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HW 68700 **DEL**

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

HW--68700-Del.

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FEBRUARY, 1961

Compiled By
OPERATION MANAGERS

March 21, 1961

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1961

I. SUMMARY

A. RESPONSIBILITY

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

B. PRODUCTION

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

Approximately 220 kilocuries of strontium-90 were isolated in the Purex plant and stored for further decay of strontium-89.

The production of UO_3 conformed to the operating schedule. Ten carloads of powder were shipped ahead of schedule because of a threatened work stoppage at Hanford.

Unfabricated plutonium metal production exceeded that forecasted, both for February and fiscal year-to-date. The fabrication of Model 81 weapon components was started and forecasted production was achieved. Delivery commitments for all finished products were met or exceeded.

C. ENGINEERING

Purex processing continued at a 3.0 capacity factor until the scheduled shutdown in February for equipment changes and to make a neptunium recovery run. Plutonium and uranium products met shipping specifications, except for two plutonium product batches which were retained for recycle.

The new E-metal dissolver was installed in the Redox plant and the first uranium was charged to it on February 9. Operation of the dissolver is currently restricted to below capacity rates, with very careful control being maintained while performance characteristics are being thoroughly identified.

The Redox backcycle scrub stream was switched to the precycle extraction column to replace virgin salt formerly added. This stream, raffinate from second cycle plutonium decontamination, previously backcycled to the first cycle decontamination column. In addition to realizing appreciable cost savings, approximately 90 percent of the iron, introduced into Redox process streams and which has a tendency to precipitate in the backcycle concentrator, will be eliminated via the precycle extraction column waste.

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The principal source of excessive iron contamination in Redox final plutonium product was identified as the reflux from the final concentrator de-entrainment tower. Temporary diversion of the reflux stream to the plutonium recycle tank effected a five-fold reduction (from 15,000 to 3,000 parts per million) in final plutonium product iron content, which is well below specifications. Replacement of the tower with one fabricated from titanium is planned as the permanent solution to the impurity problem.

The process design report covering the installation of backup dissolver off-gas filters at Purex was completed. This installation, estimated to cost \$185,000, will provide permanently buried filters in each of the three off-gas lines.

Detail design of the strontium carbonate shipping cask, HAPO-II, was completed. Designed for shipping 180,000 curies of strontium-90 as the stabilized carbonate salt, two casks will be constructed on an expedited schedule to meet shipping demands from the Hot Semi-Works during June of this year.

Detail design work on the modified cerium cask for strontium shipment in a decalco insert was completed, approved, and the summary design analysis and hazards review report was forwarded to the Commission. Fabrication work is already underway to modify the cerium filter cask, currently being fabricated in Seattle, in accordance with this design for March shipments of purified strontium-90 from the Hanford Laboratories to Oak Ridge.

P. H. Linker

General Manager
Chemical Processing Department

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

February January

1. Production Statistics

a. Purex

Uranium nitrate produced (tons)	474.9	331.77
Average production rate during operation (T/D)	25.5	24.3
Total waste loss (%)		
Plutonium	0.30	0.52
Uranium	0.09	0.18
On-line efficiency (%)	66.6	71.4

b. Redox

Uranium nitrate produced (tons)	75.0	74.77
Average production rate during operation (T/D)	6.8	6.9
Total waste loss (%)		
Plutonium	0.16	0.29
Uranium	0.01	0.13
On-line efficiency (%)	55.1	51.4

c. Uranium Reduction

Normal UO ₃ loaded (tons)	483.2	455.83
Enriched UO ₃ loaded (tons)	72.1	120.80
Normal UO ₃ approved for shipment (tons)	502.47	400.87
Enriched UO ₃ approved for shipment (tons)	96.42	96.77
Normal UO ₃ shipped (tons)	502.77	599.51
Enriched UO ₃ shipped (tons)	96.64	0
Normal UNH backlog (tons U)	203	167
Enriched UNH backlog (tons U)	63	52

d. Plutonium Metal Processing

Input to Task I (batches)	285	260
Reduction yield (%)	97.5	97.8
Plutonium metal buttons produced (% of commitment)	112.2	90.3
Plutonium metal buttons shipped (% of commitment)	99.4	100.6
Product recovery output (% of schedule)	148.5	104.6
Product recovery backlog (Kg's)	246.0	261.6
Waste disposal (grams)	498	552

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	<u>February</u>	<u>January</u>
e. <u>Plutonium Metal Fabrication</u>		
Weapons parts produced (% of commitment)	100	-
Weapons parts shipped (% of commitment)	50	-
f. <u>Power</u>	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	10 778	4 717
Filtered water pumped (gpm)	1 046	1 018
Maximum steam generated (lbs./hr.)	258 000	138 000
Average steam generated (lbs./hr.)	182 383	99 132
Total steam generated (M lbs.)	122 562	66 623
Coal consumed (est. tons)	6 358	3 554

J. N. Warren
Manager - Production

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Processing continued at a 3.0 CF rate until February 20, when the plant was shut down for planned equipment changes. The replacement of the J-4 (first cycle plutonium stripping) pulser, which failed on February 18, interrupted processing for 15 hours.

All uranium and plutonium met shipping specifications with the exception of two plutonium batches which were retained for recycle. Waste losses were normal.

2. Processing Experience

Although essentially all plutonium and uranium product met shipping specifications, decontamination for ZrNb in the process was marginal with the #1 solvent gamma levels ranging from 12,000 to 20,000 microcuries per gallon. Accelerated solvent washing was necessary to control solvent quality. The IOS (#1 solvent column scrub) was re-routed for continuous flow in an attempt to achieve better solvent cleanup. This scrub stream was previously recycled via a batch tank (tank G-2).

The A and B dissolver silver reactors were regenerated.

The N cell ion exchange resin was replaced.

Strontium-90 recovery activities for February consisted of six carbonate runs, three oxalate runs and two concentration runs. The strontium-90 product produced amounted to 220 kilocuries and was stored in the 244-CR-002 tank.

3. Mechanical Experience

Two centrifuge failures were experienced. The E-2 centrifuge failed on February 10 and the E-4 was lost on February 25. Both failures were due to mechanical seizure. The E-4 unit was partially cleaned with chemical flushes and transferred to T Plant for decontamination and repair.

The IBS (plutonium scrub column) pulser failed on February 18 and was shipped to T Plant for repair. A reconditioned spare pulser was installed as the replacement.

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The condenser, filter, and vent jet for the F-1 vessel vent and condenser vent systems were replaced. The condenser had leaked and caused severe corrosion of the filter dummage. The condenser will be decontaminated for repair.

The 2-A (second plutonium cycle extraction) column containing fluoroethene Raschig rings was replaced. The new column has stainless steel nozzle plates.

The IO (#1 solvent wash) column containing fluoroethene sieve plates was replaced with the original IO column having stainless steel nozzle plates.

The G-1 (#1 solvent wash tank) recirculation pump was replaced with a modified pump eight inches shorter in shaft length.

The F-6 (#2 acid concentrator) jet-out dip tube failed from corrosion and was replaced.

The east tube bundle on the H-4 (backcycle) concentrator failed and was replaced. The F-11 and F-7 (#1 and #2 acid waste concentrators) west tube bundles also failed.

The push tank, resin receiver, and resin reservoir of the plutonium ion exchange facility were replaced with units of improved design.

The HAK (1st cycle waste) jumper and the J-5 (2nd plutonium cycle feed) pump were replaced on a preventive maintenance schedule.

The number two water demineralizer units were opened for inspection. The "Duolite" anion resin was removed and replaced with "Nalcite WBR".

Diversion box jumper changes were made to route high level waste to 106-A to preheat the tank for regular service. Other changes were made to permit routing of 103-A waste tank supernate to E cell for cesium recovery.

The tank farm Gantry crane was decontaminated and the control cables extended to permit more remote operation.

4. Radiation Experience

The total radio-iodine emission was 13 curies. The maximum 7-day emission was 6.6 curies compared to the CFD control limit of 10 curies.

There were seven radiation occurrences and eight cases of skin contamination. The maximum skin contamination was 40,000 d/m plutonium and 40,000 c/m fission products.

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5. Analytical Experience

The RAC (Remote Analytical Cave) was used for determination of neptunium losses in the HAW (co-decontamination cycle) wastes. The results substantiated the validity of results obtained by the normal Gilmont sample. Greater accuracy is expected from large samples of the high activity wastes.

Plutonium valence determinations were made throughout the month on L cell sump and flush samples. All plutonium was in the IV and VI states with plutonium IV concentration varying from 84 to 100 percent of the total. No plutonium polymer was found.

Hot Semiworks methods development was completed with respect to current analytical requests.

A coulometric aluminum method was developed and utilized for the D-2 (coating waste) tank caustic flushes.

