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CHEMICAL PROCESSING DEPARTMENT MONTHLY REPORT FOR NOVEMBER, 1960

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Compiled By
OPERATION MANAGERS

December 21, 1960

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1960

I. SUMMARY

A. RESPONSIBILITY

There were no changes in the responsibilities of the Chemical Processing Department during November.

B. PRODUCTION

Production of plutonium nitrate from the separations plants was slightly below that forecasted, both for November and fiscal year-to-date.

Ten strontium-90 recovery runs were completed in the Purex plant. To-date an estimated 285,000 curies of strontium-90 have been segregated and stored for further decay of strontium-89.

The production and shipments of UO_3 conformed to the operating and shipping schedules.

Unfabricated plutonium metal production exceeded that forecasted for November; however, fiscal year-to-date output is below that forecasted. All shipping commitments were met on schedule.

C. ENGINEERING

The decontamination performance of the Purex extraction columns ranged from marginal to unsatisfactory, and was attributed to the processing of shorter aged metal, i.e., approximately 100 days. Improvement was obtained by recycling cold uranium to the first cycle decontamination column (HA) and simultaneously increasing the frequency of wash solution changes in the No. 1 organic system. By the end of the month, gamma activity levels had decreased to the extent that both products were within specifications while processing virgin feed although the uranium product required silica gel treatment.

Three test batches of enriched uranium, associated with E-N loading in the reactor operations, were processed in a Redox dissolver.

A reduction in time cycle, from sixteen to ten hours, was achieved in the Recuplex wet skull dissolver by the addition of dry sodium fluoride in lieu of physical drying prior to charging. Use of sodium fluoride not only eliminated the drying operation but also increased the dissolution rate.

Design of the waste cask unloading station, Strontium-90 Interim Storage Facilities, was completed and field construction work was started by Minor Construction on November 30. The target ready-for-use date is December 15, 1960.

The following conceptual design work was performed on Phase II and III fission product recovery and waste calcination activity planned for "B" Plant: (1) the conceptual design of the Phase II Strontium cask loadout station was completed. Two cells are designed for slurry cask loadout operations, Cell 24 for cask loading and Cell 4 for cask surface decontamination; (2) a master plan was formulated covering integrated waste processing and Phase II and III fission product recovery operations.

Conceptual equipment flow sketches and cell layouts were completed for all three waste calcination schemes under consideration, batch pot, spray, and fluid bed. This work included feed preparation, calcination, calcined waste disposal, and low level effluent disposal from the "B" Plant waste calcination installation.

Design was started on a container for transferring contaminated equipment from the Redox and Purex plants to the decontamination facility for reclamation and repair.

D. GENERAL

The Chemical Processing Department qualified for the Department General Manager's Safety Award on November 27, upon completion of 107 days without a disabling injury.

P. H. Reinker

General Manager
Chemical Processing Department

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

	November	October
a. Purex		
Uranium nitrate produced (tons)	685.7	403.3
Average production rate during operation (T/D)	27	25
Total waste loss (%)		
Plutonium	0.48	0.43
Uranium	0.16	0.08
On-line efficiency	100	86
b. Redox		
		69.35 N
Uranium nitrate produced (tons)	88.6	6.9 E
Average production rate during operation (T/D)	6.5	6.5
Total waste loss (%)		
Plutonium	0.10	0.56
Uranium	0.05	0.12
On-line efficiency	67.5	56
c. Uranium Reduction		
Normal UO_3 loaded (tons)	656.7	602.80
Enriched UO_3 loaded (tons)	112.2	33.57
Normal UO_3 approved for shipment (tons)	652.37	601.69
Enriched UO_3 approved for shipment (tons)	48.48	0
Normal UO_3 shipped (tons)	504.36	797.84
Enriched UO_3 shipped (tons)	96.11	0
Normal UNH backlog (tons U)	255	220
Enriched UNH backlog (tons U)	34	24
d. Plutonium Metal Processing		
Input to Task I (batches)	267	190
Reduction yield (%)	97.4	96.7
Plutonium metal buttons produced (% of commitment)	108.7	72.9
Plutonium metal buttons shipped (% of commitment)	90.1	122.9
Product recovery outout (% of schedule)	79.6	55.7
Product recovery backlog (Kg's)	270.3	268.0
Waste disposal (grams)	917*	13

*Includes 401 grams waste for October.

[redacted]

	November	October
e. Plutonium Metal Fabrication		
Weapons parts produced (% of commitment)	-	-
Weapons parts shipped (% of commitment)	-	-
f. Waste Storage		
Redox salt waste reserve (tons U)	2 558	2 645
Purex salt waste reserve (tons U)	23 417	24 106
Redox coating waste reserve (tons U)	18 864	18 958
Purex coating waste reserve (tons U)	30 591	31 548
g. Power		
Raw water pumped (gpm)	10 543	4 707
Filtered water pumped (gpm)	1 327	993
Maximum steam generated (lbs./hr.)	296 000	152 000
Average steam generated (lbs./hr.)	261 830	107 757
Total steam generated (M lbs.)	188 517	77 585
Coal consumed (est. tons)	9 348	4 173

J. N. Warner
Manager - Production

[redacted]

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Processing was continuous throughout the month. A 3.1 CF was maintained from October 20 through November 11. Rates were then increased to 3.4 CF and held here for the remainder of the month. Cold uranium was recycled to Head End for four days and mixed in the proportion of one part cold uranium to two parts normal feed. For two additional days cold uranium was on total recycle.

All uranium met specifications after silica gel treatment.

2. Processing Experience

Solvent quality was generally poor during the period with solvent gamma activities increasing from 7,000 uc/gal to an all-time high of 33,000 uc/gal after the material in F-8 was reworked through the system. After recycling cold uranium and increasing the frequency of wash solution changes in the No. 1 organic system, the solvent activity decreased to satisfactory levels and plant operations were maintained.

Gamma levels in the process streams increased when the process rates were raised to 3.4 CF. When the F-8 rework material was introduced to the extraction columns, the gamma levels dropped two- to three-fold but again increased as the solvent quality deteriorated. Gamma activity in the process and in the solvent system returned to normal only after recycling of cold uranium.

Plutonium decontamination was marginal. Even with fluoride additions the ion exchange system was not able to cope with the activity levels in the feed. Efforts to increase the dF of the ion exchange facility above 10 were unsuccessful.

Strontium 90 recovery during the month was limited due to centrifuge failures. Carbonate product, which was separated from FP runs 9 through 14, was successfully processed through the oxalate precipitation step with the recovered material stored in the F-13 vessel. Three additional carbonate product recovery runs were completed; however, failure of the E-4 centrifuge during cake removal of the last run resulted in loss of this run. An additional carbonate product run is in progress at month end.

The silver reactors on A and B dissolvers were regenerated during the period after iodine-131 emissions increased significantly.

Coating waste was diverted from the 112-C to the 102-C tank when the delivery manifold to the former tank plugged.

3. Mechanical Experience

The E-2 fission product recovery centrifuge developed a mechanical drag after only three weeks of service. Presumably the cause was a bad bearing since pulling the dip tubes made no change in the drag. The centrifuge was thoroughly flushed before transporting it to T Plant for further decontamination and repair. The failed centrifuge was replaced with the last remaining new spare.

The E-4 fission product recovery centrifuge failed during the removal of a carbonate cake. The failure was indicated by high amperage and unusual noise. Investigation revealed leaks at both bowl spray lines may have caused incomplete cake removal and eventual damage to one of the skimmers. Two remotely-installed spray lines are being fabricated and after installation an attempt will be made to remove the cake and repair the remaining skimmer.

The R-3 centrifuge which failed in September was repaired by replacing the motor-drivehead assembly with a reconditioned spare. The unit is currently being test run.

The effluent line from the dissolver off-gas ammonia scrubber developed a restriction. The scrubbers were taken out of service while the line was flushed out.

A heavy schedule of diversion box work was experienced during the month. This work included unplugging of the drain line in the 001 vault; unplugging of the 001-CR sump weight factor dip tube with reactivation of the sump jet; installation of jumpers to route the contents of the 011-CR tank to 101-C; installation of special jumpers in the 002-003 CR vault to permit new strontium-90 routings and installation of a new jumper in the 151-A diversion box to permit pumping strontium-90 solutions from the CR vault to 202-A.

Work associated with the construction of containment buildings around the strontium-90 loadout station and the waste loadin station was started.

The D-5 pump was replaced with a reconditioned spare after excessive upper seal leakage developed.

A spare Lapp pulsafeeder pump was installed in N cell to serve as an alternate pump for fluoride additions.

