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HW 78817

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

HW--78817

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AUGUST, 1963

By Authority of CG-PR-2
RM Iten 8-24-92
By J Tang 9-23-92
TL Phillips 9-28-92

Compiled By
OPERATION MANAGERS

September 20, 1963

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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I. SUMMARY

Production through August, as compared with the July 25, 1963 HAPO Production Forecast (HW-78187), is summarized below:

	<u>Percent of Forecast Achieved</u>	
	<u>August</u>	<u>Fiscal Year To Date</u>
Separated plutonium nitrate	44.8	54.3
Separated uranium nitrate	44.7	53.4
Uranium oxide	38.7	55.7
Plutonium metal buttons	15.2	48.3
Fabricated parts	73.6	89.5

August production was below forecasted quantities for all products. Contributing factors were: 1) unscheduled outages of the Purex plant, caused by solvent degradation and mechanical failures; 2) subsequent inability of Purex to operate at maximum rate because of a restriction in the final uranium decontamination cycle; 3) equipment repairs and process difficulties in the Redox plant; 4) feed shortage at the Uranium Oxide plant and also for the button line; and, 5) casting difficulties in the fabrication of weapon parts.

The Purex plant resumed processing on August 6, following a scheduled shutdown which began July 1. Failure of the interface jumper on the co-decontamination column, however, combined with the discovery of degraded solvent in both solvent systems, caused an unscheduled outage from August 8 until August 19. Operation was then continuous after August 19, except for a brief outage to replace the final uranium cycle feed pump and jumper, but at reduced rates because of a restriction in the final uranium cycle feed flow system.

Four STT casks, loaded with approximately 210,000 curies of cesium-137, were released to the AEC on August 2 for shipment. The HAPO II-1, containing approximately 140,000 curies of strontium-90, was released for shipment on August 5. A week later, the HAPO I-B-1 cask, loaded earlier with about 470,000 curies of strontium-90, was also released for shipment.

The fifth purification run at Strontium Semiworks resulted in a gain of 670,000 curies of purified strontium-90.

B-Plant received "hot" feed on August 2, following which the first series of strontium separation runs was satisfactorily completed.

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A Research and Development run for the separation of cerium from rare earths was successfully demonstrated in the Strontium Semiworks. Using potassium persulfate as the oxidizer and silver nitrate as a catalyst, 95 percent of the cerium was separated.

The use of Diban (dibasic aluminum nitrate) as the scrub solution in the Redox third uranium cycle was started on a test basis. Although the effects of this change have not been evaluated, the Diban flowsheet has the potential for increasing the capacity of the 1A precycle extraction column.

Redox plant processing during August was limited to about 60 percent of the available time because of: 1) difficulties experienced with high product waste solutions, which necessitated extensive reprocessing; 2) inadequate decontamination of the uranium product, which required re-zoning to meet specifications; and, 3) repairs to process equipment.

The excavation subcontractor for Project CAC-945, "New Waste Storage Tanks - Purex", started work on August 2. Removal of contaminated soil was completed on August 7. At month-end, the excavation was about 80 percent completed.

All equipment associated with repair of the 234-5 Building incinerator has been installed. Heating of the furnace, in accordance with initial start-up procedures, was started on August 22.

P. H. Reinker

General Manager
Chemical Processing Department

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

August Fiscal Year
to Date

1. Production Statistics

a. Percent of Forecast⁽¹⁾ Achieved

Separated plutonium nitrate	44.8	54.3
Separated uranium nitrate	44.7	53.4
Uranium oxide	38.7	55.7
Plutonium metal buttons	15.2	48.3
Fabricated parts	73.6	89.5

b. Purex

August July

Uranium nitrate produced (tons)	202.30	12.28
Average production rate during operation (T/D)	23.7	0
Total waste loss (%)		
Plutonium	0.90	4.19
Uranium	0.92	3.27
On-line efficiency (%)	46	0

c. Redox

Uranium nitrate produced (tons)	128.21	132.40
Average production rate during operation (T/D)	8.7	7.0
Total waste loss (%)		
Plutonium	0.41	0.37
Uranium	0.22	0.23
On-line efficiency (%)	59	61

d. Uranium Reduction (tons)

Normal UO ₃ loaded	131	246
Enriched UO ₃ loaded	101	61
Normal UO ₃ approved for shipment	201.05	199.72
Enriched UO ₃ approved for shipment	50.22	50.54
Normal UO ₃ shipped	301.87	347.09
Enriched UO ₃ shipped	100.77	50.10
Normal UNH backlog	257	186
Enriched UNH backlog	129	102

(1) HW-78187, HAPD PRODUCTION FORECAST, dated 7-25-63

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e. Plutonium Metal Processing

	<u>August</u>	<u>July</u>
Reduction yield (%)	95.76	98.04
Product recovery output (Kgs)	88	74
Product recovery backlog (Kgs)	1303	1268
Waste disposal (grams)	542	326

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	10,772	4,907
Filtered water pumped (gpm)	1,088	1,182
Maximum steam generated (Lbs./hr.)	210,000	140,000
Average steam generated (Lbs./hr.)	125,000	66,923
Total steam generated (M lbs.)	93,160	49,791
Coal consumed (tons)	4,710	2,585

August production was below forecasted quantities for all products. Contributing factors were: 1) unscheduled outages of the Purex plant, caused by solvent degradation and mechanical failures; 2) subsequent inability of Purex to operate at maximum rate because of a restriction in the final uranium decontamination cycle; 3) equipment repairs and process difficulties in the Redox plant; 4) feed shortage at the Uranium Oxide plant and also for the button line; and, 5) casting difficulties in the fabrication of weapon parts.

J. N. Warren
Manager, Production

2. FISSION PRODUCT DATA

	PUREX* RECOVERY	244-CR* INVENTORY	B-CANYON* INVENTORY	SEMIWORKS PRODUCTION	PRODUCT INVENTORY	PRODUCT IN CASK	PRODUCT SHIPPED	CUSTOMER	REMARKS
Sr-90 (Kilocuries)	25	420	320	670	2450	--	140	NYO	HAPD II-1 8-5-63
Cs-137 (Kilocuries)							470	ORNL	HAPD I-B-1 8-12-63
							210	ORNL	Four STT Casks 8-2-63

* Estimated figures based on Cs. calculations

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CHEMICAL PROCESSING DEPARTMENT
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AUGUST, 1963

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Processing was resumed on August 6 following an outage that began on July 1, 1963. Failure of the interface float jumper on the co-decontamination column August 8, combined with the discovery of degraded solvent in both solvent systems caused an unscheduled shutdown until August 19, 1963. During this period, the jumper was replaced and extensive solvent clean-up and waste recovery operations were completed. Operation then continued until August 24 when a brief outage was taken to replace the second uranium cycle feed pump and jumper.

