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**CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR**

AUGUST, 1960

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Compiled By
OPERATION MANAGERS

September 21, 1960.

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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

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CHEMICAL PROCESSING DEPARTMENT
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I. SUMMARY

A. RESPONSIBILITY

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

B. PRODUCTION

Production of plutonium nitrate from the separations plants exceeded that forecasted for August. A new record high for uranium nitrate production was achieved by the Purex plant, exceeding the previous record by almost three percent.

The third neptunium recovery run was completed in the Redox plant and yielded 430 grams.

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

Although production of unfabricated plutonium metal and weapon parts was below that forecasted for August, delivery requirements were met for both products.

C. ENGINEERING

Purex operations were continuous at a nominal 3.5 capacity factor except for four brief shutdowns for equipment replacements. Both the plutonium and uranium products met specifications although the latter required silica gel treatment.

The Redox plant was shutdown the latter half of August to replace the D-14 backcycle concentrator, which had developed a large leak. Replacement, together with other necessary maintenance repairs, were near completion at month-end.

Following decontamination of the damaged Redox E-metal dissolver, visual and photographic inspection confirmed the suspected extensive damage to the crib wall and to the inner dissolver shell. Repair of the vessel for reuse appears to be impractical.

A comparison of weapon parts currently being fabricated at Hanford with those made elsewhere has revealed a difference in physical properties. The significance of this finding is not yet known.

The Purex acid concentrator tantalum demister has demonstrated a decontamination factor of 10 to 20, which is below the anticipated performance. It is believed that a portion of the liquid, trapped by the demister, is re-entrained into the vapor stream, thus contributing to activity carry-over. A new jumper has been designed to return trapped liquid to the bottom to the concentrator for improved decontamination efficiency.

Project CGC-909, "Strontium-90 Interim Storage Facilities," was authorized by the AEC (Directive No. 518, dated August 31, 1960) in the amount of \$90,000. These facilities are planned for storage and transfer of solutions which are rich in strontium-90.

Preliminary design for the second Purex equipment burial tunnel was issued for comment. The design was based on capacity for storing failed canyon equipment for a period of five years, requiring an estimated 1680 feet of tunnel storage length.

The fixed-price contractor completed his work on the new Z-Plant Inspection Facility on August 6, 1960, the contract completion date, with minor exceptions; and the facility was taken over by Finished Products Operation on August 8, 1960.

D. GENERAL

The Chemical Processing Department became eligible for the Safety Council Award at midnight August 12, 1960, after accumulating 1,462,000 man-hours since the last disabling injury on January 11, 1960.

W. J. MacReady

General Manager
Chemical Processing Department

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

	<u>August</u>	<u>July</u>
a. <u>Purex</u>		
Uranium nitrate produced (tons)	754.0	423.3
Average production rate during operation (T/D)	27.2	22.5
Total waste loss (%)		
Plutonium	0.46	0.96
Uranium	0.17	0.10
On-line efficiency	89.0	60.7
b. <u>Redox</u>		
Uranium nitrate produced (tons)	21.5	79.0
Average production rate during operation (T/D)	5.0	7.7
Total waste loss (%)		
Plutonium	0.98	0.56
Uranium	0.28	0.15
On-line efficiency	18.0	41.1
c. <u>Uranium Reduction</u>		
Normal UO ₃ loaded (tons)	643.5	428.9
Enriched UO ₃ loaded (tons)	0	0
Normal UO ₃ approved for shipment (tons)	693.2	398.7
Enriched UO ₃ approved for shipment (tons)	0	0
Normal UO ₃ shipped (tons)	544.2	449.6
Enriched UO ₃ shipped (tons)	0	0
Normal UNH backlog (tons U)	279.5	160.2
Enriched UNH backlog (tons U)	4.5	4.5
d. <u>Plutonium Metal Processing</u>		
Input to Task I (batches)	258	190
Reduction yield (%)	96.0	95.2
Plutonium metal buttons produced (% of commitment)	81.5	67.7
Plutonium metal buttons shipped (% of commitment)	99.1	101.2
Product recovery output (% of schedule)	86.0	95.7
Product recovery backlog (Kgs)	232.8	195.7
Waste disposal (grams)	362	591

e. Plutonium Metal Fabrication

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AugustJulyf. Waste Storage

Redox salt waste reserve (tons U)	2 789	2 791
Purex salt waste reserve (tons U)	25 327	26 067
Redox coating waste reserve (tons U)	19 110	19 112
Purex coating waste reserve (tons U)	31 800	32 540

g. Power

	<u>200 East</u>	<u>200 West</u>
Raw water pumped (gpm)	11 563	5 162
Filtered water pumped (gpm)	1 178	1 047
Maximum steam generated (lbs/hr)	240	109
Average steam generated (lbs/hr)	199 450	62 335
Total steam generated (M lbs)	148 391	46 377
Coal consumed (est. tons)	8 107	2 376

J. H. Warner
Manager - Production

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**CHEMICAL PROCESSING DEPARTMENT
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II ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

A new production record was achieved. The plant started up on August 2, following the installation of the spare waste concentrator. Operations were continuous at a nominal 3.5 CF throughout the month except for four unscheduled shutdowns (each of less than 24 hours duration) to replace three leaking jumpers and a first-cycle feed pump. All plutonium produced met specifications. Due to a partitioning failure following the August 2 startup approximately 37 tons of uranium were out of specifications with respect to plutonium content. All of this material was reworked through the final uranium cycle by the end of the month. The activity of the uranium product ranged from 1.0 to 10.0 gamma ratio with an average of about 4.3. Both plutonium and uranium waste losses were higher than normal.

2. Processing Operations

Prior to startup on August 2 the entire organic inventory in the #1 system was discarded and replaced with used organic which had been stored in the P-2 tank. Laboratory tests indicated that the stored organic was of better quality than that in the system.

A partitioning failure occurred during the first sixteen hours of operation early in the month. During the same period the HAW Birch losses were unusually high and a large portion of the inventory was segregated in a single batch of waste for rework.

Throughout the month the HAW plutonium waste losses remained higher than normal and occasionally reached a maximum of five to eight percent over short periods. The cause is not known for certain but an inextractable form of plutonium in the various rework solutions is suspected.

During the period of high plutonium losses the Birch losses remained low although usually these losses follow the same trend as plutonium losses.

All of the out-of-specification plutonium remaining from the previous run period was blended with current production. Rework of all out-of-specification uranium, which had been stored in the P tanks, was also completed. The rich wastes from the June Birch run were reworked without difficulty.

The silica gel facility processed 523 tons of uranium during the period to meet specifications. Twelve tons of uranium were shipped to Redox for silica gel treatment.

3. Mechanical Experiences

The following three jumpers failed and required replacement:

- a. The second plutonium decontamination cycle waste jumper.
- b. The final waste concentrator feed jumper.
- c. The feed jumper to the back-cycle concentrator.

The drive wheel assembly on the west canyon crane failed during the month. This is the third such failure since startup. In each case the failure occurred on the north end of the crane which carries the shielded cab. To help prevent shaft failures in the future the spare wheel and axle will be fabricated out of higher grade steel as recommended by the manufacturer.

Two centrifuge failures were experienced, R-2 and G-4. Both failures are attributed to seal failures in the drivehead assemblies. The R-2 unit was repaired by replacing the drivehead assembly and the other will be repaired at a future date.

Excessive upper seal leakage on the H-1 pump resulted in a plant shutdown on August 17. The F-7 pump was replaced on a scheduled basis after two years of service.

4. Radiation Experience

The total radio-iodine 131 emission for the month was 43 curies. The maximum 7-day emission was 13 curies and the daily average was 1.4 curies. There were seven Radiation Occurrences and a total of 15 cases of skin contamination during the month.

The failure of a locking device on a lead pig containing process solution resulted in a spill in the laboratory area with contamination levels up to 1.5 rads/hr. at surface and plutonium contamination in excess of 40,000 d/m on the floor. The affected areas were decontaminated.

The failure of a valve in the concentrator waste sampler resulted in process solution being sprayed inside the sampler hood. The sampler was successfully decontaminated inside and out.

5. Analytical Experience

A large number of special samples were analyzed by the laboratory in an attempt to define the cause of the erratic first cycle plutonium waste losses.

On the recommendation of SS Accountability Operation the plutonium analyses by X-ray spectrophotometer method were compared at the

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Purex and FPO laboratories. The results indicate that the FPO results are biased 0.5% higher than Purex results.

6. Events Influencing Costs

Two Group I canyon pumps, valued at \$14,000, were decontaminated and repaired at a total cost of \$5,000.

P. R. McMurray
Manager-Purex

PR McMurray:EAF:gt

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

The third Redox Plant birch recovery run was completed on 8-3-60. Normal uranium metal processing was resumed on 8-9-60. However, processing difficulties were encountered and on 8-15-60 it was necessary to discontinue virgin feed and concentrate on rework activities. On 8-26-60 the plant was shutdown for much-needed equipment repair work including replacement of a leaking D-14 backcycle concentrator.