HLO analytical group and the Purex laboratory conducted a series of calibrations and sample exchanges in order to clarify discrepancies in the strontium-90 results reported by the two laboratories. Values from both the two laboratories fall within the ± 10 percent confidence levels of the available instrument calibration standards.

An extensive rearrangement of the hoods and laboratory equipment was carried out to consolidate space, simplify work flow, and provide work space for the Critical Mass and Hot Semiworks analytical work.

Manager-Purex

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

The new Mark V multipurpose dissolver was installed and put into service during the early part of the month. E-metal dissolution in the new dissolver was started on February 9 and continued as scheduled for the balance of the month. Performance of the new unit has been very satisfactory to date. The monthly production commitment was exceeded by 25 percent.

2. Processing Operation

Installation of the new Mark V multipurpose dissolver, which was started on January 28, was completed on February 7. E-metal dissolving was started on 2-9-61 under careful and continuous observation and at dissolving rates at only 65-70% of expected capacity. This very conservative approach was taken to provide the greatest possible safety insurance. Except for a failure of the south crib thermohm, performance of the new unit has been very satisfactory and operation to date has been continuous and without incident.

With the installation and successful start-up of the Mark V dissolver, the two remaining conventional dissolvers were taken off the line and placed in standby status.

The iron content of the plutonium nitrate product was reduced from a range of 11,000 to 15,000 parts of iron per million parts of plutonium to 1,500 to 3,000 ppm. This was accomplished by temporarily diverting the reflux stream from the de-entrainment tower of the final plutonium concentrator (L-3) to the plutonium recycle tank (L-16). A new L-3 tower, fabricated from titanium, is now being planned as a permanent solution to the iron impurity problem at this location.

3. Mechanical Experience

The major maintenance item during the month was the completion of the Mark V multipurpose dissolver installation which was started on January 28. Twenty-eight cell jumpers, in addition to the associated dissolver equipment, were involved in the installation. The work was accomplished without incident.

Piping installations were completed this month which permit direct unloading of hexone tank cars to the O-1 storage tank in the 276-S Building. Prior to this installation it was necessary to pump all

hexone to underground storage tanks and then to the O-1 tank.

A new device for installing terminal caps on the electrical wall connectors in the processing cells of the 202-S Canyon was used for the first time this month. This device places a new metal cap on each of the seven electrical contact terminals and is operated remotely from the crane hook on the canyon crane. Preliminary results indicate that the terminal caps will provide better electrical contact and thus improve thermohm jumper performance.

There were eight cell jumper replacements made during the month. One process pump (H-1) was also replaced because of seal leakage and the B-2 dissolver silver reactor was replaced because of a restriction in the column.

4. Waste Handling and Decontamination

Equipment valued at \$189,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at approximately \$127,850 was returned to customers. A savings of approximately \$75,000 over the cost of new replacement equipment was realized through the equipment decontamination program during the month.

A total of 320 man-hours was charged to the decontamination of railroad, automotive, and heavy equipment. The following is a breakdown of the major items decontaminated:

<u>Item</u>	<u>Operation Charged</u>
Well Cars No. 39 & 40	CFD
Gondola Cars No. 4611 & 3656	CFD
Flat Cars No. 3610, 3615 & 3622	CFD
Power Wagon No. 1H-706	P&GM
Motor Crane No. 17T-10797	P&GM
Truck No. HO-13-16287	HLO
Dunnigan Tanker	HLO
Panel Truck No. 1D-480	F&GM
Pickup Truck No. 1C-297	P&GM
Back-Hoe No. 17-4628	F&GM
Core Drill	P&GM
Air Compressor No. 13-16287	Purex
UNH Truck Tires	Purex

5. Radiation Experience

There were six radiation occurrences, ten cases of skin contamination, and two cases of contaminated personal effects incurred during the month. The maximum skin contamination level was 6,000 c/m. All skin contamination was reduced to less than detectable.

The most significant radiation occurrence involved nose and mouth contamination to 300 c/m to a chemical operator during the decontamination of a cask which had contained waste from

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the strontium extraction of Purex crude concentrate. The contamination was caused by an improper fit of the assault mask, which allowed contamination to come through underneath the chin. A pressure drop test of the cannister for the mask in question indicated satisfactory operation. The contamination was reduced to non-detectable and smears were sent to Internal Dosimetry, HLO, for strontium analysis. The employee was also counted in the whole body monitor and the highest result indicated a transient deposition for $ZrNb^{95}$ and Ce^{144} of less than 0.1% of the maximum permissible burden for the whole body. Special strontium⁹⁰ analyses are to be run on the bioassay sample obtained.

There were two "hot" equipment moves from the 202-S Canyon Building during the month. On 2-3-61 a burial box containing cell jumpers and a process pump was transferred to the Redox Equipment Reclamation Facility. The maximum dose rate was 260 mr/hr at 53 feet. On 2-28-61 a burial box containing obsolete and unrepairable miscellaneous equipment was removed and buried. The maximum dose rate for this burial was 900 mr/hr at 53 feet. Both equipment moves were completed without incident.

6. Analytical Experience

The program of setting up all the necessary constants, characteristic of the isotopes to be calculated with the aid of the 7090 computer, was completed this month. The tabulated data will be utilized by the 7090 computer to perform quantitative computations from the complex gamma spectra obtained from the 256 channel analyzer. This data includes 11,000 constants and permits the gamma calculation of 35 radioactive isotopes.

The commitment to the Reactor Coolant Studies Group for calculating and reporting isotopic analyses of 686 multi-channel analyzer tapes from the backlog is on schedule. One hundred sixty tapes have been processed with seven hundred fifty isotopes quantitatively reported.

C. T. Grosz
Manager, Special Separation
Processing and Auxiliaries

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Specifications for Model 81 were received on February 1 and fabrication proceeded on a scheduled basis. Schedules and commitments were met and the first delivery of complete assemblies of this new model was made to the customer on February 20. Schedules and commitments for unfabricated plutonium and uranium oxide were also met, and the plutonium recovery schedule was exceeded by fifty-one per cent.

2. Processing Operations

a. Plutonium Fabrication

The overall yield of acceptable parts was this month. The Task Force continues to operate on the casting process work which still presents the most significant problems.

Molding capacity was doubled this month when additional melting equipment was placed in operation. The melting area is still production limiting due to pre-melting requirements of the currently used operating procedure.

Jigs and fixtures for the machining of the minor parts of Model 81 have not been satisfactory and it has been necessary to fabricate replacement equipment on-site. Production of the minor parts should improve significantly when this revised equipment is available next month.

Additional shipping equipment was fabricated during the month and was placed in service.

The investigations directed toward eliminating the "hunt" in the tool control systems of the six new Gorton lathes have continued without success. Vendor's representatives' recommendations have been followed but have not corrected the problem. Studies and experimentation continue.

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b. Plutonium Processing

Unfabricated plutonium operations were generally good this month. The quality of buttons produced was exceptionally good, with the reject rate being significantly improved. The backlog of reject material generated in December and January has been reduced by 75 per cent by normal rework procedures.

Recovery operations were carried on with only one slag and crucible dissolver. Impure nitrate solution from the Redox plant and dissolved metal made up the bulk of the feed. Late in the month the J-7 and J-26-A concentrators failed due to corrosion. Replacement, which requires a production shutdown, is scheduled to coincide with the Purex outage in early March.

c. Uranium Reduction

Uranium Reduction Operations were normal except for the failure by corrosion of an evaporator tube bundle for the enriched stream.

3. Mechanical Experience

Plutonium fabrication casting equipment operated satisfactorily from the maintenance standpoint during the month. Modifications to the casting equipment in Hoods 19-A1 and 19-A2 were completed and these units were placed in service without incident. In the machining area difficulties involved the compressor for Hood 24-C and the lathe in Hood 24-B.

Equipment in the plutonium preparation area performed satisfactorily during the month. News rams are being installed on the RMC, Task III reduction furnaces by the Minor Construction forces. They are also modifying the controls and vents in the Task III system.

Equipment performance in the plutonium recovery operations was satisfactory with the major difficulties centered around two failed concentrators (J-7 and J-26A). Preparations for the replacement of these are underway at the end of the month. A scrubber was installed in the off-gas line from the M-1 and M-2 metal dissolvers in order to lessen corrosion by removing HF from the off-gas stream.

Uranium Reduction equipment performance was satisfactory with the exception of the ED-6 concentrator which failed because of corrosion of the tube bundle.

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4. Radiation Experience

Radiation and contamination control statistics show general control to be satisfactory for the month.

Three contaminated injuries were experienced during the month. Initial assays indicate that there will be no significant deposition in any of the cases.