2. Processing Operation

The presence of degraded solvent was discovered near the end of the July outage. Investigation revealed that the solvent had been inadvertently boiled in the LCU concentrator during a neptunium recovery period earlier in the outage.

Clean-up efforts were accomplished prior to start-up on August 8. Although solvent samples indicated a successful flush, the period of operation (8/6 through 8/8) resulted in degraded solvent being distributed throughout the solvent clean-up systems (G Cell and R Cell), the second uranium cycle and the backcycle equipment. Flushing, uranium recovery, and solvent recovery operations were conducted during the period 8/8 through 8/19.

Operation continued the rest of the month at a reduced rate due to a restriction in the second cycle uranium feed flow system which was not remedied by replacement of the pump and feed jumper. Product specifications have been met.

The four SIF casks, loaded in July with approximately 210,000 curies of Cs-137, were made ready for AEC shipment to ORNL on 8/2/63.

The HAPC II-1 cask, loaded in July with approximately 140,000 curies of Sr-90, was made ready for AEC shipment to Martin-Marietta Company on 8/5/63.

The HAPC I-B-1 cask, loaded last December with approximately 470,000 curies of Sr-90, was made ready for AEC shipment to ORNL on 8/12/63.

B-1

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A Research & Development run for the separation of cerium from the rare earths was completed at the Strontium Semiworks. Potassium persulfate was used as the oxidizing agent with silver nitrate as a catalyst. Greater than 95 percent cerium separation was obtained. The concentrated rare earth fraction is stored at the Semiworks.

The fifth strontium purification run was initiated and completed at the Strontium Semiworks. There were 670,000 curies of purified Sr-90 obtained from the run.

Hot feed was brought into B Plant on 8/2/63, and the first series of strontium separation runs were satisfactorily completed.

3. Equipment Experience

Major items completed during the month include:

- a. Replaced J-1 pump and 3WB jumper.
- b. Replaced F-6 overflow jumper.
- c. Replaced K-3 pulser.
- d. Replaced H-2 interface float jumper.
- e. Replaced K-1 pump and 2DF jumper.

Excavation was started for the new 241-AX Tank Farm during the week of 8/2/63.

Installation of a buried two-inch carbon steel line for movement of supernate or leaching solutions between A & C Farms was started on 8/26/63.

Manager - Purex

PR McMurray/sc

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

C. REDOX OPERATION

1. Operating Continuity

The Redox plant operated on a five-day-per-week schedule during the month. Difficulties experienced with high product waste solutions, poor decontamination of the uranium product and repairs to cell equipment limited operating time to approximately 60 percent of the time available, and only eighty-eight percent of the scheduled production was achieved.

The production and shipment of enriched UO_3 was satisfactory for the month. However, normal UO_3 production and shipments were below forecast due to a shortage of feed material.

2. Processing Operations

a. Redox Processing

High plutonium losses in the waste streams, caused by plutonium polymerization in the feed metal solution, forced extended shutdowns during the early part of the month for reworking large amounts of waste solutions. Some waste material required a second rework before waste losses met specifications. The plutonium polymerization problem was subsequently resolved by extending the oxidation time of the feed metal solution.

Poor gamma decontamination of the uranium product was encountered this month and essentially all of the uranium production required rezoning to meet shipping specifications. The poor decontamination was caused by a high concentration of nitroso compounds in the hexone solvent. Washing of the hexone solvent with caustic subsequently removed the nitroso compounds and by month end the uranium gamma ratios had returned to normal levels. Approximately 88 tons of high gamma uranium is currently being held in storage for additional ozoning or reprocessing through solvent extraction as appropriate.

Approximately three kilograms of stabilized plutonium recycle from the Weapons Manufacturing Operation were reprocessed through the plutonium decontamination cycle during the month.

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The use of Diban (dibasic aluminum nitrate) as the scrub solution for the third uranium cycle was started on a test basis this month. At this writing full evaluation of the effect of this change in flowsheet has not been made. The Diban flowsheet has the potential for increasing the 1A extraction column capacity.

b. Uranium Oxide Processing

Iron contamination above specifications was encountered in the concentrated depleted uranium feed tank (X-30) at month end. Although the problem is still being investigated, it appears that the source of the iron contamination is the TD-4 demister vessel, which is used to de-entrain overheads from the UNH concentrators. The high iron is probably a result of the concentrator not being operated for extended periods due to the current shortage of depleted uranium feed.

3. Mechanical Experience

a. Redox Plant

The F-7 metal solution feed pump developed excessive leakage at the pump flange on 8-15-63 and was replaced with a reconditioned unit. The failed pump had given comparatively good service, having operated for approximately 3400 hours.

On 8-18-63, the pump in the backcycle concentrator tank (D-14) failed because of excessive leakage at the throttle bushing. For the first time, a regenerative turbine type pump without the water seal feature, was installed as a replacement. This pump was extensively tested in the shop to make sure that the pump shaft, with a boron carbide bushing, would operate satisfactorily without water lubricant. To date performance of the new pump has been very satisfactory.

Eight canyon cell replacement jumpers were fabricated and installed during the month. Two of these were discharge jumpers from the 2E extraction column, which twice during the month developed excessive leakage at the base flange.

An apparent restriction in the feed line to the ion-exchange contactor in the 233-S Concentration Building forced a shutdown of the unit at month end. The trouble was finally traced to a plugged filter, which necessitated removal and cleaning before satisfactory operation was restored.

4. Waste Handling and Decontamination

Fifty-three, fifty-five gallon drums of depleted uranium waste from the Dow Chemical Company, Rocky Flats, Colorado, were received and buried on 8-2-63.

Equipment valued at approximately \$277,000 was received from customers for decontamination, repair, inspection or burial during the month. Equipment valued at approximately \$136,000 was returned to customers, representing a savings of approximately \$57,000 over the cost of new equipment.