The bearings on the No. 3 exhaust fan motor were replaced as a preventive maintenance measure after routine inspections revealed a noisy bearing.

4. Radiation Experience

Iodine-131 emissions totaled 24 curies for the month.

Four Radiation Occurrences were experienced. There were two cases of skin contamination and nine cases of contamination of personal effects. All skin contamination was reduced to less than detectable.

A sample cask and adjacent floor areas in the sample gallery were contaminated from 1 to 20 rads/hr. when the cap of a pressurized cask was removed.

A small amount of fission product contamination was spread during work in a diversion box in the 241-CR tank farm. Levels varied from 50 to 100 mrads/hr. at the edge of the box.

5. Analytical Experience

Studies were continued to determine the plutonium valence state of final product solutions. Similar studies will be made on rework solutions processed through the ion exchange facility. These studies are expected to correlate with high waste losses.

Final plutonium product solution aliquots were added to plutonium partitioning solutions under simulated plant conditions. No solids or plutonium polymer were formed.

A series of tests were conducted to determine the optimum ratio of F-8 rework to feed to give the maximum dF improvement. At least 150 gallons of F-8 rework added to a normal feed batch was necessary to show dF improvement throughout the process.

An order for a 400-channel analyzer was placed on 11-30-60 from the Radiation Instruments Development Laboratory, Inc. Receipt is expected in 90 days.

6. Events Influencing Costs

During November the consumption of fresh nitric acid was above normal, reflecting the backlogging of UO_3 acid for a planned process test.

The number of personnel increased by two during the month.

P. R. McMurray /by
Manager-Purex

PR McMurray:EAF:gt

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

Processing operations were conducted as scheduled throughout the month, and the production commitment was exceeded by approximately 27 percent. Good quality control was maintained, and all production was within shipping specifications. Processing activities were curtailed during the Thanksgiving holidays to allow the maximum number of personnel to observe the holidays. The E-13 ozonator and the F-5 concentrator, which had developed coil leaks, were both replaced during the curtailed holiday operating period.

2. Processing Operation

E-metal processing was conducted as scheduled, and the monthly production commitment was exceeded by approximately 27 percent. As usual, the three dissolvers were operated continuously over the week-ends and holidays to provide sufficient uranium metal feed for the production accomplished.

Week-end startups and shutdowns were very smooth, and all production was within shipping specifications. Waste losses were kept under very good control, averaging 0.05 percent and 0.10 percent for uranium and plutonium respectively.

Three, 300-400 pound test batches of uranium, associated with the E-N loading program in the Hanford reactor operations, were dissolved and sampled this month. Analytical results on Pu-U ratio, isotope content, etc., will be used as a basis for decision on the E-N loading program.

3. Mechanical Experience

The E-13 uranium ozonator, which had developed a coil leak, was replaced with a reclaimed unit on 11-25-60. The replacement was completed without incident, and subsequent operation has been satisfactory.

The F-5 concentrator and tower were both replaced this month because of excessive coil leakage in the pot and a leak at the tower flange gasket. The fact that the gasket was permanently bolted to the tower made it necessary to replace the tower. The new tower has been equipped with a removable gasket which should save tower replacements on future gasket failures. Some difficulty was experienced in obtaining a satisfactory seal between the tower and the pot, and it was necessary to use C-clamps before effective operation was obtained. The installation was completed on 11-29-60.

Two process pumps (H-5 and F-7) were replaced because of leaking seals. Five replacement cell jumpers were also installed during the month.

A special reelite hose reel and hose assembly were installed on the Redox Canyon Crane on 11-15-60. The new reelite provides better housekeeping, better working conditions, and a ready means of supplying fresh air to the canyon crane cab.

4. Waste Handling and Decontamination

Equipment valued at $307,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at approximately $63,000 was returned to customers after decontamination and repair.

A total of 245 man-hours was charged to the decontamination of railroad, automotive, and heavy equipment during the month. The following is a breakdown of the major items decontaminated:

Item	Operation Charged
Flatcars No. 3622 & 19028	Purex
Well Car No. 37	Transportation
Flatcars No. 3613 & 3615	Redox
Power Wagon No. 1H-728	P&GM
Motor Crane No. 17-T-10797	"
Panel Trucks No. 1D-491 & 1D-463	"
Truck No. 68-E-9318	P&GM (300 Area)
Lowboy Trailer	" "
Power Wagons No. 1H-4971 & 707	HLO
Tractor-Trailer & Tank	HLO
UNH Tractor No. 68-E-8930	Purex
Oil Truck - Erwin Construction Co.	AEC
Pickup Trucks No. 1C-346 & 1C-14935	Transportation
Sedan No. 1A-816	Patrol

5. Radiation Experience

On 11-17-60, a burial box containing miscellaneous failed equipment and contaminated waste from the Redox Canyon was transferred without incident to the burial grounds. During burial operations, the lid of the box collapsed, however, the initial back-filling around the sides and top of the box had been completed so that the box was completely covered when the incident occurred. All contamination (maximum 60,000 c/m) was confined to the burial trench and was easily reduced by further back-filling. Burial box design and burial techniques are again being reviewed in an effort to prevent any future incidents.

Using the solvent spray technique, two decontamination assaults were made on the Redox Canyon Crane this month. Dose rates on the left-hand auxiliary hoist were reduced from ten to five rads/hour at four inches. Radiation levels in general were reduced by approximately ten percent.

The maximum personnel dose rate during crane maintenance was three rads/hour and was received during repairs to the crane brakes. Dose rates for maintenance generally ranged from one to two rads/hour.

During a routine survey of the sampling gallery, high dose rates and gross contamination were found around the H-4 oxidation tank sample port. Investigation revealed a leaking flange on the discharge line to the canyon cell. Dose rates four inches above the open pipe trench were 20 rads/hour, including 1,500 mr/hour. A mock-up of the sample box is now being made in order to develop shielding and decontamination techniques prior to repair.

6. Analytical Experience

A second 256 multi-channel energy analyzer was installed and put into operation this month. This instrument, which was obtained from the Hanford Laboratories Operation in lieu of purchasing a new unit, is identical to present equipment. In addition to the substantial savings realized over the cost of a new instrument, the long and costly calibration work on this second instrument will not have to be repeated.

Chas. S. Smith
Manager - Special Separation
Processing and Auxiliaries

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Fabrication was on an unscheduled basis again this month, with activities centered on preparations for the future production of Model 81. Net production of unfabricated plutonium was six percent below schedule due to mechanical difficulties, but forecast and delivery requirements were met. Plutonium recovery was up significantly over that of previous months but achieved only eighty percent of an expanded schedule. Uranium oxide production was on schedule during the month and delivery requirements were met.

2. Processing Operations

a. Plutonium Fabrication

Fabrication progress during the early part of November was unsatisfactory, with principal problems being in the casting operations. A task force composed of Research and Engineering and Finished Products representatives was established to concentrate attention in the area of casting quality. After several days of upgrading equipment performance, melting was started on November 14 under task force direction.

This performance is considerably better than that of previous months.

Additional new equipment for the fabrication of the various small parts of the Model 81 was installed in Hoods 24-B and 24-C during the month. Plutonium parts will be machined on a test basis starting in December. Additional melting equipment was accepted from Construction and cold testing has started in this equipment. Functional testing of the new briquetting hood was initiated. The six new Gorton lathes were tested for conformance to purchase specifications and all proved acceptable. Operator training on these machines is to start in December using stand-in material.

Document HAN-77056 was received from the Atomic Energy Commission transmitting CXXX-1921, Revisions D and E, outlining production and delivery requirements. The principal change shown is an extension of the Model 81 schedule for three months.

b. Plutonium Processing

All of the conversion of plutonium nitrate to plutonium fluoride was performed on the new RMC Line. About 80 percent of the buttons were fired on the new equipment also. Adequate feed supply was present all month, and thirteen buttons with slightly high impurities were blended successfully. Failure to achieve the high schedule this month is attributed to a total of three days down time resulting from failure of the vacuum drum filter drive on two occasions, three filter cloth changes, and failure of the supernate concentrator in the recovery facility.

The trend toward an expanding inventory of recoverable plutonium wastes was arrested this month when the recovery facility achieved 80% of a schedule which had been increased to compensate for the change from a five to seven-day work week. During the month six consecutive days of processing time were lost because of a contamination spread in the operating area. This resulted from the failure of a line to the concentrate receiver concurrently with a plug in the product concentrator (J-26-A) itself. Another day was lost when it became necessary to replace the supernate concentrator (G-59). The Recuplex operating crews worked on both the holidays.

c. Uranium Reduction

Uranium Oxide production was satisfactory this month with no significant problems apparent. It was necessary to work one of the holidays in order to achieve the heavy schedule.