2. Processing Operation

Processing of the third Redox Plant birch recovery run, which was started during the latter part of July, was completed on 8-3-60. Approximately 430 units of birch were delivered to the Process Chemistry Operation for final purification and isolation.

The plant returned to normal uranium metal processing on 8-9-60, after reprocessing large volumes of waste solution, high in uranium and plutonium content, which had accumulated during the birch recovery run. The processing of normal uranium was marred by partition failures in the 1B column (partition column), poor decontamination, and a severe leak in the LABS backcycle concentrator (D-14). On 8-15-60 the processing of virgin feed was discontinued to clean out the waste section in preparation for replacement of the D-14 pot. The replacement along with other much-needed repair work started on 8-26 and was completed by 9-3-60.

Dissolution of the twelve special two-ton test batches of normal uranium fuel elements, irradiated in the Hanford reactors to provide information on plutonium formation rates, was completed this month. Analyses by the Redox Laboratory on the numerous samples taken have been completed.

Approximately 11 tons of UNH, with a high gamma ratio, were received from the Purex Plant and reprocessed through the silica gel system to reduce the gamma content to within shipping specifications.

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3. Mechanical Experience

The non-critically safe L-16 recycle receiver tank, located in the 233-S Concentration Building, was replaced with a new critically safe unit. Installation was started during the last week of July and was completed on 8-9-60. The work was completed without incident although the potential for personnel and building radioactive contamination was extremely high. The old L-16 tank was transferred to the Redox Equipment Decontamination Facility for salvage.

The D-14 backcycle concentrator required replacing this month when a large leak developed in the tank wall approximately 55 inches from the bottom and at a level corresponding to the bottom of the top recirculator tube. Installation of the replacement unit (a modified G-3 organic still tank) was started on 8-26-60 and completed on 9-3-60.

On 8-5-60, a new agitator was installed in the E-13 uranium ozonator tank. The old agitator, which had been in service since 12-26-55, failed after shearing a gear.

The off-gas filter for the conventional B-2 dissolver, which was installed during July as a replacement for the failed multipurpose dissolver, was received and installed this month along with a new silver reactor. All jumpers and connectors have been checked and the dissolver is now ready for service.

4. Waste Handling and Decontamination

Equipment valued at \$84,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at \$26,500 was returned to customers after decontamination and repair and represents a savings of approximately \$18,000 over the cost of new replacement equipment.

A total of 202 man-hours was charged to the decontamination of railroad, automotive, and heavy equipment. The following is a breakdown of the major items decontaminated:

<u>Item</u>	<u>Operation Charged</u>
Well Car No. 44	Purex
Well Cars No. 40, 98	Redox
Flat Car No. CPD-6	Purex
Flat Car No. 3626	Redox
Hydro Crane No. 17-T-5694	P&GM
Water Truck No. 68-C-4644	P&GM
Motor Crane No. 17-T-19951	P&GM
Pick-up Truck No. 1C-172	P&GM

<u>Item</u>	<u>Operation Charged</u>
Evacuation Bus No. 1B-6866	Purex
Pick-up Truck No. 1C-3971	Purex
Truck No. 68-L-2599	Transportation
Truck No. 68-B-2637	Transportation
G.E. Bus No. 1B-5165	Transportation
G.E. Bus No. 1B-5145	Transportation

5. Radiation Experience

Removal of the grossly contaminated L-16 recycle receiver tank from the 233-S Concentration Building, which was completed this month, was a difficult and dangerous job to perform, but was completed without excessive radiation exposure to personnel or uncontrolled spread of contamination. A total of six skin contamination cases and five shoe contaminations resulted from the job. The maximum skin contamination was 5000 d/m and was readily reduced to less than detectable. The viewing room and load-out room were protected from gross contamination by a temporary greenhouse and air lock. The temporary greenhouse was contaminated to over a million d/m and the air lock to 40,000 d/m. However, only a few spots to 2000 d/m migrated to the load-out room. Two-piece plastic suits gave the workmen good contamination protection.

Decontamination work completed this month on the failed B-2 multipurpose dissolver was sufficient to allow limited visual inspection. Dose rates were reduced from 1.5 r under three feet of water in the 221-T Canyon swimming pool to less than 1 r with the pool empty. Eighteen people were subsequently authorized to take from 200 to 300 mrem to inspect and photograph the dissolver. Dose rates were up to 800 mr/hr and the average exposure received was 100 mrem. This limited inspection of the interior of the failed dissolver confirmed the extensive damage to the crib wall and the inner dissolver shell that was indicated by the preliminary TV inspection reported during July.

6. Analytical Experience

Work was completed on all of the many analytical control analyses requested on the twelve special two-ton test batches of normal uranium fuel elements, irradiated in the Hanford reactors to provide information on plutonium formation rates. Results have been forwarded to the Process Chemistry Operation, Research and Engineering, for evaluation in connection with other data being accumulated.

A more rapid analytical method for determining sulfate in uranyl nitrate solutions and UO_3 powder was tested, approved, and placed in service this month. In the new method, sulfate

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ion is separated from uranium by extracting the uranium into TBP Shell Spray Base. The sulfate in the uranium free aqueous phase is determined turbidimetrically as BaSO_4 . The use of the new method will result in a net reduction of applied labor charges to the Uranium Reduction Operation of approximately 35 hours per week.

7. Events Influencing Costs

Costs during August will be affected upward due to the failure of expensive processing equipment, extensive rework operations, and difficulties in securing satisfactory product decontamination.

C. J. Beaulieu
for Manager - Special Separation
Processing and Auxiliaries

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

In the Finished Products Operation, model 85 parts were fabricated on a formal basis this month, and while the forecast was not met, the delivery requirements were satisfied. The production of unfabricated plutonium was below forecast but here too, delivery requirements were met. Mechanical difficulties resulted in plutonium recovery being approximately twenty percent under schedule. Uranium Oxide production met all requirements.

2. Processing Operations

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b. Plutonium Processing

The production of unfabricated plutonium during August was significantly higher than in the two previous months, reflecting an adequate feed supply and fewer mechanical difficulties. The reject rate which was due to high iron content has improved and is approaching normal.

The plans to activate the new RMC Line equipment were unsuccessful this month because of equipment failures. Corrective action is underway by both construction and maintenance forces. Operation of the RMA Line was satisfactory, with exceptionally good performance being demonstrated during the latter half of the month.

Numerous major mechanical difficulties, principally, dissolver vessel and solvent extraction column bellows failures, limited the Plutonium Recovery production to 80 percent of schedule this month.

c. Uranium Reduction

The Uranium Reduction plant continued to operate well and met all requirements. "G" calciner was returned to the handling of normal uranium when the Redox plant temporarily discontinued processing the enriched material. The new conveyor system in "G" cell performed well following the installation of heavier shear pins.

3. Mechanical Experience

The Plutonium Fabrication equipment performed well during the month with the only major maintenance item being the overhaul of the control system of the 24-B (Gorton) lathe.

The RMA Line plutonium preparation equipment performed satisfactorily during the month, with only routine maintenance required. The RMC equipment was down most of the month due principally to failure of the air drying system, and to difficulties with the fluorinator temperature controls, the neutron monitor and the density balance.

The plutonium recovery equipment suffered numerous major failures during the month. Both slag and crucible dissolvers (D-1 and D-2), and the metal dissolver (in Hood 43) failed due to corrosion. D-2 and the metal dissolver have been repaired but D-1 requires replacement which is in progress. In addition, the pulser bellows on the H-1 solvent extraction column failed on three separate occasions. A return to the former wider spacing of the column plates has been made to reduce bellows pressure and lengthen life.

The Uranium Reduction plant equipment performed satisfactorily. The only major items involved the overhaul of one of the large powder handling rotary valves and the rewinding of one of the calciner drive 125 hp motors.

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4. Radiation Experience

Radiation and contamination control statistics show that general control was satisfactory.

The emission of plutonium from the Z Plant stack rose to an average of 106 uc/day which is about tentimes normal. This high average resulted from failed primary and secondary filters servicing the 9A and 9B Hoods(Continuous Tasks I and II). On one occasion, when a filter disintegrated while being changed, the emission limit was exceeded. Air conditions, and wind direction and velocity were such that no environmental hazards resulted. Stack performance was back to normal at the end of the month.

Two cases of potential plutonium deposition occurred during the month. One involved exposure to contaminated air, and the second involved a puncture wound from a metallic sliver. Initial investigation of both indicates very minor deposition.

5. Analytical and Final Inspection Experience

	<u>July</u>	<u>August</u>
Number of Samples Received	1,542	998
Number of Determinations	12,669	11,657
Average Impurity, Buttons	3,945 ppm	2,067 ppm
Buttons Rejected	19.0%	2.2%
Average Purity, Model 85 Parts	98.73%	98.80%
Model 85 Parts Accepted	12%	28%

L. J. Becker

(for) Manager - Finished Products

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II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

There were no outages of Power services that affected operating continuity of the prime production facilities.

