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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

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DECLASSIFIED)

HW--80243

DECEMBER, 1963

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By Authority of CB-PB-2

Compiled By
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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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the Atomic Energy Commission and General Electric Company.

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STAFF

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CHEMICAL PROCESSING DEPARTMENT MONTHLY REPORT

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I. SUMMARY

Production through December, as compared with the October 25, 1963 HAPO Production Forecast (HW-79264), is summarized below:

	<u>December</u>	<u>Fiscal Year To Date</u>
Separated plutonium nitrate	76.5	87.8
Separated uranium nitrate	74.9	86.6
Uranium oxide	68.6	87.3
Plutonium metal buttons	80.9	95.7
Fabricated parts	57.4	93.8

December production was below forecasted quantities for all products. The output of fabricated parts was curtailed because of a reduction in delivery requirements by the AEC. The below forecast production of other products resulted from the extended shutdown of Redox, November 6 to December 20, and also the equivalent of about one week's outage at Purex.

Purex operation was continuous during December except for six short outages caused by pump and jumper failures. Despite the several shutdown-startup occasions, both products met specifications although most of the uranium required silica gel treatment.

Purex neptunium recovery and purification totaled 4500 grams, a new record high for one month's production.

The HAPO II-2 cask was loaded with 110,000 curies of strontium-90 and is presently undergoing pressure testing.

Operations were resumed in the Redox plant on December 20. The plant had been shut down since November 6 because of a fire, which resulted in extensive plutonium contamination of the 233-S Building interior. Product quality and waste losses were both satisfactory.

Before processing was resumed in Redox, flowsheets, specifications, and procedures were revised as needed for returning the plant to a three-cycle solvent extraction process for plutonium purification, with neptunium accumulation in the backcycle system and recovery on a campaign basis. These changes were necessary to restore the Redox plant to operation without the L-18 anion exchange contactor, which was damaged by the 233-S fire.

After demonstrating the feasibility of using existing incinerator equipment to burn air-dried sludge, a standard operating procedure was adopted for burning the remaining sludge from the floor of the Recuplex Receiving and Blending Hood.

At the request of the AEC, a study was made to determine the capability for processing 110 Blanket Fuel Elements from the Shippingport Reactor. The fuel elements, containing about 74 kgs of high exposure plutonium, could be processed in a single campaign through the Redox plant. Following chemical separations, the plutonium product could then be converted to the oxide or metal in the 234-5 Building. Estimated costs were also developed.

The cost estimate for the Hanford Isotope Annex Plant, by using the D2EHPA process, has been revised downward to \$9,000,000.

J. H. Warren
 General Manager
 Chemical Processing Department

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS

A. PRODUCTION OPERATION

1. Production Statistics

a. <u>Percent of Forecast(1) Achieved</u>	<u>December</u>	<u>Fiscal Year to Date</u>
Separated plutonium nitrate	76.5	87.8
Separated uranium nitrate	74.9	86.6
Uranium oxide	68.6	87.3
Plutonium metal buttons	80.9	95.7
Fabricated parts	57.4	93.8
b. <u>Purex</u>	<u>December</u>	<u>November</u>
Uranium nitrate produced (tons)	668.02	721.07
Average production rate during operation (T/D)	29.0	29.5
Total waste loss (%)		
Plutonium	0.35	0.34
Uranium	0.26	0.25
On-line efficiency (%)	75.8	89.7
c. <u>Redox</u>		
Uranium nitrate produced (tons)	55.07	10.49
Average production rate during operation (T/D)	6.3	5.3
Total waste loss (%)		
Plutonium	0.48	0.73
Uranium	0.19	0.34
On-line efficiency (%)	29	7
d. <u>Uranium Reduction (tons)</u>		
Normal UO ₃ loaded	653	577
Enriched UO ₃ loaded	31	10
Normal UO ₃ approved for shipment	651.56	551.70
Enriched UO ₃ approved for shipment	0	0
Normal UO ₃ shipped	651.84	451.82
Enriched UO ₃ shipped	0	0
Normal UNH backlog	393	370
Enriched UNH backlog	153	120