3. Mechanical Experience

Maintenance activity in the area of Plutonium Fabrication was directed toward assisting Task Force personnel in obtaining satisfactory casting capability. Primary difficulties centered around electrical circuit troubles in the mold heating system where possible design inadequacies are indicated. Preparation of machining equipment for Model 81 parts in Hoods 24-B and 24-C is essentially complete.

Equipment in the Plutonium preparation area performed relatively well with the principal difficulties involving the Task III reduction furnace equipment. Further temporary modifications of the hydraulic systems were made pending correction of inadequacies by the Project group.

Recovery equipment continues to require excessive maintenance on leaking lines and valves. In addition, the supernate concentrator (G-59) failed due to corrosion of the tube bundle. Replacement was made with a unit containing a titanium tube bundle. Preparations for the replacement of the D-1 Slag and Crucible dissolver, which failed in October, are underway at the end of the month.

Maintenance of the Uranium Reduction equipment was routine during the month with no unscheduled shutdowns encountered.

4. Radiation Experience

Radiation and contamination control statistics show general control to be satisfactory.

During the month there were two cases of potential plutonium deposition. One occurred in Recuplex when process solution backed up into an instrument air line, leaked through a loose fitting and dripped on an operator's head. Prompt detection minimized the severity of the contamination but, in order to decontaminate the scalp, it was necessary to remove the employee's hair. Approximately 5000 d/m plutonium (non-smearable) remains on the scalp. Since this is fixed in the skin layers it will be allowed to sluff off naturally. The other case involved the exposure of an operator to air-borne contamination during a glove change-out. Nasal smears showed 5,000 to 10,000 d/m plutonium. Initial findings in both cases indicate that deposition will be light and no work restrictions are anticipated.

On November 14 stack emission at Z Plant rose to 1500 µc plutonium. This was traced to failure of glass filters which had been inadvertently installed in the fluorinator (9-A, 9-B) exhaust system. The failed filters were replaced immediately with the proper CWS type and activity dropped to two µc plutonium/day, well below normal. However, because of this incident the monthly average was abnormally high (127.1 µc Pu/day). Atmospheric conditions and wind direction at the time of the incident were such that no environmental hazards developed.

5. Analytical and Final Inspection Experience

	October	November
Number of Samples Received	1,234	1,287
Number of Determinations	11,608	15,272*
Average Impurity, Buttons	1,621 ppm	2,085
Buttons Rejected	3.3%	3.2%

* High for CY-1960, due principally to 7-day week in Recuplex.

In Final Inspection, all commercial type gauges for the Model 81 shapes are now on order and delivery is expected by mid-December. Other equipment being fabricated on site, such as ball and plug concentricity gauges, and the optical slot and radius gauge, should be completed in December. Completion of the optical comparator and numbering machine is being held in abeyance in favor of the more urgently needed equipment.

6. Miscellaneous

On November 3 and 4 the Control Operation, Finished Products, hosted a business meeting of Non-Destructive Testing representatives from the various parts of the Atomic Weapon Complex. Represented were the Dow Chemical Company, the Los Alamos Scientific Laboratory, the Lawrence Radiation Laboratory, and the Nuclear Carbide Corporation, as well as Hanford.

During the month, Mr. W. N. Mobley, Manager, Finished Products, delivered a speech entitled, "The Changing World of Science", to three separate meetings of the Washington Education Association (in Seattle on November 14; in Longview on November 17; and in Spokane on November 28).

W. N. Mobley

Manager - Finished Products

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

November 1960

II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

Steam, water, and emergency electrical services were supplied the production facilities without interruption during the period covered by this report.

2. Inspection, Maintenance and Repair

Fabrication of a Purex F-1 Vent Filter is approximately 20 per cent complete. The shell and one dished head have been assembled, and the major part of the dunnage has been completed.

Repair of a contaminated Purex Condenser, formerly used as an F-11 Acid Condenser, is about 50 per cent complete, and the unit will be converted for use as an F-1 Vent Condenser. The work is being done in the T Plant canyon, where the vessel had been decontaminated to workable radiation levels. Replacement of the outer shell, saddle supports, vapor flange, and 1" piping has been completed, in addition to testing of the tube bundle.

A closed hood, designed to house weight factor instrumentation, was fabricated and installed in the Purex Sample Gallery. The hood was equipped with air filters, and was connected to the main exhaust system.

The outer shell for the Cerium^{144} Slurry Filter has been rolled and welded. Final machining of the inside diameter, however, is to be delayed until the inner shell is returned from New York, where the sintered stainless steel filter medium is being applied.

Fabrication of the Redox Mark V Dissolver is approximately 70 per cent complete. Installation of the outer wall of the vessel has been temporarily held up by a design change on the hangers and supports for the steam coil, to eliminate a potential cause of coil failure which was discovered during inspection of a failed coil in the E-13 Ozonator.

Work on a spare Redox D-12 Waste Concentrator has progressed to about 45 per cent of completion.

A stainless steel and plexiglass glove box was made and installed in the 222-S Laboratory for use in development work.

Twenty-three jumpers were fabricated--19 for Purex and 4 for Redox.

Modification, mock-up, test, and run-in were completed on 4 Purex Process Pumps and 1 Redox Agitator, and these units were placed in stand-by status. One Redox pump was prepared for service and shipped to the plant as replacement for a failed unit.

A Purex E-4 Centrifuge was modified for installation in the E-2 position, where a failure had occurred. Revisions included 180° rotation of the case; elimination, through welding, of teflon gaskets formerly used in two spray nozzle flanges; installation of lead shielding on hydraulic cylinders; and substitution of a flexible stainless steel line in place of a neoprene oil line. The latter three items were to minimize the probability of radiation damage at these points. Dimensional mock-up, run-in and tests were also completed, and the centrifuge was shipped to the plant on November 30.

Relocation of the 28-F Three-Stack Crucible Hood and associated equipment from the RMA line to the RMC line, in 234-5 Building, is about 50 per cent complete. This move includes the hood, complete vacuum system with 3 mechanical pumps, and an induction heating system. Also required is the installation of a new power supply, instrumentation, electrical services and controls, and piping system.

Installation of two hoods, an extraction column, and associated equipment in room 45 of the 234-5 Building is about 50 per cent complete. This equipment will be used to obtain wet chemistry information for use in this new Plutonium Reclamation Facility. Also in connection with this new facility, a series of annular, water-filled, lead-lined, metal tanks were fabricated to demonstrate an alternate engineering concept for shielding of process columns.

Extensive repairs were completed on the 5,000-volt DC power supply unit for the electron beam furnace at 231-Z Building. Fuses were installed in this package unit to prevent excessive current flow through the system in event of transformer failure.

The filtered water storage high tank by 284-E was painted by outside contractor forces.

Two adaptors, with 12" valves, were fabricated and installed in two locations on the 24" raw water export line to 200 West Area, to facilitate entry of photographic equipment by Hill and Ingman, consulting engineering firm, who has contracted to survey the export water line. Hill and Ingman personnel arrived to start the photographic survey, but found it necessary to redesign some equipment. To date, no pictures have been taken, and both adaptors have been removed from the export line for the duration of winter months.

Ventilation balance activities included:

(a) Maintaining desired hood and room differential pressures in the 234-5 Building, to facilitate removal of lathes from machining hoods 24-B and C without contamination spread.

(b) Numerous meetings with engineering groups or AEC to discuss ventilation problems related to the IPD confinement program, and to 221-B and 291-B. One off-site trip to Pittsburgh, Pa., was involved.

(c) Conducting a number of burning and high-humidity tests on air filters.

Replacement of two defective valves in the 241-A Tank Farm for Purex Operation was effected under SWP conditions and high radiation levels. A 2" valve was located 22 feet below grade in a 6' diameter metal casing, and was in the loop seal drain line for the 411 contact condenser. The other valve, 3/4", was in the condensate drain line for the 101 tank.

The burial of contaminated miscellaneous defective equipment from the Redox canyon, in trench #6 of the 200 West industrial burial garden, was successfully completed.

Fabrication of a tube bundle burial box (corrugated metal thimble) for the Purex facility was completed. The exterior of the box was fabricated with one 14' and one 16' section of a 6' diameter corrugated iron casing, making an enclosure 30' long.

A 4" sampling riser was fabricated and installed on the 101 underground storage tank in the 241-A Tank Farm. Exposure limits were high throughout the job. The riser will be used for sampling tank contents by Purex Operation.

