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HW 65165 **DEL**

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

MAY, 1960

Compiled By
OPERATION MANAGERS

June 20, 1960

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

HW--65165-Del.

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

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V. SUMMARY

A. RESPONSIBILITIES

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

B. PRODUCTION

The production of plutonium nitrate from the separations plants during May was below that forecasted, both for the month and on a fiscal year-to-date basis.

A neptunium recovery campaign was successfully performed in the Purex plant and yielded 1.5 Kgs.

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

Unfabricated plutonium metal production was below that forecasted for May and fiscal year-to-date; however, all shipments were made on schedule.

C. ENGINEERING

While Purex solvent extraction performance was satisfactory until early mid-May, decontamination efficiency subsided immediately before and following a neptunium recovery campaign. Although some improvement was observed after recycling the plutonium and uranium streams, performance was below that expected and intensive efforts to define the basic cause are continuing.

Restoration activities in the Redox plant following the B-2 multipurpose dissolver incident of April 17, 1960 have progressed at a satisfactory rate. Removal of the contents of the damaged dissolver was started on May 10 and by the end of the month more than one-third of the estimated load at the time of the incident (approximately 10 tons) had been removed. Processing of enriched metal was resumed in the conventional A and C dissolvers on May 12 and continued without interruption through the end of the month.

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A microspark spectrograph for determining the nature of inclusions found in fabricated plutonium metal was procured and installed.

Four kilograms of plutonium, in plutonium oxide form, were produced by large laboratory scale demonstration in a continuous direct calciner. Since the original bed of oxide powder was changed, the bed particles have increased approximately sixty diameters (from the original 10-micron range).

Scope design work on Purex neptunium recovery and purification facilities was completed. The total project cost for the entire Purex installation, capable of recovering Purex virgin neptunium without interference with plutonium production operations and of processing the combined recoveries from both Purex and Redox, was determined to be \$1,400,000, with no spare neptunium recovery package being included.

The contract for installation of the fire detection system in the 234-5 Building was awarded to Fire Detection Service, Spokane at the bid price of \$44,200.

Two new packages of work on NPF Reprocessing were released to Vitro Engineering Company and included criteria for the Mechanical Processing Cell and the Solution Storage Facility. A project proposal revision (No. 3) is being prepared for design only in view of the indeterminate construction program. The scope of work is being up-dated in accordance with communications between the General Electric Company and the Commission.

Detail design, design analysis, and hazards evaluation work on a cerium¹⁴⁴ shipping cask was completed, and the summary reports were transmitted to the Commission. This work will serve as the basis for a cooperative Hanford-Oak Ridge venture in preparing for, and eventually shipping, megacurie quantities of semi-refined cerium¹⁴⁴.

W.K. Wae Cready

General Manager
Chemical Processing Department

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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

a. Purex

	<u>May</u>	<u>April</u>
Plutonium nitrate produced (Kgs)	162.3	453.3
Uranium nitrate produced (tons)	300.5	727.2
Average production rate during operation (T/D)	20.9	24.2
Total waste loss (%)		
Plutonium	0.28	0.16
Uranium	0.29	0.06
On-line efficiency	69.4	100

b. Redox

Plutonium nitrate produced (Kgs)	5.6	43.6
Uranium nitrate produced (tons)	26.3	81.0
Average production rate during operation (T/D)	5.9	7.1
Total waste loss (%)		
Plutonium	0.45	0.41
Uranium	0.10	0.11
On-line efficiency	21.1	54.4

c. Uranium Reduction

Normal UO ₃ loaded (tons)	566.2	565.5
Enriched UO ₃ loaded (tons)	23.7	79.6
Normal UO ₃ approved for shipment (tons)	601.5	550.4
Enriched UO ₃ approved for shipment (tons)	0	49.9
Normal UO ₃ shipped (tons)	652.3	454.2
Enriched UO ₃ shipped (tons)	0	0
Normal UNH backlog (tons U)	40.5	288
Enriched UNH backlog (tons U)	12.6	11

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d. Plutonium Metal Processing

April

Input to Task I (batches)	192	275
Reduction yield (%)	98.3	96.6
Plutonium metal buttons produced (% of commitment)	79.9	116.4
Plutonium metal buttons shipped (% of commitment)	160.0	100.0
Product recovery output (% of schedule)	57.5	91.9
Product recovery backlog (Kgs)	179.4	174.3
Waste disposal (grams)	365	1485

f. Waste Storage

Redox salt waste reserve (tons U)	3 021	3 047
Purex salt waste reserve (tons U)	26 726	27 016
Redox coating waste reserve (tons U)	22 668	22 694
Purex coating waste reserve (tons U)	33 538	33 828

g. Power

200 East

200 West

Raw water pumped (gpm)	6 075	3 725
Filtered water pumped (gpm)	976	881
Maximum steam generated (lbs./hr.)	234 000	124 000
Average steam generated (lbs./hr.)	152 283	83 762
Total steam generated (M lbs.)	113 298	55 344
Coal consumed, est. (tons)	6 270	3 041

J. L. Warner
Manager - Production

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II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Processing was continuous from March 22 through 0600 on May 17. The processing rates varied from a 2.8 CF to a 3.2 CF. Until May 11 the activity of the uranium product ranged between 3 and 9, before silica gel treatment, and all the plutonium product met specifications. On May 11 activity levels rose above limits and it became necessary to recycle both streams for four days until the intercycle streams were decontaminated. Processing was then suspended to prepare for a Birch recovery run.

Normal processing was resumed on May 27. After processing only two batches of hot feed a severe gamma burst affected the entire process. The high gamma uranium and plutonium were recycled until May 31 when hot feed was again started.

2. Processing Operations

On May 3, rework of a batch of hydrolyzed F8 waste was initiated by adding it to the HAF feed batches in two-hundred-gallon increments. As was observed in several previous instances this rework resulted in a marked lowering of gamma levels throughout the process and plutonium waste losses also decreased. Upon completion of the rework gamma levels increased 10 to 40-fold beyond the levels existing at the start of the rework, and it was necessary to recycle both products for five days to attain acceptable decontamination performance.

The silica gel facility processed 240 tons of uranium to meet shipping specifications. In addition to high gamma uranium, metallic impurities, principally calcium and plutonium, were encountered. 260 tons of this material was blended and shipped to Redox for silica gel treatment.

The resin in the water demineralizer was changed during the last few days of April while the plant was operated on sanitary water. On May 2 the demineralized water system was returned to service. The use of sanitary water increased the calcium ion concentration in the uranium product, making it necessary to blend a large part

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of this production with subsequent production.

Early in the month the IOF (feed to the #1 organic cleanup column) jumper and column distributor plugged with black solid material. A spare jumper was installed and the distributor ring was flushed. During the plant shutdown it was found that the G-1 tank had a 500-600 gallon solid holdup, which was reduced to approximately 200 gallons by a series of flushes.

The F-2 silver reactor was regenerated during the shutdown.

The installation of equipment to provide continuous addition of sodium sulfite to feed water to the demineralizer units was completed during May. The purpose of the sulfite addition is to eliminate the adverse effect of free chlorine on the cation beds.

The special fission product (FP) jumpers were installed to isolate E-1, 2, 3, 4, and 5 from normal process streams to permit fission product recovery concurrent with normal processing.

3. Mechanical Experience

The following work was performed during the building shutdown:

- a. Replaced the failed H4 west and F11 east tube bundles.
- b. Replaced the F10 pump which developed a bad seal leak.
- c. Installed the demister on the acid overheads from the F6 concentrator.
- d. The new solenoids and solenoid hood for operating the Jamesbury valves in N Cell were installed by Minor Construction.
- e. Changed out the resin in the N Cell column.

Completed revision of the damper control system to permit automatic changeover to the sample gallery hood exhaust system in the event of failure of the FR-N Cell exhaust fan.

4. Radiation Experience

The total radio-iodine 131 emission for the month was 16 curies. The daily average was 0.5 curies.

Two Radiation Occurrences were experienced during the month. One of these incidents involved airborne contamination of the west crane cab during the removal of a failed F11 tube bundle. The affected area was placed on assault masks and decontaminated. The damaged external air filters were replaced.

There were nine cases of skin contamination and one case of contaminated personal effects during the month.

Several efforts were made to decontaminate the canyon deck. Selected

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areas were reduced to an acceptable level. Repairs of hot jumpers on the deck contributed to the contamination problem. The maximum dose rates on the G-1 to G-2 jumper repair was 5 rads/hr., including 1 r/hr. (largely from the contamination on the canyon deck).