(1) HW-79264, HAPO PRODUCTION FORECAST, dated 10/25/63

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e. Plutonium Metal Processing

	<u>December</u>	<u>November</u>
Reduction yield (%)	96.6	97.7
Product recovery output (Kgs)	85.37	79.02
Product recovery backlog (Kgs)	1351	1387
Waste disposal (grams)	416	260

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	11,544	4,217
Filtered water pumped (gpm)	1,213	1,179
Maximum steam generated (lbs./hr.)	255,000	160,000
Average steam generated (lbs./hr.)	227,000	122,000
Total steam generated (M lbs.)	179,953	96,624
Coal consumed (tons)	9,273	5,527

December production was below forecasted quantities for all products. The output of fabricated parts was curtailed because of a reduction in delivery requirements by the AEC. The below forecast production of other products resulted from the extended shutdown of Redox, November 6 to December 20, and also the equivalent of about one week's outage at Purex.

Manager, Production

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2. FISSION PRODUCT DATA

	<u>PUREX*</u> <u>RECOVERY</u>	<u>244-CR*</u> <u>INVENTORY</u>	<u>B-CANYON*</u> <u>INVENTORY</u>	<u>SEMIWORKS</u> <u>PRODUCTION</u>	<u>PRODUCT</u> <u>INVENTORY</u>	<u>PRODUCT</u> <u>IN CASK</u>	<u>PRODUCT</u> <u>SHIPPED</u>	<u>CUSTOMER</u>	<u>REMARKS</u>
Sr-90 (Kilocuries)	84	996	165	1000	2640**	110	-		
Cs-137 (Kilocuries)									
Ce-144 (Kilocuries)									

** Does not include 200 kilocuries for rework.

*Estimated figures based on Cs. calculations.

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II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

Purex operation was continuous during the month except for six short outages due to pump and jumper failures. Total outage time was about six days. Except for the outage periods, processing was maintained at an average capacity factor of 3.5.

2. Processing

Strontium purification run No. 6 was started on 12-4-63 and completed on 12-15-63. Approximately 1000 kilocuries were purified, 120 kilocuries were sent to rework and approximately 43 kilocuries were discarded to waste. High HC column losses were encountered until fresh organic was used.

Despite the several Purex shutdown-startup occasions, both uranium and plutonium products met specifications. Most of the uranium required silica gel treatment.

Neptunium recovery and purification yields were unusually high. Shipments were made on December 9 and 30.

Approximately 67 percent of the Purex 1WW was processed for Sr-90 recovery and approximately 20 percent was taken for cerium production. The balance (approximately 13 percent or 3,000 gallons) was sent to underground storage due to various process delays. Nineteen sulfate runs were completed.

Due to the inoperable 11-2 sampler, the peroxyacetate Ce-RE test run in B Plant was not completed.

The cask loadings and status are as follows:

<u>Cask</u>	<u>Quantity (Approx.)</u>	<u>Destination</u>	<u>Status</u>
HAPO I B-1			Received from ORNL 12-20-63.
HAPO I B-2		ORNL	Placed at Strontium Semiworks awaiting January loading of cerium.
HAPO II-2	110 Kc Sr-90	Quehanna	Loaded in December. In process of pressure checks.

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Four thousand liters of 003-CR crude were pumped to Strontium Semiworks for the cerium extraction.

The sluicing program at 241-A Tank Farm has reached the stage of pumping the supernate from 103-A Tank to 101-C. The pumping was not completed due to pump motor failure, leaky jumpers, and failure of pump to pick up the supernate.

3. Equipment Experience

The Purex Plant experienced six canyon pump failures during this report period. Three of the pump failures (R-1, F-10, and G-2) were from long service and normal wear. Cause of the other three pump failures (J-1 and two H-1) is unknown at the present time.

An improved and more dependable communication system was installed in the Purex Plant canyon east crane. This new radio telephone system provides a highly dependable method for the crane operator to communicate with others in the Purex Plant.

The 103-A pump in the 241-A Tank Farm failed when the electric motor developed an internal ground and bad bearings. A new replacement pump motor was installed and the equipment was returned to service.

The faulty 6-1 Ce-Rare Earth storage tank in B Plant has been flushed in preparation for its removal.