Request for transfer of 200-N and P Facilities to Condition V was approved by the AEC, and concurrence was given to perimeter fence removal.

Pressure vessels assigned to Buildings and Grounds in 200 West Area were inspected by the third-party inspector. No major code discrepancies were found.

T. S. LaDuca

Manager
Power & General Maintenance

TGL:ap

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

December 1960

II. ACHIEVEMENTS (continued)

F. Facilities Engineering Operation

1. Purex

a. Process Design and Development Engineering

Fission Product Concentration

A process design study was completed and a rough draft report written covering the conversion of Purex Tank TK-E2, to a concentrator for use in preparing fission product fractions for transfer as a concentrated solution. The work would involve installation of a condenser of new low pressure drop design together with approximately ten jumpers.

Waste Carton Monitor for Plutonium

The installation of the neutron counter to approximate plutonium in waste cartons in the 202-A Building is complete. The instrumentation has been checked for satisfactory operation, using a small quantity of plutonium nitrate, which will be used as a calibrating source.

b. Project Engineering

Construction of a crib was completed by the fixed-price contractor November 4, 1960. The tie-in of the crib is awaiting a Purex shutdown. When this tie-in is made, the crib will be ready for use. Drilling of the test wells was started November 4, 1960. Two test wells are complete and a third one started.

CGC-895, Rev. #1, - Reliability Improvements - Purex

The Purex 4.0 capacity increase study report was issued during the month. A scope document for the revised project has been prepared and is being circulated for approval. A draft of the project proposal has been prepared and issued for comment.

CGC-909 - Strontium-90 Interim Storage Facilities

Design of the waste cask unloading station was completed and field construction work was started by J. A. Jones forces on November 30. The target ready-for-use date on this work is December 15, 1960.

c. Manufacturing Engineering

E2 Centrifuge - Vibration Correction

The vibration analyzer was used on a centrifuge for the E2 position. It was found that on this machine a three-fold improvement could be made in the balance of the drive yoke and on the over-all machine by rotations of the coupling halves between the drive head and basket. Use of the vibration analyzer on centrifuges will be made part of the standard procedure on future run-ins of centrifuges.

Design of Equipment Burial Containers

Design was completed on a burial container for the E2 centrifuge, and on the dunnage layout for modification of an existing burial box to contain a centrifuge, two tube bundles, and a jumper liner box, for burial in the Purex railroad tunnel.

2. Special Separations Processing

a. Process Design and Development Engineering

NPR Processing

Engineering flow diagrams have been completed covering the changes needed in Redox for Zirflex processing of NPR fuels.

1B, 2B, 3B Product Stream Monitors

The prototype neutron counter instrument which has been in operation for some time on the 3BP stream was checked out, and the detector and amplifier was found to be operating correctly. The system has had an apparent loss of sensitivity; however, no fault has yet been found in the system. Checks on the operation are continuing. Fabrication work on sample pots for installation on the other streams is 80 percent complete.

Leak Detection - Non-active Tanks

"Varec", the new remotely-operated liquid level gage, detected a slow leak in the 105-TY tank. The increased sensitivity of this new instrument over the present electrode method of detecting the liquid level was credited with determining that the liquid level was steadily dropping about 1/8" in two days (an average rate of less than 200 gal/day). The wastes from this tank are currently being transferred to 241-TX-108.

A scope design, including cost estimates and construction schedule, has been completed for comment for the installation of new "Varec" liquid level gages on tanks 101-SX through 106-SX at Redox tank farm.

The total cost of this installation was estimated at $13,950. The design incorporated maximum utilization of existing equipment, and an over-all plan to continue our current engineering evaluation of this equipment and provide additional gages at other tanks later.

3. Finished Products Operation

a. Process Design and Development Engineering

Waste Treatment Facility

The Title I scope document for the Waste Treatment Facility was approved and issued to the Atomic Energy Commission for information. This document delineates the complete design scope of Project 912 except for process design of the ion exchange column and the solvent extraction column. The process design of these facilities will be issued after completion of the present development laboratory studies.

Metal Shear

All work on the metal shear has been completed and it has been successfully demonstrated and delivered to responsible FPO personnel. Since the need for the machine has abated due to a change in production requirements, it will be stored for future usage.

Button Line Improvement Program

Five prepared polyethylene cloths and modified retaining clips are available for immediate installation on the vacuum

drum filter in Hood #9. A work order for the first installation has been issued and the technique for installation has been established. A study was completed to investigate the possibilities of obtaining a transparent window for the Banjo valves. Recommendations were made on the means of obtaining reasonably transparent windows on future spare parts orders.

Plutonium Reclamation Facility

A considerable amount of testing was completed on the cell glove box and vessel mockup constructed in the 200-W shops. The testing to date indicates that a simple hook crane will be satisfactory for handling the cell vessels and performing all other functions required inside the process cell. Studies on the glove box itself are now essentially complete.

b. Project Engineering

CGC-811 - Additional Plutonium Fabrication Facilities-234-5

Punch list procurement items are being processed. Technical problems are not yet resolved between the Gorton Company and the Project Engineer in regard to the Special Lathe operation. Back charge of approximately $8,000 is being negotiated for errors in the Stokes furnaces.

CGC-813 - Plutonium Recovery from Contaminated Material-234-5

Limited items of procurement at this time are the Incinerator and Leaching Hood. The incinerator flue and slab castings were repoured November 25, 1960 and if these items pass X-ray examination, fabrication can begin on an accelerated basis as all known problems have been resolved and all orders should be complete on or before February 1, 1961.

c. Manufacturing Engineering

The five most significant physical and radiation limiting jobs in the Plutonium Processing Operation were filmed and preliminary review completed. These jobs are: PR Can Unloading, Button Knockout, Weigh and Sample, Button Sealout, and Hood 9-A Off-gas Filter cleaning. Interest is high in the use of these films to establish better radiation control limits, methods with reduced exposure, improved training and process control, and over-all performance improvement.

4. General

a. Process Design and Development Engineering

Fission Product Recovery - "B" Plant

The following conceptual design work has been performed on Phase II and III fission product recovery and waste calcination activity planned for "B" Plant.

(1) The conceptual design of the Phase II strontium cask loadout station was completed. Two cells are designated for slurry cask loadout operations; Cell 24 for cask loading and Cell 4 for cask surface decontamination.

(2) A master plan was formulated covering integrated waste processing and Phase II and III fission product recovery operations. A new high level concentrator, demister, and ion exchange column would be installed under the Phase II Fission Product Recovery Program. The waste calcination facility would provide its own calciner feed concentrator; overheads from this concentrator together with the effluent liquid streams from the calciner scrubber and condenser would be routed to the Fission Product Recovery Program concentrator for decontamination and disposal to crib. This work was undertaken to permit close integration of the requirements of these programs with those of the Phase I Fission Product Storage Program being performed under Project CGC-897.

Waste Calcination

Conceptual equipment flow sketches and cell layouts have been completed for all three waste calcination schemes under consideration: batch pot, spray, and fluid bed. This work includes feed preparation, calcination, calcined waste disposal, and low level effluent disposal. Lack of a suitable material of construction for a continuous meltpot in conjunction with the spray and fluid bed calciners has led to the adoption of batch meltpots in these alternates. Therein lies a severe technical draw-back to the continuous calciner schemes since periodic connections and disconnections would be needed in the calcined waste train where the waste is still in the finely divided solid phase.

b. Project Engineering

Project Cost Information as of 11/20/60:

Total Auth. Funds-12 active projects	$ 7,078,000
Total Cost-to-date	4,551,000
Commitments and Open Work Releases	246,000
Unencumbered Balance	2,281,000
Costs charged to above projects for period 10/16/60 to 11/29/60	243,953

Project CAC-843 was dropped from active status during this period:

Authorized Funds	$15,200
Total Cost	13,105

c. Manufacturing Engineering

Design of "All-purpose" Equipment Transfer

Design was initiated on a container for transferring contaminated equipment from the Redox and Purex Plants to "T" Plant for decontamination and repair. This "all-purpose" container will be large enough to handle all equipment to be decontaminated, and will have features to facilitate decontamination.

Waste Tank Inspection

The closed circuit TV equipment was used to inspect the 106-TY waste tank. The interior side wall and bottom of the tank were scanned for several days. Although considerable knowledge of the tank interior was obtained, it is not possible to detect positively, corrosion of the liner. Portions of the lead flashing at the spring line of the dome were gone. Picture quality was good; however, close-up viewing with the "Zoom" lens does not have good definition due to imperfections in the plastic dome used to protect the equipment from contamination. A design change has been made to eliminate the use of the plastic dome on future installations.