5. Analytical and Final Inspection Experience

	<u>January</u>	<u>February</u>
Number of Samples Received	1,623	1,701
Number of Determinations	19,189	21,552
Average Impurity, Buttons	2,101 ppm	1,727 ppm
Buttons Rejected	17.4%	3.8%

Nineteen weapon parts analyzed for Pu²⁴⁰ by Mass Spectrometer and averaged 0.14% above the mid point of the specification value. A correlation with the BF₃ Neutron Counter shows that the appropriate multiplication factors can be determined for each type of part and that the counting precision can be reduced to make this a satisfactory secondary control method for determining Pu²⁴⁰ content. The HLO Mass Spectrometer facilities have been pressed into service on a 24 hour/day basis using loaned CPD Chemists to enable the meeting of the new isotopic specifications on weapon components.

P. B. Fisk, Supervisor, Final Inspection, spent February 27 through March 1 at Dow Chemical Company, Denver, Colorado. He followed through on the gaging of the first five Model 81 assemblies shipped from HAP0. With one minor exception, namely the hole diameter on the 8105 part, everything was in good order. Comparative gaging techniques will have to be resolved on this point or waivers will be required for complete acceptance.

6. Events Influencing Costs

The work force of the Fabrication Operation was increased by the addition of eight (8) Separations Process Operators.

The Fabrication Operation worked its forces overtime on three Saturdays of the month to assure meeting the schedule.

Acting Manager - Finished Products

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

A break occurred in the aerial emergency electrical line to 202-S and 224-U areas at 12:15 p.m., February 6, which caused breakers in 284-W Building and 252-W Substation to open and activate the emergency steam turbine generator. Repairs to the line were effected promptly. Operating continuity in the facilities was not affected.

2. Inspection, Maintenance and Repair

A six-inch lateral line, off the main eight-inch sanitary water line to the 271-T area, broke at 4:00 p.m., on February 22. Efforts were made to uncover the break and effect repairs, on the night shift, but were unsuccessful due to the condition of the ground. The break in the line was found directly under the area fence and was repaired the following day.

Sixteen wooden poles were replaced with steel poles and metal supports and hangers on the three-inch steam transmission line to 241-T area.

Ventilation balance activities included: final air balancing of ventilation systems in the 105-B Building on CGI-791 Confinement Program; continued preliminary acceptance test procedures on the 105-C exhaust ventilation system; and balancing air flows for hoods 19-A&B in the 234-5 Building.

Fabrication of a Redox D-12 Waste Concentrator was completed, and it is available for service.

A spare Off-Gas Heater is being built for Redox, and all metal fabrication has been completed. Work remaining to be done includes installation of wiring, lagging, and sheathing.

A large stainless steel glove box was built and installed at 222-S Building. The hood was connected to the exhaust system and will be used by personnel of HLO in research work.

Nineteen process jumpers were completed—five for Redox and fourteen for Purex.

Two process pumps—one each for Redox and Purex—were made ready for service and shipped to the plants as replacements for failed units.

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Fabrication of the Purex F-1 Vent Filter was completed and, together with the Vent Condenser which was completed last month, was shipped to the Purex Plant on February 20.

Major modifications were completed on a spare Purex 2-A Plutonium Decontamination Pulse Column, and this unit was delivered to Purex on February 24.

Work continued on the Formaldehyde Denitration Prototype for Purex. At this time, three of four required vessels are complete, and the fourth vessel, an updraft condenser, is about 50% complete. Fourteen jumpers have been completed, leaving 28 yet to be made. Field installation of process and steam piping systems between 211-A and 202-A Buildings, is in progress and is approximately 40% complete.

Leak-testing of the Purex #1 Spare Concentrator has been completed. FEO has advised that lagging and sheathing, which were removed for testing, should now be replaced and the vessel is to be considered a serviceable spare, following installation of new-type studs.

Installation of electrical and communications services required for operation of the GE 311 Computer at 234-5 Building was completed. This is a prototype installation to determine feasibility of utilizing electronic data-processing equipment for computation, storage, and recall of data on plutonium shapes.

Fabrication of 75 birdcages, 75 shipping containers, and 300 inserts for shipping containers--all required for shipment of new-model weapons shapes--is in progress. The birdcages are 75% complete, shipping containers about 30% complete, and inserts about 70% complete.

Work has been started on fabrication of a hood to enclose a second Sheffield Rotary Contour Gauge at 234-5 Building. Also included in this project are installation of air conditioning for the hood, electrical services and instrumentation systems, and assembly of the gauging machine.

Two hundred glove port shields were made for use at 234-5 Building. These shields are a sandwich made of two outer discs of 16-gauge metal with a larger inner disc of 1/16-inch-thick neoprene. They are of a size that will compress into glove ports and are designed to reduce radiation levels through glove ports when the ports are not in use.

Installation of a Chip Hood, associated equipment, and necessary services is in progress at Cell 5, 231-Z Building, and is 90% complete at this time. The equipment will be used to press plutonium machining chips and turnings into briquettes prior to recasting.

A specially designed indestructible burial box was constructed for the Purex F-1 Filter. Construction was principally of heavy structural steel and three-inch planking. Estimated weight of the box was approximately 15 tons when loaded. Burial was made on schedule without incident.

A turndown-type vent was replaced with a filter-type vent on the 152-A Diversion Box Catch Basin. Exposure readings up to 5 r/hr made necessary the use of earth-fill around the pipe for shielding. Pipefitters received 100 mr/hr exposure while unbolting the bottom flange of the old vent. Removal and burial proceeded under strict SWP conditions.

Badly worn cables on the auxiliary hoists on both the east and west 40-ton cranes in the Purex canyon were replaced with new cables, under rigid SWP conditions and without incident.

Other services rendered the Purex Operation during the month included: pulling cover blocks over West Sample Gallery for a filter change-- the used filter was wrapped in plastic bags and buried in the 200 East dry-waste trench; five tank-truck loads of hot water and caustic solution were furnished for flushing down contamination in the No. 2 trap pit; the I-O Column was removed from a storage burial box to N Cell for modification. Personnel dose rates were 200 to 1500 mrad/hr. Workmen were authorized to receive 100 mrem.

An 18-ton cask for Purex was unloaded from a specially designed railroad car at the 272-E Shop, and transported to 202-A on a lowboy trailer. The cask will remain on the trailer while being filled with a cesium product. When filled, the cask will be loaded on the railroad car. This task will be repeated until all casks on the car are filled.

The TV-camera probe was removed from the 105 tank, 241-TY Tank Farm, for repairs, and replaced when repairs were completed.

The DXT hood in room 38, 231-Z Building, was removed and buried. Due to the dimensions of the burial box, it was necessary to move the hood out of the building for wrapping in plastic before loading in the burial box. Burial was completed in the 200 West dry-waste trench.

A burial was made for the Redox Facility, which included jumpers, pumps, and miscellaneous items. Radiation levels as high as 50 mr/hr were encountered during the burial operation, which was completed on schedule and without incident.

T. S. LaFayette

Manager
Power & General Maintenance

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY 1961

II. ACHIEVEMENTS (Continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design and Development Engineering

Dissolver Backup Filtration

The process design report covering the installation of backup dissolver off-gas filters at Purex was completed. This installation, estimated to cost \$185,000, will provide permanently buried filters in each of the three off-gas lines. These filters, to be packed with 115K fiber-glass media at various densities to 9 lbs/cu. ft., will be 9 feet in diameter, the size of current in-cell units. Inlet and outlet lines to each backup filter will be provided for measuring bed pressure drop and facilities for sampling off-gas up-stream and down-stream of each backup filter. The existing off-gas jet and control systems have sufficient range to cover the increased pressure drop due to the back-up filter units.

b. Project Engineering

CAC-881 - Emergency Water Supply, 241-A Tank Farm

High radiation from work in the 202-A Tank Farm has made it necessary to clear all of the contractor's men for 100 mr. There has been no lost time because of this condition or over-exposure.

The sub-contractor for electrical work has doubled his force in an attempt to complete work by the contract completion date of March 24, 1961. Erection of the Cooling Tower was completed, and the fans were given a one-hour test run by use of a temporary electrical hook-up. Adjustments and corrections are being made. Mechanical work was completed, but setting of controls and ATP's are dependent on completion of electrical work. Piping tie-ins were made to existing facilities.

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c. Manufacturing Engineering

Concentrator Gasket Gauge Ring

Design was completed and drawings issued for tube bundle gasket gauge ring. The design will permit remote installation of gaskets. Redesign of the gasket for improved commercial procurement was also included.

Equipment Burial Containers

Designs were completed and approved on containers for burial of the L-1 Tower and for two concentrator tube bundles (concrete box). Design was issued for comment on a "non-collapsible" jumper box and design was initiated on "beefing up" an existing jumper box to meet current burial criteria.