4. Radiation Experience

An unusually high lateral reading (maximum of 150,000 c/m) was recorded from the northeast lateral of the 105-A Tank (used for current Purex waste). The readings have not increased in the three weeks following the detection.

I^{131} emission was somewhat higher than usual during the week ending December 19. Laboratory analyses revealed the presence of some I^{132} , probably from one to two short-cooled fuel elements.

Manager-Purex

WM Harty:gt

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II. ACHIEVEMENTS (Continued)

C. REDOX OPERATION

1. Operating Continuity

Operations were resumed in the Redox plant on December 20. The plant had been shut down since November 6, because of a fire which resulted in extensive plutonium contamination of the 233-S Building interior. Operations were resumed on a seven-day-per-week operating schedule and continued at satisfactory rates for the balance of the month. Product quality and waste losses were both satisfactory.

The Uranium Oxide plant operated satisfactorily throughout the month. However, the production of both depleted and enriched uranium oxide was below that expected due to a shortage of feed material.

2. Processing Operations

a. Redox Processing

The clean-up and rehabilitation of the 233-S Building was completed by the middle of the month and the plant was started up December 20, for a test run using rework material. Operations were shut down about seven hours later to correct several minor equipment deficiencies that appeared during this test run. Check-out procedures were subsequently completed and the process was restarted December 22 using virgin feed. Except for two short periods needed for pump replacements, processing was continuous on a seven-day-per-week operating schedule through the balance of the month.

Before operations were resumed, flowsheets, specifications, and procedures were revised as needed for returning the Redox plant to a three-cycle solvent extraction process for plutonium purification, with neptunium accumulation in the backcycle system and recovery on a campaign basis. These changes were necessary to restore the Redox plant to operation without the L-18 anion exchange contactor which was damaged in the 233-S fire.

Processing operations since start-up have been satisfactory, with good over-all performance. Both the uranium and plutonium products have met specifications and waste losses have been uniformly low permitting direct discard of most of the waste produced. The over-all decontamination factor of fission products in the plutonium stream has been the same as that achieved before the loss of the anion exchange contactor. As expected, metallic impurities in the plutonium product solution have increased; however, the solution

still meets product specifications.

b. Uranium Oxide Processing

With the start-up of the Redox plant on December 20, the G-cell calciner, which had been converted to depleted uranium production during November, was returned to enriched uranium production.

At the customer's request, four carloads of depleted normal uranium oxide containing 4,000 ppm sulfur instead of the normal 3,300 ppm, were produced. Fulfillment of a similar request for enriched uranium oxide powder was started on December 26. The calciner bed temperature for these special runs was maintained at 245°C instead of the normal 275°C.

3. Mechanical Experience

a. Redox Plant

Most of the maintenance work this month was to help restore the Redox plant to operation. All instrumentation in the 233-S Building required for start-up was checked and re-calibrated. Few replacements were required as a result of the fire. A Barton transmitter for the L-12 concentrator weight factor and a new electrode assembly for the sump alarm were the main items. The plutonium load-out scale was completely overhauled and recalibrated, as was the L-22 recycle plutonium monitor.

Piping alterations were made to use the L-12 vessel as the final plutonium concentrator, and all associated equipment was checked for integrity. The L-18 anion exchange contactor was isolated pending a decision for its final disposition.

All of the piping needed to convert the 1S column to parallel operation with the 1A precycle column was installed this month. While this removes the 1S column from the neptunium collection system, it does provide greater flexibility in the precycle step. Neptunium production will be continued by the procedure used before the neptunium collection and recovery system, Project CG-913, was put into operation.

b. Uranium Oxide Plant

On December 4, the gasket failed on the bottom end of the D-6 uranium concentrator steam chest and a small amount of UNH solution was blown into the operating gallery via a ruptured instrument line. The concentrator, instruments, piping and associated equipment items were quickly repaired and the area was returned to normal status. No injuries or personnel radiation exposures were involved.

4. Waste Handling and Decontamination

Equipment valued at approximately \$47,000 was received from customers for decontamination, repair, inspection, or burial during the month. Equipment valued at approximately \$44,000 was returned to customers, representing a savings of approximately \$17,000 over the cost of new equipment.