In supplemental work, a telephoto 35 mm camera was used to photograph subjects selected by the TV monitor in this tank. The camera can be in this tank's internal

[redacted]

radiation field only 15 minutes without film over exposure. This time limit does not permit adequate time to de-fog the moisture from the camera lens during cold weather.

C E Kent

Acting Manager
Facilities Engineering

CE Kent:alr

[redacted]

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1960

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology -

a. Head End

Addition of 5×10^{-4} M mercuric nitrate to the dissolver solution was started when the iodine stack emission climbed from about 0.8 to 1.9 curies/day reflecting a decrease in metal cooling time from 120 to less than 110 days.

B Cell Silver Reactor required regeneration when an iodine breakthrough occurred after processing the off-gases from only 353 tons of dissolved uranium; A Cell Silver Reactor processed the off-gases from about a normal number of tons of uranium (843) before regeneration was required. The low throughput of B Reactor prior to the breakthrough was suspected to be due to poor distribution of the regeneration silver nitrate solution because of partially plugged regeneration nozzles.

b. Fission Product Recovery

A total of ten runs for the recovery of strontium 90 from Purex high level waste (IWW) were completed during the month. Eight of the runs utilized IWW from >200-days cooled uranium as feed while the other two were performed on 120-day "cooled" IWW. Other than elimination of the initial clarification step and addition of 5 M caustic to the 1 M sodium carbonate used for metathesis (to prevent lead interference during the final oxalate precipitation), no change was made in the recovery procedure. Over-all strontium recovery continues to be about 50 per cent.

Analysis of samples from the two tanks containing stored strontium recovery concentrate indicate the following:

Component	TK-003	TK-F13
Sr 90 - c/gal	16	41
Zr-Nb "	55	104
Ru-Rh "	2	5
Ce 144 "	425	344
Pr 147 "	-	27
Total Sr 90 - c	146,000	139,000

Notes: 1. SR 89/90 ratio = 2.8.

2. Solids in the sample taken from TK-003 were identified as lead sulfate.

c. Solvent Extraction

Decontamination performance of the solvent extraction system deteriorated as the metal age decreased from 125 to $<$110-days cooled. The uranium product gamma ratio was not appreciably effected by the loss of decontamination and generally ranged from 3.0 to 4.0 and this was reduced to $<$ 2.0 by silica gel treatment. The plutonium product reflected the decrease in solvent extraction decontamination, a processing rate increase plus loss of decontamination in the plutonium ion exchange unit and analyzed 3 x 10^{-11} G/AT. The fact that the HA Column scrub flow and the flows of the Final Plutonium Cycle were not increased when the processing rate was increased from CF = 3.0 to CF = 3.4 possibly affected the fission product split between the uranium and plutonium.

The addition of refluxed miscellaneous rework solutions to the HAF in the ratio of 1 to 56 improved the plant decontamination dramatically and produced a final plutonium product of $<$ 2 x 10^{-11} G/AT. No appreciable decrease in the uranium gamma ratio was noted as a result of the waste rework. However, after the initial drop in gamma activity throughout the plant as a result of the waste rework, the plant gamma activity level slowly rose and exceeded the initial value while the rework was still being processed. As in the past a heavy burst of gamma activity occurred throughout the plant near the conclusion of waste rework.

Because the plutonium product was out of specification and the gamma activity in the plant was high, uranium product was recycled to the Head End to form an HA Column feed (HAF) consisting of one part recycled uranium and two parts of virgin feed. When the plutonium was still out of specification after four days of operation on this feed, 100 per cent recycled uranium was used as HAF, and out-of-specification plutonium was blended with the "cold" uranium. At month end the gamma activity throughout the plant, including that of the solvent, was low and virgin feed was again being processed.

Plutonium waste losses via the HA Column raffinate (HAW) were erratic during the month and ranged from 0.02 to 0.4 per cent with an average of about 0.1 per cent. Adjustments in the HA Column uranium saturation to obtain maximum decontamination and processing recycled plutonium were the major influences upon the up and down behavior of the loss.

A 38 per cent increase in the amount of nitric acid to the HS Column via the scrub stream produced a sixty per cent plutonium recycle via the organic scrub leaving the IBS Column. Concurrently, a large

reflux of plutonium was established within the IBX Column resulting in a five-fold plutonium concentration increase in the feed to the Final Uranium Cycle (2DF). The recycle and reflux were broken by reducing the HS scrub acid addition to flowsheet value. The plutonium concentration in the uranium product increased several fold, but the specification of ten parts per billion parts of uranium was not exceeded.

d. Plutonium Concentration

The amount of decontamination obtained in the Plutonium Ion Exchange Unit remained about ten, a factor of two lower than that normally experienced since the addition of fluoride to the XAF. Some of the flowsheet adjustments which were made in an attempt to improve the decontamination included:

(1) Restoring the XAF fluoride concentration to 0.01 M from 0.005 M.

(2) Reduction in the Al/F ratio from 5/1 to 2/1. (Additional aluminum was added to the waste immediately downstream of the Ion Exchange Unit to increase the Al/F ratio back to 5/1.)

(3) The plutonium recycle via the Ion Exchange waste (XAW) was increased from about 0.1 to about 2.0 per cent to take advantage of any relationship between resin loading and decontamination factor.

(4) The XA Column scrub flow was increased thirty per cent.

Prior to recycle of cold uranium no significant improvement had been noticed in the decontamination obtained from the unit.

e. Solvent Treatment

Gamma activity of the solvent in the No. 1 System gradually increased to 7000 - 9000 uc/gal thus reflecting the processing of 110 to 120-day cooled uranium. When the addition of waste rework to the HAF boosted the gamma activity to 13,000 uc/gal, a program of accelerated wash changes in the Batch Wash Tank, TK-G1, and the Turbomixer, TK-G7, started a reversal of the upward trend. However, coincidental with this change, the last portion of the rework plus flushes of the rework tank were processed which caused the gamma activity of the solvent to jump and peak at 33,000 uc/gal. Four days of plant operation on partial "cold" uranium recycle and two and one-half days on totally recycled uranium product coupled with the accelerated wash changes reduced the solvent activity to about 4,000 uc/gal at month end.

A test using 0.23 M Na_2CO_3 in the IO Column vice 0.1 M HNO_3, thus providing three sodium carbonate solvent washes, was terminated with no apparent benefit after four days of operation because of extremely unstable IO Column performance.

f. Waste Treatment and Acid Recovery

Although efforts continued to minimize the IWW flow, high nitric acid waste losses in the acid absorber overheads, while operating at CF = 3.4, forced a reduction in the dilution water addition to the IWW Concentrator feed. As a result of the higher bottoms acid concentration, the IWW measured six flows rather than the flowsheet value of five. Waste volumes sent to the underground storage tanks averaged 58, 215, 575 and 162 for neutralized IWW, IWW after treatment for strontium recovery, solvent washes and cell drainage, respectively.

2. Redox Process Technology -

a. Solvent Extraction

Greater than 95 percent of the nitrogen compounds found in the hexone inventory at the end of September have now been removed by washing with aqueous five percent sodium hydroxide and water. Periodic alkaline washing of the hexone inventory will be continued until an apparent equilibrium (minimum) concentration of these nitrogenous products is reached. At this time washing will be stopped and the hexone inventory will be routinely sampled and analyzed to determine the rate of re-accumulation of degradation products and the effect of this build-up on process performance. Column performance using the washed hexone continues to be excellent.

A comparison of instantaneous solvent extraction product losses as measured in the first cycle raffinate, shows that the losses when using the acid flowsheet are considerably lower than those attained when using the acid-deficient flowsheet as shown by the following data:

	Instantaneous Waste Losses	
	U %	Pu %
Acid-Deficient Flowsheet (9-1-58 - 9-25-59)	0.07	0.27
Acid Flowsheet (11-1-59 - 11-26-60)	0.02	0.15
Acid Flowsheet (9-1-60 - 11-26-60)	0.02	0.06

b. Plutonium Impurities

Although the final plutonium product solution has been concentrated in a titanium concentrator containing a tantalum heat exchanger, metallic impurities are frequently above specification. The appearance of iron, chromium and nickel impurities in the final solution has been attributed to corrosion of the stainless-steel L-2 stripper-concentrator. However, recent samples taken from the L-2 overflow to the L-3 final plutonium concentrator have accounted for only one-third of these impurities. It now appears that the source of these impurities is the stainless-steel L-3 de-entrainment tower. Samples of the L-3 tower reflux solution will be obtained next month and the iron content determined; however, a replacement L-3 tower, made of titanium, is being expedited. A review of the nuclear criticality aspects of this new tower was made. It was determined that with no more than a one-quarter-inch decrease in the diameter of the tower packed section, the present cadmium shielding will not be required on the new unit.

c. Tail-End Treatment

Since the tail-end ozone treatment of the final uranium product in the E-13 tank currently requires approximately ten hours per batch and constitutes a serious potential limitation on over-all production capacity, conversion of the present E-12 sampler tank to an ozone-sparge tank paralleling E-13 has been considered as a means of increasing effective tail-end capacity. However, current ozone generating capacity will not allow parallel operation of the E-12 and E-13 tanks with one percent ozone as at present. Therefore preliminary tests were run in the plant, using 0.5 percent ozone, which indicated that the effective ozonation capacity can be increased --- but not doubled as desired --- by parallel operation of E-12 and E-13.