Additional business was received from IPD this month in the form of 600 tube caps to be decontaminated. This was done in three days' time with no significant radiation exposure to personnel, at an estimated saving to IPD of 2400 mrem of exposure and \$600 to \$1000 in cost.

5. Radiation Experience

All nuclear excursion detectors in the Redox and Uranium Oxide plants are now tied into the "AH-OO-GAH" howlers, the standard audible signal for such an emergency. Preliminary testing of the alarms has been completed and several deficiencies in operation corrected. A test evacuation is planned for the very near future.

Four radiation occurrences and five skin contamination cases were reported during the month. The maximum skin contamination ranged to 8000 c/m and 1000 d/m, which was readily reduced to non-detectable. The most significant radiation occurrence involved spot contamination ranging from 5000 to 15,000 d/m in the 233-S Concentration Building and the walkway to the 202-S Canyon Building. Spot contamination was also detected around the 202-S loading dock, chemical storage room and the switchgear room. The affected areas were immediately roped off, decontaminated and returned to normal status. An inadequate personal survey upon leaving a radiation zone was the cause of the incident. The importance of such surveys has once again been re-emphasized to all employees.

6. Analytical Experience

The Analytical Laboratory provided customer assistance by determinations for: aluminum nitrate and sodium nitrate in Redox process streams after Diban (dibasic aluminum nitrate) was used in the system; oxygen, chloride, phosphate and hydrazine in a cleaning agent to be used for a flush of the primary loop at 100-N Reactor; strontium in soil studies; plutonium, plutonium polymer, and nitric acid in solutions used for critical mass experiments; plutonium, uranium, promethium and potassium in a special electro-deposition study; radio-sodium and copper in a charcoal filter to determine isotope containment properties.

Routine analytical work in support of the boiler and water plant operation at 100-N was turned over to the power operators this month. Laboratory chemists are available for consultation, reagent preparation, equipment calibration, and special analytical investigations as required.

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7. Events Influencing Costs

The Redox Processing Operation manpower was reduced by four chemical operators during the month; they were transferred to other CPD facilities and were not replaced.

CB Foster
for Manager - Redox

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

D. WEAPONS MANUFACTURING OPERATION

1. Operating Continuity

Fabrication of Models 1807 and 74-C was limited by casting problems. Production of unfabricated plutonium was limited by feed supply shortages. Recovery activity was confined to operation of the laboratory-type oxide dissolvers. The incinerator remained out of service during the month.

2. Processing Operations

a. Plutonium Fabrication

Information on plutonium fabrication activities is presented in Document HW-78887 (Atomic Weapon Data).

b. Plutonium Processing

The production of unfabricated plutonium was limited by feed availability and was under schedule by approximately 10 percent. Also, feed received from the Redox plant during the latter portions of the month exceeded the Pu²⁴⁰ specification and this material was stored for future blending.

Scrap powders accumulated over the past several months were re-fluorinated and fired to buttons for storage.

The laboratory-type (glass) dissolvers resumed operation on plutonium oxide at mid-month.

3. Mechanical Performance

Fabrication equipment performed satisfactorily except that vibrations from the break out of charges in the new ingotting furnaces in Hood HA-21 are disturbing the adjustment of the Mettler balance and damaging the vacuum thermocouples. A study is in progress to determine the reinforcement required of the hood floor.

In plutonium reduction a new off-gas filter was installed on the calciner in Hood 9-A. The new device consists of three bayonet-type filter elements which are sequentially back blown. Operation has been satisfactory since August 8. A new type double ball valve using an air purge was installed in the 9-A equipment and has been operating

3. Mechanical Performance (Continued)

satisfactorily since August 7. The fouling of filtrate pumps has been significantly reduced by the installation of filters in the lines used to remove solutions from the floors of Hoods 9-A and 7-C.

Repairs to the incinerator were completed and programmed heat soaking of the furnace refractory is in progress at month end. Dimensional checks of the combustion chambers during the heating reveal that the expansion was in accordance with design calculations.

Nuclear excursion alarms in the 234-5 Building were modified to provide an "ah-oo-gah" howler sound instead of the siren sound.

4. Radiation Experience

Three cases of potential plutonium deposition occurred as a result of minor injuries experienced during work in the process hoods. In all three cases the wounds were excised and potential deposition was reduced to less than one per cent of the maximum permissible body burden (MPBB) as determined by the whole-body counters.

5. Analytical Experience

	August	
	<u>Weapons Grade</u>	<u>Unclassified</u>
Number of Samples Received		2,659
Number of Determinations		23,196
Total Impurities, Buttons (Average)	2480 ppm	None
Buttons Rejected for Impurities	5.0%	Made
Pu-240 Content*	5.94%	-----

*Based on Neutron Counter Data.

WJ Gartin
Manager
Weapons Manufacturing

WJ Gartin:cs

CHEMICAL PROCESSING DEPARTMENT
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AUGUST, 1963

II. ACHIEVEMENTS (Continued)

E. POWER AND CRAFTS OPERATION

1. Operating Continuity

There were no interruptions of steam, water or emergency electrical services that affected continuity of operation of the production facilities during the period covered by this report. The emergency feeder to the Redox facility was de-energized for a four-hour period on October 2, due to a malfunctioning tie-breaker; however, no emergency demands occurred during the repair period.

2. Inspection, Maintenance and Repair

During the month there has been a concentrated effort, which embraced all of the Fabrication Shops, in turning out parts and equipment for the renovation of the 9-B Calcination and Fluorination Hood at Z-Plant. All of the hood panels have been changed in preparation for cleaning out the hood and replacing or repairing the equipment in the hood. The actual work in the hood is being done by Z-Plant Maintenance personnel; however, all of the new equipment and replacement parts are being fabricated by Shops personnel. This includes the calciner, fluorinator, and vacuum drum filter.

Three major jobs have been in progress in the Boiler Shop during the month: (1) fabrication of an H-29 Sprue Removal Hood for the RMA Line in the 234-5 Building, (2) fabrication of a High Temperature Vacuum Melt Furnace Hood for development work in the 231-Z Building, and (3) fabrication of a spare Dissolver Down-draft Tower for Redox. All jobs were approximately 50% complete at month's end.

