64</u>	<u>11-29-64</u>
General Manager's Group	9	9	1	1	10	10
Financial	17	18	27	27	44	45
Employee Relations	4	4	2	2	6	6
Research & Engineering	65	64	27	27	92	91
Facilities Engineering	97	97	209	204	306	301
Production	5	5	3	3	8	8
Redox	62	61	223	222	285	283
Purex	69	71	264	266	333	337
Weapons Manufacturing	<u>60</u>	<u>60</u>	<u>266</u>	<u>274</u>	<u>326</u>	<u>334</u>
Total	<u>388</u>	<u>389</u>	<u>1022</u>	<u>1026</u>	<u>1410</u>	<u>1415</u>

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other GE Components</u>		
M. J. Smith	Pittsfield, Mass New York, N.Y.	Data processing, (11/2/64) Accounting Services (11/4/64)
<u>To AEC and Other AEC Contractors</u>		
A. E. Smith	Lawrence Radiation Lab. Livermore, Calif.	Discuss purity specifications. (11/13/64)
	Lawrence Radiation Lab. Livermore, Calif.	Discuss purity specifications. (11/23-24/64)
	Dow Chemical Co. Rocky Flats Plant Denver, Colorado	Attend PWIEG meeting. (11/17-19/64)
O. F. Beaulieu L. W. Winkle N. S. Wing	Lawrence Radiation Lab. Livermore, Calif.	To discuss plutonium analytical development and results of the plutonium metal and isotopic exchange program. (11/17-19/64)
L. M. Knights G. E. Wilbur	Silas Mason San Antonio, Texas	Non-destructive testing. (11/18-19/64)
H. P. Shaw	US-AEC Bethesda, Md.	Nuclear material transportation. (11/23-24/64)
G. E. Wilbur	Lawrence Radiation Lab. Livermore, Calif.	Radiography. (11/24-25/64)
<u>To General Industry</u>		
J. W. Kolb H. A. Lee	Process Equipment Co. Tipp City, Ohio	TIG Welding Torch. (11/17-20/64)
M. T. Slind	Electronic Products Manufacturing Co., Spokane, Wash.	Fabrication of Hand and Shoe Counters. (11/24/64)
<u>To Conventions & General Meetings</u>		
M. J. Smith	New York, N.Y.	American Management Seminar (11/5-6/64)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors</u>		
Messrs. Best and Lodtner	Dow Chemical Co. Denver, Colorado	Quality Control. (11/30 - 12/1)
J. W. Langhaar	E. I. du Pont Co., Wilmington, Del.	Co-author of Technical Article w/L. L. Zahn (11/18-20/64)
<u>From General Industry</u>		
Richard D. Bokum Wm. R. Bush,	United Nuclear Centerville, Md.	Plant tour. (11/6/64)
E. H. Brooks D. D. Busch	General Atomics San Diego, Calif.	Decontamination methods and procedures. (11/10-11/64)
W. A. Loeb	United Nuclear Centerville, Md.	Polonium production develop- ments. (11/10/64)
H. K. Nason	Monsanto Research Corp. Miamisburg, Ohio	Same as above.
R. M. Jones, Jr.	Monsanto Research Corp Washington, D.C.	Same as above.
J. W. Dickinson	Linde Co. Seattle, Wash.	Welding Equipment. (11/10-12; 18-20; 23-24/64)
<u>From Foreign Governments and Agencies</u>		
E. Hespe	Australian AEC Establishment Sidney, Australia	Waste Management. (11/9-10/64)

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IV. SAFETY AND SECURITY

<u>Operation</u>	<u>General</u>	<u>Purex</u>	<u>WMO</u>	<u>FEO</u>	<u>Redox</u>	<u>R&E</u>	<u>Finance</u>	<u>Prod.</u>	<u>Empl. Rel.</u>	<u>Total YTD</u>
Dis. Injuries									0	0
Ser. Accidents									0	4
Med. Treat. Inj.		11	15	13	9				48	450
Rad. Occurrences		2	1		1				4	112
Contam. Wds.					1				1	21
New Deposition Cases									0	15
Fires				*2					2	13
Security Violations									0	23

*Fire 64-12, November 4. Lubricant ignited in the power control unit of a D-8 Caterpillar tractor. Damage - \$300.00

64-13, November 11. A floor mop ignited spontaneously. Damage - \$10.00

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[REDACTED]