2. Inspection, Maintenance and Repair

All necessary work was completed on preparation of a spare Purex Concentrator for installation in the H-4 Backcycle Acid Concentrator position. Included were installation of lagging and sheathing, leak test, dimensional mockup and lengthening of the seal trap off the seal pot. Because of the urgent need for this unit, sheetmetal workers were placed on special nonrotating day, swing and graveyard shifts for a two-week period to expedite the installation of the stainless steel sheathing. This concentrator is the second of the two newer spares, the other one having been installed in the F-11 position last month. Support racks were also fabricated and installed on a railroad car to provide for removal and tunnel burial of the failed H-4 Concentrator.

Modification and repairs are in progress on the second of two older spare concentrators for Purex. The work includes removal of three bolted flange joints, lengthening of a seal trap, dimensional check, replacement of welded studs by screwed and keyed studs, and repair of welds in the downcomer line. The job is essentially complete.

A Purex 2-E Pulse Column was modified at the Purex Plant to allow for use of a remoteable sieve plate cartridge. This stripping column for the uranium decontamination cycle was removed from service several months ago to allow for installation of a new column with remoteable cartridge, and will be a spare for this position.

Modifications are being made on the spare Purex 2-A Plutonium Decontamination Column to provide for more accurate reading of the interface level in the lower "beaver-tail" section of this column.

Fabrication of a prototype all-steel cartridge for the Purex HS Column is about 75 per cent complete. Fabrication of spare standard sieve plate cartridges for the HA and HS columns is approximately 40 per cent complete. Completion will be delayed because of problems involved in procuring acceptable polyethylene plates from a vendor.

Reactivation and revision of equipment and facilities in the 244-CR Vault Area were carried forward this month, so that this area may be used for storage of strontium from Purex waste streams. At month's end, reactivation and repair of pumps, agitators, tank dip tubes, air compressor,

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exhaust fans, existing instrumentation, service lines and painting are essentially complete; piping revisions on the cooling water system for tanks 002 and 003 are well under way; and fabrication of 18 jumpers is about 25 per cent complete.

A centrifuge drive head and motor were prepared for service and shipped to Purex for installation on the centrifuge in the Solvent Recovery System. Replacement was necessary because of bearing failure. Three pumps were also shipped to Purex as replacements for failed equipment.

A spare Redox B-4 Dissolver Off-Gas Filter was made ready for use and sent to the plant as replacement for a unit which developed a drop in pressure differential. Preparation required packing with five layers of varying density fiberglass, welding of the top head to the vessel proper, and installation of two 4-inch nozzles as replacements for bolted flanges.

Fabrication of the Redox Mark V Dissolver was started late in the month. Current work is on the base for the vessel and neutron plug.

The Redox D-14 Backcycle Concentrator failed on August 19, and work was started immediately on emergency basis to convert a spare G-3 Organic Stripper for use in the D-14 position. The revisions involved major pipe and nozzle changes, installation of a pump chamber and flange, blanking-off of one reboiler section for use as a cooling section, and hydrostatic test. The unit was completed and sent to Redox on August 29.

Thirty-two jumpers were fabricated during the month—20 for Purex, 8 for Redox and 4 for tank farms.

Installation of the one-million-volt X-ray Hood, conveyor system, sweep arm and associated equipment and controls was completed in the new inspection section of 234-5 Building.

Installation of the Sheffield Rotary Contour Gauge, enclosing hood and related equipment and controls in Room 192-D of 234-5 Building was completed this month. Also completed was installation of the air conditioning system which controls the temperature within the hood. Work is in progress on the air conditioning system for the room and is about 65 per cent complete.

Installation of a 283-ton Extrusion Press for use in special fuel element work at 231-Z has been completed.

Outside party inspections were made of No. 4 boiler and the flash tank in West Area, and No. 5 boiler in East Area. Verbal report indicates that all three units are in a safe and satisfactory condition.

Activated charcoal feed was started to both water treatment plants on 8-16-60. Successful results have been obtained at taking the offensive odor and taste from the sanitary water. Feed will be continued until river conditions improve.

Ventilation balance activities included:

- (a) Conducting acceptance tests on the new air dryer and associated equipment in the 234-5 Building. Dryer performance would not meet design criteria, and corrective changes are under way.
- (b) Providing 202-S Building management with ventilation procedures for, and assisting in the removal of, the L-16 tank from the 233-S Building. Removal was effected without incident.
- (c) Supervising inspection of high-efficiency filters received for DOP tests for the IPD Confinement Project (CG-1-791). Three shipments were received. Of 190 filters received in the first shipment, 31 were found to be oversized. The second and third shipments (193 and 222 filters) were acceptable.

Two process hoods and a section of the general conveyor of the 234-5 Plant were buried and backfilled in accordance with a special burial procedure. Hoods H-24 and H-29 and a section of the conveyor were removed, crated and buried in a specially excavated slit trench in the bottom of the existing burial trench.

A broken drive shaft was replaced on the overhead crane in the Purex canyon. This work was accomplished under SWP conditions and without incident.

The interior of the Buffalo air conditioning units in the 231-Z Building were cleaned and painted. This work was done over a weekend to allow the shutdown of the units and to avoid disrupting building operations. SWP conditions prevailed.

Two underground water line leaks were repaired during the month. Two bell joints were found to be leaking on the 16-inch raw water loop south of the 222-B Building, and repairs were made by recaulking. These leaks are believed to be the source of water that was found in the 101-B underground tank in the 241-B Tank Farm, as the pipe encasement carrying the lines from 221-B to the Tank Farm is located approximately 40 feet from the leaking joints. The accumulation of water in the 101-B tank was reported in the July report as coming from another source.

A new 75-kva transformer was purchased and installed in 2101-M Building. Other electrical work in 2101-M included lowering all light fixtures in the Spare Parts offices, installing 35 new fixtures, installing an additional lighting circuit panel for the additional lights, circuit balancing, and installing additional electrical and telephone outlets.

Hauserman partition installations were made in the 271-T and 277-W Buildings. Additional office space was made available for the Shops in 277-W. Some improvements were made for FEO on the third floor of 271-T for their instrument training program.

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T. G. LaFollette
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

Purex Demister

The tantalum demister in the F-F6 position at Purex has demonstrated a decontamination factor of 10 to 20, which is below the anticipated performance. Entrained liquid trapped by the demister is presently returned to #2 tray of the E-F6 stripper section. It is believed that a portion of this liquid is re-entrained into the vapor stream, thus contributing to activity carry-over. A new jumper has been designed to return trapped liquid to the bottom of the concentrator. Further data gained by operation of the new jumper will be factored into the decision about single-stage waste concentration.

Waste Carton Monitor

The equipment for monitoring Purex waste cartons has been adjusted and has been given a general operational test in the laboratory in 271-T Building. Upon completing some minor mechanical corrections to the moderator box, the monitor will be installed in Purex during a convenient shutdown.

b. Project Engineering

CGC-854 - Conversion of Purex Anion Exchange Prototype to a Manufacturing Unit

A physical completion notice was issued on August 1. The XAF feed pump was shipped on August 29 and will be installed during September.

CAC-891 - Purex 216-A Crib Replacement

The fixed price contract for construction of the crib was awarded to Erwen Construction Company on a low bid of \$39,750. Fair cost estimate was \$63,000 and this appropriation estimate was \$53,000. The contractor moved in equipment to start work August 31. Work on the control box and pipe line in the contaminated ground was started by the CPFF contractor on August 9. On August 24, the Atomic Energy Commission issued bid invitations for the test wells.

New Project Authorization

Project CGC-909 - Strontium-90 Interim Storage Facilities - was authorized by A.E.C. Directive No. HW-518, dated August 31, 1960, in the amount of \$90,000. These facilities are planned for transfer and storage of solutions rich in strontium-90.

c. Manufacturing Engineering

Strontium Waste Recovery

Design for thirteen (13) jumpers was completed. This includes eleven (11) jumpers for the 244-CR Tank Farm and two (2) jumpers for the 202-A Building. Design and procurement information was completed for installation of a coil leak detection system on the 244-CR tanks.

Preliminary Design-Purex Equipment Burial Tunnel #2

Preliminary design for the second Purex Equipment burial tunnel was issued for comments on August 12. A review meeting was held with the Purex Operation on August 17. The preliminary design presently is based on capacity for storing all changed-out canyon equipment for a period of five (5) years, estimated to require 1680 feet of tunnel storage length. Approved preliminary design is planned for September 2. Descriptions of alternate burial methods for use in the project proposal preparation, is scheduled for completion on September 6, 1960.

