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HW

70588

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

HW--70588

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JULY, 1961

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OPERATION MANAGERS

August 21, 1961

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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

JULY, 1961

I. SUMMARY

July production, as compared with the June 28, 1961 HAP0 Production Forecast (HW-69958), is summarized below:

	<u>Percent of Forecast Achieved</u>	
	<u>July</u>	<u>Fiscal Year To-Date</u>
Separated plutonium nitrate	98.2	98.2
Separated uranium nitrate	101.4	101.4
Uranium oxide	99.9	99.9
Plutonium metal buttons	105.3	105.3
Fabricated parts	103.4	103.4

The production of plutonium nitrate was slightly below that forecasted for July, primarily because of temporary startup difficulties at the Purex plant following the scheduled shutdown for neptunium recovery and maintenance repairs. Forecasted production was achieved or exceeded for all other products.

The neptunium campaign at Purex yielded 1.7 Kgs., representing a recovery of about 85 percent of the inventory which had accumulated in the solvent extraction system.

HAP0 Cask I-A, loaded with 13.4 kilocuries of strontium-90, and slurry filter cask HAP0 II-1, loaded with 120 kilocuries of strontium-90 as strontium carbonate, were delivered to the AEC during July for shipment to Oak Ridge National Laboratory.

Following caustic-tartrate flushes through the deentrainment tower of the Purex No. 1 waste concentrator, the pressure drop returned to normal. The No. 2 waste concentrator, which re-evaporates condensate from the No. 1 unit for additional decontamination, now appears to be similarly limited at 75 percent of capacity. This restriction was probably building up over a period of time but was previously masked by the performance of the No. 1 concentrator.

Further operations with the Redox Mark V E-metal dissolver established a record dissolution rate of 6.85 tons per day, sustained for a one week period. A dissolver clean-out following this run revealed that the calculated heel was essentially correct (within 0.6 percent of total metal dissolved). Current Redox production requirements are being met with this one dissolver.

Recuplex capacity was increased during July. A sixty percent dissolution capacity increase resulted from the elimination of metallic plutonium from its

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feed by the controlled burning of plutonium skulls. A two-fold solvent extraction capacity increase resulted from a more concentrated plutonium flowsheet.

The following work was authorized by AEC Directives received during July:

\$1,380,000 new construction funds for "Fission Product Concentrates Storage - 200-E Area," Project CGC-897.

\$195,000 for engineering and construction of the Redox portion of "Secondary Containment of Dissolver Off-Gases, Redox and Purex," Project CGC-930.

\$495,000 additional funds for completion of work previously authorized and for new scope items, "Additional Plutonium Fabrication Facilities, 234-5 Building," Project CGC-811.

Project CGC-813, "Plutonium Recovery From Contaminated Material, 234-5 Building," was completed on July 31, 1961. Preliminary test runs were satisfactory; however, further testing will be required to establish firm process criteria.

P. H. Rinker

General Manager
Chemical Processing Department

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

AUGUST 1961

II. ACHIEVEMENTS

A. Production Statistics

July

Fiscal Year
to Date

a. Percent of Forecast(1) Achieved

Separated plutonium nitrate	98.2	98.2
Separated uranium nitrate	101.4	101.4
Uranium oxide	99.9	99.9
Plutonium metal buttons	105.3	105.3
Fabricated parts	103.4	103.4

b. Purex

July

June

Uranium nitrate produced (tons)	480.18	580.36
Average production rate during operation (T/D)	25.3	25.3
Total waste loss (%)		
Plutonium	0.38	0.35
Uranium	0.11	0.10
On-line efficiency (%)	72.3	91.0

c. Redox

Uranium nitrate produced (tons)	127.9	181.24
Average production rate during operation (T/D)	9.2	8.9
Total waste loss (%)		
Plutonium	0.21	0.19
Uranium	0.17	0.13
On-line efficiency	66.0	90.4

d. Uranium Reduction (tons)

Normal UO ₃ loaded	504.7	701.8
Enriched UO ₃ loaded	96.7	136.0
Normal UO ₃ approved for shipment	398.98	706.20
Enriched UO ₃ approved for shipment	96.74	143.02
Normal UO ₃ shipped	449.59	657.07
Enriched UO ₃ shipped	49.29	93.32
Normal UNH backlog	264	258
Enriched UNH backlog	127	109

(1) HW-69958, HAPO PRODUCTION FORECAST, dated 6-28-61

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CHEMICAL PROCESSING DEPARTMENT
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AUGUST 1961

e. Plutonium Metal Processing

	<u>July</u>	<u>June</u>
Input to Task I (batches)	259	260
Reduction yield	99.3	99.05
Product recovery output (Kgs)	119.36	70.38
Product recovery backlog (Kgs)	510.6	496.1
Waste disposal (grams)	902	621

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	9 927	4 700
Filtered water pumped (gpm)	1 218	971
Maximum steam generated (lbs./hr.)	228 000	98 000
Average steam generated (lbs./hr.)	149 319	61 356
Total steam generated (M lbs.)	107 900	45 649
Coal consumed (est. tons)	5 726	2 387

The production of plutonium nitrate was slightly below that forecasted for July, primarily because of temporary startup difficulties at the Purex plant following the scheduled shutdown for neptunium recovery and maintenance repairs. Forecasted production was achieved or exceeded for all other products.

J. L. Warner
Manager - Production

CHEMICAL PROCESSING DEPARTMENT
PUREX OPERATION

July, 1961

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Operating rates ranged from 3.0 to 3.4 CF. The production schedule was met. Continuity of operation was interrupted three times for a total of eleven days downtime.

2. Processing Operation

Processing of the Birch run, started last month, was completed on July 4 with recovery of about 85 percent of the material accumulated.

Following completion of scheduled maintenance, normal processing was resumed on July 11. An eight-hour shutdown was experienced on July 15 when the J-5 plutonium cycle feed pump failed. The process was interrupted momentarily on July 23 due to an electrical storm.

Startup difficulties and the power outage resulted in segregation of five batches of uranium high in gamma and plutonium, and two batches of plutonium. The uranium was recycled for 30 hours and plutonium was diverted to the L Cell concentration package twice.

Eighteen cans of previously accumulated plutonium were successfully reworked through the N Cell ion exchange unit.

Uranium and plutonium waste losses were normal.

Performance of the new 2-D uranium cycle extraction column improved; two floods caused temporary high gamma activity.

Rates were reduced to 3.0 CF on July 24 when A Cell silver reactor T-A2 plugged; flushing and regeneration were started.

Chemical flushes of F-11 acid waste concentrator removed restrictions in the tower section, which limited concentrator capacity during the previous run period.

HAPO Cask I-A, loaded with 13.4 kilocuries of Sr-90 in the 300 Area, was pressure tested and placed in the buffer for shipment to ORNL. HAPO Cask II-1, loaded with 120 kilocuries of Sr-90 at Hot Semiworks, was repaired, cleaned, pressure tested and placed in the buffer for shipment to ORNL. Aged strontium feed was transferred from 002 tank to Hot Semiworks; two oxalate product runs were transferred from 202-A Building to 002 tank in CR vault.

3. Mechanical Experience

The 2D uranium cycle extraction column, suspected of plastic plate failure, was removed and stored. The replacement 2D column contains stainless steel scrub plates which are remotely replaceable.

A leaking west tube bundle of the J-8 uranium concentrator was replaced with a reclaimed spare tube bundle. A leaking west tube bundle of the F-6 acid waste concentrator was replaced with a spare tube bundle. The leaking steam trap and condensate jumper assembly servicing F-6 in outside Trap Pit #2 was also replaced.

The J-5 pump failed from mechanical seizure and was replaced with a reconditioned spare. F-10 backcycle pump was replaced for preventive maintenance reasons.

Four vessels and several jumpers were installed in F Cell in preparation for denitration of IWW waste by formaldehyde treatment.

4. Radiation Experience

The total radio-iodine 131 emission was 13 curies; daily average 0.4 curies; maximum seven-day emission 4.2 curies.

One radiation incident, five radiation occurrences, 15 skin contaminations, and eight contaminated personal effects were reported. The radiation incident involved a localized overexposure of 5 rads per second to one square centimeter of an employee's forefinger during sampling.

5. Analytical Experience

The beta proportional counters were recalibrated for strontium, using an ORNL standard. Purex values were increased 20 percent and HLO values were increased 10 percent, thus resolving variance between laboratory strontium recovery values.

Plutonium rework was analyzed by spectrophotometer to determine valence state concentrations. Good correlation was shown between high Pu^{VI} material and high N Cell ion exchange waste losses. Extensive valence state studies were made with Critical Mass Laboratory samples to determine a Pu^{VI} to Pu^{IV} disproportionation rate.