5. Analytical Experience

The major investigative work during May centered around the Purex recovered acid system. Extensive Zr-Nb distribution ratio studies were made to determine physical or chemical treatment needed to improve the Zr-Nb distribution ratios of the acid. The two principal findings to date on laboratory scale are:

1. A one-hour total reflux of Purex recovered acid resulted in a lowering of the Zr-Nb distribution ratios by a factor of five.
2. A 0.114 percent PO_4 ion concentration in recovered nitric samples reduced the Zr-Nb distribution ratio by a factor of three.

Remote manipulators for the High Level work station were received and set up in the laboratory for training purposes.

6. Events Influencing Costs

Extensive rework operations during the month added substantially to the manufacturing costs during the month. The replacement of two concentrator tube bundles added \$58,000 to the Applied Material account.

Manager - Purex

RR McMurray:EAF:gt

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II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

Restoration activities following the B-2 multipurpose dissolver incident of April 17, 1960 have progressed at a satisfactory rate. Removal of the contents of the damaged dissolver was started on 5-10-60 and by the end of the month more than one-third of the estimated load at the time of the incident (approximately 10 tons) had been removed. Processing of E-metal was resumed in the conventional A and C dissolvers on 5-12-60 and continued without interruption through the end of the month.

2. Processing Operation

Processing operations remained shutdown during the first part of the month as a result of the B-2 multipurpose dissolver incident of April 17, 1960 (cf. this report for April, 1960). All efforts were directed toward restoring normal operating conditions without spread of radioactivity to the atmosphere and/or environs, and without jeopardizing the health of employees.

By May 10, 1960 the restoration program was far enough along to permit special dissolution procedures to be started to remove the contents of the B-2 dissolver. Only one method was used, namely the addition of cold, dilute nitric acid. For monitoring and emergency control of the chemical reaction, if and as needed, the dissolver vessel was equipped with three new strategically-placed thermohms and two separate methods of rapid "drowning" with water, before the start of the dissolving steps. By the end of the month ten dissolution efforts had resulted in the removal of more than one-third of the estimated dissolver load at the time of the incident.

Concurrent with the restoration program and removal of the contents of the damaged multipurpose dissolver, the two conventional dissolvers (A & C), which were taken out of service when the

[REDACTED]

multipurpose dissolver was installed during the latter part of March, 1960, were reactivated. E-metal dissolving was started on 5-12-60 and metal solution reached the extraction columns on 5-18-60. Processing operations continued as scheduled for the balance of the month.

Approximately 335 tons of UNH, with a high gamma ratio, were received from the Purex Plant for reprocessing through the silica gel system to reduce the gamma content to within shipping specifications. By the end of the month all of the material had been processed and shipped to the UO₃ Plant for final processing.

3. Mechanical Experience

Maintenance work toward restoration of the B-2 multipurpose dissolver cell was purposely delayed until a back-up filter was installed in the B-2 off-gas line and additional air sampling equipment was installed to define conditions in the building prior to restoration work. Equipment was subsequently installed to thoroughly flush B-cell. On 5-3-60, the B-cell cover blocks were removed and the dissolver lid replaced with one equipped with nozzles for a temperature thermohm and a water spray. With these assurances for monitoring and controlling the chemical reaction, removal of the B-2 dissolver contents was started on 5-10-60.

Revisions were made this month in the piping and valving systems of the dissolver off-gas lines at the 292-S and 293-S Buildings to eliminate the possibility of the dissolver off-gases going directly to the 291-S stack. Off-gases must now be routed either through the absorber and/or the scrubber at all times. Installation of continuous monitoring equipment for hydrogen and ammonia content in the dissolver off-gases was also completed.

The temperature thermohm installed with the new B-2 dissolver lid on 5-3-60 failed on 5-25-60. A new thermohm jumper was subsequently fabricated and installed on 5-27-60.

4. Waste Handling and Decontamination

Equipment valued at \$86,314 was received for decontamination and/or repair during the month. Of this total, equipment valued at \$33,214 was decontaminated (at a cost of \$2,400) and released to customers during the month. The major portion of the work involved the decontamination of tanks and agitators which are to be used on Project No. CAH-870 by Kaiser Engineers.

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A total of 169 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>
Flat Car No. 3618	WH&DO
Flat Car No. 3615	WH&DO
Water Truck No. 68C-4644	P&GM
Evacuation Bus No. 1B-6717	P&GM
Carry-all No. 1D-5403	Purex
Duplex Tractor No. 68E-2963	P&GM
Pick-up Truck No. 1C-306	Redox
Carry-all No. 1D-480	Redox
Air Compressor No. 13-16290	Transportation
Duplex Tractor No. 68E-2960	P&GM
Duplex Tractor No. 68E-9303	P&GM
Two Tanks and Two Agitators	HLO

5. Radiation Experience

A total of six radiation occurrences were experienced during the month. Most significant was a general spread of contamination in the SX Tank Farm during the transfer of a deep-well pump from the 112 to the 109 SX tank. Difficulties were encountered when the hose on the end of the pump kinked on removal from the 112 SX tank. This delayed positioning the pump into the 12 inch riser of the 109 SX tank and, although the work had been delayed for two weeks waiting for a calm day with no wind, an unexpected whirlwind went through the area during the transfer. This caused some spread of contamination from the protective paper covering which had been placed between the two tanks. With the exception of a few radioactive particles, all of the contamination was confined to the tank farm area. Conditions have subsequently been restored to normal.

Since the B-2 multipurpose dissolver incident of April 17, 1960, an all-out effort has been made to wash down the 202-S Building canyon and to re-establish normal contact maintenance conditions on the canyon crane. Spraying of the canyon proper, railroad tunnel, and crane maintenance platform with the roof sprays and a fire hose remotely manipulated by the crane, has successfully reduced canyon air-fission product activity to normal levels. Repeated decontamination assaults on the crane and crane maintenance platform have reduced significantly the level of contamination on

this equipment. The condition of the crane maintenance platform is essentially normal. Crane contamination is about twice the normal level and continued cleaning will be required before routine maintenance can be performed without excessive shielding or undue personnel exposure.

A continuous air monitor and recorder were installed this month on the down-stream side of the in-cell filter on the failed B-2 multipurpose dissolver. This instrumentation was installed to promptly detect any fission product breakthrough during the dissolution of the residual uranium which remained in the dissolver when it failed. Although the activity to the filter has been about 10 times that of normal operation no breakthrough has occurred, and the filter efficiency has remained at greater than 99.8%.

Seven criticality dosimeters were installed at appropriate locations throughout the Redox Plant during the month. These instruments are the same type as currently in use at the Oak Ridge National Laboratory.

6. Analytical Experience

Conclusive proof that the multipurpose dissolver incident of April 17, 1960, was non-nuclear in origin was derived from two principle sources of data; namely - the gamma radiation levels in the cell during periods of unexplained heat evolution during the incident, and analyses of in-cell materials for neutron activity products. A stainless steel (304) plug removed from the damaged dissolver was analyzed on the multi-channel gamma analyzer for isotopes normally found in a nuclear incident. Since none of these isotopes were found, and the detection limits are less than one-thousandths the calculated quantities of pertinent isotopes present if such an incident had occurred, the evidence is considered conclusive.

C. T. Grosz / H. H. Murray

Manager - Special Separation
Processing and Auxiliaries

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II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

All shipping commitments were met. No formalized plutonium fabrication was scheduled but a limited number of typical weapon parts continued to be cast and machined for process development and operator training purposes. The output of unfabricated plutonium was down significantly from last month (to 90% of forecast) but production was sufficient to exceed the quarterly AEC commitments. Plutonium recovery was handicapped by mechanical difficulties and achieved only 60% of schedule. Uranium oxide production met schedule.

2. Processing Operations

a. Plutonium Fabrication

Additional experience was gained during the month in melting plutonium and casting it to shape the graphite molds. Developed during the month was a new technique which involves the holding of the metal in molten condition in the melt pot for longer periods of time and then dumping by a mechanical means into the receiving mold. X-ray examination of the castings produced using this new method reveals the quality of the metal to be much improved. It is estimated at this time that approximately half of the castings produced should be acceptable for machining.

b. Plutonium Processing

Operation of the button line continued at a high rate for the first two-thirds of the month at which time feed supplies became exhausted.