Aqueous Foam for Equipment Burials

An arrangement for filling burial containers with aqueous foam at the burial trench was designed. The foam and generation equipment (rental) were ordered for the three large boxes stored above ground in the 200-E side-burial trench. The L-1 Tower is also planned to be buried using foam in the box. All of these burials are scheduled for March.

2. Special Separations Processing

a. Process Design and Development Engineering

L-3 Concentrator Demister

Following a routine review of an L-3 de-entrainment section redesign to incorporate titanium, a recommendation was formulated that a 7-inch diameter by 6-inch thick tantalum demister pad be substituted for the two parallel 6-inch diameter Raschig ring-packed sections. The change in material from stainless steel to titanium in the de-entrainment section of the concentrator is warranted from the need to reduce the iron content of the final plutonium product. Also, this change will permit substantial savings in material costs and fabrication. Design and drawings were completed.

b. Project Engineering

CGC-830, Rev. 4, - Plant Modifications for Reprocessing Non-Production Reactor Fuels

The abandonment proposal was transmitted to HOO-AEC on February 28, 1961.

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CGC-913, Rev. 1 - Birch Recovery - Redox

A project proposal revision to request total project authorization in the amount of \$325,000 was transmitted to HOO-AEC on February 28, 1961. A revision to the scope design has been virtually completed. This revision covers an improvement in flowsheet wherein the 10 Column is eliminated from the Birch accumulation and isolation system, and the scrub section of the 1S Column is substituted. This proposed new scheme will provide increased Birch stripping efficiency and greater processing flexibility for the 1S Column. The revision will require 4 new jumpers, but will permit the deletion of 8 jumpers included in the original scope.

3. Finished Products Operation

a. Process Design and Development Engineering

Button Line Improvement Program

A representative of the Bird Machine Company visited HAPC from February 7 through 17 to assist with the correction of mechanical difficulties experienced with the 6-inch continuous centrifuge. The principal modification to the centrifuge was an increase in the clearance between the centrifuge bowl and the outside housing. The optimum performance tests have been started; however, no success in achieving dry solids has yet been attained.

Production testing of the linear polyethylene filter cloth on the vacuum drum filter in Hcod H-9 has continued throughout the month. The polyethylene cloth continues to show a marked improvement over the dynel cloth in its ability to resist the radiation and corrosive environment. The length of time required for the cloth to plug appears to be related to the type of weave. Tests will continue on evaluation of various weave patterns.

Detail designs were completed for a new type calciner off-gas filter. This filter utilizes a wet scrubbing process in which most of the scrubbing is done with off-gas condensate.

GE 311 Computer System

The computer was installed, and diagnostic tests are being made. Program desk debugging is continuing in the absence of a tape loader routine needed for compiling program into 312 language. The tape loader routine is being worked out

by the Computer Department at Phoenix. Arrangements have been made by team members to increase the drum memory from 16,000 to 20,000. This additional memory is necessary to handle the program as it is presently coded. About one month's delay in startup is anticipated.

Fabrication Line Tooling

Final specifications for the 81 model were received during the month. This made it possible to complete all phases of the tooling, gaging, and fixtures needed for the production of this model. Although production experience to date has shown some improvement would be desirable in certain of this equipment, over-all performance has been very satisfactory. Preliminary criteria drawings on the 45 model have been received, and evaluation of these drawings has been started. It is presently assumed that HAPO comments on these drawings will be directed to the design agency through Rocky Flats.

Purchase specifications were prepared during the month for a Lodge & Shipley Floturn machine. This machine will be purchased from FY-1961 funds, and present plans are to install it in the "A" line area for testing and evaluation.

Neutron Counters for Critical Mass Tests

Equipment is being assembled and checked for counting neutron flux levels in a test to redefine the permissible batch limit at certain points on the RMC line.

b. Project Engineering

Job 095 - CGC-811 - Inspection Facility - 234-5 Building

On February 17, this job was closed out. The final cost of the work was \$722,000 versus an authorized \$765,300.

CAC-880, Rev. 2 - Pu Reclamation Facility - Z Plant

Directive No. AEC 172, Modification 3, dated February 17, 1961, authorized the total project in the amount of \$2,900,000. Detail design work was resumed January 31, subsequent to the suspension of the work at the direction of the AEC on January 6, 1961. The continuous dissolver prototype has been tested, and specifications for the dissolver are being prepared. The prototype will be installed in the existing Recuplex facility to replace the D-1 batch dissolver which failed recently.

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c. Manufacturing Engineering

Methods Analysis

Radiation control limits were established by detailed analysis of the films on knockout-and-weigh phases of the fabrication process.

Performance Improvement Program

The first session for the pilot phase of this program was held in Z Plant button line operation. Representatives of all components concerned are combining their efforts toward performance improvements. To implement this program, a 16-minute motion picture has been prepared.

4. General

a. Process Design and Development Engineering

Dissolver Containment - Redox & Purex

An engineering study to define the containment requirements of the Purex and Redox dissolver off-gas systems and to evaluate the containment capabilities of the existing systems with respect to these criteria was completed. Consistent with: 1) containment of the particulate activity within established permissible limits during normal operations; and 2) prevention of gross plant environmental contamination during or after the occurrence of two or less credible events existing alone or in combination, it was recommended that reliable backup filters be installed in each dissolver off-gas line at both plants. The backup filters must be packed with 115K fiberglass media to meet the integrity requirements postulated in the study. If the primary filter units are not packed with 115K media, the backup filters must also be designed for absolute freedom from hazard of impact.

Closed Circuit TV

The closed circuit TV was first used on a diversion box job at 241-A, 200-East. The camera was attached to the gantry crane, and was found to replace the mirror. If lowered into the diversion box, the camera could enable the operator to work even farther from the box than was possible with this method.

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Strontium Carbonate Shipping Cask, HAPO-II

Detail design of the strontium carbonate shipping cask, HAPO-II, was completed. The design analysis and hazards review report was approved by the Hazards and Liability Evaluation Team and transmitted to the Commission for approval of the various governmental agencies. This cask was designed for shipping of 180,000 curies of strontium-90 as the stabilized carbonate salt. Two such casks will be constructed on an expedited schedule to meet shipping demands from the Hot Semiworks during June of this year.

Decalso Insert Cask - HAPO-IA

Detail design work on the modified cerium cask for strontium shipment in a decalso insert, the HAPO-IA, was completed, approved, and the summary design analysis and hazards review report forwarded to the Commission. Fabrication work is already underway to modify the cerium filter cask currently being fabricated in Seattle in accordance with this design for March shipments of purified strontium-90 from the Hanford labs to Oak Ridge.

Cerium Cask - HAPO-I

Two cerium slurry filter casks are now under construction in Seattle. As mentioned above, the first cask is to be diverted to strontium service; the other will remain a cerium cask.

b. Project Engineering

Project Cost Information as of February 19, 1961:

Total authorized funds - 13 active projects	\$7,198,000
Total cost-to-date	5,166,000
Commitments on open work releases	199,000
Unencumbered balance	1,833,000
Costs charged to above projects 1/22/61 to 2/19/61	127,433

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

FEBRUARY, 1961

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology

a. Fission Product Recovery

Although recovery of Sr 90 from high level waste was resumed early in February, the failure of one and then the other centrifuge brought operations to a halt on February 25. Decontamination performance, which had slipped recently, showed marked improvement. More exacting pH control during the lead-sulfate carrier precipitation step increased the Zr-Nb decontamination by a factor of two, while flushing the dual-purpose tank after the oxalate precipitation step and prior to recycle of the strontium oxalate for further processing improved the Ce decontamination factor five fold. When the current recovery was added to previous production, the Sr 90 recovered to date in the Purex Plant totals about 800,000 curies. At month end the equipment was being decontaminated in preparation for Cs 137 recovery activities.

b. Solvent Extraction

During the February operating period which ended in a scheduled shutdown on February 19, solvent extraction decontamination performance was subnormal. The final uranium product gamma ratios generally ranged between 5.0 and 7.0 but were reduced to /2.0 by silica gel treatment. Plutonium ion exchange product ranged between 2.4 and 3.8 x 10⁻¹¹ ZrNb/AT despite higher than normal decontamination in the ion exchange unit. The poor plutonium decontamination was attributed to the high gamma activity of the organic extractant (supplied by the No. 1 Solvent System) in the final plutonium cycle. In addition to the various attempts designed to reduce the gamma activity of the solvent as described below, process changes made to improve the overall decontamination were as follows:

- (1) No significant improvement resulted from increasing the EA Column (co-decontamination column) organic phase uranium saturation thus raising the plutonium effluent loss from 0.1 to 0.2 per cent.