AJ Waligura
Acting Manager, Purex

AJ Waligura:BEC:gt

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

Processing operations were conducted as scheduled until July 24, at which time the Redox Plant was shutdown for planned equipment changes. During the outage the top stainless steel section of the final plutonium concentrator was replaced with one of titanium. This is expected to eliminate the main source of iron contamination which has been troublesome in the Redox product. Separation of plutonium is expected to be resumed about August 1, 1961.

2. Processing Operations

Except for the normal week-end shutdowns, E-metal processing was continuous until the planned outage on July 24. The good processing performance realized during June continued through July. All production was well within shipping specifications and waste losses continued at a low level. The mechanical efficiency during the production run was 100 percent, there being no malfunctioning or failure of equipment that interfered with scheduled processing.

The failure of a rotometer to respond properly resulted in the flooding of the L-3 product concentrator in the 233-S Concentration Building. As a result, plutonium solution drained to the greenhouse sump and floor. There was no approach to criticality, but considerable inconvenience was encountered in recovering the material for reprocessing.

The silver nitrate reactor on the multipurpose dissolver was regenerated on 7-25-61 as a precautionary measure against excessive I-131 emissions. A total of 659 tons of uranium metal had been processed through the dissolver since the silver reactor was last regenerated.

The recurring difficulties in securing good steam trap operation on the new G-3 organic still have been eliminated to a large extent by replacement of the Yarway steam trap with a diaphragm operated control valve (DOV). Experience to date with the new valve has significantly improved operating control and stability.

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Piping changes were completed this month which provide direct routing of the plutonium nitrate solution from the third plutonium decontamination cycle sampler tank (E-3) in the 202-S Canyon Building to the plutonium stripper-concentrator (L-2) in the 233-S Concentration Building. The non-critically safe stripper concentrator feed tank (L-1) has now been removed from service. With this change, all plutonium processing in the 233-S Concentration Building will be in equipment of favorable geometry.

Piping modifications were completed in the 293-S Acid Recovery and Iodine Removal Facility which allow the off-gas from the multipurpose dissolver (Mark V) to by-pass the acid absorber and scrubber during the uranium metal charging and coating removal operation. This change will minimize the problem of ammonium nitrate build-up in the absorber tower and also allow the use of the scrubber as a back-up acid absorber. More efficient acid recovery should result.

The E-13 uranium ozonator condenser tower was removed and replaced with a flange and straight-line jumper on 7-28-61. Use of the tower as a condenser had previously been discontinued to prevent refluxing of condensate into the ozonator.

3. Mechanical Experience

The major maintenance item completed during the Redox Plant shutdown at month-end was the replacement of the two-branched de-entrainment tower (stainless steel packed with stainless steel Raschig rings) of the final plutonium concentrator (L-3) in the 233-S Concentration Building. Although the contamination potential was exceedingly great, the installation was completed on 7-31-61 with good radiation control being maintained throughout. The replacement unit is a single tower made of titanium and containing a six inch tantalum wire mesh demister. It is expected that the new installation will eliminate the iron contamination problem in the final plutonium product.

The D-14 backcycle concentrator reboiler tube bundle was replaced with a helical type reboiler on 7-25-61. The helical type bundle is expected to give longer service life and possibly better steam consumption efficiency than the old tube chest bayonet type. A 50 percent reduction in equipment cost will also be realized.

In conjunction with the piping modifications made this month to by-pass the non-critically safe stripper-concentrator feed tank (L-1) in the 233-S Concentration Building, a new two-stage pump, which functions both as a pump and an agitator, was installed in the E-3 plutonium sampler tank. Tank agitation is provided by liquid discharged horizontally through four holes drilled through the bowl of the lower stage. Since the cost of the pump agitator is essentially the same as a regular pump, consideration is being given to similar installations at other locations.

The three-quarter inch black iron inert gas header in the 202-S Building silo sample gallery was replaced on 7-24-61 with a one inch stainless steel line. The replacement was made because severe corrosion in the black iron header was restricting the gas flow.

The agitator in the 3D column feed tank failed due to a seized shaft and was replaced on 7-21-61. The failed agitator had been in operation for approximately 18,440 hours since it was originally installed on 2-16-57.

A major accomplishment in canyon jumper activity was completed this month with the successful installation of the final uranium product gamma monitor. Three previous attempts to install the monitor jumper were unsuccessful. The size and shape of the jumper, plus the number of canyon cell jumpers which had to be removed and replaced during the installation, made the job extremely difficult and time consuming. The new instrument is expected to provide rapid, accurate measurements of process variables for quick presentation and subsequent correction.

4. Waste Handling and Decontamination

A shipment of twenty (20) fifty five gallon drums containing 2,225 lbs. of depleted uranium waste was received and buried on 6-27-61. Approximately 1,150 lbs. of this material was from the Oregon Metallurgical Corporation, Albany, Oregon and the remaining 1,075 lbs. from local HAPO projects.

Equipment valued at approximately \$20,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at \$9,300 was returned to customers. A savings of approximately \$6,500 over the cost of new replacement equipment was realized through the equipment decontamination program during the month.

A total of 227 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>
Gondola Car No. 4606 (repaired coverage)	Transportation
Tank Car No. SCCX-1467	Purex
Flat Car No. 3622	Purex
Trucks No. 1C-209 & 1C-202	Purex
Tractor HO-75-2798	Purex
Trucks No. 1D-2398, 1D-436 & 1C-3969	P&GM
Regulated Motor Crane	P&GM
Power Wagons No. 1H-4496 & 1H-4179	HLO

5. Radiation Experience

Twelve skin contamination cases were recorded during the month. Maximum radiation levels were 40,000 d/m alpha and 40,000 c/m beta-gamma. All skin contamination was reduced to non-detectable.

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Two of the five radiation occurrences recorded during the month were significant. One involved product contamination to 40,000 d/m on the upper left arm of a pipefitter while replacing the de-entrainment tower on the final product concentrator (L-3) in the 233-S Concentration Building. This happened when the arm pit of a plastic man ruptured and allowed product contamination to penetrate the perspiration-soaked coveralls of the employee. Decontamination of the individual was difficult, but successful.

The other significant radiation occurrence involved a spread of fission product contamination in the 241-SX Tank Farm and adjacent road area. This happened during the removal of the failed pump in the 109-SX waste tank and subsequent transfer to the burial grounds. In cleaning up the grossly contaminated paper around the 109-SX pump pit, contamination to 5 rads/hr, including 3 r/hr at three feet, was spread over a 10 x 20 foot area, and three process operators were contaminated to 40,000 c/m. Spot contamination to 40 mr/hr was also detected on the roadway north of the SX Tank Farm. The area was immediately cleaned up and subsequent checks have revealed no additional contamination. Personnel contamination was readily reduced to non-detectable.

6. Analytical Experience

The SSP&AO Analytical portion of a cooperative program with the Process Chemistry group to obtain an accurate Np 237/T versus MWD/T for current E-metal was completed this month. This program was started several months ago and involved numerous analyses of pig samples of dissolver material plus purification of 500 milligrams of uranium from these samples for submission to HLO for mass spectrographic analyses for U²³⁵ content.

A pipet washing apparatus designed by Process Chemistry, Research and Engineering Operation, was fabricated and installed in the high level sampling facility in the 222-S Analytical Laboratory. It consists of reservoirs for water, nitric acid, and alcohol with solenoid valve controlled outlet flow. The solenoid valves are controlled by a series of switches on a foot-operated control plate. The liquids flow into a common header which is moved as needed inside the cave by a remote control handle. The apparatus can also be used to add reagents, if desired. This replaces the polyethylene squirt bottles with long glass tubing and the attendant hazards from contamination spread and broken glass.

Cell holders for uranium and plutonium x-ray photometer cells were modified by machining out the steel and replacing with teflon linings. Chipping of the fragile and relatively expensive glass cells should be eliminated and less calibration work will be required.

Chas. S. Brown

Manager - Special Separation
Processing and Auxiliaries

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

3. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Approximately fifty percent of the fabrication output was directed to development work related to the dimensional stability problems. Production of parts was limited because of feed shortages resulting from the scheduled outage of the Purex plant. The production of unfabricated plutonium was limited also early in the month by the Purex outage, but excellent operation of the button line during the latter part of the month permitted schedules to be met. Recovery operations were slowed during the first half of the month because of mechanical and rework problems, but a combination of satisfactory operation and rich feed (from dissolved metal) resulted in the schedule being exceeded by sixteen percent. Production of uranium oxide was normal following the annual vacation outage which ended July 10.