Laboratory data indicate that the ruthenium present in the final uranium product solution should be removed in approximately one-tenth the current batch time cycle. If the efficiency of ruthenium removal in present plant equipment could be raised to approach the efficiency demonstrated by these laboratory data, parallel operation in E-12 and E-13 would not be required to eliminate the potential "bottleneck". Tests to determine how the ruthenium removal efficiency can be improved will be conducted early next month.

d. Waste Storage

The Redox neutralized salt waste stream was diverted from the 112-SX underground storage tank to the 110-SX underground storage tank on November 21, 1960, at which time the 110-SX tank contained 175,000 gallons of dilute waste at a temperature below 100 F. Sufficient current waste will be added to provide fission product heat to bring the tank contents to the boiling point in accordance with formal process specifications.

At the end of the first year of the five-year program for using boiling waste to concentrate non-boiling waste in the 241-SX tank farm, the net volume reduction is approximately 20 percent ahead of schedule. However, re-evaluation shows that due to the increase of salt from neutralization of the acid precycle raffinate the ultimate degree of concentration possible on this program will be approximately 20 percent below the original estimate. Approximately 284,000 gallons of non-boiling waste have been pumped from the 109-SX tank to the 115-SX tank and concentrated by a factor of two in accordance with this program. An additional 66,000 gallons will be moved from the 109-SX tank to the 115-SX tank as soon as a replacement pump can be installed in the 109-SX tank.

3. Finished Products Technology

a. Uranium Reduction Operation

1. Concentration and Calcination

The experimental notched-spline type trim installed in four 100 percent UNH feed control valves during July and August, 1960, were inspected. Wear on the titanium plugs and the 17-4 PH stainless steel seats was found to be excessive for satisfactory control. Corrosion appeared to be negligible.

No instances of loss of pump suction occurred during the month, when the submerged centrifugal test pump was operated without tank agitation. It is concluded that the erratic performance of the molten salt feed pump was due to the proximity of the agitation to the pump suction. Frequent failures of the shaft packing (located above the liquid level) have been attributed to liquid "creeping" up the shaft. A slinger ring has been attached to the shafts to prevent liquid from reaching the packing gland.

b. Metal Finishing Operation

1. Recuplex

Three months of operation with addition of dry sodium fluoride to the wet skull dissolver, in lieu of physical drying prior to charging, has resulted in a time cycle of ten hours, a time saving of six hours per batch. The increased dissolution rate (about three hours less time required) is attributed to a more constant concentration of fluoride ion, since the sodium fluoride dissolves slowly. Elimination of the drying operation also saves about three hours. The acid charged, 0.25 M HF in 60% HNO_3, was unchanged.

Isolation of the extraction column (H-1) teflon pulser bellows from high concentrations of plutonium by moving the organic effluent point from one foot below to two feet above the center line of the bellows appears to have resulted in a substantial increase in bellows life. The stagnant section was initially filled with carbon tetrachloride and after one month the plutonium concentration was only seven grams per liter compared with the organic effluent concentration of 40 to 60 grams per liter. The bellows appears to be in good condition after two months of operation (average bellows life is about one month).

The Task I filtrate concentrator failed after two years of service. This was about four times the expected life of the 304 L stainless steel tube bundle. A titanium tube bundle was installed.

2. Task I, II, and III

A polytetrafluoroethylene coated glass wool cloth was tested in drum filter service for filtration of plutonium oxalate. The material appeared to lose tensile strength and failed after two days of operation.

The occurrence of burned pressure vessel lids during reduction to metal was eliminated by re-initiating a triple argon purge of the vessel prior to firing. It is concluded that sufficient air remained after a single purge to cause the erratic past performance.

4. Process Chemistry - [redacted]

a. Purex Process Assistance

Recent laboratory studies in support of the Purex Plant have been concerned with 1) the so-called "tonic" effect of concentrated rework material from the F-8 tank upon HA-HC column performance; 2) the cause for the high plutonium losses, 0.2 to 1.0 per cent, experienced in the plant during August and early September; and 3) the quality of the solvent currently in use in the plant. Preliminary work on the "tonic" effect of the F-8 rework material upon decontamination has shown a slight improvement in scrubbing Zr,Nb from plant solvent, with the inclusion of synthetic rework solution in the aqueous feed. More detailed information will be reported later, with additional results. The results of the other work mentioned above were as follows:

1) The high plutonium losses were shown to be caused by something other than the recycle of back-cycle waste (3WB) to the first cycle feed. This had been thought a possible cause, because of the unusually high sulfate and fluoride content of the 3WB during the period in question.

2) In the solvent quality studies, a sample of unwashed plant solvent (1CW with 8×10^4 microcuries per gallon of gamma activity) was reduced in Zr,Nb activity by a factor of 45 by the standard laboratory washing procedure: a five minute contact, at 50 C, with an equal volume of 3% Na_2CO_3 - 0.02 M $KMnO_4$; a wash with 3% Na_2CO_3; and a wash with 1.0 M HNO_3. The Zr,Nb activity in a sample of the same solvent, washed in the plant with carbonate-permanganate, had been reduced only by a factor of 5.9, indicating once again the inefficiency of the plant solvent-washing procedure.

b. Redox Process Assistance: Neptunium Oxidation

The studies reported in September, on the oxidation of neptunium in an acid-deficient solution, have been extended and completed. It has been found that, in a solution containing 1.3 M $Al(NO_3)_3$, - 0.2 M HNO_3, and 0 - 0.0004 M $Cr_2O_7^=$, hexavalent neptunium is readily formed by a twice-stoichiometric quantity of sodium bismuthate or periodic acid at room temperature or potassium persulfate at 95-100 C. Since the use of bismuthate and periodate result in the formation of precipitates, presumably bismuth subnitrate and a neptunium iodate or periodate, respectively, these oxidants are unsuited for plant use. The use of potassium persulfate, however, gave rise to no undesirable side effects.

Work on the persulfate reaction showed complete oxidation of 2.15 g/l Np(V) by twice-stoichiometric persulfate in 15 minutes at 95-100 C. Enough oxidant had to be added to take care of any oxidizable impurities in the solution, including chromic ion if present, and to allow for the slow loss of persulfate by oxidation of water. Observation of the oxidized solution showed stability at room temperature, but

slow reduction of neptunium(VI) to (V) by stainless steel if the solution was heated and contained no persulfate.

Extraction coefficients for neptunium(VI) for the system hexone vs. an aqueous phase containing 1.3 - 2 M $Al(NO_3)_3$ and -0.3 to 0 M free HNO_3 were measured as 3 to 6. The results of multiple batch countercurrent runs indicated that the waste loss in the Redox 3A column with the acid deficient flow sheet should be less than two per cent, even with slow reduction of neptunium(VI) by hexone.

c. Neptunium Purification

Two neptunium purification runs (a total of 1910 grams, from Purex) were completed during the month. Neptunium in the ion exchange column effluents amounted to 0.62 per cent of the feed, with 0.28 per cent being discarded to unrecoverable waste. For the first time since early 1959, the feed contained large quantities of thorium-234 (UX_1), with 1.4 curies per gram of neptunium. Adequate decontamination, the extent of which has not as yet been completely determined, was achieved by increasing the 0.01 M HF wash from 13 to 17 column volumes.

5. 234-5 Development

a. Direct Calcination Of Plutonium Nitrate

The capacity of the three-inch calciner was doubled in a run using 500 g/l Pu feed at a rate of one liter per hour. Since this run employed a thermally cold feed stream, considerably greater capacity probably is available using a hot feed of composition approaching a molten salt. Entrainment remains a major problem and one toward which most of the effort is directed.

b. Waste Recovery By Plutonium Chloride Volatilation

The possibility of recovering plutonium from incinerator ashes by volatilization as chloride has been briefly tested. The method shows promise, but no similar tests are planned pending results of other methods of ash treatment.