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2. Special Separation Processing

a. Process Design and Development Engineering

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NPR Liaison

Liaison has been re-activated with the N Reactor Design Group as their design of the fuel discharge and storage equipment reaches the critical stage. The dissolver canister concept for transporting fuel between the reactor and the separation plant has remained unchanged; however, details are still being revised. American Machine and Foundry, Incorporated, is developing the reactor discharge and canister design within the limits previously established by CPD. Changes in canister design are being checked against the Redox Mark V Dissolver design to assure they are compatible.

b. Project Engineering

CGC-830, Rev. #3 - Plant Modifications for Reprocessing Non-Production Reactor Fuels

Directive No. HW-483, Mod. #2, dated August 23, 1960, authorized a reduction of funds from \$1,450,000 to \$928,000 and reversion to design only. The Dissolution and Cross Country Pipeline Criteria were approved by the Commission on August 29, 1960. These criteria are being transmitted to Vitro Engineering Company and Design Engineering Operation, respectively, for Title II design.

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c. Manufacturing Engineering

Removal of L-16 Tank

During removal of the L-16 Tank from the 233-S Bldg., a 25-minute film was made. The film recorded work scenes beginning with disconnecting the tank from its position in the system and ending with sealing the tank into its burial box. This study has possible benefit for maintenance, radiation, and engineering groups. An edited version of the film will be analyzed with them.

3. Finished Products Operation

a. Process Design and Development Engineering

AirTube Material Transfer System

Of the possible vendors previously consulted, three (3) have stated they can supply a system capable of transferring solid materials between "Z" Plant and the new Plutonium Reclamation Facility. Also, the indicated prices are much less than the amount of \$51,000 which was determined previously to be justifiable. All three vendors - Standard Conveyor Tube Company, Airmatic Systems Corporation, and the Grover Tube Company - have agreed to present preliminary specifications on the air tube system which they propose.

H-9 Button Line Improvement Program

In-line tests were performed during the month on a Poroloy off-gas filter, installed inside the fluorinator tube. These tests show that the Poroloy Filter, constructed of Hastelloy C, will not last more than a day or two in this service. It was concluded that failure resulted from the vigorous vibration rather than actual corrosion of the material itself. Filter elements made of coarse carbon material have withstood vigorous tests (vibrational) in 271-T Building.

New designs were prepared for a carbon filter and carbon materials ordered. Development work was continued on filtering cloths for the vacuum drum filter, particularly to use linear polyethylene cloth instead of the dynel cloth now being used. Also, the continuous centrifuge which was ordered as a possible replacement to the vacuum drum filter,

is now being tested with sodium oxalate as a stand-in material.

Plutonium Recovery Alternate Design Basis

All drawings and supporting data for a recovery plutonium facility, based on the alternate design of using completely hermetically sealed equipment, was transmitted to Estimating. The cost estimates for this facility were completed and show that it may be possible to achieve savings as high as 25 percent in the over-all capital costs of the facility, based on this design. Effort is continuing on procurement and demonstrating each of the new features and equipment that would be used in a facility based on this concept.

Final Inspection Neutron Counter

The electronic equipment cabinet was installed and interconnected with the neutron detector tubes at the HI-71NC inspection hood. Troubles with some faulty detectors and with noise in the amplifiers have been corrected. Additional calibration checking is required, but the tests to date indicate satisfactory operation.

Neutron Counters for Pu Reclamation Facility

Instrumentation requirements for neutron counting were given a general review. An effort is being made to obtain an instrument combining the functions of several different components which are now required. This will result in more reliable, more compact, and more useful instrumentation.

b. Project Engineering

CGC-811 - Job 905 - Inspection Facility - 234-5 Building

The fixed-price contractor completed his work on August 6, the contract completion date, with minor exceptions; and the facility was taken over by Finished Products Operation on August 8. Relocation and installation of three (3) existing hoods in the new inspection facility was started by CPTF forces on August 31.

CAC-880 - Plutonium Reclamation Facility

Based primarily on an economic evaluation, it was decided

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to relocate the facility at the southeast corner of the 234-5 Building with the proposed Waste Treatment Facility situated between the subject facility and the 234-5 Building. General agreement has been reached on the process flow diagram, engineering flow diagrams, and building arrangement; and these drawings were approved at the end of the month.

D.O. # 51212 - Waste Treatment Facility - "Z" Plant

A preliminary project proposal, requesting interim authorization of \$70,000 for design of facilities at "Z" Plant, for recovery of plutonium from Recuplex CAW and sump wastes is circulating for approval.

4. General

a. Process Design and Development Engineering

Transistor Training Class

Arrangements have been completed for teaching semiconductor circuitry to a class of maintenance craftsmen. The first class will start September for 11 students.

TV Camera Prism Control

A control unit has been completed for a prism drive mechanism. The prism is mounted on a TV camera and permits scanning a hemispherical area without moving the camera position.

b. Project Engineering

Project Cost Information as of 8/14/60:

Total Authorized Funds - 13 active projects	\$ 7,950,000
Total Cost-To-Date	5,491,000
Committments and Open Work Releases	654,000
Unencumbered Balance	1,805,000
Costs charged to above projects 7/17 to 8/14/60)	301,958

CGC-830 - NPF Reprocessing

Document No. HW-65973 - on the design criteria for the remaining "U" Plant facilities, was transmitted to the Commission on August 15. In addition, HW-66118 - the criteria for the Cross Country Line between 221-U and 202-S Buildings, was transmitted to the Commission on August 17.

The design criteria on the remaining phase of the project, the Redox Plant alterations, are now being prepared.

C. Manufacturing Engineering

Process Connector Drawings - Revisions are currently being made to up-date process connector drawings required for the purchase of about 685 connectors from various types and sizes for four (4) projects. It is expected that the updating of 100 to 200 drawings will be involved, with completion required by October 1, 1960.

Optical Scanning System - Tests were made with the television camera connected to the optical scanning system which is planned for examination of the interior of waste tanks. A double image over portions of the scan has been corrected. A reversal, or mirror image, can be compensated for in reversal of the scan circuit on the TV monitor. Lighting requirements with the zoom lens will be high.

A. P. Shaw, Manager
Facilities Engineering Operation
CHEMICAL PROCESSING DEPARTMENT

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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 - R. G. Geier

a. Feed Preparation

With the increased production rate ($CF = 3.5$) and the decreased cooling time of the uranium (85 to 95 days) the evolution of radioiodine to the atmosphere has increased to an average of about 1.5 curies per day. Attempts to reduce this emission rate by regenerating all three dissolver silver reactors and adding mercuric nitrate to the metal solution were unsuccessful. Approximately 25 per cent of the released iodine originates in each of the three dissolver cells with the remaining 25 per cent coming from the vessel vent system silver reactor.

b. Solvent Extraction

Plant startup following the July shutdown was smooth with excellent decontamination performance. The improved performance was attributed to the better organic quality after the solvent change. Decontamination, particularly in the uranium product, suffered somewhat when the plant processing rate was increased from $CF = 2.8$ to $CF = 3.6$. The higher rates required operating on a "biased" flowsheet in which several scrub flow rates were below flowsheet values. In addition, a temporary reduction in HA Column uranium saturation - dictated by high waste losses - caused further deterioration of decontamination. However, introduction of neptunium recovery run waste rework and refluxed miscellaneous wastes in the HA Column feed (1:20 ratio) helped restore and even improved decontamination performance.

All plutonium batches produced met gamma activity specifications after ion exchange treatment. Several uranium batches produced shortly after startup were less than 2.0 gamma ratio, but as solvent extraction decontamination deteriorated as a result of higher processing rates and reduced uranium saturation, the gamma ratio increased to the 8 to 10 range. At month end, after addition of the waste rework, the gamma ratio had dropped to 5.0 - 5.5.

Plutonium losses via the HA Column effluent (HAW) were generally high during the month. After the plant operation had leveled out, losses in the HAW continued in the 0.1 - 0.3 per cent range, despite drastic downward adjustments in the HA Column uranium saturation.

Shortly after startup, an unexplained partitioning failure occurred. Although partitioning was restored by increased ferrous sulfamate in the IBX (0.03 to 0.045 M) and periodic, direct sulfamic acid additions to the IBXF, the presence of an oxidizing agent in the process was apparent for an extended period of time as evidenced by the absence of ferrous ion in the IBP. Concurrent checks of the flow control instrumentation indicated a lower-than-flowsheet sodium nitrite addition was being made to the IOO for neptunium recovery. After partitioning was restored, a 1.5 to 2.0 per cent IBU plutonium concentration (normal = 0.5 per cent) persisted despite a 125 per cent flowsheet ferrous ion concentration in the IBX stream. This higher plutonium concentration occurs because the present IBX Column cannot be operated at the optimum pulse frequency and extractant flow for the present high processing rate.