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Recovery operations were hampered by mechanical difficulties throughout the month. Principal among these was damage by breakage of three sections of the glass, H-2, solvent extraction column when construction forces dropped a heavy object in the duct level in the vicinity of the top of the extraction columns. Also later in the month plugging occurred in the J-26 product stripping tank which resisted repeated efforts to clean. At the end of the month the facility is back in normal operation.

c. Uranium Reduction

Higher than normal calcium content of the UNH feed to the Uranium Reduction plant resulted in two carloads of UO_3 product abnormally high in impurity content. These cars were within specifications, but, due to knowledge of previous difficulties at the customer site, Carbide Nuclear was contacted and they agreed to accept this material. Increasingly high acidity of the UNH feed is resulting in severe corrosion to concentration, deentrainment and storage facilities at the Uranium Reduction plant. This corrosion has also resulted in the increase in iron content of product shipments. At the end of the month cleanout of all equipment is underway and a nitric acid passivation treatment is to be made of all affected equipment.

3. Mechanical Experience

Operation of the plutonium fabrication equipment was satisfactory during the month with the exception of failures of the cutting oil compressor and the hood atmosphere recirculation blower for the 24-B machining hood. Plutonium preparation equipment functioned well during the month as did that at the Uranium Reduction plant. Considerable difficulty was again experienced with plutonium recovery equipment. The high incidence of routine failures plus the damage to the H-2 solvent extraction column resulted in excessive amounts of maintenance manpower being required in this operation.

4. Radiation Experience

Radiation and contamination experience statistics indicate that satisfactory control was achieved during May.

Examination of actual air conditions throughout the Uranium Reduction plant has shown that mask requirements can be eliminated in many areas. Steps are being taken to revise the radiation work procedures to allow this, as well as set up those additional controls required to assure that air contamination levels remain below limits.

A motion picture study made by the Analyst, Radiation and the Industrial Engineer (FEO) of the plutonium fabrication step revealed

an unexpectedly low exposure to the operator's hands for this one operation. It is anticipated that this and other similar motion picture studies will result in improved techniques which will reduce exposure, improve design, and facilitate operation. Some improvements have already been installed."

5. Analytical and Final Inspection Experience

	<u>May</u>	<u>April</u>
Number of Samples Received	1,192	1,053
Number of Determinations	11,701	7,894
Average Button Impurity	1,182	1,045
Button Rejections	3.8%	0.9%

Counseling by Mr. Dana Elliott of the Los Alamos Scientific Laboratory clarified the "depth of void" specifications in the plutonium weapon shapes inspection. The effect has been to raise the acceptance rate from roughly 10% to about 50%.

6. Events Influencing Cost

The air sample counting work at the 271-U Building was transferred to the 234-5 Building. This change will permit the retirement of approximately \$10,000 worth of equipment and save \$750/year maintenance expense.

J. M. Mobley
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 of the prime production facilities during the period covered by this report.

Fabrication and installation of the High-level Cave at the Purex Facility was an estimated 80 per cent complete at month's end. The Cave is being equipped with two remote mechanical manipulators and other facilities designed for handling high-radiation-level process samples.

Installed on the Ion Exchange Hood at the Purex Facility was a stainless steel panel, incorporating a 24-inch air filter to improve ventilation through the area where plutonium nitrate purification and concentration is accomplished. The fire-resistant filter was equipped with a fire screen and a layer of coarse fiberglass on the exterior of the hood, and was provided further spark protection by installation of a sheetmetal duct on the interior of the hood. The new stainless steel panel and air filter replaced an existing plexiglass panel.

Fabrication of a spare Ruthenium Oxidizer Pot (H-4) for the Redox Facility is approximately 65 per cent complete.

The piping and instrumentation systems to the Decontamination Vessels in the 221-T Canyon Building are undergoing modification which, when complete, will permit control of decontamination work from the operating gallery or canyon deck. These modifications are designed to facilitate decontamination of grossly-contaminated process equipment.

A Jumper Fabrication Jig for use in the straightening and repair of contaminated cell pipe jumpers was installed on the deck of the 221-T Canyon Building. The Jig will also be used in the fabrication of new pipe jumpers, utilizing decontaminated connector heads and new piping. The pipe configurations will be made up in the cold shop and brought to the 221-T Building, where decontaminated connector heads will be welded on under controlled conditions.

Fabrication of an Inspection Hood for the Finished Products Operation, required for the production of new models, is approximately 80 per cent complete. Also in progress and nearing completion is the fabrication of containers and bird cages required for shipment of the new models.

Action was initiated May 25 to fabricate, on an emergency basis, a replacement Steam Stripper Column (J 26 A) for the Solvent Extraction Hood in the Recuplex Section of the 234-5 Building. Failure of the in-service unit appeared imminent, due to its being plugged; however, the condition was corrected by flushing on May 27, and fabrication of the new column proceeded in the normal manner. The new unit will be placed in standby status.

Fabrication and installation of a hood and services for a 1,000-ton press in the 231-Z Building is complete, with exception of two filters and a recording temperature control instrument, which have not as yet arrived on the job site.

The No. 2 boiler in 200 West Area Power House and the No. 3 boiler, 200 East Area, were inspected by an indemnity representative of the Travelers Insurance Company. Verbal reports indicate the two units were in excellent condition.

Integration of the 614 Building (Monitoring Stations) Monitoring Program with the Plant Telemetering System resulted in the transfer of instrument maintenance responsibility for twenty-three 614 buildings to the Power and General Maintenance Operation, effective May 23. Instrumentation equipment housed in the subject buildings was previously maintained by other departments; however, it was established that the work could best be accomplished by consolidating the twenty-three out-lying buildings with those currently being maintained by the Chemical Processing Department. The geographical location of the additional buildings entails approximately 250 miles of travel per week, which necessitated an addition to the CPD rolls of one instrument technician.

A temporary construction building (2708-E), located to the rear of the 200 East Area Power House, was disposed of as excess property. Appropriate property disposal documents were processed, after which the building was sold in-place to the successful bidder on a sealed-bid basis.

Other activity involving property management during the month was the letting of a contract for reroofing the 272-E Shops Building in its entirety.

In progress at month's end was the construction of a steel-and-concrete box required for storage and transportation of the failed multipurpose dissolver at Redox. The box will be framed with 5" channel iron, encased in 16 cubic yards of concrete, using 3/4" boiler plate for the bottom, and will weigh an estimated 30 tons upon completion.

Made ready for service and placed in standby status were two vendor-fabricated tube bundles for the concentrators at the Purex Facility.

Shop fabrication of process pipe jumpers, required for maintenance of the production facilities, totaled 15 for the month.

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The removal of 12 contaminated fuel element hoods and associated equipment from the Hanford Laboratories Operation's 231-Z Facility, in the 200 West Area, and delivery of same to the 308 Building, 300 Area, has been completed. The hoods were temporarily located in 231-Z for development of fuel element fabrication techniques, and were removed to the 300 Area for permanent installation in the new facilities at Building 308, as part of Project CA-747 (PRTR Program).

Radiation monitoring equipment, alarm system, etc., in the Critical Mass Laboratory, Building 209-E, 200 East Area, were checked out, calibrated and made to function properly, as part of acceptance tests of Project CG-731.

T. S. LaSalle

Manager-Power and General Maintenance

JFL:ap

CHEMICAL PROCESSING DEPARTMENT

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WITH DELETIONS**II. ACHIEVEMENTS (continued)F. FACILITIES ENGINEERING OPERATION1. Purexa. Process Design and Development EngineeringDemister Vessel

The demister vessel and its associated jumpers were installed in the F-Cell position at Purex on May 21-22. This equipment is now in service; however, performance characteristics have not been demonstrated.

Gross Gamma Monitor, HAP Stream

Preliminary design has been completed for a prototype "in-cell" gamma monitor installation for the Purex HAP stream. Lead shielding will be required on the framework of the column to shield the ion chamber from background radiation.

b. Project Engineering**DECLASSIFIED
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CAC-891, Purex 216-A-6 Crib Replacement

Work Authority CAC-891 (2) issued by the Commission May 18, 1960, authorized General Electric Company \$65,500 to perform Title I, II, III, and related management services.

CGC-895, Expansion to 4.0 Capacity Factor - Purex

Directive No. HW-512 issued by the Commission May 20, 1960, authorized General Electric Company \$72,000 to perform Title I, II, and related management services.