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V. REPORTS

A. PREPARED AND ISSUED

- HW-71918 REV, Secret, "Evaluation of Hazards - CPD", dated November 2, 1964, by E. G. Pierick and R. E. Tomlinson.
- HW-75380 REV 3, Unclassified, "Critical Mass Control Specification - Storage of Plutonium Metal In Vault 106", dated November 10, 1964, by R. J. Sloat.
- HW-82294 L11, Secret, "Button Purity Data - Letter No. 11", dated November 17, 1964, by R. J. Sloat.
- HW-83202, Secret, "Plutonium Concentration and Storage, Design Criteria for Purex 'L' Cell Package Replacement", dated July 15, 1964, by C. W. Smith.
- HW-83912 REV, Unclassified, "Critical Mass Control Specification - Storage of Plutonium Compounds - Operating Gallery, 224-T Building", dated November 3, 1964, by R. J. Sloat.
- RL-SEP-1, Confidential, "IA Column Specific Gravity Control Analysis by Analog Computer", dated October 1964, by R. A. Watrous and R. D. Benham.
- RL-SEP-10, Secret, "Integration of the Waste Management and Fission Products Recovery and Purification Programs - Engineering Study", dated November 26, 1964, by H. L. Caudill.
- RL-SEP-25, Unclassified, "Plutonium Reclamation Facility - Interim Report - Phase II", dated November 4, 1964, by L. E. Bruns.
- RL-SEP-36, Secret, "Process Specifications for the Thorium Test in the Purex Plant", dated October 30, 1964, by D. F. Davis, J. B. Kendall, G. A. Nicholson and S. M. Nielson.
- RL-SEP-39, Secret AWD, "Weapons Process Engineering Technology Report - September and October, 1964", dated October 29, 1964, compiled by members of Weapons Process Engineering, Research and Engineering.
- RL-SEP-48, Secret, "Plutonium Reclamation Facility Scrap Processing Schedule and Capability", dated November 3, 1964, by M. K. Harmon.

- RL-SEP-50, Unclassified, "Operating Limits - Miscellaneous Treatment Hood 3 - Plutonium Reclamation Facility", dated November 11, 1964, by R. J. Sloat.
- RL-SEP-56, Secret AWD, "Waiver of Specifications", dated November 2, 1964, by A. E. Smith.
- RL-SEP-59, Secret AWD, "JOWOG 22 Discussions", dated November 3, 1964, by A. E. Smith.
- RL-SEP-60, Unclassified, "Design Criteria, Analytical Laboratory Ventilation Changes, 234-5 Building, dated November 4, 1964, by M. E. Borgeson.
- RL-SEP-63, Secret, "Waste Discards - FY 1965, CPD", dated November 5, 1964, by M. K. Harmon.
- RL-SEP-65, Unclassified, "Chemical Processing Department Hazards Evaluation - In-Tank Waste Solidification - Project CAC-965", dated November 24, 1964, by G. E. Backman, E. M. Johnston, H. C. Rathvon, L. W. Roddy, and M. F. Wiitala.
- RL-SEP-66, Unclassified, "Hazards Review - Thorium-Uranium-233 Processing - Purex", dated November 9, 1964, by O. D. Erlandson, for Task Force.
- RL-SEP-71, Unclassified, "Miscellaneous Treatment - 236-Z Building - Hood 3 'Hot' and 'Cold' Run Plans", dated November 16, 1964, by L. C. Brown.
- RL-SEP-76, Secret AWD, "Fabrication Process Test FPT-64-37 Shear Strength Measurement", dated November 6, 1964, by C. J. Bronken.
- RL-SEP-77, Secret, "Analyses of Brandy Batch - Purex No. 22", dated November 9, 1964, by M. K. Harmon.
- RL-SEP-79, Unclassified, "Critical Mass Control Specification - Storage of Plutonium Metal in the 271-T Bault", dated November 16, 1964, by R. J. Sloat.
- RL-SEP-86, Unclassified, "Trip Report - Visit to Oak Ridge National Laboratories, Savannah River Plant, General Electric Laboratories and National ISA Show - October 3-16, 1964", dated November 15, 1964, by H. M. Jones, G. A. Nicholson, W. W. Schulz and P. W. Smith.
- RL-SEP-87, Secret, "Purex Waste Tank 241-A-105 Fill Limit", dated November 17, 1964, by S. J. Beard and B. F. Judson.
- RL-SEP-88, Secret, "Analyses of Brandy Batch - Purex No. 23", dated November 16, 1964, by M. K. Harmon.
- RL-SEP-89, Secret AWD, "A Line Product Characteristics", dated November 19, 1964, by A. E. Smith.

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B. PREPARED FOR SIGNATURE AND ISSUANCE

RL-GEN-4, Secret, "Production - October, 1964", dated November 12, 1964, by
W. E. Johnson.

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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.

INVENTOR

TITLE

None

General Manager
Chemical Processing Department

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END

DATE
FILMED

4 / 28 / 93