Other items of interest to solvent extraction included:

- (1) Poor 2A Column stability at high processing rates was somewhat improved by increasing the 2AX temperature from 45 to 50° C, but a greater improvement occurred when the scrub flow was reduced to fifty per cent flowsheet. However, increased gamma activity in the intercycle streams forced a return to ninety per cent of flowsheet for the 2AS flow.
- (2) The two-fold increase in gamma decontamination, obtained in the IC Column by lower ICX flow and temperature, was partially lost at the processing rate CF = 3.6 when the ICX temperature was increased 40 to 60° C for better column stability.
- (3) The operation of the plant at CF = 3.6 on a "biased" flowsheet was estimated to increase the cost of uranium processing by \$24 per ton. About fifty per cent of the increase was chargeable to higher waste handling and storage costs because the Acid Absorber limited acid recovery.
- (4) No unusual waste losses or gamma activity bursts occurred during startup after four short (up to 24 hours) shutdowns forced by equipment failures.

c. Neptunium Recovery

Neptunium losses became uncontrollable shortly after startup with the result that almost the entire neptunium inventory (about 600 grams) was discharged into the waste via the HA Column. The high loss was

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concurrent with the loss of partitioning in the IBX Column, and no satisfactory explanation for its occurrence was found. One waste batch containing a major portion of the inventory was segregated and later reworked.

Sodium nitrite, which was previously added to the HA Column via the organic extractant (HAX), is now introduced as a five per cent solution directly into the bottom of the HA Column via a four point distributor located about three feet above the HAX distributor. This change assisted in gaining control of the neptunium loss which averaged about twenty per cent of the virgin neptunium introduced with the feed during the remainder of the month.

d. Plutonium Concentration

Addition of fluoride ion to the feed for the plutonium ion exchange unit (XAF) continued to produce decontamination factors up to 25. Generally, the fluoride ion concentration was 0.01 M in the XAF; however, for short periods of time, the concentration was reduced to 0.005 M with no apparent change in decontamination performance. An aluminum nitrate concentration of 0.02 M was maintained in the XAF to combat the corrosive effect of fluoride ion in the processing equipment.

For optimum stripping in the XC Column an extractant of less than 1.1 M nitric acid must be used; thus, the nitric acid concentration of the XC Column extractant (XCX) was reduced from 1.0 to 0.9 M.

e. Solvent Treatment

The gamma activity of the No. 1 System Solvent remained in the 1000 to 2000 microcuries per gallon range for the major portion of the month. One temporary burst of gamma activity, up to 6000 microcuries per gallon, was gradually reduced to normal by increasing the Batch Wash Tank (TK-G1) KMnO_4 addition to 300 per cent flowsheet. In addition, the aqueous carbonate wash was changed on a six hour instead of an eight hour interval. Lower intercycle gamma activities, produced by the addition of rework to the HAF, probably helped also to lower the solvent gamma activity.

f. Waste Treatment and Acid Recovery

Waste volumes sent to underground storage tanks averaged 74, 335 and 65 gallons per ton of uranium processed for neutralized IWW, solvent washes and cell drainage, respectively. Pressurization of the Acid Absorber, due to a low (thirty inches of water) vacuum on the condenser vent header (vice a designed vacuum of fifty inches of water), necessitated a reduction in the amount of dilution water added to the high level waste prior to concentration. As a consequence, acid recovery was reduced and the amount of high activity waste (IWW) increased from 5 to about 7.3 flows.

2. Redox Process Technology -

a. Dissolving

Limited visual and photographic inspection of the interior of the failed B-2 multipurpose dissolver at the Equipment Decontamination Facility confirmed the extensive damage to the crib wall and the inner dissolver shell indicated by the preliminary TV camera inspection reported last month. Two large holes were visible in the shell wall about four feet above the fuel support grating. The holes appeared to be 12 to 18 inches wide and two to three feet long. A hole about a foot in diameter was also visible in the crib wall just above the solid baffle. Four or five turns of the coil were visible through the hole and an irregular slit, approximately three inches long and an inch wide, could be seen in the top coil. Severe warpage of the crib wall was readily apparent but deformation of the inner shell was not noticeable. Although no evidence of damage to the exterior shell could be seen, repair of the vessel for reuse appears impractical.

In the continuing search for uranium losses exceeding those accounted for by analysis of plant wastes, it was suggested that metallic uranium fines chipped off or eroded from the unclad metal heel in the dissolver during charging and jacket removal, could then be transferred undetected with the cladding waste to the underground waste storage tanks. (If this theory is correct, a portion of the uranium transferred as chips or fines should settle out and remain in the cladding waste sampler tank, H-10.)

To check this theory, 690 gallons of 30 percent nitric acid were added to the H-10 tank and digested at 60-70 C, with agitation, for 24 hours. Analytical results on samples taken four hours after the addition of the acid indicated six pounds of uranium and two grams of plutonium in solution. No additional uranium or plutonium was dissolved during the remaining 20-hour digestion. Since the cladding waste sampler tank, H-10, had not been flushed with acid during the past year, this small recovery of uranium and plutonium indicated that the postulated mechanism does not contribute significantly to the over-all problem of product loss.

b. Neptunium Recovery

The third neptunium recovery run was completed early in the month. The neptunium "lost" to the third cycle uranium concentrator at the end of July was recovered from the concentrated uranium in the partition column (1B) using standard extractant (1BX) which contained twice the normal concentration of ferrous ammonium sulfate. Ferrous ion quantitatively reduces Np(VI) to the non-extractable Np(V); however, in acid concentrations above 0.1 M the Np(VI) is further reduced to extractable Np(IV). Twice the normal concentration of

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ferrous ammonium sulfate (0.11 M vice 0.055 M) was therefore used to assure formation of the strong, inextractable Np(IV)-sulfate complex. Separation of the neptunium from the uranium was very successful. After decontamination and final concentration a total of 430-440 grams, approximately 60 percent of that accumulated since the previous recovery run, was sent to the Process Chemistry Operation for final purification and isolation. Due to numerous difficulties experienced during the removal run, 30 grams of neptunium were irretrievably lost to the waste sent to underground storage. The balance is believed to be present in accumulated wastes and is expected to be recovered and returned to internal recycle as usual on resumption of operations. The three neptunium removal runs are compared in the tables below.

PRODUCT COMPARISON

	<u>Removal No. 1</u> <u>December, 1959</u>	<u>Removal No. 2</u> <u>March, 1960</u>	<u>Removal No. 3</u> <u>July and August, 1960</u>
Removal, percent of starting amount	37	42	60
Pu/Np, gm/gm	2.8	0.5	1.8
U/Np, gm/gm	3.8	6.1	25
Gamma/Np, Microcuries/gm	1.21×10^4	2.4×10^4	3.3×10^4

ARITHMETIC FISSION PRODUCT DECONTAMINATION FACTORS

(Dissolver solution $\sim 1 \times 10^{11}$ microcuries of gross gamma activity per gram of neptunium)

<u>Process Step</u>	<u>Removal No. 1</u>	<u>Removal No. 2</u>	<u>Removal No. 3</u>
Accumulation	85	500	440
Precycle	5	8	25
2nd Extraction Cycle and Partitioning	850	4	8
3rd Extraction Cycle and Ozonation	20	420	35
Over-all	8×10^6	4×10^6	3×10^6

c. Solvent Extraction

Although the static pressure instrument on the 3D Column (third uranium cycle extraction) was recalibrated to correctly position the organic-aqueous interface and provide a normal scrub section, decontamination across the third uranium cycle was less than normal for the second consecutive month. The final uranium product exceeded the gamma ratio specification of 2.0 by a factor of 8 to 10. More than 95 percent of this fission product contaminant was ruthenium and was a species exceptionally resistant to oxidation, the step on which final ruthenium decontamination depends. The processing of abnormally large volumes of rework solution, both waste and products, which resulted from a leak in the LABS back-cycle concentrator pot (D-14) and from partitioning failure is believed to have been responsible (as it was the preceding month) for this unusual ruthenium problem.

Failure of the extractant (LBX) to reduce the plutonium in the partition column (1B) on start-up following a normal week-end shutdown, allowed gross quantities of plutonium to extract with the uranium. To prevent a recurrence, operating procedures were modified so that the partition column organic-aqueous interface will be lowered prior to the week-end shutdown and the proper amount of fresh extractant (LBX) will be added to re-establish a normal organic-aqueous interface prior to start-up.

d. Tail-End Treatment

Following replacement of the agitator in the ozone sparger vessel (E-13), the out-of-specification final uranium product produced during July and August was reprocessed through the tail-end ozone treatment. Ozonation for periods of up to 48 hours with 50-100 grams of periodic acid per batch (20-40 parts per million parts of uranium) gave an average additional arithmetic decontamination factor of 2.3, thus reducing the uranium gamma ratio to 3.5. Fourteen tons (approximately 20 percent) of this material was shipped to the Uranium Reduction Building, 224-U, for blending and calcination. The remainder requires further decontamination.

e. Final Plutonium Concentration

The non-critically safe plutonium recycle tank (L-16) was replaced with a critically safe vessel early in the month.

Design work is also in progress on a routing for plutonium nitrate solution from the 3BP sampler tank (E-3) in the 202-S Building directly to the stripper (L-2) in the 233-S Building, thus bypassing the non-critically safe L-1 tank. When this work is complete, all processing in the 233-S Building will be done in critically safe vessels.