2. Processing Operations

a. Plutonium Fabrication

Information on plutonium fabrication is presented in Document HW-70691 entitled "Chemical Processing Department, Finished Products Operation, Z Plant Monthly Report, July, 1961," classified "Secret, Atomic Weapon Data, Production Rate and Stockpile Quantity Information."

b. Plutonium Processing

Production of unfabricated plutonium was satisfactory during the month. Startup following the primary plant outage was delayed but subsequent operation was excellent, and the schedule was exceeded by six percent. The only significant difficulty experienced during the month involved the attempt to blend off feed containing higher-than-normal gamma activity. This resulted in high radiation levels on the canned product, high exposure to personnel on the Button Line, and very high exposure levels at the supernate processing equipment pieces in the Recovery Operation.

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b. Plutonium Processing (Continued)

Recovery output was extremely low during the early part of July when leakage to the hood floors resulted in time-consuming repair and rework activities. During the latter part of the month equipment performance was satisfactory, and the processing of rich feed (from the dissolved metal originally intended for treatment in the Purex ion exchange unit) resulted in a significant increase in output. The continuing problems associated with hood floor wastes have resulted in priority being given to the installation of an HF scrub column in the solvent extraction hood to aid in the processing of this material. As a result of this shift in priority, the continuous slag and crucible dissolver which was installed in June has not been placed in service.

c. Uranium Reduction

Operation of the Uranium Reduction Plant, following the annual vacation outage which ended July 10, was normal and feed supplies were adequate. Schedules and commitments were met without difficulty.

3. Mechanical Performance

Plutonium preparation, plutonium fabrication, and uranium reduction equipment all performed satisfactorily this month, requiring only routine maintenance and minor repairs.

Plutonium recovery equipment continues to require excessive maintenance, but an improvement in reliability was noted during the latter half of the month, especially in the "A" (concentrated) feed system. Some planned overtime for valve repairs resulted in improved continuity of operation.

Minor Construction forces are in the process of installing the HF scrub column in the solvent extraction hood at month end.

4. Radiation Experience

Radiation and contamination control statistics indicate satisfactory control of radiation occurrences but the number of personnel contamination cases increased during the month.

One employee received a contaminated minor injury which was successfully excised. Deposition was less than ten percent of the maximum permissible.

One radiation occurrence was investigated as a Class C incident. It involved a gasket failure in the equipment in Hood 26 during the melting of plutonium chips. Air-borne contamination resulted and one employee experienced contamination which was removed by irrigation.

5. Analytical Experience

	<u>June</u>	<u>July</u>
Number of Samples Received	1,739	2,044
Number of Determinations	16,180	16,903
Total Metallic Impurities, Buttons	900 ppm	513 ppm
Total Carbon Content, Buttons	370 ppm	500 ppm
Buttons Rejected	0.0 %	3.0 %

W. J. Garton
 Manager,
 Finished Products

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II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

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

2. Inspection, Maintenance and Repair

A final uranium cycle decontamination column (K-2), containing a stainless steel cartridge of recent design, was delivered to the Purex Facility following mockup in the 200-East Area shop. The new vessel was required to replace an existing unit containing a malfunctioning plastic cartridge. The replaced K-2 column will be equipped with a new stainless steel cartridge and held in stand-by status.

The HAPO-1A cask, used for strontium shipments to Oak Ridge, required repairs and minor design changes upon arrival from its second road trip. Inspection disclosed the tie rods on the buffers were badly worn at point of contact. A tie-rod support of different design was installed to prevent recurrence. Similar corrective measures were taken on the HAPO-II cask, which is being made ready for its first road trip.

Dampers #1 and #2 on the X29 powder-handling system at the Uranium Reduction Facility (224-UA) were replaced with units of a modified design to prevent powder buildup in the dampers. The work was accomplished during the vacation outage at the UO₃ Plant.

An exhaust-filter assembly was installed in the Plutonium Ion Exchange Facility (N-Cell) at the Purex Plant. The purpose of the new installation is to serve as a backup filter to prevent a spread of Pu to the outside environs in case of a breach of the N-Cell hood.

In progress at month's end was the installation of three completely new Gilmont-type sampler stations at the Purex Facility, as a part of the Palm Project (CGC-821). Work currently in progress consists of site preparation, forming for concrete, fabrication of lead-filled shielding panels and the Gilmont-type sampler equipment.

Concentrated effort to improve the vacuum to the hood that houses the plutonium foil-rolling mill in Cell #2 of the 231-Z Facility met with success. A satisfactory vacuum of 50 microns was obtained.

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A leaking steam trap, which had caused considerable spread of contamination throughout the Purex area, was removed from service and buried, on an emergency basis. Exposure rates exceeded 300 mr/hr at the rim of the trap pit, thus creating considerable difficulty in staffing the job. Exposure time of General Maintenance personnel was used to allowable limits, necessitating the use of workmen from other HAPO components in completing the job. Aluminum asphalt paint, in the amount of 450 gallons, was applied to the roof of the main production building (202-A) to secure the spread of contamination. The incident occurred during a recent shutdown of the Purex Facility and while a routine maintenance inspection was in progress.

Approximately three tons of contaminated malfunctioning equipment was removed from the Purex canyon and buried in the conventional manner. The burial box used on this occasion was left over from a 1958 program and required extensive modifications to meet present-day requirements for safety and stability. Injected into the box, to a depth of four feet, was a heavy foam for containing contamination particles. The burial was completed without incident.

Extensive repairs were made to the No. 4 boiler in 200-East Area Power House. Included was the replacement of all front water-wall connector tubes. It was necessary that the overall length of the replacement tubes exceed that of the original tubes by one inch, to compensate for a fixed contraction of the front water-wall header. The unit has been returned to service and is performing satisfactorily at this time.

Progressing satisfactorily at month's end was the fabrication of three specially designed Heliarc welding torches for use in replating tubes in HAPO reactors. These are gear-driven, motorized units, designed to remotely perform a continuous 360° weld around the outer perimeter of the tube.

Fourteen metal steam-line support poles and hangers were fabricated and installed as replacements for existing wooden poles which were showing evidence of dry-rot.

A container of new design was installed on the 283-ton extrusion press in Hanford Laboratories Operation's 231-Z Facility. The new container is designed to accommodate different size dies and liners, whereas the original unit necessitated a change of containers with each die-and-liner change.

The outgassing furnace and vacuum system, used in connection with fuel-element testing in Hanford Lab's 231-Z Facility, was reactivated. The work included installation of instrumentation necessary for vacuum measurements and furnace temperature control.

There were 22 cell-pipe connectors fabricated during the month, of which four were required on an emergency basis. Of the total number fabricated, twelve were required for the production facilities and the remainder were for the Palm Project.

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Services rendered other departments included conducting acceptance tests on new ventilation units in the 190-KE and KW Buildings, and final air balance of the 105-C Building for the Irradiation Processing Department.

By mutual agreement, an uncompleted contract with a Seattle consulting firm, for photographic inspection of the export raw-water lines, was permitted to expire. In keeping with performance and payment stipulations, no costs will accrue to GE or AEC under the contract.

Manager
Power & General Maintenance

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design and Development Engineering

Concentrator Condensate Disposal

A process design study was completed and recommendations were made covering the installation of remotely-operated valves in the Purex concentrator cells for disposal of steam condensate. These diaphragm-operated valves, to be jumper-mounted on condensate discharge lines between individual tube bundles and the trench wall, have the inherent ability to pass steam condensate and reject steam, to eliminate cyclic effects common to trap operation, and to improve reliability of the condensate disposal system. The pipe arrangement in the trap pits with the traps and valves will be removed from service, and a simple pipe connection made for disposal of condensate through the trap pits. Detail design work is now underway in preparation for the physical changes at the plant.

Alpha Energy Analyzer

Fabrication has been completed of a laboratory model alpha detector and preamplifier for use with the Purex multi-channel energy analyzer. The detector is a silicon semiconductor, and it will be evaluated as a potential improvement over the Frisch-grid ion chamber currently used. A similar unit is also being readied for use in Redox.

b. Project Engineering

CGC-821, Project Palm - Purex

Nine bids on the fixed-price construction of purification facilities were received. They ranged from \$270,500 to \$366,000, compared to a fair cost estimate of \$280,000. The financial status of the project is being reviewed before awarding this contract.

CGC-897, Rev. 1 - Fission Product Concentrates Storage System - 200-East Area

On July 12, 1961, Directive No. 513, Modification 2, authorized \$1,380,000 new construction funds and the transfer of capital property worth \$20,000. CE&UC [REDACTED] started detail design work.

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CAC-925, Purex 216 Crib Replacement

The contract for construction of the crib was awarded on June 30, 1961. Excavation for the crib was completed July 25, and gravel backfilling was started July 26.

c. Manufacturing Engineering

Equipment Burial Container Design

Design was completed and issued for comments on an off-gas filter burial box and on K-2 Tower storage box. Design was initiated on a dissolver burial box.