CGC-897, Fission Product Concentrates Storage System - 200-E Area

A preliminary project proposal requesting preliminary engineering funds in the amount of \$21,000, for work associated with providing a storage system for fission products from Purex, was transmitted to the AEC on April 18, 1960. Washington AEC approval was received on May 31, 1960, and a Directive is being prepared.

c. Manufacturing Engineering

Purex Reboiler Condensate System

Design of a new condensate jumper has been made which includes a steam trap and a remotely operated bypass valve. The trap placed in this location should provide improved operation. The bypass valves are included in the jumper to allow operation to continue in case of trap failure.

Remote Gasket Gauge Ring

Design and drawings have been completed for remote gasket gauge ring on the F-E1 vessel flanges. Although similar units have been used at Redox, this will be the first installation of this type at Purex. Three gasket gauge rings were converted to remote units for the Demister installation. This is part of a Maintenance Engineering effort to improve integrity and reduce personnel exposure for equipment repair.

Teflon Lining For Piping Through Concrete

A procedure was issued covering the installation of teflon tubing as lining of failed steam piping through concrete in the Purex Plant. This included design of a pipe carrier for crane transfer of the tubing to the cell nozzle, and a connector head insert for protection of the tubing from projections on the connector block. Installation in Purex is planned for the first week of June.

2. Special Separation Processing

a. Process Design and Development Engineering

Television Camera Adaptation

A small enclosure has been designed for a television camera and is being fabricated. This will allow the camera to be lowered into the "B" cell dissolver. A light source will be carried with the camera, and it is expected that a reasonable good examination of the interior of the vessel can be made while still installed in the cell.

Flow and pH Instrumentation

Electrical wiring arrangements were developed for a jumper assembly in F Cell, with associated pH probe for the waste stream of 2D column and 1A column scrub flow magnetic meter. A modified coaxial connector is being designed for use in the pH jumper connector. Specifications were prepared for the magnetic flowmeter.

3. Finished Products Operation

a. Process Design and Development Engineering

Plutonium Reclamation Facility

Design was completed on a steam stripper evaporator to replace the existing Recuplex steam stripper and evaporator and serve as a prototype for the new Plutonium Reclamation Facility. Drawing H-2-23891 was approved and the vessel was fabricated on-site.

Glove Boxes

Two additional prototype glove box port covers were designed, fabricated and delivered to Finished Products for evaluation and approval. This should complete the work done in this area as one or both of the last prototypes is expected to be approved for the RMA Line (CGC-800). The modified commercially-available vacuum handling tools (SK-2-18329) were installed in H-24B in the RMC Line. A forceps-type manipulator-carrier has been designed, fabricated and delivered to Finished Products for evaluation in Hood HC-24B.

b. Project Engineering

CG-789, Additional Fire Protection - 234-5 Building

The contract for installation of the fire detection system was awarded to Fire Detection Service, Spokane, at the bid price of

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\$44,200. Since the employees will require "L" type security clearance, it is expected that work at the site will start approximately July 11, 1960. The project proposal revision, requesting a 5½-month extension of time and deletion of some minor work, is still under consideration by the AEC.

CAC-880, Plutonium Reclamation Facility

Criteria were established and published to cover the shielding and broad scope requirements of Pu Reclamation Facility. Preliminary issues of the engineering and process flow diagrams were made. Plant layout alternates are being developed.

c. Manufacturing Engineering

Fabrication and Control

Radiation exposure measurements of a Gorton lathe operation, using film documentation for the first time in CPD as an analytical tool, were completed and reviewed with Fabrication and Control management. Exposure control limits were established. High radiation operations were pinpointed for potential reduction.

4. General

a. Process Design and Development Engineering

Fission Product Shipping Cask

Detail design, design analysis, and hazards evaluation work on a cerium¹⁴⁴ shipping cask was completed, and the summary reports were transmitted to the Commission. This work will serve as the basis for a cooperative Hanford-Oak Ridge venture in preparing for, and eventually shipping megacurie quantities of, semi-refined cerium¹⁴⁴ fraction.

Leak Detection - Non-Boiling Tanks

Two new liquid level instruments were received for engineering evaluation and testing. The design has been completed for a support frame for this equipment to enable mounting on existing 12" risers.

Leak Detection - Active Tanks

Preliminary test runs were made with the electrically-positioned scintillation probe in a 4" conduit. Maximum speeds of 1.5 feet per second were attained forward, backward, either upright or inverted. The probe would not negotiate the four-foot radius, 90° bend, because of a crimp and irregular arc of bend. A new 90° bend was ordered

off-site specifying a drawn tubing with the bend being formed by the proper size shoe rather than shop bending with a pneumatic bender.

b. Project Engineering

Project Cost Information as of May 15, 1960:

Total authorized funds - 13 active projects	\$7,935,000
Total cost-to-date	3,916,000
Commitments and Open Work Releases	1,681,000
Unencumbered balance	2,338,000
Costs charged to above projects 4/17/60 to 5/15/60	468,527

Projects Dropped from Active Status During This Period:

<u>Project No.</u>	<u>Authorized Funds</u>	<u>Total Cost</u>
CG-772	\$ 265,000	\$ 186,475
CGC-873	66,000	57,917

CGC-830, NPF Reprocessing

Final drawings for the Receiving and Storage Facilities were received from Vitro this month. The Receiving Facility drawings and a part of the Storage Facility drawings had been reviewed previously. The design criteria for the remainder of the 221-U Building work (Dissolution) has been issued for comment.

Two new packages of work have been released to Vitro. These are the criteria for the Mechanical Processing Cell and the Solution Storage Facility.

A project proposal revision (No. 3) is being prepared for design only in view of the indeterminate construction program. The scope of work is being up-dated in accordance with communications between the General Electric Company and the Commission.

c. Manufacturing Engineering

Equipment Burial Improvements

Tests were conducted on the application of an aqueous chemical foam for displacing contaminated air from burial boxes. The results show that this type of foam has sufficient life to warrant further development of this alternate as a method of contamination control during equipment burials.

Acting Manager
Facilities Engineering

JB Fecht:WWC:bp

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology - R. G. Geier

a. Head End

The dissolution procedure of adding about fifty per cent of the required nitric acid to the dissolver pot and slowly adding the remainder of the acid over a period of several hours once the solution in the pot reached boiling has been replaced with a procedure of adding all the acid and covering the slugs prior to heating the solution to boiling. No change in mol ratio of acid to uranium has been made, but the time required to dissolve a cut has increased thirty per cent; consequently, the dissolvers capacity factor have been reduced from $CF = 4.0$ to $CF = 3.2$. The change in procedure followed a recommendation of the Redox Incident Investigating Committee.

b. Solvent Extraction

During continuation of the April run period, the decontamination performance of the HA Column remained poor despite high uranium saturation in the organic phase which produced 0.1 to 0.2 per cent plutonium losses; however, both the final plutonium and uranium products were within gamma activity specifications after ion exchange and silica gel treatment, respectively. The addition of rework containing miscellaneous wastes, refluxed for 22 days, to the HA Column feed (HAF) in a 1:20 ratio materially increased the HA Column decontamination performance and decreased the gamma activity of the final solvent extraction product streams three to four fold. However, upon completion of processing the rework, the gamma activity of the intercycle streams rose markedly so as to force the plutonium out-of-specifications and require total recycle of both plutonium and uranium for three days prior to a planned shutdown.

Plutonium waste losses via the HA Column remained in the 0.10 to 0.20 range except during the short period of waste rework when the losses were reduced by a factor of four. A partitioning failure with plutonium losses up to 20 per cent in the uranium feed to the Final Uranium Cycle (2DF) was somewhat reduced by Partitioning Cycle flowsheet adjustments, but was not completely

corrected until the sodium nitrite addition to the Solvent Feed Tank (for neptunium recovery in HA Column) was reduced to flowsheet from a high of 137 per cent of flowsheet. Despite an additional 200 per cent increase in the ferrous sulfamate to the 2DF during the period of high plutonium concentration, some uranium product exceeded plutonium specifications and required blending.

Plant startup following the neptunium recovery run was characterized by an extremely large gamma burst throughout the plant although the plant had been processing recycled uranium at shutdown. Indications are that solvent may have been added to the Backcycle Waste and/or Intercycle Uranium Concentrator while transferring miscellaneous waste rework streams during the plant shutdown. At month end the gamma activity throughout the plant is gradually falling off from a high of five fold above normal.