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Before the new L-16 tank can be put into routine use, new procedures will be required covering the transfer from it of plutonium solutions --- more highly concentrated than in the past --- into non-critically safe vessels with established batch limits. The procedures are being drawn up and the changes required in the existing formal specifications for critical mass control will be made to coincide with the procedures and to comply with the applicable policy guide.

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3. Finished Products Technology -

a. Uranium Reduction Operation

1. Concentration and Calcination

The four feed control valves of the K-cell calciner were provided with spline type trim with a titanium V-notch plug. The seat rings are fabricated of 17-4 PH stainless steel. The test trim will allow a greater maximum flow rate and a larger physical opening at equivalent flow rates than is currently obtained with the annular plug. Flow and control characteristics have been excellent thus far.

2. Powder Handling

The inlet of the G-cell calciner mechanical powder conveyor-loading system flooded with UO_3 , causing the equipment to jam. Performance was satisfactory after the conveyor was cleaned out and the shut-down cycle modified to discharge any accumulated powder.

b. Metal Finishing Operation

1. Recuplex

The currently used neoprene hood gloves fail rapidly when contacted with Recuplex solvent. Gloves fabricated of sheet polyvinyl chloride (PVC) and PVC coated fabric have been tested in plant service with the following conclusions:

- (a) The PVC coated fabric gloves gave longer service life than the all PVC glove.
- (b) The all PVC and neoprene gloves are softer than the PVC-fabric gloves and provide a greater ease of motion.
- (c) The chemical resistance and softness of the all PVC gloves result in an excellent compromise where tributyl phosphate or carbon tetrachloride are not present.

Submergence tests conducted by the Hanford Laboratories Operation resulted in the following data:

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b. Metal Finishing Operation (Continued)

<u>Chemical</u>	<u>Elapsed Time Before Failure</u>		
	<u>PVC-fabric</u>	<u>All PVC</u>	<u>Neoprene</u>
HNO ₃	Greater than 28 days	16 days	No effect
Recuplex CAX	Greater than 28 days	21 days	1 day
Purex HAX	Greater than 28 days	16 days	30 hours
CCl ₄	No effect	16 days	30 hours

Both slag and crucible dissolvers (D-1 and D-2) failed due to corrosion during the month. Both failures occurred in the vapor region (above the steam jacket) and repair by welding was possible. This was the first failure of the D-1 dissolver since plant start-up (about 5½ years). The material of construction is 309SCb. The long life of these dissolvers in 1 M free fluoride ion concentration service, in comparison to that of the skull dissolvers (six months, material 304 L or 309SCb, 0.25 M F⁻) is attributed to the fact that the stainless steel protective coating is not penetrated during the three hour cycle time before the fluoride is complexed with aluminum. The skull dissolvers are exposed for seven hours before complexing. It is estimated that corrosion is rapid after about four hours.

2. Task I, II, and III

The total impurity content of buttons returned to normally expected values during the month. Corrosion in the calciner, due to diffusion of HF gas from the hydrofluorinator and to recycling of substandard PuF₄ powders through the calciner, appears to have been the major source of the contamination.

Replacement of the powder-gas seal valves (B valves) reduced the necessity for servicing the hydrofluorinator off-gas filter by a factor of three (two versus six times per week). Measurements have indicated that gas leakage through these valves is sufficiently great to cause appreciable entrainment of powder into the gas stream. Coincident with replacement of the B valves, the yield to metal increased to 97.6% from 95.3%. This effect is attributed to consistently higher hydrofluorination product quality effected when dilution of the process gas was minimized.

b. Metal Finishing Operation (Continued)

The platinum liner in the 9-B (RMC) hydrofluorinator was found to be defective. Continued operation with the defective liner has been possible with no apparent adverse effect.

The Porolloy filter elements in the test 9-B hydrofluorinator off-gas system (elements located in the end of the reactor tube) failed twice. Failure appeared to be by fatigue. The old filter system is currently in use.

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4. Process Chemistry -

a. Purex Process Assistance: Solvent Quality Studies

Recent laboratory studies in support of the Purex Plant have emphasized problems of solvent quality. One such study has been concerned with the effect of rework operations, specifically with the possibility that organic-favoring, zirconium-niobium complexing agents are being introduced into the system by the processing of concentrated rework material (from the F-8 tank). The laboratory work has now shown that, with simulated process streams at least, this does not happen to a measurable extent. A simulated F-8 solution was prepared by adding Purex solvent to a synthetic concentrated rework solution and refluxing for forty days. Samples were taken at various times during the forty days, spiked with dissolver solution, and contacted twice with laboratory solvent. The two resulting organic solutions were equilibrated with 3.0 M HNO_3 and the zirconium-niobium-95 distribution coefficients were measured. The distribution coefficients for the two contacts were not significantly different, either as a function of reflux time or order of contact.

b. Neptunium Purification

Four hundred and thirty grams of virgin neptunium (from Redox) contaminated with over 900 grams of plutonium, 15.5 kg. uranium, 11.6 curies Zr-Nb^{95} , 0.5 curies Ru^{103} , and 0.6 curies Th^{234} (UX_1) were purified in the anion exchange facility along with 210 grams of neptunium from recycle wastes and dissolved reject elements. Because of the large amount of plutonium associated with this material, it was necessary to split it into two batches for purification. Acceptable neptunium product was produced by washing the loaded resin bed with 12 to 13 column volumes of reducing solution (5.5 M HNO_3 , 0.1 M hydrazine, 0.1 M ferrous sulfamate), to remove the co-absorbed plutonium. Fission products were removed by 10 and 17 column volumes (in runs 34 and 35, respectively) of hot 7 M HNO_3 , 0.05 M hydrazine, 0.01 M HF. Neptunium waste losses amounted to 0.9% for run 34 and 4.2% for run 35, the latter figure including 1.3% which was recycled.

5. 234-5 Development -a. Continuous Direct Calcination Of Plutonium Nitrate

Photographs have been taken of the oxide bed at various times since startup with the initial fine-particle charge. Photographs at 25X and 125X show the particle size of the bed has increased from an original 10-micron particle size to a fairly uniform 100 - 170 micron particle size. Intermediate samples of the bed show that a wide range of particle size was encountered in the early calcination runs prior to the formation of the uniform bed.

Samples of both feed and product were sent for spectrographic analysis. The results show that the product is roughly as pure as the feed.

During one run, the coupling between the agitator shaft and the motor came loose. The agitator stopped turning, and the bed material caked into a solid mass of olive-green oxide. However, the cake readily broke up into particles similar to the original bed material (no dusting occurred). During the next run, the powder became gray-green in color, and it is returning to its original black color.

b. Plutonium Dioxide Reactivity

Samples of plutonium dioxide prepared by direct calcination of nitrate solution showed lower reactivity than the oxide from calcined oxalate. Similarly, oxide made from steam-treated skulls was less reactive than material from oxalate.

The comparison test was a 20-minute chlorination of seven-gram samples, followed by analysis for water insolubles. Plutonium dioxide from oxalate yielded approximately three percent insolubles, from steam-treated skulls 30 percent insolubles, and from directly-calcined nitrate 30 - 60 percent insolubles. Further tests will tell whether this is a particle size effect.

c. Continuous Electrolytic Reduction Of Plutonium Trichloride

Runs during this period showed increased current efficiency over previous runs, ranging from 54 - 58 percent. The average operating currents were increased from 23 to 31 amps. These factors, plus increased length of the runs, resulted in increasing the yields from 100 grams per run to over 200 grams per run.

One run was terminated due to suspected plugging of the product overflow; post-run analysis indicates the run could have been extended, since the overflow was not plugged. The other runs were terminated due to actual plugs.

Several new problems were encountered and some were solved.

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Melting of plastic seals was prevented by installation of circuit breakers and changing plastics. A serious foaming condition was alleviated by changing the cell temperature, heat distribution, and molten salt composition. Plugging of off-gas flow by condensed solids continues to be a problem, and source of these solids is being investigated. The only mechanical failure was the break of the plastic feed screw, which was replaced by a metal one. Cells and vent tubes (MgO-TiO₂ cells with nickel jackets) are currently having a life longer than the runs, and are not the primary cause of run termination.

d. Magnesia-Titania Ceramics

First phase of the development is now complete. Water-tight slip-cast ware can now be routinely produced. These containers are adequately impervious for holding molten chloride salts, which the usually porous magnesia ones cannot do.

Next phase will involve pushing the development of glazed surfaces in order to minimize surface area available for reactions, develop gas-tightness, and completely eliminate tendency to abrade. The work will involve milling calcined TiO₂ with the fine calcined MgO preparatory to slip casting.

Another development is the pressing of magnesia-titania mixtures, with and without added calcium fluoride. Objective here is to produce glazed, non-abrading surfaces, suitable for melting crucibles and diverters.