Sealing of Trap Pit Cover Blocks

Test applications were made of 14 materials for use in sealing the cover block joints on the Purex trap pits. Cost comparisons are being made to aid in selection of the sealing method.

Diversion Box Jumper

Design and working drawings have been completed for a jumper in the 151-A diversion box. This jumper will provide a pressure spray to the floor drain both to clean it and to reduce radiation levels.

2. Special Separations Processing

a. Process Design and Development Engineering

In-Line Pu Monitor

Design information has been completed for installation of in-line neutron monitors on the feed line to the ion exchange column and on the product line in the new ion exchange facility in Building 233-S. Operation of the three monitors, 1BP, 2BP, and 3BP, in test at 202-S has been satisfactory the past month. The 3BP monitor will be taken out with the changeover to the ion exchange facility.

Concentrators

Two jumpers comprising installation of a diaphragm-operated valve on the west tube bundle, bayonet type, of G3 were installed as a replacement for the Yarway steam trap previously used in that service. Preliminary tests reflecting only about a week's operation showed possible improvement in the capacity of the tube bundle. Further tests are planned, with the heat load to be alternated between the east and west bundles to compare performance with a steam trap on one side and a diaphragm-operated valve on the other.

b. Project Engineering

CGC-913, Project Birch - Redox

Detail design was 99 percent complete July 31, with all drawings having been issued for comment and three drawings remaining to be approved.

CGC-930, Secondary Containment of Dissolver Off-Gases - Redox & Purex

On June 30, 1961, Directive No. 527 authorized \$195,000 of the \$400,000 requested. This is an interim authorization for the engineering and construction of the Redox portion.

c. Manufacturing Engineering

E-13 Coil

A prototype coil for E-13 ozonator vessel was fabricated and tested. Tests indicate that control of expansion had been accomplished, but some stiffening of supports was necessary. The coil is being modified to meet these requirements.

3. Finished Products Operation

a. Process Design and Development Engineering

Calciner and Scrubber Segregation Facilities

Process design work was completed, and the summary scope design report covering the 3-3 calciner split at the UO₃ Plant was transmitted to management for approval. The recommended system provides additional segregation facilities for E-Metal and NPR uranium at the UO₃ Plant.

Contamination Confinement

Further refinements have been made in the double sleeve flange sealing technique to improve both efficiency and insurance against potential leaks during removal of plutonium-contaminated equipment. Total time for removal and replacement of conventional equipment is now approaching two hours. Replacement runs using cold water alone have been repeated without incident. The system is being prepared for runs with fluorescent powders, hot water, and eventually simulated process solutions including organic solvents.

Continuous Dissolver and Fusion Hood Design

Tracings are being revised to include comments. Material and equipment lists were prepared. Design has been completed and the equipment procured for the vertical bank which will replace one of the existing horizontal column feed tanks.

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Processing Off-Site Pu Scrap

Study engineering flow sketches, equipment arrangement drawings, and project cost estimates have been completed for two alternate types of facilities to process off-site scrap: (1) a high-capacity fully-instrumented facility and (2) a low capacity manually-operated facility; project cost estimates are \$640,000 and \$250,000, respectively. An engineering report of this study is now being prepared.

RMC Fabrication Line

A drawing of the mold for the new shape, was completed, approved and issued during the month. Several design modifications were made on the mold stack for the HC-27 Ingotting Hood. The two furnaces, vacuum pumps, and induction heating equipment for this hood are being installed.

Gorton Lathes

Two machines were readied for operation, incorporating the so-called "quick-fixes" known to date to help achieve acceptable operation. Engineering work is continuing on a machine to trace out possible ground loops, to improve signals, and to obtain additional test information.

b. Project Engineering

CGC-811, Rev. 4 - Additional Plutonium Fabrication Facilities -
234-5 Building

On July 19, 1961, Directive No. 475, Modification 3, authorized the additional \$495,000 for completion of work previously authorized and for several new scope items.

CGC-813, Pu Recovery from Contaminated Materials, 234-5 Building

The facilities on the project were accepted and the project was completed on July 31, 1961. During the past two months, test runs of the facility have indicated its potential capability to perform satisfactorily. However, full capacity demonstration runs are yet to be performed. Further startup tests are required to establish firm process criteria.

CAC-880, Pu Reclamation Facility - Z Plant

The invitation for bids for fixed-price contract for the Phase I construction was issued by the Commission July 25, 1961. This bid invitation also included the Phase II work for Project CGC-912.

4. General

a. Process Design and Development Engineering

Fission Product Recovery

Information was developed on the feasibility of routing aged B Plant fission product concentrates to Semiworks during Phase I operation for purification and loadout. The transfer could be made by reversing the direction of flow in the line intended for routing Purex concentrates to B Plant. Only two new jumpers are needed for the routing to Semiworks. A report has been drafted on the hazards of operating Phase I equipment in B Plant under the Fission Product Program.

Fission Product Shipping

Following loading and stabilization of the HAPO-II-1 Cask at the Hot Semiworks, failure of the vent valve necessitated repair work on the cask, loaded with 120,000 curies of strontium-90. The vent valve was repacked and the cask was pressure tested.

Leak Detection

Mock-up tests in 271-T Building for the pneumatic air system have been successfully completed. Size and location of "air dump" holes at the far end of the 3" air tube were defined which provides a method for automatic air and reel shut-off, and safety-stop for instrument carrier in case of malfunction. A conceptual method of retrieving the carrier and the pneumatic tube from the horizontal lateral was developed.

b. Project Engineering

Project Cost Information as of July 23, 1961:

Total Authorized Funds - 12 Active Projects	\$11,158,000
Total Cost-To-Date	5,544,000
Commitments and Open Work Releases	763,000
Unencumbered Balance	4,851,000
Costs Charged to Above Projects 6-18-61 to 7-23-61	196,096

Manager
Facilities Engineering

HP Shaw:WWC:bp

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology

a. Fission Product Recovery

A third strontium 90 shipment of 13,400 curies was made to ORNL in the HAPO IA Cask (Decalso insert). Contrary to previous shipments, the rate of pressure buildup was only 6 psig per day since the bulk of the water was removed from the cask and a larger free volume was available for accumulation of gaseous radiolysis products.

After testing showed no significant pressure rise, the HAPO II-1 slurry filter cask containing 120,000 curies of Sr 90 as SrCO₃, was shipped to ORNL.

b. Solvent Extraction

Although decontamination performance was excellent during periods of steady-state operation, several plant shutdowns and startups, caused by equipment failures, produced gamma activity bursts throughout the process. Approximately fifteen per cent of the solvent extraction final uranium product was unsuitable for silica gel treatment because of excessive plutonium and/or gamma activity but this material was reprocessed through solvent extraction prior to month end. Fourteen per cent of the plutonium product exceeded gamma specifications after ion exchange treatment; however, the majority of this off-standard product can be blended in the future to form specification product.

Plutonium losses via the HA Column effluent (HAW) were generally $\frac{1}{10}$ per cent but ranged as high as four per cent. The erratic nature of the losses apparently resulted from inextractable plutonium in the plutonium network recycled to head end.

Although performance of the newly-installed, stainless steel, nozzle plate, 2D Column scrub cartridge is comparable to that of a "Zebra" cartridge, the column now floods more

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easily and the floods are more difficult to break. (This behavior somewhat parallels the performance of the HA Column prior to the time the stainless steel plates became "organic" wet.) Three floods developed during tests to establish optimum operating conditions, and in each instance excessive plutonium and/or gamma activity appeared in the final uranium product.

c. Neptunium Recovery

A recovery run, utilizing the standard hydrazine-ferrous sulfamate flowsheet, isolated and decontaminated 85 per cent of the neptunium inventory in the Backcycle Waste (3WB) System. The latter quantity represented 82 per cent recovery of the neptunium added to the process in feed during the last operating period. Processing performance was normal except for the following conditions:

- (1) The neptunium loss in the organic from the stripping (2B) column, while processing the 3WB, was three to six-fold above normal and did not respond to adjustments in the 2B Column L/V. The loss returned to normal when processing the 3WB terminated.
- (2) Shortly before processing of the 3WB was completed, the neptunium loss from the extraction (2A) column increased ten-fold as did the gamma activity of the neptunium stream (2BP) from the stripping column.

These two conditions were probably associated with the presence of organic and/or resin and the degradation products of each in the 3WB feed.

Accumulation of neptunium in the Backcycle Waste System has been normal since startup. The neptunium loss to the final uranium product, which has been an order of magnitude above the normal one per cent previously established, returned to normal. The correction was attributed to replacement of the damaged "Zebra" 2D Column scrub section cartridge with a stainless steel cartridge.

d. Plutonium Concentration

Inspection of the Plutonium Ion Exchange Unit XA Column effluent (XAW) screen during the last shutdown period revealed the screen had allowed resin to escape into the Backcycle Waste (3WB) System. Although no specific process difficulty has been traced to the resin in the process, it may have contributed to some of the minor process upsets experienced recently.