Other items of interest to solvent extraction during the month were:

- (1) Operation of the present 2E Column was stable at a capacity factor of $CF = 3.9$ while using sanitary water throughout the plant. The column capacity had previously been limited to $CF = 2.4$ when operating on demineralized water.
- (2) Replacement of the water demineralizer cation resin has corrected the adverse effect demineralized water previously had on the uranium stripping column processing capacity.
- (3) Brief operation of the 2A Column (packed with 1-inch fluorothene Raschig rings) without the use of the pulse generator did not noticeably affect the column operation or efficiency.

c. Neptunium Recovery

Neptunium losses to the HA Column raffinate (HAW) remained near or at the lower detectable limit during the normal uranium processing period despite an inventory of >2000 grams in the system. However, losses to the final uranium product increased four to five fold above normal loss (three per cent) when the final uranium cycle was operated at rates above $CF = 3.2$. The increase in the latter loss may have been due to one or more of the following: (a) poor organic phase uranium saturation control at the higher processing rates, (b) a lower-than-flowsheet 2D Column scrub flow, and (c) the high neptunium inventory in the plant.

During the neptunium recovery run 1530 grams of neptunium were isolated and decontaminated from the 2050 gram inventory in the plant. Although normal recycle losses to the Backcycle Waste System were only about 2.5 per cent, two sizeable quantities of neptunium were recycled as a result of equipment failures. The final product contained 0.04 and 2.5 per cent of uranium and plutonium, respectively, (based on the weight of neptunium) and a γ/Np AT of 3.7×10^{-7} .

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Neptunium recovery, since startup, has been excellent and essentially all the neptunium recycled during the recovery run has been accounted for in the plant inventory.

d. Solvent Treatment

The gamma activity of the No. 1 System solvent remained in the 3000 - 4000 uc/gal. range until the gamma burst occurred throughout the plant at the end of the waste rework. The peak gamma activity of 9000 uc/gal. was reduced to 2000 uc/gal. prior to shutdown. A further reduction to 900 uc/gal. was affected by continuous recycle during the neptunium recovery run, but startup operations returned it to ~ 3500 uc/gal.

A 500 - 600 gallon holdup of solids, presumably MnO_2 , in the Batch Wash Tank, TK-G1, was reduced to 250 gallons by several flushes of hot 2 per cent HNO_3 - 5 per cent oxalic acid plus a hot 20 per cent HNO_3 flush.

e. Waste Treatment

Waste volumes sent to underground storage tanks averaged 65, 1067 and 135 gallons per ton of uranium for neutralized IWV, solvent washes and cell drainage, respectively. The above-normal volumes of waste show the effect of reworking waste and extensive flushing and calibration of the Solvent Batch Wash Tank, TK-G1.

Analyses of the clear supernatant liquid and suspended solids in a large liquid sample taken from Underground Storage Tank, TK-241-A-103, which contains the waste from approximately 3900 tons of processed uranium (about 3.5 years average age) revealed the following information:

TK-241-A-103 Clear Supernate Chemical Analysis

<u>Component</u>	<u>M</u>
NO_3^-	2.6
NO_2^-	4.2
SO_4^{--}	0.07
CO_3^{--}	~ 1.0
PO_4^{--}	0.02

pH = 9.9

Radiochemical Analysis of Clear Supernate and
Suspended Solids

<u>Component</u>	<u>Clear Supernate</u>	<u>Suspended Solids</u>	
		<u>6 M HNO₃ Soluble</u>	<u>6 M HNO₃ Insoluble</u>
Cs 137, c/gal	16	12.0	0.12
Sr 90, c/gal	1.8 x 10 ⁻² (2)	27	1.6 (2)
Tc 99, g/gal	0.076	-	-
Ru-Rh 106, c/gal	1.4	<1.3 x 10 ⁻²	4.9
Zr-Nb 95, c/gal	<3.4 x 10 ⁻⁴	-	-
Cr-Pr 144, c/gal	-	44	27

Notes: (1) The majority of the suspended solids are not soluble in 6 M HNO₃ and are believed to be dehydrated ferric oxide.

(2) Isotopic analysis shows the SR 90 represents only 14 per cent of the total strontium present.

The above data indicate the following:

- (a) TK-241-A-103 supernate is an excellent source of aged Cesium 137 and Technetium 99.
- (b) Strontium 90 recovery from the supernate does not appear profitable due to the large fraction of undesirable strontium.
- (c) Dissolution of sludges in underground storage tanks by means of nitric acid does not appear feasible; however, no data are available as yet as to whether or not nitric acid will slurry the sludge sufficiently to permit its removal.

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2. Redox Process Technology - M. K. Harmon

a. Dissolving

Removal of the contents of the damaged Multi-purpose dissolver (cf. this report for April, 1960) was started early this month. Only one method was used, namely the addition of cold, dilute nitric acid. For monitoring and emergency control of this chemical reaction if and as needed, the dissolver vessel was equipped with three new strategically placed thermohms and two separate methods of rapid "drowning" with water, before the start of the dissolving steps.

To prevent the possibility of overheating and ignition, the dissolver contents were cooled before acid addition by flooding with water. Through the hole in the vessel wall, all this water in excess of about 450 gallons drained to the cell sump and was removed. Cold, dilute acid (20 weight percent HNO_3) was then added. This was repeated for a total of ten such additions during the month, with each acid charge volume being approximately the same as the equilibrium volume in the dissolver. Both the rate of acid addition and point of acid entry were changed from time to time, but the water flooding was kept on a rigid 12-hour schedule. Dissolving was relatively rapid despite the low initial acid concentration (further diluted, of course, by the blending with an approximately equal volume of water in the dissolver) and by the end of the month, more than one-third of the estimated dissolver load at the time of the incident (10.5 to 11 tons) had been removed.

The ease of removal and rate of reaction, combined with rather crude stoichiometric and material balance calculations, indicate the uranium being removed from the dissolver exists in the dissolver largely in the form of UO_2 . This is consistent with the theory that the incident involved rapid oxidation and ignition of dekad fuel above the water level in the dissolver at the time. Nevertheless, it is not considered likely that all of the uranium has been oxidized, and therefore it is expected that removal with cold, dilute acid will become progressively more difficult as the composition of the contents approaches all uranium metal. As this happens, the dissolving techniques will be correspondingly altered.

b. Neptunium Recovery

Operation of the two standard dissolvers was resumed on the same basis as used before the Multi-purpose dissolver was installed in March. This permitted the resumption of solvent extraction processing after a month's enforced idleness following the dissolver incident. The

neptunium accumulated in the system at the time of shut-down amounted to approximately 320 grams, and was held in the intercycle concentrator vessels until processing was resumed. Accumulation and internal recycle were restarted on the "standard" interim flowsheet with no evidence of adverse effect from the shut-down period, and at the end of the month the total inventory was calculated at about 430 grams with no signs of loss having been observed. It is tentatively planned to make the third neptunium "unloading" during June, subject to production scheduling.

c. Non-Production Fuels Reprocessing

A change in the composition of the Plutonium Recycle Test Reactor fuel alloy (from Pu-Al alloy to a Pu-Al-Ni-Fe-Si alloy) prompted laboratory studies on reprocessing this new fuel core. Data from these studies indicate that the Redox Plant may have considerable difficulty.

1. The alloy dissolves rapidly in 2 M HNO_3 , 0.002 M $\text{Hg}(\text{NO}_3)_2$ solution; however, the dissolution rate decreases abruptly with an increase or decrease in acid concentration.
2. Considerable hydrogen is evolved in the dissolution reaction when such dilute acid is used. Instantaneous concentrations of up to 40 volume percent H_2 have been measured in the off-gas.
3. The dissolving rate under these low-acid conditions can probably be controlled by the addition of aluminum or uranyl nitrate solution. However, the silicon present in the alloy is not dehydrated in the low acid dissolution and therefore cannot be removed from the feed solution by centrifugation.
4. Dissolution time cycles at higher acid concentrations (6-8 M HNO_3) will be excessive, viz. 40-60 hours to dissolve 0.5-inch-diameter rods.
5. Silicon, in feed solutions made from low-acid dissolution of the alloy, will cause emulsion problems so severe as to make solvent extraction nearly impossible.
6. Silicon, in the feed solutions made during the high acid dissolving will probably not give serious emulsification in solvent extraction.