The Reactor Containment Test Program has been approved; Hanford Laboratories issued a work order for a new crane maintenance platform to be built in the 221-T canyon and to be completed by February, 1964. Meanwhile, clean-up of the canyon sections to be used by the new occupants, is proceeding at a rate which will see the job done at the time the new CMP is finished.

5. Radiation Experience

Construction of a new ventilation exhaust facility for the 233-S Building was started this month. The new facility will consist of two exhaust systems in parallel, each with double filtration units, i.e., two filters in series. The new equipment is required to:

- 1) assure protection of personnel and the environs from plutonium in the 233-S exhaust air; 2) simplify maintenance of the filter system.

6. Analytical Experience

Analytical support to the N-Reactor Department is now being provided on a four-shift, seven-day-per-week schedule. This work currently requires the services of six technical and four non-technical personnel. There is a firm need to increase this force by five non-technical personnel during January, 1964.

Provision of seven-day-per-week analytical coverage to the Redox plant, required transfer of personnel from the Day Shift and will mean delay and cancellation of some work for other customers as well as increased use of scheduled overtime.

Manager - Redox

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II. ACHIEVEMENTS (Continued)

D. WEAPONS MANUFACTURING OPERATION

1. Operating Continuity

The fabrication of Model 1807 weapons components continued at the normal rate during the month. Production of Model 74-C weapons components was curtailed during most of December pending Design Agency approval of the fabrication process. This approval was obtained late in December and shipments were resumed on December 30, 1963.

Unfabricated plutonium feed supplies were improved during the month by a system of partially blending classified and unclassified plutonium. Button line outages were required for panel replacement work, ion exchange difficulties and other miscellaneous maintenance work. Plutonium scrap dissolving and incinerator operation were continued. Test runs at the new recovery facility were delayed when it became necessary to correct wiring defects in the control panels.

2. Processing Operation

a. Plutonium Fabrication

Information on fabrication activities is presented in Document HW-80367 (Atomic Weapon Data).

b. Plutonium Reduction

During December a program was developed for utilizing a portion of the unclassified plutonium by blending it with other material. This helped to relieve a plutonium shortage in the system and permitted greater operating continuity in the Purex plant and in the plutonium reduction equipment. The impurity level of plutonium buttons continued to improve. Average impurities were approximately 1800 ppm.

c. Plutonium Reclamation

Approximately 150 kilograms of plutonium were successfully processed through the recovery dissolvers during December.

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c. Plutonium Reclamation (Continued)

The incinerator operated normally on dry waste materials until December 18, at which time a fire in the chopper hood resulted in damage to the conveyor belt. Following the fire, while awaiting the receipt of a new belt, the incinerator was successfully used for the burning of sludge from the floor of the Recuplex reception and blending hood. Late in the month the hood work was interrupted when a leak occurred in the piping from the L-3 waste tank. This leak permitted approximately 200 liters of liquid to reach the hood floor. At month end, the liquid was being removed.

In the new recovery facility the start of test runs was delayed so that Minor Construction forces could correct faulty wiring in the control panel board circuits. The operating manpower made available by the delay was used for around-the-clock processing at the incinerator.

3. Mechanical Performance

The fabrication equipment on both the RMA and RMC lines operated exceptionally well during December.

The Hood 9-A button line equipment continued to require excessive maintenance effort. During December the principal difficulties involved the vacuum system.

Renovation work on Hood 9-B was continued. Testing of the new fluorinator tube and the sintered platinum off-gas filters was initiated. Failure of the platinum filters to withstand vibration was corrected by gold soldering of the end caps. Additional air inlet filter capacity has been installed in the top level of the hood to lower temperatures at that location. The vacuum drum filter installation was essentially completed. Replacement of worn components on the powder pan conveyor was in progress at month end.

In the new recovery facility (Project CAC-880) process tank calibrations and Diaphragm Operated Valve operational checks were completed during the month. Instrument calibration is awaiting the energizing of the control and instrument panel boards by Minor Construction forces.

4. Radiation Experience

Radiation and contamination control statistics revealed satisfactory performance in December.