- (2) A threefold improvement in decontamination of the solvent extraction plutonium product (2EF) resulted from increasing the aqueous scrub through the HS and HA Columns 32 per cent, but the improvement after ion exchange processing was only 1.5 fold.
- (3) Increasing the HS Column pulse frequency from 64 to 85 cycles per minute, reduced the gamma activity of the final plutonium cycle feed (2AF) 1.5 - 2.0 fold.

Throughout all the adjustments, no significant effect was noted on the gamma activity of the feed to the 2D Column (2DF) nor the final uranium product.

A decrease in the first cycle stripping column processing capacity, which was noted near the start of the month, has been definitely traced to demineralized water produced by the No. 2 anion unit. The resin in this unit was not replaced in March 1960 when the resin in all other units of the demineralizer was renewed.

c. Neptunium Recovery

Neptunium accumulation in the solvent extraction system was generally satisfactory. Losses via the uranium product were normal, but those via the HA Column waste (HAW) were somewhat erratic and two to three fold above normal during a one week period, probably due to the high organic phase uranium saturation in the HA Column.

At month end a recovery run was in progress to isolate and decontaminate the one kilogram of accumulated neptunium in the system. This inventory represented a 53 per cent recovery of the neptunium added to the solvent extraction system via recycle and virgin feed during the last processing period.

d. Plutonium Concentration

Decontamination performance of the Plutonium Ion Exchange Unit was excellent (~ 20) during the major portion of the month. The fluoride ion concentration in the feed to the unit (XAF) was maintained at 0.01 M with an aluminum to fluoride ratio of two. Sufficient additional aluminum nitrate was added to the XA Column effluent (XAW) prior to further processing to produce an Al/F ratio of five to six.

e. Solvent Treatment

The gamma activity of the No. 1 System solvent gradually increased from 15,000 to 20,000 uc/gal at midmonth and then declined to the 10,000 - 12,000 uc/gal range prior to plant shutdown. The

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improvement coincided with general plant improvement after continued processing rather than from any of the many attempts to improve the quality by flowsheet adjustments:

- (1) Increased change frequency of the aqueous phase and increased aqueous volume for the Turbomixer (TK-G7).
- (2) A potassium permanganate addition rate to the Batch Wash Tank (TK-G1) equivalent three times flowsheet.
- (3) Increased Turbomixer speed and Acid Wash Column (IO) pulse frequency, plus periodic purge of the IO Column interface.
- (4) Single pass of the nitric acid scrub in the IO Column rather than recirculation for a predetermined time interval.

f. Waste Treatment and Acid Recovery

Waste volumes sent to the underground storage tanks averaged 53, 193, 712 and 101 gallons per ton of uranium processed for neutralized high level waste (IWW), IWW after treatment for strontium recovery, solvent washes and cell drainage, respectively. Accelerated washing activities in the solvent treatment system increased the organic wash volume substantially above normal.

The process of warming TK 241-A-106 has been started in preparation for storing high activity waste (IWW) in that tank. Approximately 4400 gallons of neutralized IWW were added to about 400,000 gallons of water in the tank, and the tank contents mixed by operation of the air recirculators. The temperature of the resulting mixture has increased 1 - 2° C per day.

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2. Redox Process Technology - M. R. HARRIS

a. Dissolution

The Mark V multipurpose dissolver was installed and put into service early in the month. Detailed information concerning this dissolver was published in HW-68044, "Mark V Dissolver Information Manual", by H. P. Simonds. Although the new unit does not differ in basic design from the previous multipurpose dissolver, several minor improvements were made which are expected to provide greater safety and improved performance. Some of these are:

1. Four new thermocouples were provided, two to measure the temperature of the fuel metal at opposite high points of the charge in the annulus, one to measure the temperature of the gas leaving the dissolver vessel to enter the tower, and one to measure an additional point in the solution at the bottom of the annulus.
2. Ten 0.187-inch-diameter holes were drilled in the dissolver lid to provide a down flow of air into the upper section and prevent the possible accumulation of stagnant pockets of gas in this space.
3. A second sparge ring was provided, and was installed in the outer annulus just below the dissolver coil. Cladding waste and dissolved metal solutions are cooled to jetting temperatures more rapidly using both spargers.

At present this dissolver is being operated under careful, continuous observation by Redox Technology Operation personnel in an effort to detect and prevent operating difficulties and to develop the optimum routine dissolution procedure. Thus far, the rate has been limited to approximately five tons per day (only about 65 to 70 percent of its expected capacity). This very conservative approach is being taken to provide the greatest possible safety insurance and thus avoid a repetition of the fire of April, 1960, which destroyed the first multipurpose dissolver. (cf. HW-66850, "Redox Dissolver Incident - Comprehensive Report", 9-13-60, Secret.) Performance of the new unit thus far has been highly satisfactory.

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b. Solvent Extraction

A neutron detection instrument was installed on a test basis in the 1B (U-Pu Partition) Column plutonium product stream late in January, 1961, to allow continuous monitoring of the plutonium concentration of this stream. It was hoped that the plutonium concentration could be measured accurately enough to be used to determine the required stream flows for optimum column operation. (Additional benefits would be realized from more positive critical mass control and uniform plutonium concentration of the second plutonium decontamination cycle feed stream.)

The potentially serious problem of interference by aluminum (due to the expected alpha-neutron reaction) did not materialize. Calibration of the instrument was accomplished without difficulty, and the monitor is currently being used successfully to detect and signal incipient plutonium reflux in the partition column. This has permitted prompt, effective regulatory action to correct what appears to be a hitherto unnoticed cyclical reflux phenomenon. Studies were made of the quality of the aqueous and organic influent streams, but investigations to date have failed to provide an explanation for this 1B Column behavior.

A prototype installation was completed which routes the raffinate from the second cycle plutonium decontamination column (2A) directly to the top of the pre-cycle extraction column (HA) as a scrub stream. Routine use of the 2A Column raffinate in this manner as a replacement for virgin salt (scrub) formerly used here, is expected to reduce chemical costs by \$30 and waste storage by \$20 per ton of uranium. Since this stream was previously backcycled and used to provide salt in the first cycle decontamination column (1A), several changes in chemical composition and flow rates of a number of streams were required to re-balance the process. These changes were accomplished without difficulty despite the delicacy of the balance required.

Several incidental benefits were realized from this change -- e.g., more than 90 percent of the iron introduced into the Redox process (via various chemical process streams) is now eliminated to waste storage via the HA Column raffinate. This more direct routing overcomes difficulties caused by complex iron precipitates formed in the course of the previous more complicated backcycle flow pattern.

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c. Plutonium Concentration

The de-entrainment tower (stainless steel packed with stainless steel Raschig rings) of the final plutonium concentrator (L-3) has been identified as the principal source of the metallic impurities in the Redox plutonium nitrate product. The condensate stream normally returning from the tower to the reboiler section (titanium and tantalum), was sampled and found to contain gross amounts of iron, chromium, and nickel. This reflux stream has therefore been diverted to the plutonium recycle tank (L-16) pending the installation of a new L-3 tower to be fabricated of titanium. Since this diversion, the concentration of iron in the final plutonium nitrate solution which formerly ranged from 11,000 to 15,000 parts of iron per million parts of plutonium has dropped to 1500 to 3000 ppm.

d. Essential Materials

A brief review was made of Redox process nitric acid requirements, in the light of an offer made by a potential alternate supplier to furnish 57.5 weight percent HNO_3 solution at a substantial reduction in the current price being paid for 60 percent acid. It was concluded that the lower concentration would be satisfactory. In addition to the acid, this vendor is interested in supplying the aluminum nitrate and dibasic aluminum nitrate used in the Redox process. Since his principal problem at present is in the technology of manufacture of the aluminum nitrate, the fund of knowledge and experience on this subject in the Process Chemistry and Redox Technology Operations is being made available to him. This includes the development work done in 1949 (in the Redox Development Section) on the preparation of acid-deficient aluminum nitrate solutions from hydrated aluminum oxide and nitric acid.

Because of the criticality of the timing and the importance of assuring a satisfactory supply of ANN (aluminum nitrate nonahydrate), a preliminary engineering study was made of the feasibility of preparing the required ANN in the CPD plant facilities on a temporary basis. Tentative findings of this study are: a) it would be feasible in Redox plant aqueous make-up facilities, modified; b) the modifications would require 2 to 3 weeks and \$15,000; c) the cost of ANN so produced would be 60 to 65 percent of that now being purchased from private industry. In addition, further, relatively simple modifications could be made which would also permit the preparation of dibasic aluminum nitrate (DIBAN).

3. Finished Products Technology -

a. Uranium Reduction Operation

1. Concentration and Calcination

The magnetic flowmeter servo-amplifiers were replaced by the vendor (Fischer and Porter) with improved, modernized units. Better flow control has resulted due to the more reliable signal.