Six fume hoods, which were fabricated off-site, were installed in the Purex Laboratory. Installation of the off-gas duct work and instrumentation is now in progress.

Twenty pipe jumpers (Purex, 8; Redox, 10; Redox R&E, one; E-Plant, one) were fabricated, and seven pumps (Redox, 3; Purex, 4) were assembled and made ready for service.

Six additional PR cans were modified for neptunium shipment. These were some of the containers that were made following the Z-Plant criticality incident. Modifications included installation of lead-shot shielding on the outside of the cans and bails for handling purposes.

Assistance was rendered the Hanford Laboratories in the installation of a new hydraulic unit on the isostatic press located in the 231-Z

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facility. The new unit is capable of producing 100,000 psi. Installation of the instrument panel, high-pressure piping, shielding and electrical work was performed by Power & Crafts personnel.

Third-party inspections were completed on No. 2 boiler in the 200-East Area Power House, and on No. 4 boiler in 200-West Area. Both units were reported as being in good condition.

Fifty-eight drums of radioactive waste materials from the Dow Chemical Co., at Rocky Flats, were buried in the 200-W dry-waste burial grounds, on August 2.

Repainting of the evaporators, risers, instrument buildings, etc., in the B and BX tank farms in 200-East Area is in progress.

The cyclone fences around the 241-U tank farm and the TXR crib are being removed as an aid to better weed control and lower maintenance costs. Alternate posts are being left in position, to which radiation signs will be attached.

Evacuation of a new 900 ft. long dry-waste burial trench was completed in dry-waste burial ground #12 in 200-East Area.

Balancing of the ventilation systems in the Irradiation Processing Department's 105-N Building was started during the month. There are five zones to be balanced, of which one is sixty per cent complete at this time.

During August, 6,586 tons of coal were stored. This represents a savings of approximately \$3,000, in that increased coal prices and freight rates advanced the cost of coal \$0.45 per ton, under new contracts effective September 1.

Manager
Power and Crafts Operation

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design Engineering

Purex H-4 Titanium Tube Bundle

The titanium tube bundle which lost its heat transfer capacity in the H-4 Purex Concentrator was cleaned on August 14. The silica scale deposit was removed by reaction with hot 10 percent caustic. This caustic treatment descaled the tubes; however, considerable sludge remains on the bottom tube sheet. Certain stainless steel components of the shroud (tube spacers) have suffered severe corrosion and may require replacement. A pressure test revealed that the tubes and heads were still pressure tight after two years of H-4 service.

b. Project Engineering

CAC-945 - New Waste Storage Tanks - Purex

The excavation subcontractor officially started work on August 2, and skimming of the work area for removal of contaminated soil was completed on August 7. Excavation is approximately 80 percent complete.

c. Manufacturing Engineering

Instrument Air Dryer

Performance of the instrument air dryer system has been improved at Purex by three changes. The air trap associated with the cooler is being replaced; temperature of the air going into the dryer has been lowered; and a blow-down valve has been installed in the process air line which connects to the instrument air system. A significant improvement in air supply quality has been achieved.

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2. Redoxa. Process Design EngineeringPlutonium Monitor - L-18 Contactor

Based on results of laboratory tests, a two-channel neutron counter with recorder was selected for L-18 Contactor service. Specifications were prepared, and a purchase requisition has been issued.

b. Project EngineeringCAC-101 - Redox 216-S-7 Crib Replacement

Final drawings and specifications were approved on August 23. Vitro's bid package information letter was sent to the Commission on the same date. The portion of the Special Conditions furnished by the Company was transmitted to the Commission on August 13.

3. Weapons Manufacturinga. Process Design EngineeringButton Line

Engineering drawings for the HC-9B Hood improvement program are completed. The calciner insulation and vacuum drum filter fabrication are completed. The fluorinator fabrication is scheduled for September 6. The H-9A Calciner blow-back filter has been operating successfully for approximately one month. The H-9A fluorinator ball valve replacements for the "Banjo" valves likewise are operating well and will be incorporated in HC-9B.

Incinerator Facility

Installation of all equipment associated with repair of the Incinerator Facility has been completed. An initial start-up procedure has been issued, and heating of the furnace in accordance with this procedure was initiated on August 22. During start-up, special attention is being given to: (1) drying of the refractory, and (2) measurement of the movement of the combustion chambers due to thermal expansion. A design has been completed for installing a high

temperature indicator controller on the spare thermocouples in each of the three heat zones. In the event of a high temperature condition, these controllers will shut off power to the furnace through a magnetic contactor in the power supply. Fabrication of the glove box for the additional leaching facilities has been completed, and preparations are being made for installation in the 232-Z Building.

Isostatic Press

Bids were received from four vendors on the isostatic press system. Review of the bids is underway. Generally, the material presented by the vendors is similar to that which they had previously submitted. A document discussing the safety features and philosophies of the isostatic press has been completed, approved, and is now ready for issue. The design scope document for this facility has been completed for comment.

Degreasing and Briqueting Facility

All design scope drawings for this facility have been completed and approved. The design scope is being circulated for final approval.

Arc Melting Facility

Design scope work on the arc melting facility has been completed. The drawings have been approved and reproduced for incorporation into the scope document.

Additional Casting Facility - "A" Fabrication Line

The design scope drawings for the Casting Facility were completed and issued for comment. A preliminary draft of scope was distributed for comment.

Blank Preparation Glove Box

Drawings covering equipment, installation, and all details of this glove box are completed and have been released for construction. Hood fabrication is nearly completed. Fabrication of hydraulic presses and tooling has been started.

b. Project EngineeringCAC-880 - Plutonium Reclamation Facility - "Z" Plant

Of the 30 vessels required in the cell, 24 have been installed. The six remaining are two each of dissolvers, columns, and concentrators. The Phase II contractor has completed testing of installed process piping.

CGC-983 - Plutonium Ingotting and Auxiliaries Facility - RMA
Line - 234-5 Building

This project was completed and a Physical Completion Notice issued on August 15.

CGC-984 - Electrical and Hydraulic Equipment Mezzanine - RMA
Line - 234-5 Building

This project was completed and a Physical Completion Notice issued on August 15.