Samples of pure plutonium oxide were heated and treated with chlorine or with phosgene. The latter resulted in greater volatilization under similar conditions. Most of the greenish-blue trichloride condensed within one inch of the heated tube end, with approximately 10 percent being carried onto a filter about six inches downstream.

A sample of ashes containing numerous metallic oxides was mixed with one-half as much plutonium salt. The mixture was chlorinated with phosgene for one hour at 450 - 500 C, then heated to 800 - 820 C for two hours with a decreased gas flow. The remaining ashes and the volatile chlorides were separately recovered and analyzed. The volatilized and condensed portion contained 96.4 percent of the plutonium. The ash remaining weighed 30 percent of the original sample and contained 3.6 percent of the plutonium.

c. Ceramic Development

The development of cells for electrolytic reduction processes progressed with the achievement of glazed surfaces on the interior of the MgO-TiO_2 cells. The glaze should impart considerably improved chemical resistance and hence longer life. It is not yet known how well these cells will survive actual tests in reduction service.

Best results were obtained using calcined TiO_2 and a shorter milling period. Shop problems remain in overcoming lumpiness in the slip and a tendency to stick to the plaster molds.

d. Continuous Electrolytic Reduction Of Plutonium Trichloride

Progress was made in showing that purity will probably be satisfactory on a steady-state run, and that a shutdown and subsequent overnight startup can be accomplished by dumping cell contents.

Other runs disclosed electrode limitations.

In a product purity run, successive samples showed the metal to decrease in metallic impurities (spectrochemical analysis) from 4400 ppm to 1500 ppm as the initial metal heel was diluted by over three throughputs by product metal. The initial chloride had 1950 ppm impurities. Major metallic ion cleanup was in elements having volatile chlorides. The only impurity to increase was magnesium, which may be boiled out in vacuum melting. Tantalum results were not obtained, but some loss of weight of the tantalum cathode connector was noted. The final metal had a density of 19.1.

Another run demonstrated the feasibility of an overnight shutdown if the cell is emptied prior to shutdown (in contrast to last month's run). A depletion of plutonium salt in the molten salts to five percent was demonstrated in the run.

A run with a tungsten vent tube-cathode was made. Corrosion to failure occurred at the salt-gas interface, again demonstrating the need for protection of metallic components in this region.

Recent runs have continued to exhibit erosion of the anode, as noted in September; oxide impurity in the feed is considered the prime cause of this action.

V. R. Cooper

Manager
Research and Engineering

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1960

II. ACHIEVEMENTS (continued)

H. FINANCIAL OPERATION

1. Production Cost

Data for the FY 1961 Budget Review was completed and forwarded on schedule to Contract Accounting Operation for consolidation with the HAPO budget. Distribution within CPD of budget details by organizational component is now in process. Revised fund allocations will be reported on the financial plan summary statement beginning with November cost reports and budget details will be shown on the operating statements for January providing AEC does not request adjustments.

Additional steps were taken to reflect all appropriate expenditures and commitments in the November equipment report. An accrual of $30,000 was made for material received not billed, and close follow-up of open requisitions for the Purex concentrators permitted the recording of $200,000 in commitments for FY 1961 and $175,000 in FY 1962. Spare parts with a book value of $115,000 were reclassified as spare equipment in November.

A review of Redox essential materials used for Birch retention and recovery was completed and the costing method was updated to reflect the findings.

CPD's net investment in inventories at 10-31-60 is compared to the net investment at 9-30-60 below:

(amounts in thousands)	Balance 9-30-60	Balance 10-31-60	Dollar Change	Percent Change
Inventories				
Essential Materials	$ 803	$ 855	$ 52	6.5
Special Materials	66	66	-0-	-0-
Spare Parts	1 657	1 646	(11)	(.7)
Gross Inventories	$2 526	$2 567	$ 41	1.6
Reserves				
Essential Materials	$ (53)	$ (53)	$ -0-	-0-
Special Materials	-0-	-0-	-0-	-0-
Spare Parts	(419)	(421)	(2)	(.5)
Total Reserves	$ (472)	$ (474)	$(2)	(.4)
Net Investment	$2 054	$2 093	$ 39	1.9

The Essential Material Inventory turnover rate was 3.1 in October and 3.3 FYTD compared to 2.6 in FY 1960 and 2.0 in FY 1959.

The Spare Parts Inventory turnover rate was .52 in October and .45 FYTD compared to .43 in FY 1960 and .32 in FY 1959.

2. General Accounting

Financial activity regarding construction projects is detailed as follows:

As of October 31, 1960 there were 13 active projects which had incurred costs of $4,475,666 against authorized funds of $6,993,600. Outstanding commitments totaled $214,024.

Construction Completion and Cost Closing Statements were issued for two projects:

(1) Project CG-734 - RMC Button Line - 234-5 Building ($1,845,000).

(2) Project CGC-854 - Conversion of Purex Pu Anion Exchange Unit ($94,500).

Five Appropriation Requests with a total value of $25,165 were approved as follows:

(1)	61-19 - Four Point Radiation Monitor	FEO	$11 000
(2)	60-4 (Supplement #1) - Concentration, Purification and Recovery Hood for Critical Mass Program	R&E	9 000
(3)	61-8 (Supplement #1) - 400 Channel Analyzer	Purex	2 500
(4)	61-22 - T.V. Camera	FEO	1 300
(5)	61-22 - One Ton Hoist	Purex	1 365
	Total		$25 165

The following projects have been unitized during the current fiscal year:

CG-686 - Monitoring Instruments - Redox and Purex	$ 377 893
CG-800 - Radiation Reduction - RMA	171 797
CG-745 - RMC Fabrication Lines	1 060 546
	$1 610 236

3. Auditing

A formal audit report was issued covering findings and recommendations relating to the Audit of the Need and Use of Financial Reports. In our opinion, the activities audited were generally satisfactory. Distribution was decreased by 102 copies of the various reports.

Field work was completed in connection with an Audit of Duplicating Services. A formal audit report is in the preparation stage for issuance in early December.

Manager - Finance

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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

Information regarding college graduate starting rates for 1961 was distributed to managers. One new exempt position was established in the Special Separation Processing and Auxiliaries Operation.

The Specialist, Salary Administration participated in a study of foreman position relationships for certain positions in Fuels Preparation Department.

2. Personnel Placement

During the month offers for permanent assignments were made to two Technical Graduates with Chemical Engineering degrees and acceptances received. It is expected that both will join the Chemical Processing Department permanently at the completion of their present rotation on January 1, 1961.

Outstanding requisitions for various craft personnel were filled during the month. Assistance in the filling of these was received from the declaration of excess personnel by both Construction Engineering and Utilities Operation and Irradiation Processing Department wherein three Electricians and one Pipefitter were received.

The situation regarding experienced Instrument Technicians continues to be a very serious one throughout HAPO. While Instrument Trainees have been hired in fairly good numbers this calendar year, it will be over three years before these people can be considered as fully qualified. The Department should continue to look at other critical crafts such as the machinist classification where predictions are that within two years the United States as a whole will be short several hundred thousand machinists. Serious consideration should be given to hiring machinist trainees in the near future.

3. Wage and Benefits

As a result of personnel changes and realignment of functions in the Process Chemistry Subsection, three jobs have been combined into one new job. The new description has been evaluated, reconciled and officially established.

Suggestion activity dropped off even further during the month. It appears that special promotional activities will be required to get participation back up to previous years. No programs will be scheduled however, until concurrence is indicated by Section Managers. There were 27 suggestions received, 26 adopted in the amount of $520 accounting for a savings of $3,050.

4. Health, Safety, and Radiation

After a careful review of circumstances of the incident involving back injury to an employee, final classification has been of the case as a nonwork injury. In the considered opinion of Industrial Medical, there was no clear record of an accident sufficient to produce the effect. It was concluded, therefore, that back strain was attributable solely to a pre-existing physical condition. Decision was based on the ASA method of recording and measuring work injury experience, applicable section - 5.2.

Chemical Processing Department qualified for the Department General Manager's Safety Award on November 27, upon completion of 107 days without a disabling injury. A preselection list of 40 available items has been distributed to employees who will designate the 18 most popular award to appear on the final selection card. A change will be made to assist the employee in determining his individual choice of awards by distributing photographs of the awards rather than displaying the items.

5. Communication

Two Professional Business Management-I classes, with 27 participants, were started this month. These are the first classes in the Department to experience the revised PBM-I approach and revised study material.