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3. Finished Products Technology - R. E. Smith

a. Uranium Reduction Operation

(1) Concentration and Calcination

Contamination of the depleted product stream with corrosion products has become increasingly severe in the past few months. Although all UO_3 shipped has been within specifications, the maximum total metallic impurity (TMI) content has been higher than normal. Iron, which is the primary contributor to the impurity, has increased from an average of less than 50 to 150 ppm uranium. General corrosion, corrosion of the mist separator, and entrainment from the waste concentrator are under investigation for possible sources.

Investigation of the erratic performance of the two test magnetic flowmeters revealed that the polyethylene insulation of the coaxial cable leads had softened sufficiently to allow intermittent shorting and grounding of the signal. The cable leads are subjected to the high temperatures ($90^{\circ}C$) of the feed control equipment box. Steps are being taken to prevent short circuiting. The flowmeters appeared to be in good condition.

b. Metal Finishing Operation

(1) Task I and II

The calciner off-gas condenser was replaced with a water cooled scrubber in an effort to eliminate the frequent pluggage of the off-gas line. Performance has not yet been evaluated.

4. Process Chemistry - K. M. Harmon

a. Purex Process Assistance

1. First Cycle Decontamination

For some time an increase in zirconium-niobium decontamination has been noted after concentrated high level waste (IWW or F-8 waste) has been added to first cycle feed (HAF) in the form of rework. Since these wastes contain significant amounts of phosphate, known to be beneficial to zirconium-niobium decontamination, laboratory tests were carried out to see if the phosphate content of these wastes could account for the effect. These tests showed that about 40-50 times the amount of phosphate actually added via such wastes is required for phosphate alone to produce the observed effect. Consequently, it would appear that the beneficial effect is largely due to other constituents (or constituent) than simple phosphate ion.

2. Solvent Treatment

As a result of continued poor solvent quality, extensive solvent clean-up studies were re-initiated. Initially, a number of filtration tests were made on plant recovered solvent to test for the removal of particulate matter. Sand, silica gel, charcoal, anthrafil, filter aid (diatomaceous earth) and asbestos fibers were used. None of these treatments gave any improvement in first cycle decontamination. In all cases, filtration removed about 25% of the gamma activity from the solvent.

Laboratory contacts were made with plant recovered solvent using a wide variety of chemical combinations. These included $\text{Na}_2\text{CO}_3\text{-KMnO}_4$; $\text{Na}_3\text{PO}_4\text{-Na}_2\text{CO}_3\text{-KMnO}_4$; $\text{H}_2\text{C}_2\text{O}_4\text{-Na}_3\text{PO}_4$; HNO_3 ; $\text{HNO}_3\text{-H}_3\text{PO}_4$; $\text{H}_2\text{C}_2\text{O}_4\text{-H}_3\text{PO}_4$; and $\text{ZrO}(\text{NO}_3)_2\text{-HNO}_3$. Of the various combinations tested, the one found most effective for improving first cycle (HAFS to ICU) decontamination was an equal volume contact with a 3% $\text{Na}_2\text{CO}_3\text{-0.02 M KMnO}_4\text{-0.02 M Na}_3\text{PO}_4$ solution followed by an equal volume wash with a 0.5 M $\text{H}_3\text{PO}_4\text{-0.06 M H}_2\text{C}_2\text{O}_4$ solution. This treatment improved first cycle decontamination by a factor of 3 over recovered plant solvent retreated in the laboratory by the standard plant clean-up procedure. Of the two steps, contact plus wash, the washing procedure appeared to achieve the greatest improvement in solvent quality. A 24 hour contact with 1 g/l $\text{ZrO}(\text{NO}_3)_2\text{-4 M HNO}_3$ was found to be as effective as a 3% $\text{Na}_2\text{CO}_3\text{-0.02 M KMnO}_4$ contact (standard plant contact).

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DECLASSIFIEDb. Analytical Assistance1. Microspark Spectrograph

The microspark spectrograph purchased to determine the nature of the inclusions found in fabricated plutonium metal has been set up. Fabrication of the sample stand and power source has been completed. Standard plates covering all the elements of interest have been prepared. With the exception of a lucite greenhouse for housing plutonium samples, the equipment is ready for use with plutonium metal.

5. 234-5 Development - H. H. Hopkins, Jr.

a. Continuous Direct Calcination Of Plutonium Nitrate

Approximately four kg of plutonium as plutonium nitrate has been calcined to plutonium oxide in the continuous direct calciner. The nitrate feed solution was 240 g/l plutonium in 4 M HNO_3 . The oxide bed temperature was maintained at 275 C during the test runs. Solution feed rate was approximately one liter per hour. Off-gases were passed through a cyclone separator and off-gas filter to remove any entrained oxide. The initial bed material was plutonium oxide (very fine particle size) formed from plutonium oxalate calcination. As the experimental runs progressed, the bed particle size increased from the 10-micron range to approximately 600 microns (by visual estimate). The formation of the large particle size oxide bed has progressed satisfactorily during the run period.

A number of operational difficulties were encountered the past month. Most of these were concerned with filter plugging, cyclone plugging, and off-gas condensation at the cyclone and filter. Installation of a heated off-gas line and heated filter housing appear to have corrected these difficulties.

b. Electrolytic Reduction Of Plutonium Trichloride

Corrosion tests of cell and electrode materials continued. Samples of tungsten rod withstood exposure to the two-phase system, molten salts - molten plutonium, for one day's exposure. A single, molybdenum sample failed in this test. Similar, but less severe, results were noted in a molten metal test. Tungsten exhibited some loss in the gas phase (nominally clean argon). Further testing will emphasize tungsten.

Two crucibles were tested under conditions of uniform heating. Morganite (Al_2O_3) survived the test with the two-phase system; and 10 percent TiO_2 - MgO survived a test with molten plutonium. These crucibles did not rupture on cooling down, as usually is the case. The metal used in these runs showed titanium and tungsten non-detectable.

c. Recuplex Studies

Stripping Recuplex CCW organic with hydrofluoric acid has been the most satisfactory method found to date. Rate studies are under way to determine the necessary contact time for efficient stripping. Table I reports results to date (20 ml of organic is stripped with 5 ml of 1 M HF).

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TABLE IHF STRIP OF RECUPLEX CCWg/l Of Plutonium Remaining In The Organic Is Tabulated

<u>Contact Time</u> <u>Min.</u>	<u>Original</u> <u>Organic</u>	<u>After 1st</u> <u>Strip</u>	<u>After 2nd</u> <u>Strip</u>
1	0.0051	0.00022	0.00003
2	0.0051	0.00040	0.00013
3	0.0051	0.00015	0.00001
5	0.0051	0.00011	0.00010

Carbonate washing the organic to remove DBP remaining after the hydrofluoric acid strip has also proven satisfactory in initial small-scale tests. Table II gives results of washes made using 20 ml organic samples with 10-minute contacts of 5 ml Na_2CO_3 :

TABLE IICARBONATE WASHING RECUPLEX CCWg/l In The Organic After Washing Tabulated

<u>Original</u> <u>Organic</u>	<u>After</u> <u>HF Strip</u>	<u>After</u> <u>1st Wash</u>	<u>After</u> <u>2nd Wash</u>	<u>Lost To</u> <u>Carbonate</u> <u>Aqueous</u>
0.059	0.00020	0.00002	0.000002	0.0002
0.059	0.00020	0.000002	0.000002	0.0002
0.059	0.00020	0.00001	0.000002	0.0002
0.059	0.00020	0.000002	0.000001	0.0002
0.059	0.00020	0.000003	0.000002	0.0002

It is noted that only about 0.2 grams per 1000 liters of organic washed would be sent to waste if a column could be operated at this efficiency.

d. Critical Mass Fuel Preparation

Concentration experiments were performed using stock solutions with plutonium concentrations of 45 g/l. The nitric acid content of the

stock solutions was varied to determine a safe initial acid concentration which would eliminate subsequent plutonium polymer precipitation during the solution concentration step. No polymer formation was noted when using an initial acid concentration of 1 M HNO_3 . Solutions with initial acid concentrations of 0.45 M HNO_3 and 0.6 M HNO_3 exhibited polymer formation in the early stages of concentration. All polymerized plutonium was redissolved when the acid concentration reached 5 M HNO_3 . These results are in agreement with previous work concerning polymerization in plutonium nitrate solutions. Final plutonium concentrations of 550 g/l were attained in the evaporation tests.