4. Generala. Process Design EngineeringWaste Management Program

Investigation of methods for closing fission product shipping containers was continued. Three firms are conducting tests of electron beam welding, and preliminary results are expected during September. Development of the tungsten-inert gas welding process has continued, and several successful welds have been made with the container neck and cap at 800°F. A firm joint design has been evolved which appears promising and seems to have eliminated the problem of weld cracking experienced in earlier tests.

Criticality Control Specification - 224-T Building

In preparation for use and storage of plutonium samples within the 224-T Building for measuring plutonium, a criticality control specification has been written and approved. A procedure incorporating controls for contamination confinement as well as a control of critical mass has been prepared. Procedures outlining evacuation procedures in the event of a nuclear burst are being prepared.

b. Project Engineering

Project Cost Information as of 8/25/63:

Total Authorized Funds - 14 active projects	\$ 3 729 000
Total cost-to-date	2 883 000
Commitments and Open Work Releases	150 000
Unencumbered Balance	696 000
Costs Charged to Projects - 7/21/63 to 8/25/63	98 000

Manager, Facilities Engineering

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

AUGUST, 1963

II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Engineering

(a) Solvent Extraction

Performance of the Second Uranium Cycle has been excellent since the installation of the Fluorothene "zebra" scrub cartridge. The column throughput rate, however, is limited by a flow restriction in the 2DF system. Presumably the restriction is the result of solids formed by degradation of a large quantity of solvent in the LCU Concentrator.

During the July - August shut-down activities, about 5,100 gallons of solvent was added to the LCU Concentrator. As a result, a large quantity of a dense viscous uranium-organic compound was formed. Although the LCU Concentrator and 2DF tank were flushed with a sodium carbonate solution to remove the uranium-organic complex, sufficient organic material remained to seriously degrade the solvent in both systems during subsequent operations. The solvent quality was restored to normal after several passes through the solvent extraction and treatment systems.

(b) Product Treatment

A neptunium purification run was successfully completed in the new ion exchange unit. However, two passes were required to meet specifications because the equal blend of Purex and Redox feed solutions was 5 and 50-fold above normal with respect to radioactive Ru-103, 106, and Zr, Nb-95.

(c) Waste Rework

About 70 per cent of the uranium associated with the LCU Concentrator degraded organic was recovered in the Purex Head-End fission product equipment by dispersion in diluent sodium carbonate and precipitation with sodium hydroxide. The sodium diuranate was dissolved in dilute nitric acid for blending with virgin solvent extraction feed.

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(d) Fission Products

A strontium purification run was completed at the Strontium Semiworks. Process performance was normal in spite of operating problems associated with instability of the HA Column. During the run the "free" DTPA in the HAW was reduced from 0.075 to 0.05 M without affecting process performance. In addition, during the destruction of citric acid with hydrogen peroxide 0.9 moles of nitric acid was added per mole of citric acid. Essentially complete destruction of the citrate was achieved with 2.5 moles of hydrogen peroxide per mole of citrate, and no foaming or pressurization was noted during the citrate kill.

A batch R & D run was made to demonstrate a cerium oxidation-extraction process. Greater than 99 per cent of the cerium as Ce IV was extracted with Semiworks solvent from a 2.0 M HNO_3 - 0.2 M $\text{K}_2\text{S}_2\text{O}_8$ - 0.02 M Ag NO_3 solution in a single batch operation. In addition, excellent separation of the rare-earths from the resulting sulfate solution with Semiworks solvent was demonstrated.

Oxalate precipitations for separating strontium from cerium and the rare-earths were started at B-Plant. Process and equipment performance was satisfactory.

2. Redox Process Engineering

a. Evaluation of the Dibasic Aluminum Nitrate Test

During the entire report period dibasic aluminum nitrate was used in place of aluminum nitrate as 3DS salt solution. The dibasic aluminum nitrate provided 80 per cent of the acid adjustment for the acid-deficient third uranium cycle and sodium hydroxide was used for the rest of the adjustment. With the dibasic aluminum nitrate flowsheet, the quantity of sodium nitrate in the backcycle salt stream was reduced by about 35 per cent; the aluminum nitrate salt concentration in the LAFS and HALS streams was increased, which in turn increased the capacity of the HA and LA Columns.

Because of limitations other than the HA and LA capacities, the maximum rate achieved during the report period was 10 tons per day. The HA Column flooded and became limiting at a ten ton per day rate after 72 hours of column operation following the weekly acid flush. (Only the last 30 of the 72 hours were at a ten ton per day rate.)

b. Uranium Product Decontamination

The hexone solvent was washed twice with five per cent caustic and six times with ten per cent caustic in order to remove the nitroso compounds which were responsible for poor decontamination. Following the solvent washing operation, the arithmetic decontamination factor across the third uranium cycle increased from five to thirty.

c. Solvent Extraction Integrated Control System

The installation of the solvent extraction integrated control system was completed during the report period and is operating satisfactorily. All the stream flow rates are set from a central control console which assures correct flowsheet rates and helps to prevent over-usage of essential materials. Time required for start-up, shutdowns, and rate change is reduced by about one hour per rate change.

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3. Plutonium Process Engineering Operation

a. Button Line

Thirty-three of the 157 buttons produced during the month were unsuitable for fabrication processing. Twenty-one of these were purposely-produced scrap buttons resulting from processing hood floor sweepings and miscellaneous off-standard powders. The remaining 12 of the scrap buttons represent an abnormally high reject button production. However, such a reject rate was expected because of the following factors which prompted button line operations at "border line" impurity control conditions:

- (1) High purity, high plutonium concentration Redox and Purex plutonium nitrate feed solutions were in short supply. This necessitated either shut-down or processing feed batches relatively high in recycle metal dissolver solution (high in impurities) and elution solutions from the ion exchange columns (low plutonium concentration — approximately 30 grams plutonium per liter).
- (2) Processing of very dilute feed solutions necessitated operating the line at low processing rates because of feed handling and preparation limitations. Since process equipment corrosion is relatively constant, low production rates introduced high impurity levels in the small amount of plutonium produced.
- (3) Some reject buttons were produced subsequent to the off-standard powder processing period as the equipment returned to "normal" processing.

The yield across the ion exchange unit was 98.2 percent. The lower yield was caused by processing of potentially troublesome stored solutions other than filtrate solutions. Approximately 15 cans of waste solutions (e.g., analytical laboratory solutions and dissolver clean-out solutions) were processed through the ion exchange along with many hood 227 leach solutions (e.g., spent resin leach).