An electrician received a small puncture wound while working in a process hood. No plutonium was detected in the wound and no deposition is anticipated.

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4. Radiation Experience (Continued)

A new air sample counter was placed in service during December. This new device permits the immediate determination of alpha activity from natural sources in air samples and thus eliminates the former 24-hour delay period which was necessary to allow the decay of natural radiation.

5. Analytical Experience

December

Number of Samples Received	2,999
Number of Determinations	23,468

In preparation for the startup of the new recovery facilities, the DK-2 Spectrophotometer has been calibrated for the determination of plutonium valance states, americium concentrations from 0.1 to 2.0 g/l Am, and DBBP concentrations in CCl₄.

In support of plutonium metal impurity studies the X-ray fluorescence spectrometer has been calibrated for tantalum, titanium, tungsten and iron.

In support of research studies an analytical method was developed for the determination of sulphur in plutonium oxides and chlorides.

WJ Gartin
 Manager
 Weapons Manufacturing

WJ Gartin:csj

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II. ACHIEVEMENTS (Continued)

E. FINANCIAL OPERATION

1. Production Cost Accounting

Considerable effort was given to analysis of the Isotope Inventory budget with regard to the recent notice of substantial cuts in Isotope Inventory balances as of June 30, 1964 and also a reduction in the strontium-90 shipping schedule. It was determined that an increase of \$350,000 in this budget was required for the continuation of current operations.

Estimated costs of handling and dissolving Shippingport reactor fuels in the Redox plant were developed during the month.

A request was submitted to the AEC for the establishment of a new end function account for waste management. Justification for this account is based on increased activity in this area in the future.

Special requests handled during the month included (1) 10 grams of plutonium for the Federal Republic of Germany and (2) 90 grams of plutonium nitrate for Argonne National Laboratories.

CPD's investment in inventories at November 30, 1963, compared with budgeted amounts, is as follows:

(in thousands)	<u>Balance</u> <u>11-30-63</u>	<u>Control</u> <u>Allocation</u>	<u>Surplus</u> <u>(Deficit)</u>
<u>Inventories</u>			
Essential Materials	\$ 851	\$ 815	\$ (36)
Spare Parts & Standby	1 578	1 615	37
Special Materials	90	103	13
Yttrium	<u>153</u>	<u>150</u>	<u>(3)</u>
Gross Inventories	<u>2 672</u>	<u>2 683</u>	<u>11</u>
<u>Reserves</u>			
Essential Materials	42	59	(17)
Spare Parts & Standby	527	404	123
Yttrium	<u>153</u>	<u>150</u>	<u>3</u>
Total Reserves	<u>722</u>	<u>613</u>	<u>109</u>
<u>Net Investment</u>	<u>\$1 950</u>	<u>\$2 070</u>	<u>\$ 120</u>

2. General Accounting

As of November 30, 1963, nineteen active projects had incurred costs of \$3,142,763 against authorized funds of \$4,154,500. Outstanding commitments totaled \$252,624.

During December two work authorities and one directive modification were received from the AEC: Directive No. AEC 229, Work Authority No. 1, Project CAC-117, Modification of Steam Lines - 200 Areas, authorized \$4,700 and Work Authority No. 2, clarification of funding; Directive No. HW-553, Modification No. 1, Project CGC-122, Exhaust Ventilation Facility - 233-S Building for increase of funds to \$75,000.

Three appropriation requests were processed during the month totaling \$32,600. An AR for improving the Redox sand filter, stack and off-gas monitors accounted for \$19,500 of the total.

3. Personnel Accounting

Statistics relative to exempt appraisals were developed during the month for the Department General Manager for his use in completing the annual salary review.

Manager - Finance

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design Engineering

Remote Cartridges

As a part of the Purex extraction process improvement, the remote cartridges are being revised according to operating experiences. A drawing for the G-2 cartridges in the IO extraction column was issued. Information for a J7 cartridge in the IC extraction column was obtained, and a new cartridge is being designed.

Increased Processing Flexibility - Purex

Multipurpose dissolver drawings were completed and issued for comment on items such as "D" and "E" Dissolver Cell Arrangements, "D" and "E" Cell Engineering Flow Diagrams, Process Flow Diagrams, and Conceptual Insert Design for the dissolver.