The new resin added to the ion exchange unit consisted of a blend of 25 per cent 10 - 20 mesh and 75 per cent 20 - 40 mesh resin. The larger resin was added in an effort to improve the pushing

characteristics of the system. No effect on plutonium recycle via the XAW was noted as a result of the larger resin.

Eighteen cans of out-of-specification plutonium product were successfully reworked through the Plutonium Ion Exchange. XAW plutonium recycle losses were acceptable and appeared to be wholly dependent upon the amount of PuVI in the rework.

e. Solvent Treatment

During the shutdown period, the Batch Wash Tank (TK-G1) was flushed with oxalic acid to remove solids (mostly MnO_2) from the packed section. Recycle of the solvent through the No. 1 System equipment prior to startup removed the activity loosened during the flush.

The gamma activity of the No. 1 System solvent slowly increased during the run period (from 400 uc/gal at plant startup) and leveled off at 2500 - 3000 uc/gal near month end.

f. Waste Treatment and Acid Recovery

Waste volumes sent to underground storage tanks averaged 59, 590 and 112 gallons per ton of uranium processed for neutralized high level waste (IWW), solvent washes (OWW) and cell drainage, respectively.

Caustic-tartrate flushes (5 per cent NaOH - 2 per cent $H_2C_4H_4O_6$) of the No. 1 Waste Concentrator Tower (T-F11), which were made during the shutdown, were successful in reducing the high pressure drop across the tower that limited concentrator capacity during the last run period. Performance of the concentrator has been normal since startup; however, the capacity of the No. 2 Waste Concentrator has been restricted to 75 per cent of its normal capacity since startup. This behavior probably originated during the last run period but was not detected because of the large restriction in the capacity of the No. 1 Concentrator.

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2. Redox Process Technology - M. K. Harmon

a. Dissolving

Operation of the Mark V multipurpose dissolver during the month, using the standard procedure, was very satisfactory. An average dissolution rate of 6.85 tons/day was sustained for a one-week period, employing slightly higher terminal acidities than those which gave a rate of 6.34 tons/day during June. A complete clean-out of the dissolver, following the dissolution of 129 tons of uranium metal since the last clean-out on 6/29/61, removed a heel of 2.43 tons of uranium. The dissolver heel had been calculated to contain 1.65 tons of uranium based on the nitric acid required for uranium dissolution, 1.176 lbs. acid as 100% HNO_3 per pound of uranium. The discrepancy of 0.78 tons amounts to only 0.6 percent of the total dissolved in this period and provides further confirmation that the dissolver heel can be estimated reasonably well from nitric acid consumption.

Current Redox production commitments, consisting entirely of E-metal, are being met using only the Mark V dissolver. The off-gas from this dissolver passes through two high-efficiency filters in series, thus meeting the new requirements for improved radioactive containment established following the dissolver fire of April, 1960. Therefore, the piping in the 293-S Acid Recovery and Iodine Removal building was modified to allow the off-gas to by-pass the acid absorber and scrubber during charging and coating removal. The scrubber is being used as a back-up acid absorber and should permit more efficient acid recovery. Should operation of the A or C Cell dissolvers be required, prior to the installation of their secondary off-gas filters, it will be necessary to re-route the coating removal off-gas through the scrubber.

b. Solvent Extraction

The routine use of ferrous sulfamate in place of the mixture of ferrous ammonium sulfate and sulfamic acid in the uranium-plutonium partition column extractant stream (1BX), and the third cycle uranium decontamination cycle scrub stream (3DS), was begun at mid-month after a period of testing showed no adverse effects. Although there will be no reduction in chemical costs, the following process improvements will be attained:

1. The total solids content of the Redox salt waste will be decreased by the reduction in the amount of sulfate ion.
2. The evolution of ammonia during waste neutralization will be decreased by approximately two-thirds.
3. Aqueous make-up procedures will be simplified.

4. The over-all recovery of neptunium will be improved. Neptunium reaching the partition column (1-B) was complexed into the aqueous phase (1BP) by the sulfate present and was lost with the plutonium product stream.

When the second cycle plutonium decontamination column raffinate (2AW) was routed to the pre-cycle extraction column (HA) as the scrub stream (HAA) in February, 1961, the modified flowsheet provided additional aluminum nitrate salt for the solvent extraction columns by the addition of concentrated salt waste solution (D-9) to the pre-cycle column feed solution oxidizer (H-4). The effect of the additional salt on the freezing point of the feed stream required that the uranium concentration be reduced by approximately 25 per cent. The concentration of the holding oxidant, sodium dichromate, was kept at 0.1 M and resulted in an increased usage of 32 pounds sodium dichromate per ton of uranium. During June, 1961, a stepwise reduction of the quantity of sodium dichromate added to the H-4 oxidizer was initiated. Currently, the addition has been decreased from 137 to 90 pounds per ton of uranium with no adverse effect on process waste losses. Further reductions will be made until an optimum concentration of holding oxidant has been determined.

c. Plutonium Concentration

The bifurcated de-entrainment tower (stainless steel packed with stainless steel Raschig rings) of the final plutonium concentrator (L-3) was replaced at month-end. The replacement unit is a single tower made of titanium and containing a six-inch tantalum wire mesh demister. Tower reflux, routed to the plutonium recycle tank (L-16) during the past several months because of its high iron content, is now refluxed to the final plutonium concentrator (L-3).

Further piping and equipment changes, made at month-end, route the plutonium nitrate solution from the third plutonium decontamination cycle sampler tank (E-3) in the 202-S building directly to the plutonium stripper-concentrator (L-2) in the 233-S building, by-passing the stripper-concentrator feed tank (L-1). With the non-critically safe L-1 tank removed from service, all plutonium processing in the 233-S building will be in equipment of favorable geometry.

Plutonium nitrate solution is transferred from the E-3 tank to the L-2 stripper by a two-stage pump, which functions both as a pump and an agitator. Agitation of the tank contents is provided by liquid discharged horizontally through four holes drilled through the bowl of the lower stage. Since the pump-agitator can be provided at the cost of a regular pump, several additional installations will be made when pump replacements are required.

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3. Finished Products Chemical Technology - L. M. Meeker

a. Recuplex

Controlled burning of skulls to plutonium dioxide has resulted in a sixty percent increase in dissolution capacity. The increased capacity is due to the larger batch size that became possible (nuclear safety considerations) when the dissolver feed was changed from metal to all oxide. Further rate increases may be possible when the optimum dissolution conditions for oxide are determined.

A new concentrated plutonium feed flowsheet was developed and put into operation. Initial results indicate achievement of a two-fold increase in productive capacity, compared to that of the last four months, or a capacity factor of over fourteen (compared to design rates). The salient details of the new flowsheet are:

1. The organic effluent from the extraction column is maintained close to 80 percent of saturation by regulating the rate of concentrated feed input.
2. The concentrated plutonium feed is blended with the best dilute feed available.
3. Column inventory is controlled by frequent product removals.

The extraction column (H-1) pulser teflon bellows failed after six months of service. The extended life (average service has been about three weeks) is attributed to the lower rate of radiation damage achieved by purging plutonium to a low concentration in this section of the column.

Tasks I, II, and III

Tasks I and II (precipitation through hydrofluorination) production rates up to 2350 grams of plutonium per hour have been tested successfully. Filtrate losses and reduction performance of the tetrafluoride have been satisfactory. Higher rates appear feasible and are currently under test.

Button purity has continued to be good, with non-volatile metallic contaminants (Fe, Cr, Ni, etc.) averaging less than 140 and greater than 96 ppm. Carbon averaged 418 ppm, while the volatile metallic impurities (Mg, Ca, Na, etc.) averaged 367 ppm.

4. Finished Products Fabrication Technology

a. G.E. 312 Computer Test

Desk debugging, flow diagramming and machine debugging based on the latest compile is in progress. This work is being done on a scheduled 16 hour day (P and Q shift).

The auxiliary equipment typewriter that accompanied the computer, caused considerable trouble in input and print-out of data and it has now been recommended that a replacement typewriter, plus a spare typewriter be secured before computer-line operation is established. Some flaws still exist either in the program or the equipment which causes unexplainable and erroneous deviations in previously proven routines.

Computer equipment failure caused some delay. Several panel boards were changed to eliminate part of the trouble. Certain tracks will not load nor record from Mode "B" commands as they should, although they do perform properly under Mode "A" commands. Negotiations are being conducted to change rental starting date from May 21, 1961 to the time when the machine is fully operable.

Fabrications operating personnel have been given computer orientation lectures in preparation for on line testing. Also fabrication operations have been requested to: (1) mark and tare all containers, (2) provide desired reject codes, and (3) provide the metal equivalent factors for all materials processed.