Results to date have been quite encouraging on recent equipment modifications on the button line. A double ball valve installed as a replacement for the butterfly valve on the powder line between the calciner and the fluorinator has given excellent operation and has reduced air in-leakage significantly. A bayonet-type blow-back filter has been installed in the calciner off-gas system. It has given excellent performance in the three weeks it has been installed. On blow-back, powder apparently drops free and full line vacuum is restored. A teflon housing installed on the fluorinator off-gas filter has shown no signs of deterioration (exposed to border line temperature environment for teflon).

b. PuO₂ Teflon-Lined Dissolvers

The prototype teflon-lined plutonium oxide dissolvers gave encouraging results during the month. The M2 dissolver is a teflon-lined unit

with a bottom probe immersion heater. The probe is a 2" OD x 0.75" ID x 12" long 304 L stainless steel pipe containing a 2-kw, 0.75" electrical cartridge heater. The M-2 dissolver averaged approximately 650 grams/run, including clean-out runs. The M-1 dissolver was put back into service on August 30. It has a new type stainless steel probe, 310, with dimensions similar to M-2. The 310 stainless steel probe has demonstrated an 8-fold better corrosion resistance than the 304-L.

c. Incinerator

Repairs to the equipment have been completed, and the fire brick is undergoing a heating-drying period that will be completed in approximately one week. Start-up of the equipment is expected in mid-September.

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4. Separations Chemistry Laboratory

a. Purex Process Improvement

Samples of an over-concentrated batch of organic material containing uranium were delivered during the month for investigation of methods of separation or recovery. The final recommendation consisted of a 5% carbonate wash to remove the uranium and the dibutyl phosphate. Uranium was then precipitated from DBP by treatment with 10% caustic. The precipitate was then redissolved in nitric acid. Hydrolysis of this resulting solution should be adequate to remove traces of organic.

Samples of both organic systems in Purex (G cell and R cell) were investigated in the laboratory also to determine the optimum wash procedure. Carbonate-permanganate washes were superior to $Mg(OH)_2$ washing. Successive washes were found to give greater improvement than a single wash, therefore a series of washes was recommended as a cleanup procedure.

b. Redox Process Improvement

A sludge sample obtained from the Redox 114-SX waste tank had the approximate consistency and color of chocolate syrup. Ninety-three per cent of a weighed portion of the sample was soluble in 6M HCl with greater than 99% of the fission products dissolving. A spectrochemical analysis of the insoluble residue (7% of the original sludge) indicated that aluminum was the principle ingredient with iron, chromium, and silicon being major constituents. Analysis of the soluble portion of the sludge is in process.

Laboratory work concerning the recovery of aluminum nitrate from future Redox waste (low $NaNO_3$ and Fe content), by crystallization from concentrated nitric acid, indicates that an arithmetic fission product decontamination factor of 24 may be obtained with one crystallization and two wash steps.

c. Fission Product Process

An order has been issued to remove equipment from and decontaminate the I-F subisle. The subisle will then be equipped with ion exchange columns for the chromatographic separation and purification of promethium as part of the program to recover limited amounts of promethium from Purex supernate wastes.

d. Laboratory Improvement

Correction factors for the three 3 x 3" NaI(Tl) detectors and the three RIDL 400 channel analyzers at Redox have been established and placed in service. Gamma Scintillation Spectrometry - Conversion Factors Between Analyzers and Between Detectors, HW-78754, is being published to document the procedure used for this and future correlations. Supplement No. 1 of this document, for local distribution only, lists all of the pertinent factors.

Preliminary tests have been completed on the 5 x 5" well scintillator. The detector conforms to the purchase specifications and to the operating characteristics stipulated by the manufacturer. Present plans are to operate in the range 0 to 4 Mev at 20 Kev per channel using liquid sources. Seven-eighths inch by three inch polystyrene vials containing approximately 10 milliliters of solution will be one sample configuration that will be calibrated.

Six NaI(Tl) scintillation detectors from Redox, including three 3 x 3" detectors, have been X-rayed in an effort to establish the reason for variations in response from the orientation of the crystal in its can. A first approximation of response difference can be obtained from the difference in distance between crystal and the can at the counting surface, and hence, the distance between detector and sample. Means have not as yet been found to correlate these measurements adequately with counting data to allow consideration of this as an alternate method of determining detector conversion factors.

A procedure was developed to determine oxalic acid concentrations in the presence of hydrogen peroxide. The peroxide was first decomposed by making the solution alkaline and adding several drops of 0.1% osmic acid. After acidification with sulfuric acid, an excess of ceric sulfate was added to oxidize the oxalic acid. Oxalate concentration was calculated by difference in the total ceric and excess ceric titer with ferrous ammonium sulfate. A small excess of osmic acid did not interfere.

Technetium(VII) adsorption from supernate by IRA-401 strong base anion exchange resin was materially increased by addition of 72% nitric acid. The following table shows percent adsorption as a function of feed pH following nitric acid addition.

<u>Vol. Ratio (72% HNO₃)</u>	<u>pH</u>	<u>% Tc(VII) adsorbed</u>
0	10.0	30
0.07	8.4	44
0.10	5.6	74
0.20	2.9	100

Each addition of acid was followed by a rapid evolution of NO₂ and CO₂ gases. With moderate agitation, gas evolution subsided within four minutes.

An analysis, specific for americium-241, was developed. This procedure can be completed within 45 minutes with an exceptionally high decontamination from all other alpha emitting isotopes normally encountered. Americium was extracted from a low acid matrix (0.05-0.10M HNO₃) into 1.4M D2EHPA. A 3M nitric acid strip removed americium selectively from the organic phase. Standard recovery for this analysis was 99.2% and the standard deviation was $\pm 0.8\%$.

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Pretreatment of process water with KMnO_4 to yield a 0.1 ppm KMnO_4 concentration hastened the beginning of alum floc formation in the alum treatment step of the water processing. It had no apparent effect on the floc settling rate but it enhanced the formation of large floc particles. The treatment had no effect on dissolved silicate concentration.