2AF Tank Scope

The rough draft of the scope design study for the final-cycle feed tank has been completed. Check prints of the vessel drawing and engineering flow diagram have been corrected as necessary. An initial check print of the hydraulic schematic drawing has been completed.

Purex Sumps

A study is being made of modifications necessary to make the Purex sumps critically safe for processing of enriched metal. The work to date has been devoted to determination of the existing condition of the sumps and in setting limits which could exist in the sumps with the process modifications now visualized.

"I" Cell Package Re-design

Work on the new "I" Cell package has been resumed, and the EFD and preliminary cell arrangement drawings are ready for comment issue.

b. Manufacturing Engineering

The instruction for the Purex Canyon equipment accountability system was published. New History Record and Activity Report forms were received and are for use while gaining experience with the system.

2. Redox

a. Process Design Engineering

Redox Reactivation

The engineering flow diagrams and drawings for the Redox re-activation were completed and transmitted during the month.

233-S Building

A fire detection system, employing smoke detecting elements along with a temperature sensitive element has been designed for the 233-S Building. A lighting layout and panel replacement for the greenhouse has been proposed. Lighting and communications in the greenhouse are temporary.

b. Manufacturing Engineering

Cost Model for Redox Processing Subsection

A preliminary draft for the cost model for Redox Processing Subsection was completed. This model was designed to differentiate between fixed costs and variable costs which fluctuate with various levels of production. The following categories of cost items are to be measured: (1) direct and applied labor; (2) utilities (steam, raw water, and sanitary water); and (3) essential materials.

3. Weapons Manufacturing

a. Process Design Engineering

Button Line

The new fluorinator for Hood HC-9B was mocked-up in the "Z" Plant maintenance shop and cold testing was started. Design work to correct deficiencies is underway. A decision was made during the month to revise the new vacuum drum filter that had been mocked-up previously in the maintenance shop and ready it for installation in Hood 9B by February. The bearings and drive mechanism for the new VDF have proved unworkable and a major over-haul will be needed to correct the problems. Engineering evaluation of the various alternatives has been

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completed and revised drawings are being prepared. A new design was prepared for installation of a metering pump in the Hood 9 Oxalate Acid Line.

Incinerator

The new leaching and scrubber solution solids recovery glove box has been closed up and pressure tested. Tie-ins will be made after the equipment has been cold tested.

PR Can Balance

Fabrication of the PR can guide and support for the new 100 kg Mastergram Hadley Balance has been completed. The can guide and balance support is currently mocked-up in the 234-5 Building instrument shop. The balance will be installed near Hood 6 after completion of cold testing.

Briquette Press Chip Tray - HC-40

A new chip tray for feeding chips to the briquette press has been designed, fabricated, and installed in Hood HC-40. A new degreasing basket has been designed and fabricated.

New Glove Box - Plutonium Chemistry Laboratory

Ten (10) drawings on the mechanical design of the prototype general purpose glove box have been completed and distributed for comment. An estimated two more drawings will be required for electrical design.

Portable Critical Incident Alarm

All components required for the portable critical alarm have now been received with the exception of the timer and batteries. The two items remaining have been simulated with shop equipment and the alarm has been "breadboarded". Testing is currently underway.

b. Manufacturing Engineering

Power Rolled Model - Data Forms

Twelve (12) forms for registering in-put data were developed, approved, and released for issue. This completed the preparation of EDP-oriented in-put data forms for the improved data collection system in Fabrication Operation.

4. General

a. Process Design Engineering

Radio Transceivers

Belt-mounted radio transceivers were used successfully during repeated entries into the Redox 233-S Building. As a result of this experience and of demonstrations elsewhere, additional units will be purchased for use in Redox, Purex, and "Z" Plants.