Winter term catalogues for Columbia Basin College were distributed throughout the Department, and, at the request of the Richland Public Schools, a survey form was distributed to craft groups to determine interest in a General Machining course.

RB Britton
Manager
Relations Practices

RB Britton:lj

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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

Operation	Monthly Salaried		Weekly Salaried		Total	
	10-31-60	11-30-60	10-31-60	11-30-60	10-31-60	11-30-60
General Manager's Group	10	10	1	1	11	11
Financial	13	13	12	12	25	25
Relations Practices	5	5	6	6	11	11
Research & Engineering	61	62	28	27	89	89
Facilities Engineering	64	65	21	22	85	87
Power & General Maintenance	42	42	236	240	278	282
Production	5	5	3	3	8	8
Special Separation Processing and Auxiliaries	48	50	214	213	262	263
Purex	51	51	213	215	264	266
Finished Products	54	54	219	218	273	272
Total	353	357	953	957	1 306	1 314

B. PERSONNEL CHANGES

There were no personnel changes during the month of November.

C. TRIPS

Visitor	To	Nature of Discussion
To Other G.E. Components		
F. A. Fieser	Computer Department Phoenix, Arizona	Measurements (11/9-11/60)
To AEC and Other AEC Contractors		
T. S. Soine	Argonne National Laboratory Lemont, Illinois	Liquid metal reduction, electrorefining, and ceramic developments. (11/14,15/60)
T. S. Soine	Dow Chemical Rocky Flats Plant Denver, Colorado	Casting and electro-refining (11/16/60)
T. S. Soine	LASL Los Alamos, N. Mexico	Casting, electrorefining, ceramic development, and recovery of incinerator ash. (11/17,18/60)
To General Industry		
C. E. Kent	Vitro Engineering Co. New York, N.Y.	Close out of NPF contract. (11/15-17/60)
J. H. Palmer	Mine Safety Appliance Pittsburgh, Pa.	Filter tests for project CGI-791. (11/15-18/60)
To Conventions and General Meetings		
J. P. Pierard	Los Angeles, Calif.	Business Equipment Exposition. (10/31/60 and 11/1-3/60)
W. N. Mobley	Seattle, Washington	Speaker and panel member, Washington Education Assoc. (11/14/60)
" " "	Longview, Wash.	Speaker and panel member, Washington Education Assoc. (11/17/60)
" " "	Spokane, Wash.	Speaker and panel member, Washington Education Assoc. (11/28/60)
R. B. Britton	Spokane, Wash.	Washington Education Assoc. (11/28/60)
J. R. Cartmell	Olympia, Wash.	Panel member, Washington State Safety Panel (11/17/60)

D. VISITORS

Visitor	From	Nature of Discussion
From Other G.E. Components		
L. E. Clover	Manufacturing Services Schenectady, N.Y.	Plant engineering and tour shop areas.(11/8/60)
H. L. Palmer	Industrial Electronics Div. Schenectady, N.Y.	Electronic computer applications. (11/16/60)
From AEC and Other AEC Operational Contractors		
J. B. Bond	Washington AEC (Hearing Examiner) Washington, D.C.	Orientation and tour of Purex. (11/2/60)
D. E. Elliott B. L. Moore G. H. Tenney	LASL Los Alamos, N. Mexico	Nondestructive testing meeting. (11/3-4/60)
D. Lord	Lawrence Radiation Lab. Livermore, Calif.	" "
V. C. Jackson	UCNC-ORNL Oak Ridge, Tenn.	" "
H. C. Anderson W. Stump	Dow Chemical Co. Rocky Flats Plant Denver, Colorado	" "
D. G. Heberlein I. B. Venable	" " "	Plutonium fabrication and processing problems. (11/14-16/60)
From General Industry		
F. Morris P. Panseau R. E. Selff	Turco Chemical Company Wilmington, Calif.	Decontamination agents (11/29/60)
From Other Government Agencies		
L. W. Holm	Research Institute of National Defense Stockholm, Sweden	Personnel protection, safety measures and criticality controls. (11/17/60)

IV. SAFETY AND SECURITY

Operation	Facil. Eng.	Finan.	Fin. Prod.	P&GM	Purex	SSP&AO	Prod.	Rel. Prac.	Res.& Eng.	Total CPD	Yr.to Date
Disabling Injuries										0	1
Serious Accidents										0	13
Medical Treatment Injuries			7	21	8	5			1	42	420
Radiation Occur.			5		4	2				11	175
Contam. Wounds			1*							1	10
Pu Depositions			1**							1	9
Fires					1***	1***				2	14
Security Violations			1						1	2	9

* An operator received a contaminated injury while working in a hood. The operator slipped while trying to catch his balance. A screwdriver sliced through the hood glove and the surgical glove resulting in a cut to the left wrist. The injury was contaminated to 40,000 d/m, and his hand was contaminated to 500 - 40,000 d/m. The hand and wound area was easily cleaned to less than the detectable limits of counting instruments.

** The cause of this plutonium deposition is unknown. The contamination was picked up in the bioassay sample and was well below the ten per cent MPL.

*** Both fires started in the Analytical Laboratories of each group. In either case, the damage did not amount to more than $10.

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V. REPORTS

A. PREPARED AND ISSUED

HW-65859, Unclassified, "Nuclear Safety Control in the 234-5 Development Operation", dated 7-15-60, H. H. Hopkins, Jr. by H. W. Crocker.

HW-67010, Official Use Only, "Design Scope of the Waste Treatment Facility - Z Plant - Project CGC-912", dated November 4, 1960, by L. J. Battey.

HW-67164, Unclassified, "An Analysis of the Redox CMP Radiation Variables", dated November 7, 1960, by L. R. Wallis.

HW-67274, Secret, "Distribution of Recuplex Costs", dated November 2, 1960, by S. A. Spohr.

HW-67279 RD, Secret, "Costing High Exposure Plutonium", dated November 2, 1960, by S. J. Beard.

HW-67313, Secret, "Birch Recovery from Stored Waste", dated November 3, 1960, by W. K. MacCready.

HW-67343 RD, Secret, "Redox Plant Production Schedule - November 1960", dated November 8, 1960, by D. McDonald.

HW-67345 RD, Secret, "UO_3 Plant Production Schedule - November 1960", dated November 8, 1960, D. McDonald.

HW-67344 RD, Secret, "Purex Plant Production Schedule - November 1960", dated November 8, 1960, by D. McDonald.

HW-67346 RD, Secret, "234-5 Plant Production Schedule - November 1960", dated November 8, 1960, by D. McDonald.

HW-67379, Confidential, Movie Film - "PR Can Unloading", dated November 2, 1960, by D. C. Bowden and C. M. Thomas.

HW-67380, Secret, Movie Film - "Button Knockout, Pickling, Weighing, and Sampling", dated November 4, 1960, by D. C. Bowden and C. M. Thomas.

HW-67381, Secret, Movie Film - "Button and Slag and Crucible Seal Out", dated November 8, 1960, by D. C. Bowden and C. M. Thomas.

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HW-67387, Secret, "Essential Material Consumption - Purex, CPD - October, 1960," dated November 10, 1960, by J. E. Lentz.

HW-67475, Secret, "Supplementary Birch Production", dated November 21, 1960, by B. F. Judson and L. W. Lang.

HW-67488, Secret, "CPD Production and Unit Cost Goals - CY 1961", dated November 21, 1960, by F. A. Fieser.

HW-67489, Secret, "CPD Plant Production and Unit Cost Goals - CY 1961", dated November 21, 1960, by F. A. Fieser.

HW-67511, Secret, "CPD Comparison of Production and Unit Cost Performance", dated November 21, 1960, by F. A. Fieser.

HW-67643, Confidential, "Nuclear Safety Review, CPD, October, 1959 through September, 1960", dated November 21, 1960, by R. L. Stevenson.

HW-67696, Secret, "CPD Waste Status Summary - September, 1960", dated November 29, 1960, by J. E. Lentz.

HW-67705, Secret, "CPD Waste Status Summary - October, 1960", dated November 30, 1960, by J. E. Lentz.

B. PREPARED FOR SIGNATURE AND ISSUANCE

HW-67251, Secret, "Production, October, 1960" dated November 1, 1960, W. E. Johnson.

HW-67478, Secret, "Uranium Recycle at Hanford", dated November 21, 1960, 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
C. W. Pollock, Research and Engineering	A Method for Preparation of the Dibutyl Ester of Phosphoric Acid

P. H. Reinker

General Manager
Chemical Processing Department

[redacted]

END

DATE FILMED

3/18/93