The reduction of permanganate led to a colloidal dispersion of MnO_2 . This dispersion caused a turbidity of 1.0 A.P.H.A. units if the original KMnO_4 concentration was 1 ppm and 3.8 A.P.H.A. units if it was 2 ppm. Alum scavenged the MnO_2 turbidity more effectively than it scavenged the natural turbidity. Since the MnO_2 formation is slow its removal could be further facilitated by allowing time for the KMnO_4 to be destroyed before the alum treatment.

5. Plutonium Chemistry Laboratory

a. Plutonium Solubility In Sump Solution

The solubility of plutonium (as either polymer or hydroxide) in D-7 sump solution at pH 2 and 10 was measured.

Two samples of D-7 sump solution (0.08 g/l H^+) were neutralized to pH 2 and pH 10 respectively, with 50 percent NaOH. Plutonium nitrate solution (250 g/l Pu, Hood 6 solution) was added dropwise until precipitation occurred. The pH of the solution was checked and readjusted as necessary throughout addition of plutonium solution. After periodic shaking for a day, the measured solubility of plutonium was 0.017 g/l at pH of 2 and <0.001 g/l at pH -10.

The solubility of plutonium or plutonium hydroxide was also determined in 50 percent NaOH. Plutonium solution was added dropwise to a sample of 50 percent NaOH until precipitation occurred. Solubility was 0.12 g/l Pu.

b. Plutonium Recovery From Chloride Button Line Wastes

A document of the above title was issued as HW-78655, Confidential. Portions of the Summary And Conclusions follow:

"A chloride dissolving step followed by a chloride boil-off is the currently preferred technology for handling the New Button Line wastes. Further aqueous processing may be by either of two existing processes--the supernatant ion exchange, or the Reclamation Facility solvent extraction.

"An incentive exists for developing the direct chlorination of metallurgical wastes. Economy is achieved by avoiding aqueous processing while utilizing chloride volatility to achieve purification."

A. S. Frank
 Manager
 Research and Engineering

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

H. FINANCIAL OPERATION

1. Production Cost Accounting

Estimated costs of producing U-233 in CPD under three production assumptions were prepared for Research & Engineering Operation during the month.

The annual report regarding physical inventory of essential materials inventories was prepared.

Liquidation rates for servicing organizations were updated to conform with FY 1963 results and estimated future costs.

Special requests handled in August included the shipment of 480 grams of Pu nitrate to APED and the burial of 53 drums of contaminated material for Dow Chemical.

CPD's investment in inventories at July 31, 1963 compared with budgeted amounts is as follows:

(in thousands)	<u>Balance</u> <u>7-31-63</u>	<u>Control</u> <u>Allocation</u>	<u>Surplus</u> <u>(Deficit)</u>
<u>Inventories</u>			
Essential Materials	\$ 834	\$ 815	\$(19)
Spare Parts & Standby	1 660	1 615	(45)
Special Materials	78	103	25
Yttrium	<u>153</u>	<u>150</u>	<u>(3)</u>
Gross Inventories	<u>2 725</u>	<u>2 683</u>	<u>(42)</u>
<u>Reserves</u>			
Essential Materials	42	59	(17)
Spare Parts & Standby	566	404	162
Yttrium	<u>153</u>	<u>150</u>	<u>3</u>
Total Reserves	<u>761</u>	<u>613</u>	<u>148</u>
<u>Net Investment</u>	<u>\$1 964</u>	<u>\$2 070</u>	<u>\$106</u>

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CHEMICAL PROCESSING DEPARTMENT
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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Operation</u>	<u>Monthly</u> <u>7-28-63</u>	<u>Salaried</u> <u>8-25-63</u>	<u>Weekly</u> <u>7-28-63</u>	<u>Salaried</u> <u>8-25-63</u>	<u>Total</u> <u>7-28-63</u>	<u>8-25-63</u>
General Manager's Group	11	11	2	2	13	13
Financial	14	13	15	15	29	28
Research & Engineering	63	66	31	30	94	96
Facilities Engineering	72	72	25	25	97	97
Power & Crafts Operation	38	38	236	234	274	272
Production	6	6	4	4	10	10
Redox	59	58	231	227	290	285
Purex	70	70	261	259	331	329
Weapons Manufacturing	<u>50</u>	<u>50</u>	<u>222</u>	<u>225</u>	<u>272</u>	<u>275</u>
Total	<u>383</u>	<u>384</u>	<u>1027</u>	<u>1021</u>	<u>1410</u>	<u>1405</u>

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
P. R. McMurray	New York, New York East Lynn, Massachusetts	Consult with management of Manufacturing and Compensation Services. (8/6 - 10/63)
P. H. Reinker R. E. Smith	Palo Alto, California	Laboratory programs. (8/5 - 6/63)
R. B. Britton	Daytona Beach, Florida New Orleans, Louisiana	Personnel placement consultation. (8/9 - 16/63)
<u>To AEC and Other AEC Contractors</u>		
J. E. McDonald	Dow Chemical Company Rocky Flats Plant Denver, Colorado	Compare financial data. (8/5 - 12/63)
R. J. Dal Ponte G. E. Wilbur	Dow Chemical Company Rocky Flats Plant Denver, Colorado	To discuss inspection techniques and inspect 74-C condition. (8/12 - 13/63)
R. W. Lambert T. R. McKenzie J. J. Shefcik	E. I. du Pont Company Savannah River Plant Aiken, South Carolina	Technical discussion on reactor fuel processing, waste disposal and U-IV production. (8/26 - 28/63)
	Oak Ridge National Lab. Oak Ridge, Tennessee	Ditto above. (8/29/63)
L. L. McGregor	Sheffield Corporation Dayton, Ohio	Inspect gaging equipment prior to shipment. (8/29 - 30/63)
<u>To General Industry</u>		
D. R. Giblett	Northwest Copper Works, Inc. Portland, Oregon	Equipment for Pu Reclamation Facility. (8/7/63)
H. S. Bjorklund H. W. Stivers	U. S. Army Engrs. Troutdale, Oregon	Concrete testing program. (8/14/63)

C. TRIPS (Continued)

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To General Industry (Continued)</u>		
M. E. Yates	Bovay Engineering Company Spokane, Washington	To discuss scheduling for Purex Essential Waste Routing Systems. (8/28/63)