E. R. Irish

Acting Manager
Research and Engineering

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II. ACHIEVEMENTS (continued)

H. Financial Operation

1. Production Cost

Preliminary advice received in regard to submission of operating and equipment FY 1961 and 1962 budgets by the local AEC indicates that CPD 2000 Program Production and R & D requests have been transmitted to Washington intact, and in the cases of some production subfunctions at slightly higher levels. The major upward adjustment in FY 1961 involved Purex in recognition of high cost experience in March and April.

A study is in process analyzing force increases and decreases by type of manpower and facility for six-month intervals from December 31, 1956, to December 31, 1959, and for March 31, 1960, with the purpose of establishing possible areas for future improvement.

The report on the April 30 steam coal physical inventory was issued. Statistical evidence indicates that past surveys had an accuracy of $\pm 2\%$ rather than the $\pm 10\%$ guarantee historically established. This finding, combined with provable explanation of the April 30 excess of physical over book, led us to adjust book. At the same time the nature of the inventory was more fully recognized by establishing a fixed amount reserve, changing from the percentage (5%) reserve used in the past. Use of the percentage reserve underprovides for "fouled" coal at field pile bases at times of low stock level (as at present).

A review of possible year end contingency liabilities was made with Legal, Relations Operation, and CPD Relations Practices. No additional liabilities appear likely at this time.

The Essential Material Inventory has continued its rapid downward trend having decreased each month since September, 1959, when the balance was \$953,000. The Essential Material turnover rate was 4.0 in April and 2.7 fiscal year to date compared to 2.0 for FY 1959. The Spare Parts turnover rate was .40 in April and .40 fiscal year to date compared to .32 for FY 1959.

2. Personnel Accounting

During May several local insurance company representatives were contacted in order to develop the cost of automobile liability insurance applicable to private cars. This information, to be offered to employees upon request, reveals in particular a reasonably small additional cost in coverage between \$10,000/20,000 Bodily Injury and \$100,000/300,000.

A decision was made that doctors' charges for treatment of allergies would be paid in advance of treatment as has been the practice for the last four years. This practice had been questioned by C&AO Personnel Accounting management and Relations Benefits Specialist.

3. General Accounting

The reconciliation of the physical inventory of CPD uninstalled equipment was completed and a report issued May 31, 1960. Reports will be issued to section managers covering the portion of the inventory applicable to their operation.

Commission concurrence with CPD's decision to change the status of the RMA Line of the 234-5 Building from In Service to Not Used Nor Currently Useful has been requested.

4. Auditing

A formal audit report was issued covering findings and recommendations relating to an audit of Material and Package Passes. In our opinion, the activities audited were satisfactory. Two audit memorandums were issued relating to violations of Plant Property Pass procedures. A follow-up was made of the Traveling Auditors' 1959 memorandum relating to CPD activities. Satisfactory compliance with recommendations was accomplished.

A review was made to determine the eligibility of ten CPD employees to receive tuition refunds for the winter quarter 1959-60 under the terms of AEC Approval No. 201 and the G.E. Tuition Refund Program.

Verification was made of rates paid a random sample of CPD employees for the week ended March 20, 1960. Minor discrepancies noted were referred to C&AO Auditing for clarification and inclusion in their audit of C&AO Payroll Preparation Activities.

Field work continued in connection with an audit of the Adequacy of Documentation Supporting Payrolls. An interim audit memorandum recommending changes which we believe will strengthen control and effect economies was directed to section managers involved for consideration.

5. Measurements and Procedures

The review of zero maximum spare parts for the Chemical Processing Department has been completed. This review resulted in a 17% reduction in the number of line items.

During May the Specialist, Measurements and Procedures completed the Company-sponsored seminar on Value Analysis.

Manager - Finance

[REDACTED]

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

HW-65165 [REDACTED]

MAY--1960

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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

A review of the Department's 1960 Salary Action Plan was made with organization changes considered. The Department is in a favorable position. Trends and recommendations were discussed with management.

A comparison of the Department versus the Company manufacturing organization staffing patterns as expressed by exempt position levels was developed.

Two exempt positions were established; one in Production Operation and one in Facilities Engineering Operation.

2. Personnel Placement

Two offers were extended to recent college graduates. An offer to a Chemist for the Purex Analytical Control Laboratory has been accepted, and he will report early in July.

General employment specifications have been established for new hires to Utility operator classifications, or the transfer of other HAPO people into this classification. The Relations Operation employment office has been requested to correlate these specifications with similar ones originated by Irradiation Processing Department.

3. Health, Safety, and Radiation

Approximately 500 Chemical Processing Department employees participated in the project Operation Alert National Defense exercises conducted on May 3, 1960. With minor, correctable deviations, the communications, procedural, and equipment systems tested satisfactorily.

The results of the Chemical Processing Department Safety Quiz were analyzed, and recommendations were provided for internal discussion.

4. Wage and Benefits

Two Chemical Processing Department employees retired at the end of the month.

The annual pre-retirement contact meeting for HAPO employees in the fifty-nine year age group was conducted. Approximately

ninety employees were invited, twelve of which were from the Chemical Processing Department.

The Insurance and Pension plans were reviewed with the employees assigned to the Uranium Oxide facility. Lively interest was shown by the group as evidenced by the number of thoughtful questions.

A Chemical Processing Department employee passed away February 18, 1960. Due to divorce action, re-marriage, and his failure to change the beneficiary for his pension contributions, a friendly suit has been filed by legal to determine the legal disposition of this fund. It is expected that this will take several months to determine.

Suggestion Plan Activity

	<u>May</u>	<u>April</u>
Received	46	56
Adopted	11	19
Awards	\$365	\$495
Savings	\$2842	\$3341

5. Communication

On May 9, a PBM graduation dinner was held in the Desert Inn for some fifty Chemical Processing Department employees.

A series of five Report to Employees meetings were arranged and conducted during the month. Day meetings were held on May 19, 20, 26, and 27, and a meeting for swing-shift workers was held on May 25. Total combined attendance for the five meetings was slightly over 1,200 employees, approximately 95 per cent of the total Department employees. In his report the Department General Manager discussed the Department's competitive situation, goals, safety record, achievements, and challenges.

R. B. Britton
R. B. Britton, Manager
Relations Practices

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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>4-30-60</u>	<u>5-31-60</u>	<u>4-30-60</u>	<u>5-31-60</u>	<u>4-30-60</u>	<u>5-31-60</u>
General Manager's Group	10	10	1	1	11	11
Financial	13	13	11	11	24	24
Relations Practices	5	5	6	6	11	11
Research & Engineering	60	60	27	27	87	87
Facilities Engineering	67	65	21	21	88	86
Power & General Maintenance	43	41	227	227	270	268
Production	6	6	4	4	10	10
Special Separation Processing and Auxiliaries	48	47	216	218	264	265
Purex	48	49	204	205	252	254
Finished Products	<u>51</u>	<u>51</u>	<u>208</u>	<u>208</u>	<u>259</u>	<u>259</u>
Total	<u>351</u>	<u>347</u>	<u>925</u>	<u>928</u>	<u>1 276</u>	<u>1 275</u>

B. PERSONNEL CHANGES

There were no personnel changes during the month of May.

C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To other G.E. Components</u>		
M. H. Curtis	GEL and GERL Schenectady, New York	Refractory materials and ceramics (5/4-5/60)
M. H. Curtis	Lamp Metals and Components Dept. Cleveland, Ohio	Refractory materials and ceramics (5/6/60)
R. B. Britton	APED San Jose, California	Relations Practices (5/13/60)
V. R. Cooper	GE-AMC, Crotonville Ossining, New York	Advanced Management Course (5/19/60 - 7/22/60)
R. L. Stevenson	APED San Jose, California	Criticality work (5/23-24/60)
<u>To AEC and other AEC Operational Contractors</u>		
M. H. Curtis	Battelle Memorial Institute	Refractory materials and
T. S. Soine	Columbus, Ohio	ceramics (5/9/60)
M. H. Curtis	Argonne National Laboratory	Refractory materials and
T. S. Soine	Lemont, Illinois	ceramics (5/10-11/60)
M. H. Curtis	Ames Lab., Iowa State Univ.	Refractory materials and
T. S. Soine	Ames, Iowa	ceramics (5/12/60)
R. Y. Lyon	UCNC - ORNL	Uranium trioxide technology
M. J. Szulinski	Oak Ridge, Tennessee	(5/9/60)
R. Y. Lyon	UCNC	Uranium trioxide technology
M. J. Szulinski	Paducah, Kentucky	(5/10-11/60)
R. Y. Lyon	National Lead of Ohio	Uranium trioxide technology
M. J. Szulinski	Fernald Plant Cincinnati, Ohio	(5/12-13/60)
A. E. Smith	Dow Chemical, Rocky Flats Denver, Colorado	Component specifications (5/10-11/60)
A. E. Smith	LASL Los Alamos, New Mexico	Information on which to base development program (5/12-13/60)