V. R. Cooper

Manager
Research and Engineering

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

AUGUST, 1960

II. ACHIEVEMENTS (continued)

H. Financial Operation

1. Production Cost

At the request of the AEC, an estimate was prepared for recovery of plutonium from Lawrence Radiation Laboratory. The material is currently being processed and costs charged to a special request code.

We assisted in the preparation and reviewed final draft of costs of the proposal for processing Savannah River Pu nitrate.

The accounting implications of the anticipated expansion of Recuplex charter (to include reclamation for offsite customers) was discussed in a meeting with Contract Accounting and AEC Finance. It was agreed to bookkeep future work on a product cost transfer rather than a bill-and-pay basis. The AEC Director of Finance agreed that Chemical Processing Department's product measurements would be the final quantity authority for billing purposes.

A meeting was held with representatives of Fuels Preparation Department Cost in an effort to gain additional knowledge on methods that both Chemical Processing Department and Fuels Preparation Department might use to better inform their managers on maintenance costs of systems, equipment, preventive maintenance, etc. Preliminary studies are presently being made and further meetings will be held.

Facilities Engineering Operation salary and direct end function budgets were modified (in equal amounts - without change of total budget) to provide for a revised manpower ceiling of 91, which includes "contract" draftsmen rather than buying the services of these draftsmen from Construction Engineering and Utilities Operation.

The approval letter for FY 1961 services to be performed by Manufacturing Services Laboratory ("Hands Off" services) was received. The \$30,000 approval for FY 1961 is expected to fund completion of this program.

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Detailed schedules were forwarded to Contract Accounting supporting the Chemical Processing Department need for approximately \$1,000,000 additional allocation in 2000 Program equipment and \$260,000 added 3000 Program equipment funds. The major 2000 Program problems result mainly from transfer by the AEC of approximately \$500,000 in construction projects to equipment, funding of a Purex titanium tube bundle (\$146,000), and replacement costs relating to heavy Purex process equipment failures in last half of FY 1960. 3000 Program problems result from the absence of formal reallocations within the AEC complex based on revised FY 1961 estimates.

2. Singular Cost Studies

Prepared cost estimate for obtaining crude cuts of Cesium from Purex. This estimate was prepared at the request of HOO AEC and involved an integrated effort of personnel from Research and Engineering, Purex, Production, and Finance.

In collaboration with Production Operation we developed an estimate of costs involved in processing segregated plutonium for use in unclassified programs. The estimate was requested by HOO AEC.

A detailed study was prepared concerning departmental investment, operating costs, and developmental costs involved in radioactive waste disposal and containment. The study covered FY 1950 and prior as a cumulative item and FY 1951 through FY 1960 by year. The study was submitted to HOO AEC for transmittal to the AEC Comptroller, Washington, D.C.

3. Personnel Accounting

Three Chemical Processing Department employees have applied for and qualified for educational loans for their college age children. As in previous years we have discussed the conditions of the promissory note, rate of deduction for repay, and legal requirements in relation to the pledging of pension contributions. After obtaining required signatures, arrangements were made for preparation and delivery of the checks.

4. General Accounting

A Construction Completion and Cost Closing Statement was issued for Project CGC 872, Palmolive Fabrication and Reprocessing Facilities - 200 East Area.

A schedule of investment in plant and equipment, accumulated depreciation, and remaining book value at June 30 of fiscal years 1950 through 1960 was prepared.

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Physical inventories of installed plant and equipment in the custody of Finished Products and Special Separation Processing and Auxiliaries were started August 29, 1960. A physical inventory of 200 East and West supporting facilities is scheduled to start September 7, 1960.

5. Auditing

Formal audit reports were issued covering an examination of Chemical Processing Department Travel and Living Expenses reported during the period January 1 through June 30, 1960, and an audit of local Cash Working Funds for the nine months period ended July 31, 1960. Activities audited relating to travel and living expenses were, in our opinion, excellent. Cash working funds were handled in a satisfactory manner.

The issuance of the above reports completes all audits scheduled with the Commission for the period August 1, 1959 through July 30, 1960, plus three additional reports issued at their request.

A tentative audit schedule was prepared and integrated with the over-all HAPO audit program for submission to the AEC covering proposed audit activities for the period August 1, 1960 through July 31, 1961.

6. Measurements and Procedures

In line with our program of less paper and better management reports, two meetings were held during August. Representatives from Industrial Engineering, Financial, and Data Processing participated in an integrated effort to secure responsibility reports by section for work orders. Considerable progress was made at these meetings and the results should be reflected in our September reporting.

J E Mc Donald
for Manager - Finance

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

The Department's Functional Organization Charts were revised and issued.

As a result of our requests, the Relations Operation has recognized the need for a study of position level relationship across HAPO for a sizable number of positions in certain manufacturing and engineering functions. This study became active during the month.

2. Personnel Placement

Offers were extended to two Manufacturing Training Program graduates for permanent placement. One rejection of the HAPO offer had been received at month end. Offers were extended during the month to one Chemist and one Mechanical Engineer.

Due to increased work requirements, the Chemical Processing Department is now looking for nonexempt personnel in the following categories: Utility Operators, Pipefitter Journeymen, Millwright Journeymen, Boilermaker Trainees, Welders, Instrument Trainee, Electrician Trainee, Laboratory Assistants, Administrative Clerks and a Secretary. Difficulties are anticipated only in finding suitable personnel in the Welder and Boilermaker classifications.

One exempt person was transferred to the Hanford Laboratories Operation during the month to a position of greater responsibility. Arrangements were completed during the month for the movement of one foreman to the Irradiation Processing Department with a promotion involved.

3. Wage and Benefits

At the request of Special Separation Processing and Auxiliaries Analytical Control, a review of the chemical technologist position concerned with multi-channel analyzer work is being conducted.

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Suggestion Plan

	<u>August</u>	<u>July</u>
Received	48	32
Adopted	15	18
Awards	\$580	\$445
Savings	\$4543	\$2560

4. Health, Safety and Radiation

The Chemical Processing Department became eligible for the Safety Council Award at midnight August 12, 1960, after accumulating about 1,462,000 man-hours since the last disabling injury on January 11, 1960.

A new safety policy was developed to improve follow-up on Serious Accident and Injury Investigation recommendations. This will be issued as CPD-CPG 33.8.

In cooperation with the Safety Program Council, a written, panel-type safety quiz program, CPD Safety Bowl was organized. The contest will run through September and October.

5. Communication

Participants for the first two Chemical Processing Department classes of Business Operations in our Changing Environment have now been selected. Participants to attend other HAPO classes have also been designated, and the other HAPO components notified. Course materials have been ordered, and Chemical Processing Department classes are expected to get under way by October 1. Notification to the participants will begin in September.

PBM-I classes for Chemical Processing Department's Fall session have been determined and the sections notified. However, the classes will start later in the year than expected. The course has been revised by Services and there will be a time lapse before we receive the revised study guide.

Two questionnaires were sent out to a selected list of first-line supervisors and sub-section managers during August to get comments regarding two special issues of the GE NEWS. This type of questionnaire will be continued throughout negotiations.

Other Communication activities during the month included one Management Information Meeting, eight Management News Bulletins, four Headliners, eight GE NEWS items from Chemical Processing Department, and four priority messages. Three were on union negotiations and one concerned the Department's winning the Safety Council Award.

RB Britton

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RB Britton
Manager, Relations Practices

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CHEMICAL PROCESSING DEPARTMENT
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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>7-31-60</u>	<u>8-31-60</u>	<u>7-31-60</u>	<u>8-31-60</u>	<u>7-31-60</u>	<u>8-31-60</u>
General Manager's Group	10	10	1	1	11	11
Financial	12	12	14	14	26	26
Relations Practices	5	5	6	5	11	10
Research & Engineering	61	62	27	27	88	89
Facilities Engineering	65	65	24	22	89	87
Power & General Maintenance	41	41	231	231	272	272
Production	6	6	3	4	9	10
Special Separation Processing and Auxiliaries	48	48	212	213	260	261
Purex	48	48	206	209	254	257
Finished Products	<u>52</u>	<u>52</u>	<u>214</u>	<u>215</u>	<u>266</u>	<u>267</u>
Total	<u>348</u>	<u>349</u>	<u>938</u>	<u>941</u>	<u>1 286</u>	<u>1 290</u>