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5. Process Chemistry - K. M. Harmon

a. Purex Process Assistance

Laboratory studies on the proposed use of uranium(IV)-hydrazine for plutonium partitioning were continued. In the proposed flowsheet for the use of uranium(IV), the organic scrub solution from the IBS column (IBSU) would be mixed with organic product solution (HSP) from the first cycle in the J-3 tank. It was feared that the uranium(IV) in the IBSU would reduce the plutonium(IV) in the HSP when the two organic solutions were mixed in the J-3 tank. Previously, no production of plutonium(III) was observed when 30% TBP-diluent solution of uranium(IV) and plutonium(IV) were mixed together. However, further tests on this system show that there is an immediate reduction of the organic plutonium(IV) to plutonium(III) upon mixing with the uranium(IV) organic solution. This is accompanied by a rapid re-oxidation of the plutonium(III) to plutonium(IV), resulting in an organic solution of plutonium(IV) and uranium(VI). When a 5.5 fold excess of uranium(IV) is used, the plutonium(III) concentration reaches a maximum (of about 75% of the total Pu) in about 40 seconds and decreases to zero in an additional 80 seconds when the reaction is carried out at room temperatures.

When the organic reaction $[U(IV) \text{ organic} - Pu(IV) \text{ organic}]$ is carried out in contact with an aqueous solution, the plutonium(III) strips into the aqueous as it is formed and its re-oxidation to plutonium(IV) is largely prevented. The extent to which the plutonium is retained in the aqueous phase as plutonium(III) after five minutes of organic-aqueous inter-mixing was found to depend on the nitric acid concentration of the aqueous phase. For a 0.5 M HNO_3 aqueous phase, about 98% of the plutonium is retained in the aqueous phase as plutonium(III), whereas for a 3.0 M HNO_3 aqueous phase, only about 9% of the plutonium is retained in the aqueous phase at the end of five minutes of inter-mixing. Similar results were obtained at the same nitric acid concentrations with hydrazine (~ 0.1 M) present. These results indicate that there is little likelihood of a plutonium(III) build-up in the organic mixing tank (J-3) from the reaction of uranium(IV) and plutonium in the organic phase. However, because of the evidence of a "catalytic-like" kill of uranium(IV) by plutonium in the organic phase, further experimental tests are planned to determine the uranium(IV) requirements of the proposed flowsheet. Tests are also in process to evaluate more fully the effects of nitric acid concentration on plutonium partitioning in the various parts of the proposed system.

A laboratory technique was developed for the preparation of an essentially 100% uranium(IV) nitrate solution. The technique involves the separation of uranium(IV) from uranium(VI) by precipitation of the insoluble uranium(IV) oxalate. This step is followed by a caustic metastasis to remove oxalate and then dissolution of the resulting uranium(IV) hydroxide in nitric acid-hydrazine to yield a 100% uranium(IV) solution.

b. Neptunium Purification

Two neptunium purification runs were made during the period to recover 1740 grams of neptunium from Purex. The purified neptunium nitrate was converted to the oxide and sent to the Plutonium Metallurgy Operation for fabrication into target elements. Fabrication was done this time at HAP0 to enable Savannah River to meet a reactor loading deadline scheduled for early August. From the oxide product (1720 grams) 42 acceptable elements were made. Three elements were rejects.

Impurities received with the neptunium product from Purex amounted to 20 grams of plutonium, 594 grams of uranium, 21 curies of Th^{234} , and 4.23 curies of Zr-Nb^{95} . Approximately 900 grams of neptunium was loaded on the resin for each run, amounting to a loading of ca. 30 g Np/liter of wet settled resin. Plutonium was removed with 9 and 7 column volumes of reducing wash for runs 47 and 48, respectively. Eighteen column volumes of the hot nitric-HF wash did not remove as much of the Th^{234} as anticipated. Also, even though there was no detectable radio-ruthenium in the virgin neptunium from Purex, the purified nitrate contained appreciable amounts of ruthenium. Evidently a considerable amount of ruthenium from the previous run, using neptunium product from Redox, is trapped within the resin bed, probably as particulate matter. This trapped ruthenium is being slowly leached out during subsequent runs and is contaminating the purified product. Oxalate precipitation of the neptunium and calcination to the oxide, as was done with the last two runs, reduced the ruthenium to where it was not detectable in the oxide. The effect of ruthenium on a renewed anion exchange bed will be closely watched during future runs.

The analyses of the oxide produced are as follows:

	<u>47</u>	<u>48</u>
Np, % oxide	87.78	87.79
Pu, % of neptunium	L 0.01	L 0.01
Th, % of neptunium	L 0.1	L 0.1
U, % of neptunium	L 0.01	L 0.01
TMI, % of neptunium	L 0.1	L 0.1
Zr-Nb, uc/gm Np	1.33	0.76
Ru, uc/gm Np	Not detected	Not detected
Th^{234} , uc/gm Np	340	74

Waste losses amounted to 1.46% and 1.44% for runs 47 and 48, respectively.

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6. 234-5 Development -

a. Plutonium Purification

The decontamination of boron across oxalate precipitation was measured.

Oxidized skull which was dissolved in glass equipment showed high boron content. Three samples of the solution were used to perform an oxalate precipitation and calcination. The following reduction in boron content was measured across the oxalate precipitation:

<u>Boron Concentration</u> <u>In Feed Solution</u>	<u>Boron Concentration</u> <u>In Calcined Oxide</u>
<u>ppm</u>	<u>ppm</u>
500	25
500	50
200	50

The hydrofluorination step should remove most of the remaining boron as volatile BF_3 .

b. Ion Exchange Studies

A report, "The Removal Of Plutonium From 234-5 Building Sump Water", HW-70406 (Confidential), was issued. The "Summary And Conclusions" follow:

"An ion exchange process for recovering plutonium from sump water has been demonstrated on a laboratory-scale. Aqueous waste containing up to 10^{-3} grams of plutonium per liter was pumped through a two-foot length of two-inch ID Pyrex pipe containing 20 to 50 mesh Dowex 50WX8 cation exchange resin. Over 90 percent of the plutonium was recovered.

"The efficiency of the ion exchange process was improved by initially adjusting the sump water to 0.03 M H^+ , 0.1 M NH_4HSO_3 , and 0.009 M $\text{Al}(\text{NO}_3)_3$. A plot of effluent concentration over feed concentration, C/C_0 , versus resin loading was found to be essentially constant at about 5×10^{-3} for feed containing 10^{-3} grams of plutonium per liter and resin containing up to a gram of plutonium per liter. The removal efficiency of the resin is better than 90 percent for sump water containing more than 4×10^{-5} grams of plutonium per liter. The optimum residence time was found to be approximately four minutes. The best elution cycle consists of three column volumes of 3 M HNO_3 inhibited by 0.3 M sulfamic acid followed by three column volumes of 3 M HNO_3 plus 0.3 M sulfamic. This elution will readily remove 70 percent of the total plutonium without gassing.

c. Ammonium Bifluoride Fusion Of Incinerator Ash

Ammonium bifluoride fusion of plutonium dioxide-bearing materials is being investigated as a plutonium recovery method.

Analyses on the third and fourth runs on fusion of incinerator ash gave a plutonium recovery of 80 percent based on "book value" plutonium content. Slow filtration remains a problem.

d. Plutonium Metal Dissolution

Dissolution rates for plutonium metal as turnings are being investigated to define conditions for a high-capacity, continuous dissolver.

A dissolution run was made using 10.0 M HNO_3 -0.5 M HF. Turnings were added at intervals. The composition of the dissolver solution varied from 0 to 400 g/l plutonium. The dissolution rate in this run was greater than the rate of metal addition (2.60 g/min). Plutonium concentration in the solution did not affect the rate of dissolution. During this run, no formation of PuO_2 was seen. Final volume of the solution was 0.5 liter. An equivalent freeboard was more than adequate to contain the initial foaming.

e. High-Exposure Plutonium Preparations

Special developmental compound preparations are being performed in support of the PRTR program.

A 130-gram plutonium button was prepared from plutonium oxide via chlorination and bomb reduction. The metal was 17 percent Pu^{240} and is for fuel studies.

An attempt was made to precipitate $\text{Pu}(\text{OH})_4$ onto high-fired UO_2 particles as a means of attaining uniform plutonium dispersion. The material was then calcined to give PuO_2 on the UO_2 . Two batches (100 grams each) with U/Pu ratios of 1/5 and 1/50 were sent to Plutonium Metallurgy Operation for evaluation.

f. Powdered Metal

Fine plutonium powder (-100 mesh) can be prepared from plutonium gallium alloy by a hydriding process.