The tube bundle of a 60 percent to 100 percent UNH concentrator (ED-6) failed by corrosion of the tube-to-tube sheet welds after approximately eight years of service. The extended life, about four times that expected from original corrosion testing data, is attributed to the low nitric acid content (0.1 pound/gallon) of the feed UNH. The material of construction was 309 SCh stainless steel.

2. Powder Handling

One (X-25-1) of the two parallel hammermills has consistently resulted in a large particle size product during recent months. Replacing the screen, hammers, and deflector plate, and modifying the inlet piping for improved distribution of the feed resulted in no improvement in the product particle size. Increasing the speed of the mill to 6300 rpm from 5700 rpm has resulted in a product essentially similar to that of the No. 2 mill, which continues to operate at 5700 rpm.

b. Metal Finishing Operation

1. Recuplex

The test neutron probe located at the bottom of the slag and crucible dissolver (D-1) has indicated that the dissolution period is essentially complete in one hour. A dissolver heel of 200 grams of plutonium, the point at which a clean-out run is desirable, has resulted in a neutron counter reading of 600 counts per minute. Another month of testing is planned to verify the reliability of the heel values versus neutron count.

Decreased entrainment from the skull dissolvers (Hood 42) into the vent system (E-4) was attempted by changing the vent trap tank to a scrubber. The off-gas leg was extended to the bottom of the tank and the vessel packed

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with half-inch by half-inch Raschig rings. Water is used as the scrub solution. Although the effectiveness of this system has not yet been demonstrated, it is postulated that it will be adequate for both the present operation and for the skull oxidizer planned for this hood.

Oxidation of Pu(III) to Pu(IV) is being accomplished by the continuous addition of nitric acid to the product recycle tank (J-1). Elimination of the sodium nitrite has extended the time between organic-carbonate washes due to lower decomposition rates of the solvent. The increased acidity also prevents polymerization of plutonium during subsequent concentration. Extraction waste losses were not affected.

2. Task I, II, and III

Continued studies of pressure vessel external temperatures have indicated that the furnace with most of the induced heat concentrated at the bottom of the pressure vessel (furnace A) consistently resulted in lower maximum temperatures and had the lowest frequency of "burned" lids. The induction coils on furnaces B and C are being modified to duplicate the geometry of the A furnace.

The oxalic acid magnetic flowmeter (1/10-inch diameter, vitreous enamel lining, with platinum electrodes) has performed maintenance free since installation during October, 1960. The cause of a ten percent drift in calibration, detected during January, 1961, has not been determined. All components of the system have been checked out, indicating the drift to be in the meter itself. No further drift has occurred since recalibration.

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4. Process Chemistry

a. Purex Process Assistance1. Solvent Treatment

Further studies were made on the use of magnesium hydroxide slurries for solvent washing to see if the long disengaging times observed could be shortened with Mistron. The use of 0.02% Mistron reduced the disengaging times between 30% TBP-Shell Spray Base and carbonate, caustic, or $Mg(OH)_2$ - caustic slurries by factors of 10-20. In solvent decontamination tests using $Mg(OH)_2$ - caustic slurries and plant solvent, zirconium-niobium decontamination was lower by about 10-50% when Mistron was used.

In further tests on plant solvent, a recent sample of 1CW was found to respond better to Na_2CO_3 - $KMnO_4$ treatment than to $Mg(OH)_2$. This is the first plant solvent of the dozen or more tested to date where $Mg(OH)_2$ treatment appeared inferior to $KMnO_4$ -carbonate treatment.

2. Co-decontamination Cycle Organic Crud

Recent samples of HAP (organic-phase product from the co-decontamination cycle extraction column) were found to contain large quantities of black particles and a solvent phase which was green in color, rather than the usual yellow. Analysis of the black particles showed the presence of Fe, Mg, Mo, Pb, Si, C, P, U, Pu, and Zr, Nb-95. Further laboratory tests on the particles showed the presence of uranium and plutonium organic compounds which behaved on subsequent tests much like the DBP (dibutyl phosphate) complexes of U and Pu. These organic compounds appeared to be adsorbed on the black particles, rather than as an integral part of them.

b. Neptunium Purification

Sixteen hundred ninety grams of purified neptunium was sent to the Plutonium Metallurgy operation as the oxide for target element fabrication. Waste losses of 0.5 and 0.6 per cent were observed on the two runs made during the month. Six per cent and 0.74 per cent, respectively, of the material was recycled on the two runs.

A comparison was made between the methods used for determining the amount of neptunium loaded out of the Purex plant and the amount received in the ion exchange facility. In the Purex plant, the amount of neptunium sent in the initial load-out and in the acid flushes is determined by coulometric analysis of samples for neptunium with the volume of the load-out solutions determined by weight and specific gravity. In the ion exchange facility, the material loaded out of the Purex plant is composited in the feed make-up tank, a calibrated tank with a sight glass, and sampled. Neptunium is determined by an extraction technique, alpha counting, and

conversion to grams/liter by using an "F" factor of 1.31×10^{-9} . The following table compares the various determinations:

Original amount from Purex	2540g	100%
Amount received in ion exchange	2651	104%
Purex coulometer assay of ion exchange samples	2594	102%
Wt. of powder plus waste and recycle minus recycle from previous runs	2577	101.5%

Back calculating from the weight of final purified powder to the alpha count, an "F" factor of 1.302×10^{-9} was found as opposed to the factor of 1.31×10^{-9} which was used. In view of the over-all measurement techniques used, the above agreements are considered good.

c. Thermobalance Studies of the Chlorination of Plutonium Oxide with Phosgene

A quartz spring automatic recording thermobalance has been set up and placed in use for studying the reaction of phosgene with PuO_2 at elevated temperatures. The thermobalance employs a quartz spring and linear variable differential transformer for measuring weight changes, platinum-rhodium thermocouples for measuring temperature, and a complete recorder system which records both weight changes and temperature. For reactions in a phosgene atmosphere, a quartz chain and quartz reaction boat are used to suspend the sample in the quartz reaction chamber.

Initial findings on the phosgene- PuO_2 reaction show a loss in sample weight of four to six per cent across the cycle, low-fired (300 C) PuO_2 - PuCl_3 -high-fired (> 1000 C) PuO_2 . Four constant temperature chlorinations were run at 425, 450, 475, 500 C. The observed reaction half-times at these temperatures were 36, 14, 15, and 10 minutes, respectively. In the runs above 450 C, greater than 97% chlorination was obtained at the end of three hours. From the observed reaction half-times, a heat of activation of roughly 16-24 Kcal/mole/degree C was obtained.

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5. 234-5 Development

a. Ammonium Bifluoride Fusion Of Plutonium Dioxide

Ammonium bifluoride fusion is a promising means of rapidly solubilizing high-fired plutonium dioxide. A summary report of this work has been issued (HW-68655, Confidential); the Summary And Conclusions follow:

"An ammonium bifluoride fusion process for plutonium recovery from ignited (1000 C) plutonium dioxide has been developed. The fusion mass can be readily taken up in aluminum nitrate solution. Results of these studies show an average plutonium recovery of 95 percent in the final aqueous solution.

"The fusion method has a short time cycle (three hours), utilizes small aqueous solution volumes (one liter ANN per 35 grams of original PuO_2), and the plutonium product solution in aluminum nitrate is suitable for direct blending into the existing Recuplex system. In addition, the only off-gas handling equipment required is a small water scrubber. It is recommended that the method be given further testing in a plant-scale production test.

"The method also has application for plutonium recovery from incinerator ash, and for plutonium metal or skulls which have previously been converted to plutonium dioxide by steam oxidation or controlled burning. Direct fusion of metal or skulls may be possible, but the uncertain reactivity of these materials may make this approach undesirable."

b. Direct Calcination Of Plutonium Nitrate

The low reactivity of plutonium dioxide has prompted a study of variables. Low residence time offers significant improvement in reactivity. Grinding also results in improvement.

A 150-gram batch of plutonium as nitrate was calcined by a single-stage evaporation and denitration. A fine, yellow-green powder was obtained. A sample with 24-hours holdup time at temperature showed 65 percent conversion in a reactivity test. A two-hour holdup time sample showed 85 percent conversion.

Samples of plutonium dioxide from direct calcination in the continuous equipment were ground in a ball mill and then screened. Reactivity tests confirmed the expected improvement, with the following results:

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<u>Particle Size - Microns</u>	<u>Percent Conversion</u>
105 - 250	12
49 - 105	25
<49	71

c. Ion Exchange Recovery Of Plutonium From Process Water Sumps

The absorption of plutonium from sump water was verified in an extended run. The elution behavior was acceptable, although not completely defined.