To Professional Society Meeting

C. R. Bergdahl	Spokane, Washington	Attend Pacific General Meeting of AIEEE. (8/26 - 28/63)
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D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From Other G.E. Components</u>		
James F. Young	Palo Alto, California	Plant tour. (8/15 - 16/63)
<u>From AEC and Other AEC Contractors</u>		
P. B. Orr	Oak Ridge National Lab. Oak Ridge, Tennessee	Fission product program and promethium processing. (8/5 - 6/63)
N. W. Davis H. G. Waugh	Los Alamos Scientific Lab. Los Alamos, New Mexico	Gaging evaluation. (8/20 - 22/63)

From General Industry

James D. Head Robert A. Vandegrift Isaac B. Venable, Jr.	Dow Chemical Company Midland, Michigan	Discuss waste management. (8/7/63)
Major General W. M. Creasy Major General W. H. Draper Dr. Walter A. Zinn	Lummus Company Washington, D.C.	Discuss waste management. (8/9/63)
Dr. K. Newman	Turco Products Company Los Angeles, California	Decontamination chemicals. (8/23/63)
F. Morris	Turco Products Company Spokane, Washington	Ditto above.

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D. VISITORS (Continued)

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From General Industry</u> (Continued)		
C. Luft	DuBois Chemical Company Walla Walla, Washington	Decontamination chemicals. (8/29/63)
E. Vynne	Cascade Distributors, Inc. Seattle, Washington	Demonstration of Ramset gun. (8/29/63)

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IV. SAFETY AND SECURITY

CHEMICAL PROCESSING DEPARTMENT
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<u>Operation</u>	<u>General</u>	<u>FEO</u>	<u>Finance</u>	<u>WMO</u>	<u>P&CO</u>	<u>Purex</u>	<u>Redox</u>	<u>Prod.</u>	<u>R&E</u>	<u>Total CPD</u>	<u>YTD</u>
Dis. Injuries											5
Ser. Accidents											2
Med. Treat. Inj.			1	13	13	7	8			42	337
Rad. Occur				7		2	4			13	98
Contam. Wd.				3						3	16
Pu Dep.				3*						5	10
Fires											5
Sec. Viol.							1		1	2	13

*Three inhalation - less than 1.0% MPBB

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CHEMICAL PROCESSING DEPARTMENT
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V. REPORTS

A. PREPARED AND ISSUED

- HW-77194, Official Use Only, "Project Proposal - Remote Liquid Level Gauging System - 200 Areas (Project CAC-111)", dated July 29, 1963, by M. N. Raile.
- HW-77976 Official Use Only, "Project Proposal, Rev. No. 1, Purex Essential Waste Routings System (Project CAC-970)", dated August 14, 1963, by L. W. Finch.
- HW-78133, Unclassified, "Critical Mass Control Specification - Recovery of Plutonium from Miscellaneous Plutonium Wastes in Room 161 of 234-5 Building", dated August 26, 1963, by R. J. Sloat.
- HW-78164, Unclassified, "Hanford Isotope Plant - Architectural Alternates", dated July 8, 1963, by L. R. Michaels and H. C. Riches.
- HW-78377, Secret AWD, "Plutonium Isotopic Determination - Supplement", dated July 25, 1963, by R. J. Dal Ponte and N. S. Wing.
- HW-78443, Secret AWD, "Progress Report - Weapons Process Engineering - July 1963", dated August 5, 1963, compiled by members of the Weapons Processing Engineering Operation, Research and Engineering.
- HW-78499, Secret, "Analysis of Two Groups of "C" Overbore - 1.0 Goal Material", dated August 1, 1963, by R. P. Ringle.
- HW-78501, Secret, "Analysis of Two Groups of "C" Overbore - 0.5 Goal Material", dated August 1, 1963, by R. P. Ringle.
- HW-78502, Secret, "Analysis of Three Groups of 6th and 7th LU Core - H Material", dated August 1, 1963, by R. F. Ringle.
- HW-78503, Secret, "Analysis of Three Groups of 6th LU Blanket - H Material", dated August 1, 1963, by R. P. Ringle.
- HW-78520 RD, Secret, "Forecast of Special Nuclear Material Requirements, R&D, Other Than In Production - SS Material Projects", dated August 2, 1963, by R. E. Roberts.
- HW-78525, Secret, "HAPO Isotope Program - Po-210 Production", dated August 7, 1963, by L. W. Lang, L. E. Kusler and H. C. Rathvon.
- HW-78566, Secret AWD, "Potential Production of U-233 at Hanford", dated August 6, 1963, by J. H. Warren.

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HW-78571, Secret AWD, "Potential Production of U-233", dated August 6, 1963, by J. H. Warren.

HW-78577, Unclassified, "CPD Hazards Review Task Force Report - Waste Treatment Facility - Design Scope, Rev. #1", dated August 12, 1963, by D. E. Braden, et al.

HW-78589, Secret AWD, "Mold Temperature Calibration for Model 74-C Graphite Molds in HA-19-B1", dated August 8, 1963, by A. E. Barber.

HW-78606, Unclassified, "Critical Mass Control Specifications for Miscellaneous Plutonium Measurements in the 224-T Building", dated August 9, 1963, by J. B. Fecht.

HW-78632, Secret AWD, "Inspection of Objects of Revolution from Points Other Than the Design Center", dated August 13, 1963, by L. L. McGregor.

HW-78655, Confidential, "Plutonium Recovery from Chloride Button Line Wastes", dated August 15, 1963, by M. H. Curtis.

HW-78676, Unclassified, "Prototype Equipment Scope - Phase II - Waste Management Program", dated August 21, 1963, by J. W. Kolb.

HW-78678, Secret AWD, "Potential Production of U-233 at Hanford", dated August 19, 1963, by J. H. Warren.

HW-78705, Secret AWD, "Potential Production of U-233", dated August 21, 1963, by J. H. Warren.

HW-78726 RD, Secret, "Purex Plant Production Schedule - September 1963", dated August 22, 1963, by D. McDonald.

HW-78729 RD, Secret, "Redox Plant Production Schedule - September 1963", dated August 23, 1963, by D. McDonald.

B. PREPARED FOR SIGNATURE AND ISSUANCE

HW-78483, Secret, "Production - July 1963", dated August 1, 1963, by W. E. Johnson.

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VI. PATENT SUMMARY

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

INVENTOR

TITLE

NONE

P. H. Rinker

General Manager
Chemical Processing Department

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**DATE
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