Controlled, slow hydriding of the alloy results in a finely-powdered product. This result contrasts with the large flakes and chips previously produced from hydriding the unalloyed metal. Control is effected by maintaining a low hydrogen pressure. Further efforts will seek to achieve -325 mesh powder. Previously this was obtained by use of the hammer mill, which--although effective--contaminates the product. No problems in dehydriding are expected.

R. E. Tomlinson
Acting Manager
Research and Engineering

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

H. FINANCIAL OPERATION

1. Production Cost

The Commission has directed, beginning July 1, 1961, the billing of recuplex costs on a services rendered basis rather than charging these costs in total against O2 Production. The effect of this change will result in appropriate charges to both weapons and HLO which will amount to approximately 50 percent of recuplex costs. The budget is currently being reworked and the Commission will shortly be furnished with details supporting the transfer of approximately \$600,000 in funds from O2 Production.

Reorganization changes and other actions in July, as listed below, will require a number of budget revisions.

- a) The Purex fission products reorganization.
- b) Transfer of Hot Semi Works from HLO to Purex.
- c) Funding of recuplex costs through customers (mainly buttons, weapons and HLO).
- d) Provision for added staffing in Recuplex.
- e) Reorganization of Relations Practices.

At AEC request, a CPD task force, including the Manager - Production Cost, gave a presentation in Germantown, Maryland on Pu Reclamation, to Washington AEC headquarters personnel. The purpose of the meeting was the development of material for an AEC staff paper dealing with the feasibility of commercial participation in this area.

CPD's investment in inventories at June 30, 1961, compared with budgeted balances at that date, are shown below:

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(amounts in thousands)	Balance 6-30-61	Financial Plan 6-30-61	Surplus (Deficit)
<u>Inventories</u>			
Essential Materials	\$ 826	\$ 777	\$(49)
Spare Parts & Standby	1 752	1 846	94
Special Materials	104	83	(21)
Gross Inventories	<u>2 682</u>	<u>2 706</u>	<u>24</u>
<u>Reserves</u>			
Essential Materials	56	56	-0-
Spare Parts & Standby	454	461	(7)
Total Reserves	<u>510</u>	<u>517</u>	<u>(7)</u>
<u>Net Investment</u>	<u>\$2 172</u>	<u>\$2 189</u>	<u>\$ 17</u>

2. General Accounting

As of June 30, 1961, eleven active projects had incurred costs of \$5,428,707 against authorized funds of \$9,109,000. Outstanding commitments totaled \$555,726.

During July three directives were received from the AEC as follows:

Project CGC-811 - Additional Plutonium Fabrication Facilities, 234-5 Building, increasing the authorized funds to \$3,995,000 and changing directive completion date to July 31, 1962.

Project CGC-897 - Fission Product Concentrates Storage System, increasing the authorized funds to \$1,380,000 plus \$20,000 for Transferred Capital Property. The directive completion date is January 31, 1963.

Project CGC-930 - Secondary Containment of Dissolver Off-gases, Redox and Purex, interim authorization of \$195,000.

One appropriation request was approved in July for a button neutron counter, for \$10,000.

The recommended change in depreciation methods for Redox and Purex from 20-year limited life to standard life was approved by AEC effective July 1, 1961. The change will result in a reduction in depreciation costs during FY 1962 of \$677,150 for Purex and \$755,706 for Redox, approximately a 6 percent decrease in unit costs of products produced by these two plants.

3. Personnel Accounting

Audit revealed that two CPD unit employees were overpaid by C&AO Personnel Accounting when calculating retroactive adjustments due to the new Union Contract. Authorization to deduct were obtained in both cases without problem.

4. Auditing

A formal report was issued relating to the audit of CPD Travel and Living Expense. The activities audited were satisfactory. The audit included an examination of charges against the fee, however, comments relating to fee expenditure were omitted from the formal audit report. Expenditures were made for the purposes for which the fee was established and were reasonable.

A formal report was issued to summarize audit work accomplished during the current audit year relating to Contracting and Procurement. Department performance during the period covered by the audit (April 1, 1960 through June 30, 1961) was satisfactory. The audit work was accomplished on a continuing basis and minor discrepancies were reviewed with appropriate members of management.

In connection with the new Employee Purchase Plan effective May 19, 1961, inspections were made of 33 1/3% of appliances purchased by Department personnel. During the period May 19 through July 12, applications for 65 courtesy discounts were made by CPD personnel amounting to a total of \$2,830. In two instances it appeared that employees had deviated from the provision of the plan by installation of appliances in other than their own residence. Final disposition of these cases has not been made.

K. F. Farmer, Traveling Auditor, made the initial examination of CPD activities July 31, assisted by the Specialist-Auditing-CPD. The initial audit involved a count of CPD cash working funds and examination of cash transactions.

Manager - Finance

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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

An audit of a plant supervisory position was completed and a report of recommendations regarding revaluation was made to the appropriate section manager.

Counsel was provided in connection with the restructuring plans of the Purex operating sub-sections and position evaluations were made on eleven new or revised exempt positions.

2. Personnel Placement

The sixth Manufacturing Training Program trainee assigned to the Chemical Processing Department reported during the month. Three chemists reported who had previously accepted offers. However, due to lack of clearances, temporary arrangements have been made to have two of them work in the Analytical Laboratories of the Hanford Laboratories Operation until their clearances are received.

Due to the reassignment of responsibility for the Hot-Semi Works and B Plant to the Purex Operation for fission products recovery, requests were received for ten Utility Operators, four Instrument Technicians, one Electrician, and one Pipefitter. Contacts have been made with other General Electric components and with other companies to locate qualified Instrument Technicians.

3. Wage and Benefits

Retirement papers were completed for one Instrument Technician who retires next month.

One new semi-technical job has been evaluated and established for the Finished Products Control Operation. The job is established for the technologist who will operate the new mass spectrometer.

An audit of clerical-functional jobs was started during the month. Four representative jobs in Financial were audited. Results will not be known until [REDACTED] similar jobs in other departments have been completed. The audit is being conducted by Relations Operation with assistance from the Chemical Processing Department Wage Administrator.

Booklets describing the new Income Extension Aid plan were distributed to weekly salaried non-unit employees and supervisors. Unit employees received this same information in their copies of the 1960-1963 Agreement.

Suggestion activity dropped to the lowest point in the history of the Department. Only 17 suggestions were submitted. Previous low was 26 in June, 1959. Eleven suggestions were adopted for a savings of \$502 and awards amounting to \$165. Investigators reduced the backlog to 68, which is the smallest backlog in the history of the Department.

4. Health, Safety, and Radiation

The Accident Prevention Council, reorganized in accordance with terms of the General Electric--IAMTC Agreement, had its initial meeting on June 26. The group is composed of six members, three designated by the Council every six months to act as advisory members and three appointed from the exempt ranks as management representatives. Two of the exempt designees will serve for six months while the third member is assigned for one year, assuming the position of chairman as the incumbent.

5. Communication

A shooting script for use in preparation of a movie of safety experiences of the three winners in the recent contest was prepared and submitted to Photography. The movie will be filmed in August.

The fission products story was released during the month and included a story in the GE NEWS, releases in both local newspapers, and some regional and national usage to date.

RB Britton
Manager
Relations Practices

RB Britton

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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>6-30-61</u>	<u>7-31-61</u>	<u>6-30-61</u>	<u>7-31-61</u>	<u>6-30-61</u>	<u>7-31-61</u>
General Manager's Group	11	11	1	1	12	12
Financial	13	13	13	13	26	26
Relations Practices	5	5	6	5	11	10
Research & Engineering	65	64	27	27	92	91
Facilities Engineering	67	68	25	23	92	91
Power and General Maintenance	38	38	242	243	280	282
Production	5	5	3	3	8	8
Special Separation Processing and Auxiliaries	50	49	216	213	266	262
Purex	55	56	214	215	269	271
Finished Products	<u>53</u>	<u>54</u>	<u>236</u>	<u>245</u>	<u>289</u>	<u>299</u>
Total	<u>362</u>	<u>363</u>	<u>978</u>	<u>988</u>	<u>1 345</u>	<u>1 351</u>

B. PERSONNEL CHANGES

Vance R. Cooper, Manager of Research and Engineering, transferred to General Engineering Laboratory in Schenectady and R. E. Tomlinson is Acting Manager of Research and Engineering.

R. G. Geier, Manager of Purex Technology in R&E, transferred to Irradiation Processing Department and B. F. Judson was appointed as Manager, Purex Technology.