Samples of the sump waste were adjusted to a pH of 2 and 0.05 M NaHSO_3 . The absorption on Dowex-50W showed less than two percent breakthrough after 500 column volumes at 17.1 ml/min cm^2 . Elution with 1 M NaHSO_4 removed <80 percent of the plutonium in six column volumes. An unknown white precipitate formed in the product solution, but retained no plutonium. It was readily dissolved in nitric acid.

These results apply to the degree that the current contaminated sump is representative of those expected in the future. In this case the plutonium at one milligram per liter concentration was in a soluble ionic form.

d. Studies On The Reduction Of Recuplex Waste Loss

A report, HW-68340, Confidential, with the above title was issued. The work studied ways of treating the solvent and adding more extraction capacity so that waste losses could be reduced an order of magnitude. The Summary And Conclusions follow:

"Greater than 99.5 percent of the plutonium in the CAW was extractable. In three stages, fresh 20% TBP-80% CCl_4 reduced the CAW to less than 0.05 mg/l. The addition of sodium nitrate to the CAW before extraction with fresh organic did not affect the extractability.

"It was shown that 1 M HF (hydrofluoric acid) was more effective as a stripping agent than a ferrous ammonium sulfate - sulfamic acid wash of the organic waste stream. An HF strip reduced the CCW holdup to 0.1 mg/l. Organic which had been HF-stripped was an effective extractant for CAW, giving E_a 's of approximately 10. In two stages, stripped organic reduced the CAW to less than 1.0 mg/l.

"In order to attain the desired waste loss of 0.1 mg/l, it is recommended that (1) a continuous HF strip be made on the CCW stream. This should be followed by a carbonate wash of the organic; and (2) the CAW should be passed continuously through a backup extraction column, providing three additional stages."

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e. Continuous Dissolution Of Slag And Crucible

Continuous dissolution of slag and crucible was demonstrated in a 28-hour run.

The conditions specified in the Plutonium Reclamation Facility - Process Flow Diagram, SK-2-18400, were used in the run. Slag and crucible feed rate was 175 grams per hour. Essentially all the plutonium dissolved at the flow sheet rates. The iodine concentration in the dissolver overflow solution as iodine and iodate was 0.7 g/l and 2.0 g/l respectively. Foam formation during the initial reaction of acid and residue is still a problem. The dissolver overflow solution contained less gelatinous material than previous runs. Further dilution of the acid feed to the dissolver will be tried to eliminate the gelatin formation and dissolver residue heel.

The dissolver solution was adjusted to column feed conditions and contacted with 20% TBP-80% CCl_4 . An E_a^0 of 16 was obtained, accompanied by rapid phase disengaging.

V. R. Cooper

Manager
Research and Engineering

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II. ACHIEVEMENTS (continued)

H. FINANCIAL OPERATION

1. Production Cost

At the urgent request of HOO-AEC budget office, approximately \$300,000 of FY 1961 03 funds allocated to CPD were made available for offsite use. These funds were surplus to CPD needs as a result of shapes rescheduling by Division of Military Applications and late receipt of specifications.

The major budget activity during the month centered about the completion of organization budgets and the securing of subsection and section manager concurrence. Considerable effort was required to finalize local assumptions with regard to charges for PRTR services and Fission Product operating cost provisions.

CPD's investment in inventories at January 31, 1961 compared with budgeted control balances at June 30, 1961 are shown below:

(amounts in thousands)	Balance 1-31-61	Financial Plan 6-30-61	Surplus (Deficit)
<u>Inventories</u>			
Essential Materials	\$ 791	\$ 777	\$(14)
Special Materials	64	83	19
Spare Parts & Standby	<u>1 694</u>	<u>1 846</u>	<u>152</u>
Gross Inventories	<u>2 549</u>	<u>2 706</u>	<u>157</u>
<u>Reserves</u>			
Essential Materials	52	56	(4)
Special Materials	-0-	-0-	-0-
Spare Parts & Standby	<u>416</u>	<u>461</u>	<u>(45)</u>
Total Reserves	<u>468</u>	<u>517</u>	<u>(49)</u>
Net Investment	<u>\$2 081</u>	<u>\$2 189</u>	<u>\$108</u>

At this date, funds appear to be adequate with a surplus amount of slightly over 5% at January 31, 1961. The Essential Material balance is temporarily inflated due to possible strike.

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The Essential Material turnover rate was 3.6 in January and 3.7 FYTD compared to 3.6 in FY 1960. The turnover rate for Spare Parts was .34 in January and .51 FYTD compared to .43 in FY 1960.

2. Singular Cost Studies

A comparison of Savannah River and Hanford chemical separations facilities operating costs was completed and transmitted to HOO-AEC during the month in accordance with their request.

3. General Accounting

As of January 31, 1961, there were thirteen active projects with incurred costs of \$5,075,758 against authorized funds of \$7,198,400. Outstanding commitments totalled \$120,261.

During February, total project funds of \$2,900,000 for Project CAC-880 - Plutonium Reclamation Facility "Z" Plant - were authorized to the AEC. General Electric's portion of this project has not yet been reallocated by the Commission.

Classification of Equipment Work in Progress costs was transferred from Contract and Accounting Operation to CPD Financial Operation with no increase in number of employees.

4. Personnel Accounting

Procedures governing requests and payment of extended illness absences were completed in February and approved by all department managers at HAPO.

In connection with the strike threat, instructions and examples of payment for special shifts worked were developed which are uniform with instructions prepared by other HAPO departments.

5. Auditing

An audit report was issued relating to an examination of CPD Administration of the G.E. Suggestion Plan. The activities audited were satisfactory.

An audit memorandum was issued to section managers relating to Department usage of cleansing tissues.

A summary of AEC Manual Chapters which General Electric Company has agreed to use as guides was issued to section managers.

A review of Routine Delegations of Authority in CPD and other HAPO components was initiated to provide the basis for updating the Department OPG 11.5.

A cursory review was made of controls for safeguarding shop supplies to determine adequacy of procedures. No exceptions were taken to present procedures.

Manager - Finance

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

An analysis of the Department's status regarding exempt manpower trends in the area of promotions, transfers, time in positions, and average age was prepared and presented to section managers.

Consultation was provided in connection with three organization changes during the month. Formal audits of two exempt positions were completed, and they were found to be satisfactory. Details of minor deviations were reported to the appropriate manager.

2. Personnel Placement

An MTP graduate accepted an offer for permanent assignment with the Chemical Processing Department. A former MTP graduate refused the offer extended to him last month.

A meeting was held with the Manager, Manufacturing Training and Administration and the Manufacturing Training Program field representative from Ft. Wayne during the month. Section and sub-section managers who will offer new training assignments in the Department were present at the meeting for an orientation talk on the program and to discuss the new assignments which will be offered. It is planned to increase the number of MTP assignments in the Department from the present two assignments to a total of six. The four additional assignments to be filled by June, 1961, will be for second year trainees.

The Specialist, Personnel Placement, attended a meeting of Training Specialists with the discussion mainly focused on the assistance to be given to Columbia Basin College on developing new curricula for laboratory assistants. In this regard, the Department has received an acceptance from a chemistry teacher at Columbia Basin College, for a summer assignment in the Redox Laboratory. This assignment should enable him to see firsthand the studies needed to prepare people for positions in the Department's analytical laboratories.

3. Wage and Benefits

One employee, an Analyst in Power and General Maintenance, retired this month.

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On February 2 a Chemical Technician - Final Product Assay from Finished Products Operation passed away suddenly due to a heart attack. Completion of salary and benefits matters are awaiting appointment of an administrator for the estate.

An audit of representative semi-technical jobs in Purex, Research and Engineering, Special Separation Processing and Auxiliaries, and Finished Products was completed during the month. The audit was conducted by the Specialists, Wage Administration of Chemical Processing Department and Relations Operation. Job descriptions were reviewed with responsible supervisors and discussed in detail with one or more individuals working on each job audited. A report will be issued by Relations Operation after comparisons are completed. Suggestion Plan activity has improved slightly.

	1960 Average	January	February
Received	38	43	40
Adopted	14	21	22
Awards	\$ 298	\$ 205	\$ 640
Savings	\$ 1866	\$ 338	\$ 4387

4. Health, Safety, and Radiation

Restrictions covering the use of Amercoat were relaxed to the extent that it will be unnecessary to obtain approval from the Safety Specialists before application. Responsibility for safe conduct of painting work is placed primarily with functional management who must see that adequate precautions are taken to prevent ignition.

The operating sections are currently engaged in a review of emergency procedures. Chemical Processing Department OPG 11.2 has been revised for re-issue.

5. Communication

Arrangements were made for the Manager, Relations Operation to hold meetings with groups of 200 and 100 Area management people on February 15 and 17, to discuss the subject of negotiations. The February 15 meeting was the only one conducted.