Processing of Shippingport Reactor Fuel

At the request of the Atomic Energy Commission, a study was made to determine CPD's capability to process 110 Blanket Fuel Elements from the Shippingport Reactor to recover approximately 74 kgs of high exposure plutonium for Hanford laboratories. Based on the study, the fuel would be stored at Hanford until all the fuel had been received and then processed through the Redox Plant in a single campaign. The plutonium product would be converted to the oxide and metal forms in 234-5 Building. The operating costs for processing the assembled fuel elements are estimated to be \$712,000 if one dissolver is used and \$598,000 if two dissolvers are used. The costs of processing the unassembled fuel sub-assemblies are estimated to be \$635,000 and \$521,000 for one and for two dissolvers, respectively. In addition, approximately \$30,000 capital costs will be incurred in the 234-5 Building. If this processing is assigned to Hanford, the campaign probably would not be made before late 1964 or early 1965, due to the time required for shipment of the fuel to Hanford.

Hanford Isotope Plant

As a result of process flexibility which can be provided in the 221-B Canyon for Phase III - Waste Management - using the D₂EHPA process, considerable economies can be realized in the Hanford Isotope Plant. Specifically, the cost of 221-B Annex concept can be reduced from \$10,400,000 to about \$9,000,000. A new Budget Data Sheet for the \$9,000,000 case was prepared and submitted.

Waste Management - Phase III-"B" Plant - alterations currently planned include facilities for waste fractionization using the D₂EHPA flowsheet for isolation of the strontium and cerium-rare earth streams and precipitation and ion exchange for separation and purification of virgin cesium. On this basis, Phase III equipment is capable of providing separate purified strontium and cesium streams to the Isotope Plant.

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A study was started on the design of the large low-level waste concentrator (approximately 25×10^6 BTU/hr. unit). Consideration is being given to using of the Purex titanium tube bundle design.

Design of cesium ion-exchange facilities for supernate in Cell 18 has been started.

b. Project Engineering

Project Cost Information - as of 12/22/63:

Total Auth. Funds-16 active projects	\$ 3 413 000
Total Cost-to-date	2 482 000
Commitments & Open Work Releases	323 000
Unencumbered Balance	608 000
Costs Charged to Above Projects 11/17/63 to 12/22/63	89 000

<u>Projects Dropped from Active Status During this Period</u>		
<u>Project No.</u>	<u>Authorized Funds</u>	<u>Total Cost</u>
CGC-968	\$ 350 000	\$ 323 073
CGC-978	210 000	180 564
CGC-983	225 000	160 079
CGC-984	75 000	69 497

5. Shops Operation

As now organized, the Fabrication Shops Operation furnished engineering craft and equipment services as required by the operating facilities. Major work completions in the various shops were:

- The Boiler Shop completed the "E" Cell Plutonium Ozone Stripping mock-up and as-built for Redox.
- The Sheetmetal Shop has essentially completed the sheathing of number 6 Purex spare concentrator.
- Machine Tool and Die Shops completed 125 jobs.
- The Jumper Shop fabricated 24 jumpers and four stainless steel pump screens.
- The Rotating Equipment Shop sent three pumps each to Purex and Redox, and completed three agitators and two pumps for stand-by status.

6. Power and Services

Operating Continuity

Steam and electrical services were provided without inter-

ruption for the continuous operation of production facilities.

Repair Activities and Installations

On December 4, repairs were made to a break in the 12-inch sanitary water line to Redox and 224-U Areas.

New by-pass lines were fabricated and installed around the cone valves in the 282-E and W raw water inlet houses. These new lines are a permanent installation and provide a safer operation.

A broken 10-inch gate valve in the 2902-B high tank valve pit was replaced. This valve appeared to have had a crack in the body for some time and finally ruptured during the high tank construction work.

Manager Facilities Engineering

HP Shaw/WWC/alr

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Engineering - B. F. Judson

(a) Solvent Extraction

The plant process test of eliminating the feed adjustment step between the dissolvers and the HA Column was completed. Since operational control and performance of the HA Column were improved, particularly during plant start-ups, the feed adjustment step has been eliminated from normal make-up procedures.

A process test to increase the sulfamic acid holding reductant in the 2D Column feed was started to improve plutonium decontamination performance across the Second Uranium Cycle. Although data accumulated during the month are not conclusive, there were no marked gains in performance above that achieved with the normal ferrous sulfamate addition.