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
P. H. Reinker	New York City, N.Y.	Engineering Services. (7/19-20/61)
J. H. Warren	Schenectady, N.Y.	Manufacturing Services. (7/21/61)
<u>To AEC and Other AEC Contractors</u>		
P. H. Reinker	duPont Company	Separations Processes. (7/17-18/61)
J. H. Warren	Savannah River Aiken, S. C.	
H. H. Hopkins, Jr.	U.S. AEC	U.S.-U.K. Technical Inter- change. (7/12-14/61)
R. A. Ciccarelli	Germantown, Md.	
W. J. Gartin	U.S. AEC	Plutonium scrap processing. (7/17-18/61)
B. M. Dobbs	Germantown, Md.	
E. O. Swain		
R. C. Hollingshead	Dow Chemical Co. Rocky Flats, Colo.	Processing equipment. (7/25-27/61)
<u>To Conventions & General Meetings</u>		
W. H. Roos	San Francisco, Calif.	"Fire Hazards of AEC Facil- ities". (7/10-14/61)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From other G.E. Components</u>		
John Clark	General Electric Co. St. Petersburg, Fla.	Plant Tour. (7/25/61)
C. A. Rose	Accounting Services	Plant Tour (7/26/61)
K. F. Farmer	Schenectady, N. Y.	
Chuck McMullen		
R. G. Jacoby		
<u>From AEC and Other AEC Contractors</u>		
J. Buckham	Phillips Petroleum Co.	Unclassified information on waste treatment plants. (7/6/61)
B. Wheeler	Idaho Falls, Idaho	

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
R. M. Girdler W. P. Overbeck A. E. Wible E. A. Hine C. B. Goodlet W. E. Winsche	duPont Company Savannah River Aiken, S. C.	Waste management. (7/18-20/61)
R. J. Christl A. F. Daking	duPont Company Wilmington, Del.	Waste management. (7/18-20/61)
A. Ayer L. P. Lakey	Phillips Petroleum Idaho Falls, Ida.	" "
R. C. Blair G. H. Daly	AEC Savannah River Operations Office	Purex Plant tour and waste management. (7/18-20/61)
R. A. Vandegrift A. K. Williams	Dow Chemical Co. Rocky Flats Plant Denver, Colorado	Discuss recovery processing and plutonium technology and equipment. (7/27-28/61)
<u>From General Industry</u>		
J. Schneider D. Tuel	Wyandotte Chemical Co. California	Chemicals and to observe tests. (7/13/61)
Carl Falk	Heald Machine Co. Los Angeles, Calif.	Repairs to Heald #4 Grinder (7/13/61)
A. Strasser	Nuclear Development Corp. of America White Plains, N.Y.	U-Pu materials for fuel ele- ment studies. (7/17/61).
K. Taylor	Carborundum Co. Niagara Falls, N.Y.	" " "
J. Heaverlo	Pacific Chemical Co. Seattle, Wash.	Chemicals (7/19/61)
L. G. Schwartz	Dynametrics Corp. Corte Madera, Calif.	Repair and aid in acceptance tests. (7/19-28/61)
Ron Else	Sharp Laboratories LaJolla, Calif.	Set up original installa- tion of low beta counter purchased from Sharp Labs. (7/20-21/61)
Frank Morris Paul Pariseau	Turco Products Co. Los Angeles, Calif.	Chemicals (7/20/61)

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<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
H. V. McCormick James V. Ezell	Ingersoll-Rand, Portland " " , Seattle	Demonstrate air tools. (7/25/61)
C. C. Ballard	Joy Mfg. Co. Seattle, Wash.	Core drilling of waste tanks. (7/25-26/61)
Eustace Vynne	Cascade Distributors Seattle, Wash.	Core drilling of waste tanks. (7/25-26/61)
R. S. Ebbert	General Automation Mfg. Co., Troy, Michigan	
J. Lynch	Nalco Chemical Co. Seattle, Wash.	Demineralizer Resin. (7/26/61)

From Foreign Government and Agencies

Taruval S. Laxminarayanan Mahableshwar N. Nadkarni Ramchandra T. Chitnis	Atomic Energy Establishment of India	Analytical Methods for Fuel Reprocessing. (7/19/61)
L. P. Shortis Dr. N. L. Franklin J. A. Williams Dr. D. W. Clelland	United Kingdom Atomic Energy Authority Windscale, England	Plant tour and orientation. (7/17/61)
J. Neil	Atomic Energy Canada, Ltd. Chalk River, Canada	Discuss decontamination techniques. (7/28/61)

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IV. SAFETY AND SECURITY

<u>Operation</u>	<u>Facil. Eng.</u>	<u>Finance</u>	<u>Fin. Prod.</u>	<u>P&GM</u>	<u>Purex</u>	<u>SSP&AO</u>	<u>Prod.</u>	<u>Rel. Prac.</u>	<u>Res.& Eng.</u>	<u>Total CPD</u>	<u>Yr.to Date</u>
Disabling Injuries										0	0
Serious Accidents										0	4
Medical Treatment											
Injuries			9	12	8	4				33	296
Radiation Occur.			6		5	5		1		17	131
Contam. Wounds			1*							1	14
Pu Depositions										0	3
Fires										0	6
Security Violations										0	5

* An employee was pressing broken plutonium metal fragments in a car when a sharp piece of the metal pierced the surgical glove causing a puncture wound to the left thumb. The wound read 2,000 d/m before cleaning; after several washings with Na₄ EDTA solution, the reading was approximately 1,000 d/m. Very little bleeding could be induced, but the alpha counting of the blood smears were 51 d/m. The amount of deposition determined by the body monitor after excising the wound was 0.0033 microcuries left in the thumb. Bioassay results pending.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-69809, Secret, "Critical Mass Control Specification for Storing Plutonium-Bearing Material in the Army Ammunition Storage Igloos", by L. M. Meeker, dated July 6, 1961.
- HW-69829 6, Secret, "81-C Stability - 6/29/61 to 7/12/61", by A. E. Smith, dated July 14, 1961.
- HW-69829 7, Secret, "81-C Stability - 7/13/61 to 7/18/61", by A. E. Smith, dated July 21, 1961.
- HW-69829 8, Secret, "81-C Stability - 7/19/61 to 7/25/61", by A. E. Smith, dated July 28, 1961.
- HW-69952, Secret, "Radiographic Procedures for Parts 8105, 8106, 8107, 8108, and 8109", by G. E. Wilbur, dated June 14, 1961.
- HW-70085, Unclassified, "The Use of Aqueous Foam to Control Contamination during Underground Burial of Failed Equipment", by D. A. Snyder, dated June 26, 1961.
- HW-70110, Secret, "Purex Plant Production Schedule - July, 1961", by D. McDonald, dated June 27, 1961.
- HW-70111, Secret, "Redox Plant Production Schedule - July, 1961", by D. McDonald, dated June 27, 1961.
- HW-70112, Secret, "UO₃ Plant Production Schedule - July, 1961", by D. McDonald, dated June 27, 1961.
- HW-70113, Secret, "234-5 Plant Production Schedule - July, 1961", by D. McDonald, dated June 27, 1961.
- HW-70202, Secret, Film, "FPO-Final Inspection - ZB" by C. M. Thomas, dated June, 1961.
- HW-70206, Secret, Film, "FPO Final Inspection - Gage Plugs" by C. M. Thomas, dated May, 1961.
- HW-70207, Secret, Film, "FPO Final Inspection - Sweep Gage", by C. M. Thomas, dated May, 1961.

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- HW-70208, Secret, Film, "227 Hood and Skull Burning", by D. C. Bowden and C. M. Thomas, dated June, 1961.
- HW-70311, Secret, "Essential Materials Consumption Purex - CPD for June, 1961", by J. E. Lentz, dated July 12, 1961.
- HW-70344, Official Use Only, "Purex Instrument Development Program (Process Control Types)", by H. M. Jones, dated July 18, 1961.
- HW-70361, Secret, "The Processing of Pu Scrap at Hanford", by K. G. Grimm, dated July 13, 1961.
- HW-70406, Confidential, "The Removal of Plutonium from 234-5 Building Sump Water", by G. L. Stiffler, dated July 20, 1961.
- HW-70435, Confidential, "Scheduled Shutdown - Redox Plant", by J. H. Warren, dated July 18, 1961.
- HW-70505, Secret, "Progress Report - FPFTO, June, 1961", by members of the Finished Products Fabrication Technology Operation, dated July 21, 1961.
- HW-70548, Secret, "Analysis of Birch Oxide Produced in December, 1959 and January, 1960", by J. S. Buckingham, dated July 27, 1961.
- HW-70554, Official Use Only, "Hazards Review Phase I Fission Product Processing in B Plant", by L. R. Michels, dated July 27, 1961.
- HW-70566, Secret, "Budget Activity Number 03-16-04 Revision", by P. H. Reinker, dated July 26, 1961.

B. PREPARED FOR SIGNATURE AND ISSUANCE

- HW-70181, Secret, "Production - June", by W. E. Johnson, dated July 5, 1961.

SECRET

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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. Linker

General Manager
Chemical Processing Department

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**DATE
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