One of the two PBM-I classes in the Department was completed during the month and the other is scheduled for its last session on March 8. Initial arrangements for a graduation dinner and for graduation certificates have been completed.

RB Britton
Manager, Relations Practices

RB Britton:lj

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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>1-31-61</u>	<u>2-28-61</u>	<u>1-31-61</u>	<u>2-28-61</u>	<u>1-31-61</u>	<u>2-28-61</u>
General Manager's Group	10	10	1	1	11	11
Financial	13	13	13	13	26	26
Relations Practices	5	5	6	6	11	11
Research & Engineering	62	63	27	27	89	90
Facilities Engineering	65	65	22	22	87	87
Power & General Maintenance	42	41	243	241	285	282
Production	5	5	3	3	8	8
Special Separation Processing and Auxiliaries	50	50	214	215	264	265
Purex	53	54	215	215	268	269
Finished Products	<u>53</u>	<u>53</u>	<u>231</u>	<u>230</u>	<u>284</u>	<u>283</u>
Total	<u>358</u>	<u>359</u>	<u>975</u>	<u>973</u>	<u>1 333</u>	<u>1 332</u>

B. PERSONNEL CHANGES

There were no personnel changes during the month of February.

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
V. R. Cooper	GEL Schenectady, N.Y.	Fuel Cell Development (2/14/61)
V. R. Cooper	Manufacturing Services New York, N.Y.	Technological Hazards Review (2/15/61)
<u>To AEC and Other AEC Contractors</u>		
A. E. Barber R. H. Bond R. C. Hollingshead R. E. Smith	Dow Chemical Co. (Rocky Flats Plant) Denver, Colorado	Pu foundry techniques and part inspection (1/31 and 2/1/61)
A. E. Barber R. H. Bond R. C. Hollingshead R. E. Smith	IASL Los Alamos, New Mexico	Pu foundry techniques and Floturn developments (2/2,3/61)
B. F. Judson	AEC-DOP Washington, D.C.	Sr-90 scheduling (2/7/61)
D. E. Braden	Phillips Petroleum Co. Idaho Falls, Idaho	Design data for Project CAC-880 (2/6,7/61)
L. L. McGregor A. E. Smith	Sandia Corporation ACFI, Albuquerque, N.M.	Secondary Standards Laboratory (2/14-16/61)
P. H. Reinker	Dow Chemical Co. (Rocky Flats Plant) Denver, Colorado	Plutonium processing (2/20/61)
P. B. Fisk R. E. VanderCock	Dow Chemical Co. (Rocky Flats Plant) Denver, Colorado	Inspection of weapons (2/27,28/61)
<u>To General Industry</u>		
R. A. Kennedy	Pacific Steel Products Co., Seattle, Wash.	Slurry filter casks (2/14-16/61) (2/22/61) (2/27,28/61)
<u>To Conventions and General Meetings</u>		
L. M. Vik	Stone Park, Ill.	Radiation Instrument Development Lab. training school on 46C channel analyzer (2/27-3/2/61)

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<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
L. J. Battey	New Orleans, La.	AIChE meeting (2/27-3/1/61)
C. R. Anderson	Seattle, Wash.	AMA West coast meeting (2/20-22/61)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From Other G.E. Components</u>		
W. H. Coleman	General Electric Co. Component Products Div. Fort Wayne, Indiana	Manufacturing Training Program (2/16/61)

From AEC and AEC Operational Contractors

R. W. Hughey	AEC-SFO San Francisco, Calif.	Radiation (2/3/61)
D. Sewell Dr. W. J. Ramsey	Lawrence Radiation Lab. Livermore, Calif.	Radiation (2/3/61)

From General Industry

M. F. Slusher J. Greenen	Johnson's Wax Co. Seattle, Wash.	Discuss decontamination chemicals (2/1/61)
B. Olson	West Chemical Co. Seattle, Wash.	Discuss decontamination chemicals (2/8/61)
J. Greenen M. F. Slusher	Johnson's Wax Co. Seattle, Wash.	Discuss decontamination chemicals (2/14/61)
C. Barta	Johnson's Wax Co. Racine, Wisconsin	Discuss decontamination chemicals (2/14/61)
T. H. Lentz	Archer-Daniels-Midland Midland, Michigan	Organic diluents (2/15/61)
Dirk Verhagen	Van Waters and Rogers Seattle, Wash.	Organic diluents (2/15/61)
R. A. Koefflinke	Bird Machinery Co. South Walpole, Mass.	Failure of centrifuge leads (2/15-17/61)
J. S. Heaverlo	Pacific Chemical Co. Seattle, Wash.	Discuss decontamination chemicals (2/21/61)

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<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
P. Berner	Star Machinery Co. Seattle, Wash.	Discuss Operation of Grayco Pump (2/21/61)
J. Mayer D. Hollingsworth	Pennsalt Company Seattle, Wash.	Discuss decontamination chemicals (2/21/61)
Charles A. Larson	Gorton Machine Co. Racine, Wisconsin	Adjusting and testing lathes (2/22-28/61)
<u>From Foreign Government and Agencies</u>		
R. C. Cairns	Australian AEC, Sidney, Australia	Waste disposal (1/31/61)

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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				1						0	0
Serious Accidents										1	1
Medical Treatment											
Injuries	1		7	17	6	5	1		1	38	73
Radiation Occur.			8		7	6		2		23	48
Contam. Wounds			3*							3	7
Pu Depositions						1				1	1
Fires										0	1
Security Violations										0	2

* In all three contamination wounds, the process operators received punctures to the finger while working in hoods. The deposition was insignificant in all cases; however, bioassay samples were taken and results are pending.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-66346 SUP 2 (draft) Secret, "Redox Birch Recovery Scope Design Revision No. 2", dated February 28, 1961, J. R. LaRiviere.
- HW-68159, Secret, "Plutonium Product Specification Analyses", dated January 13, 1961, R. A. Schneider.
- HW-68286, Confidential, "Redox Test Program - January Through June, 1961", dated January 27, 1961, M. K. Harmon.
- HW-68357, Secret, "Revised Requirements for Continuous Birch Recovery at Redox", dated February 2, 1961, R. G. Barnes.
- HW-68367 RD, Secret, "Purex Plant Production Schedule, February, 1961", dated February 3, 1961, D. McDonald.
- HW-68368 RD, Secret, "Redox Plant Production Schedule, February, 1961", dated February 3, 1961, D. McDonald.
- HW-68369 RD, Secret, "UO₃ Plant Production Schedule, February, 1961", dated February 3, 1961, D. McDonald.
- HW-68370 RD, Secret, "234-5 Building Production Schedule, February, 1961", dated February 3, 1961, D. McDonald.
- HW-68376 RD, Secret, "CPD Cost Data for Combined Operations Study", dated February 2, 1961, V. R. Chapman.
- HW-68683, Unclassified, "Fission Product Shipping Cask Hazards and Liability Team Report, Decalso Insert for Cerium Cask", dated February 3, 1961, H. P. Shaw, Chairman of Evaluation Team.
- HW-68392, Secret, "Control of I-131 Releases to Atmosphere, dated February 6, 1961", J. H. Warren.
- HW-68422, Secret, "Essential Materials Consumption, Purex, CPD, for January, 1961", dated February 8, 1961, J. E. Lentz.
- HW-68451, Unclassified, "Dissolver Off-Gas Systems, Separations Plant Containment Studies", dated February 10, 1961, S. R. Bierman.
- HW-68473, Secret Film, "Button Line Operating Sequence", dated February 1, 1961, C. M. Thomas.

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IIW-68514, Unclassified, "Secondary Containment, Dissolver Off-Gas, Design Criteria for Purex Facilities", dated February 15, 1961, S. R. Bierman.

IIW-68530 RD, "Trip Report, Rocky Flats Plant and Los Alamos Scientific Laboratory, January 31 - February 3, 1961", dated February 15, 1961, R. H. Bond.

IIW-68538, Secret, "Scheduled Shutdown - Purex and Recuplex Plants", dated February 16, 1961, J. H. Warren.

IIW-68553, Secret, "Trip Report, Los Alamos Scientific Laboratory, DP West Site", dated February 17, 1961, R. E. Smith.

IIW-68578, Secret, "Hand Exposure for Routine Button Knockout, Sampling, Weighing on New 'C' Line, 234-5 Building", dated February, 1961.

IIW-68606, Unclassified, "Performance Criteria - Hanford Waste Tank Interior Inspection Equipment", dated February 23, 1961, H. W. Stivers.

B. PREPARED FOR SIGNATURE AND ISSUANCE

IIW-68344, Secret, "Production, January 1961", dated February 1, 1961, W. E. Johnson.

IIW-68615, Secret, "Weapon Grade Plutonium Pu 240 Content", dated February 27, 1961, 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

P. H. Reinker

General Manager
Chemical Processing Department

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