C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G. E. Components</u>		
C. M. Thomas	Manufacturing Services Schenectady, New York	Work Simplification Course for Instructors 8-19 - 9-26-60
T. E. Sparks	APED San Jose, California	Auditing procedures 8-23-60
	Apparatus Sales Division San Francisco, California	Auditing procedures 8-24-60
<u>To AEC and Other AEC Operational Contractors</u>		
P. B. Fisk	Dow Chemical Company	Inspection of weapon parts
R. E. Van der Cook	Rocky Flats Plant Denver, Colorado	8-11 and 8-12-60
R. J. Kofoed	Dow Chemical Company Rocky Flats Plant Denver, Colorado	Attend meeting as part of the AEC Methods Evaluation Seminar. Discussed plutonium metal ex- change program for analytical laboratories 8-16 - 8-19-60
L. I. Brecks	Atomic Energy Commission Washington, D. C.	Glove Box Committee Meeting
M. H. Curtis	Dow Chemical Company Rocky Flats Plant Denver, Colorado	Electro-refining, mold materials, and casting development 8-29-60
	U.S. Bureau of Mines, Reno Metallurgy Research Center Reno, Nevada	Electro-refining and electro- winning consultations 8-31-60
	U.S. Bureau of Mines, Boulder City Metallurgy Research Center Boulder City, Nevada	Electro-refining and electro- winning consultations 9-1-60
W. N. Mobley	Dow Chemical Company	Plutonium fabrication 8-30 and
A. E. Smith	Rocky Flats Plant Denver, Colorado	8-31-60
B. F. Judson	AEC, Division of Production	Strontium recovery program
J. H. Warren	Germentown, Maryland	8-31 and 9-1-60
<u>To General Industry</u>		
J. W. Kolb	Standard Conveyor Company Seattle, Washington	Equipment for pneumatic solids feed and storage 8-8-60

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<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
J. R. LaRiviere	Griscom-Russell Company Massillon, Ohio	Design problems on Purex evaporators and condensers 8-19-60
P. S. Kingsley L. L. Zahn	Pacific Steel Products Co. Seattle, Washington	Review bids and discuss cask fabrication 8-24-60
<u>To Conventions and General Meetings</u>		
E. R. Irish	Portland, Oregon	Convention of National Council of State Boards of Engineering Examiners, as representative for AIChE, National Professional Legislation Committee 8-18 and 8-19-60
L. F. Badger	Los Angeles, California	Western Electronics Show and Convention 8-22 and 8-27-60
T. E. Sparks	San Francisco, California	Western Regional Institute of Internal Auditing Conference 8-25 and 8-26-60

D. VISITORS

From Other G.E. Components

L. R. Fink	APD Palo Alto, California	Fission product recovery and waste management 8-4-60
C. H. Linder	Electric Utility Group New York, N. Y.	Fission product recovery and waste management 8-4-60
G. L. Smith	ANPD Cincinnati, Ohio	Shop operation and discussion on welding equipment 8-18 and 8-19-60

From AEC and Other AEC Operational Contractors

Dr. J. P. Baxter, III Dr. G. T. Seaburg Dr. A. H. Compton Dr. J. L. Cate Dr. F. T. Miles	Atomic Energy Commission Washington, D.C.	Historical Committee - tour 8-5-60
M. S. Bloomsburg H. L. Hull	du Pont Company (SRP) Aiken, South Carolina	High efficiency filters and waste management 8-9-60
R. A. Robinson	UCNC (ORNL) Oak Ridge, Tennessee	Shipping casks 8-25-60

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<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>From General Industry</u>		
D. R. Kelly M. G. Kramer J. J. Schneider H. R. Sutter D. Tuel	Wyandotte Chemical Company Wyandotte, Michigan	Decontamination and problems related to chemical cleaning of surfaces 8-2-60
R. E. Reynolds	Eastman Kodak Co. Supulveda, California	X-ray film and film processing 8-4-60
F. Morris	Turco Products, Inc. Spokane, Washington	Decontamination procedures and materials, and results of tests. 8-9-60
R. E. Selff	Turco Products, Inc. Wilmington, California	Decontamination procedures and materials, and result of tests 8-9-60
J. Burch L. Parmalee	Pratt & Whitney Co. W. Hartford, Connecticut	Equipment maintenance 8-31-60

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IV. SAFETY AND SECURITY

Operation	Facil.		Fin.		P&GM		Purex		SSP&A		Prod.		Rel. Res. & Eng.		Total CPD		Year to Date	
	Eng.	Finan.	Prod.		P&GM		Purex		SSP&A		Prod.		Prac.		CPD		Date	
Disabling Injuries															0	1		
Serious Accidents															0	13		
Medical Treatment																		
Injuries		1	2	23		4		4					1		35	307		
Radiation Occur.			6	1/2	1		7		2				1/2		17	141		
Contam. Wounds					1*										1	5		
Fu Depositions													1#		0	6		
Fires			2#												1	11		
Security Violations						1									1	5		

*A P&GM Welder received a small puncture wound of the right thumb performing maintenance hood work in Room 170, 234-5 Building on 8/3/60. A positive internal plutonium deposition is improbable.

Two of the three hood fires in 234-5 Building were minor with insignificant equipment damage. A total loss of \$1100 resulted from failure of the gasket closure on #2 induction furnace during routine processing, Task III, 8/22/60. Cause of gasket failure was not determined.

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CHEMICAL PROCESSING DEPARTMENT
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V. REPORTS

A. PREPARED AND ISSUED

- HW-66118, Unclassified, "Project CGC-830, Plant Modifications for Re-processing Non-Production Reactor Fuels, Design Criteria For Cross-Country Line From 221-U to 202-S Buildings," dated August 12, 1960, S. R. Bierman.
- HW-66221, Secret, "CPD Report of Representative Economy Measures - FY 1960," dated August 1, 1960, J. M. McDonald.
- HW-66305, Unclassified, "Project Proposal, CAC-880, Rev. #1, Plutonium Reclamation Facility - Z Plant," dated August 9, 1960, D. R. Gustavson.
- HW-66311, Secret, "Essential Material Utilization - Purex," dated August 5, 1960, S. A. Spohr.
- HW-66312, Secret, "Essential Material Utilization - SSP&AO," dated August 5, 1960, S. A. Spohr.
- HW-66335, Unclassified, "Plutonium Reclamation Facility - Operation and Unit Cost Forecast," dated August 15, 1960, S. A. Spohr and C. M. Thomas.
- HW-66346 RD, Secret, "Redox Birch Recovery," dated August 8, 1960, H. E. Hanthorn.
- HW-66347 RD, Secret, "2nd & 3rd Quarters FY 1961 Forecast of Nuclear Materials Requests - CPD," dated August 8, 1960, R. E. Roberts.
- HW-66357, Secret, "Essential Materials Consumption - Purex, CPD, July, 1960," dated August 8, 1960, J. E. Lentz.
- HW-66427, Confidential, "Special Request Materials Proposed for Chemical Processing," dated August 11, 1960, J. H. Warren
- HW-66431, Confidential, "Plutonium: Steam Oxidation and Oxide Dissolution," dated August 12, 1960, R. E. Smith.
- HW-66449, Secret, "Segregation of Pu for Use in Unclassified Programs," dated August 15, 1960, J. H. Warren.
- HW-66543, Secret, "Birch Recovery," dated August 26, 1960, J. H. Warren (Prepared by B. F. Campbell)

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HW-66544, Secret, "Project CGC-821 - Purex Palm Extraction - Process Specifications for Control Instrumentation," dated August 25, 1960, L. R. Michels.

HW-66557, Secret, "Waste Status Summary - July, 1960," dated August 22, 1960, J. E. Lentz.

HW-66596, Unclassified, Project Proposal CGC-909, "Strontium-90 Interim Storage Facilities," dated August 26, 1960, D. R. Gustavson.

HW-66614, Confidential, "Scheduled Shutdown - Redox Plant," dated August 26, 1960, J. H. Warren.

B. PREPARED FOR SIGNATURE AND ISSUANCE

HW-66270, Secret, "Production - July, 1960," dated August 1, 1960, W. E. Johnson.

CHEMICAL PROCESSING DEPARTMENT
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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. Mac Cready
General Manager
Chemical Processing Department

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DONT SAY IT ... Write It!

DATE

9-17-60 HE

TO

Finn

FROM

Hartman

FPD MONTHLY REPORT - AUGUST 1960

A. Points of interest,

1. PG B-5 - First L1⁶ received for cannining of N load.
2. PG B-9C-6 - "Striation" rejects to be canned and a sample lot will be irradiated. If successfully irradiated this will reduce cost of recycling uranium scrap.
3. PG C-4 - 4" fuel elements will be required for B&F Reactors early cy 1961 due to tube distortion.
4. PG D-1 - Quite an error for a G.E. typist.

3. NO Points of importance for MGR.

+

"A GOOD DRIVER IS KNOWN BY THE FENDERS HE KEEPS"

+

DON'T SAY IT --- Write It!

TO H. Connor FROM E. J. Henderson DATE 10-1-60 H.L.

August 1960 100 Monthly Report

A. Progress & Events Concerning Management of the

non

B. Events of Interest

1. Development of Ceramic Spheres for Indian Res. H-A-34-D
2. Thermal Properties of effluent lines R. H-4
3. Connection of Zinc tube installation R. B. 7
4. Minimum mention of machinery. R. D-3

"A GOOD DRIVER IS KNOWN BY THE FENDERS HE KEEPS"

END

DATE
FILMED

5 / 20 / 93