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To General Industry

G. P. Kesel	Penberthy Instrument Company Seattle, Washington	Equipment for CG-734 (5/9/60)
A. E. Smith	American Car and Foundry Albuquerque, New Mexico	Cam and template manufacturing and gaging standards (5/12-13/60)
R. C. Hollingshead	Gorton Machine Company Racine, Wisconsin	Lathe tests (5/23-26/60)
M. G. Peterson	Gorton Machine Company Racine, Wisconsin	Lathe tests (5/24/60)
M. G. Peterson	Racine Hydraulic & Machine Racine, Wisconsin	Maintenance problems (5/25/60)
M. G. Peterson	Hartman Manufacturing Co. Racine, Wisconsin	Maintenance problems (5/25/60)
G. P. Kesel	Penberthy Instrument Co. Seattle, Washington	Equipment for CG-734 (5/31/60)

To Conventions and General Meetings

R. C. Hollingshead	University of Washington	Numerical Control Machine
E. O. Swain	Seattle, Washington	Tool Seminar (5/5-6/60)
A. E. Smith		
R. B. Britton	San Francisco, California	AMA Seminar (5/16-18/60)
W. G. Browne	Columbia High School Richland, Washington	Spoke to science classes (5/16-17/60)
R. B. Chitwood	Seattle, Washington	IRE-ISA Joint Technical Exhibition (5/26-27/60)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From other G.E. Components</u>		
R. W. Clark	GEL Schenectady, New York	Orientation tour (5/11/60)
<u>From AEC and other AEC Operational Contractors</u>		
G. B. Adkins	USAEC, Nuclear Management	Orientation tour of
V. J. D'Anico	Division	separation facilities
J. J. Komoraski	Washington, D.C.	(5/4/60)

L. O'Connell	Lawrence Radiation Lab. Livermore, California	Component parts, lathe capability (5/5/60)
O. C. Dean E. S. Ernst J. W. Snider	UCNL - ORNL Oak Ridge, Tennessee	Orientation tour (5/5/60)
W. P. Bebbington R. L. Folger C. H. Foshee	Du Pont, Savannah River Plant Aiken, South Carolina	Purex process, fuel dissolving, general process, plutonium reclamation (5/10-11/60)
C. W. Pritchard	LASL Los Alamos, New Mexico	Plutonium casting technology (5/11-13/60)
D. J. Pflaum H. Gunlock	USAEC, Div. of Classification Washington, D.C.	Purex-Redox flowsheet and security (5/18/60)
A. D. Callihan H. C. Paxton	UCNC - ORNL, Oak Ridge, Tenn. LASL, Los Alamos, New Mexico	Critical mass (5/18-20/60)
D. E. Elliott	LASL Albuquerque, New Mexico	Non-destructive testing (5/27/60)

From General Industry

Dr. Newman Dr. Self F. Moms	Turco Chemical Company Wilmington, California	Decontamination and tour equipment decontamination facility (5/5/60)
B. Olson	West Chemical Products Co. Seattle, Washington	Potential usage of decontamination agents (5/19/60)
W. G. Deibel	Gougler Machine Company Kent, Ohio	Application of components (5/26/60)

From other Government Agencies

Major S. A. Jackson	US Army, Command and General Staff, Department of Nuclear Weapons, Washington, D.C.	Orientation of separations plants (5/17/60)
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IV. SAFETY AND SECURITY

Operation	Facil. Eng.	Finan. Prod.	Fin. Prod.	P&GM	Purex	SSP&A	Prod.	Rel. Prac.	Res. & Eng.	Total CPD	Year to Date
Disabling Injuries										0	1
Serious Accidents										0	10
Medical Treatment	1		4	11	12	5			3	36	191
Injuries											
Radiation Occur.			7		2	6			2	17	85
Contam. Wounds										0	2
Pu Depositions			1*							1	6
Fires										1	5
Security Violations	1									1	2

The classification, Technical Overexposure Incidents, has been eliminated in the revised Radiation Protection Standards.

*Plutonium deposition was detected as a result of routine bioassay sampling. Source is unknown.

**A fire occurred between 202-S Building and 222-S Building when a lighted match or cigarette was tossed into waste material. Damage amounted to \$10.00.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-64391, Unclassified, "Project Proposal, CGC-872, Rev. 1 - Palmolive Fabrication and Reprocessing Facilities - 200 East Area", dated May 13, 1960, L. W. Finch.
- HW-64698, Unclassified, "Transistor Pre-Amplifier for Neutron Monitors", dated April 20, 1960, P. R. Kelly.
- HW-64754, Unclassified, "Project CGC-830, Plant Modifications for Reprocessing Non-Production Reactor Fuels, Design Criteria for Metal Solution Storage", dated April 26, 1960, R. F. Duda, W. A. Graf, G. Kligfield.
- HW-64941, Secret, "Basis for Design Scope, Plutonium Reclamation Facility, Z Plant, Project CAC-830", dated May 16, 1960, D. E. Braden.
- HW-64690, Confidential, "Purex Test Program for 1960", dated May 4, 1960, G. C. Oberg.
- HW-64993 RD, Secret, "4th Quarter FY 60 and 1st Quarter FY 61 - Forecast of Nuclear Materials Requests", dated April 27, 1960, R. E. Roberts.
- HW-65054, Secret, "Pyrochemical Applications for Z Plant Recovery Process", dated May 5, 1960, H. H. Hopkins, Jr., T. S. Soine.
- HW-65060 RD, Secret, "Redox Plant Production Schedule - May, 1960", dated May 6, 1960, D. McDonald.
- HW-65061 RD, Secret, "Purex Plant Production Schedule - May, 1960", dated May 6, 1960, D. McDonald.
- HW-65062 RD, Secret, "UO₃ Plant Production Schedule - May, 1960", dated May 6, 1960, D. McDonald.
- HW-65063 RD, Secret, "234-5 Plant Production Schedule - May, 1960", dated May 6, 1960, D. McDonald.
- HW-65072, Secret, "Special Production Study", dated May 20, 1960, B. F. Judson, L. W. Lang.

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A. PREPARED AND ISSUED (Continued)

HW-65153, Unclassified, "Scope Basis, Shielding, Plutonium Reclamation Facility, Project CAC-830", dated May 18, 1960, H. A. Moulthrop.

HW-65180, Secret, "Essential Materials Consumption - Purex, April 1-30, 1960", dated May 11, 1960, J. E. Lentz.

HW-65197, Secret, "Palm Nitrate Shipping and Measurements", dated May 11, 1960, J. H. Warren.

HW-65200, Pt.I, Secret, "Purex Palm Extraction and Purification Flowsheet and Technical Criteria for Project CGC-821", dated May 20, 1960, J. P. Duckworth, R. G. Geier.

HW-65200, Pt.II, Secret, "Project CGC-821 - Title I Design - Purex Palm Extraction", dated May 20, 1960, L. R. Michels.

HW-65207, Unclassified, "Plutonium Oxide - Plastic Mixtures for Critical Mass Studies", dated May 12, 1960, H. W. Crocker.

HW-65213, Secret, "Scheduled Shutdown - Purex Plant", dated May 12, 1960, J. H. Warren.

HW-65268, Unclassified, "Design Criteria and Hazards Evaluation, Fission Product Shipping Cask", dated May 20, 1960, C. W. Smith.

HW-65272, Secret, "CPD Waste Status Summary - April, 1960", dated May 18, 1960, J. E. Lentz.

HW-65432, Unclassified, "Fission Product Shipping Cask Hazard and Evaluation Team Report", dated May 25, 1960, J. B. Fecht, et al.

HWS-7450, Rev. 1, Unclassified, "Specifications For Fire-Resistive High-Efficiency Particulate Air Filters", dated May 3, 1960, D. A. Snyder, J. H. Palmer.

B. PREPARED FOR SIGNATURE AND ISSUANCE

HW-64992, Secret, "Production - April, 1960", dated May 2, 1960, W. E. Johnson.

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VI. PATENT SUMMARY

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

INVENTOR

TITLE

NONE

W.K. Waller
General Manager
Chemical Processing Department

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