(b) Product Treatment

Three neptunium purification runs were completed during the month. The quality of the neptunium produced was well within specification requirements in terms of both fission product and inerts contents. Net recovery and purification of neptunium during 1963 using the new solvent extraction and ion exchange systems represented 72 per cent of the virgin neptunium input to the Purex Plant. Assuming that the neptunium still in the Backcycle Waste System is not lost during subsequent operations, the overall recovery yield for neptunium during 1963 was approximately 85 per cent of the Purex Plant input.

The Plutonium Ion Exchange unit sustained the longest operating period (55 days) without a resin change or addition since 1961. Several gallons of resin, however, were changed out during late December to permit continued satisfactory operation. The addition of fluoride to the plutonium ion exchange feed was not required to produce specification plutonium during most of the month.

(c) Waste Processing and Storage

Mold growth in the sugar solutions led to problems of maintaining satisfactory flow to the Waste Concentrator feed stream. On two

occasions, the sugar flow to the IWF stream was stopped for about twelve hours. During these periods, the ruthenium activity in the nitric acid production solution from the T-F5 acid absorber increased approximately 100-fold.

Radioactivity was detected with an extra sensitive probe in the north lateral under TK-105-A in the 241-A tank farm. The count level peaked at approximately 150,000 c/m at a point 8 feet below the edge of the tank and remained essentially unchanged throughout the month.

The in-tank sluice mixing program has been delayed by a motor failure of the TK-103-A transfer pump and by failure of the TK-102-A cooler assembly to pass pressure tests. The latter problem requires disassembling the unit and welding some 200 tubes.

Preparations are underway to field test removal of Cs-137 from waste supernatants by passing actual tank farm solutions through a special test cask filled with AW-400 resin.

(d) Fission Product Purification

A one megacurie Sr-90 purification run (SSW-6) was completed during a 12-day campaign at the Strontium Semiworks. Excellent decontamination from other fission products was achieved, but decontamination with respect to inerts, principally calcium, was marginal. In addition, as in the previous run (SSW-5), the plant processing rate was almost two-fold below normal because of flooding tendencies in the HA Column, and the HA and HC Column losses were two to three-fold above normal.

During the latter part of the Strontium purification campaign, the SSW solvent inventory was isolated and fresh solvent was introduced, processed and subsequently recycled. The calcium decontamination, HAW losses and HCW losses improved by a factor of three. In addition, the processing rates were increased almost two-fold and even greater processing rates appeared feasible. The solvent employed early in the operating period had been used for several strontium purification campaigns, for batch strontium rework operations, and for process tests related to the recovery and separation of cerium and the rare earths. A laboratory program has been started to determine the reason for the poor solvent quality and to develop washing techniques that will permit longer solvent use life.

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2. Redox Process Engineering

- (a) In order to produce plutonium product solution acceptable for "button" production in the 234-5 facility without the L-18 anion exchange contactor, the following flowsheet changes were made:
- (1) The 3A and 3B Columns (previously used for neptunium purification) have been restored to plutonium decontamination.
 - (2) The E-2 ozonator (previously used for final plutonium product decontamination) is being operated ahead of the third plutonium decontamination cycle, using a sodium bismuthate catalyst to obtain maximum ruthenium removal.
 - (3) The E-4 ozonator (previously used for neptunium decontamination) is being used to decontaminate the final plutonium product solution and also to strip hexone from the solution prior to concentrating in 233-S.
 - (4) The plutonium product solution is being concentrated, sampled and loaded out in the L-12, L-6, and L-7 vessels, respectively, in the 233-S facility.

The over-all decontamination factor of fission products in the plutonium stream is comparable to that achieved on the old flowsheet using the anion exchange contactor. Typical decontamination factors of the two flowsheets are tabulated below.

	<u>Log Decontamination Factor</u>	
	<u>Present Flowsheet</u>	<u>Former Flowsheet</u>
Precycle	1.2	1.1
Partition Cycle	2.3	2.0
Second Plutonium and Ozonator	2.8	2.4
Third Plutonium and Ozonator	1.8	-
Anion Exchange	-	<u>2.6</u>
Total	8.1	8.1

There has been an increase in metallic impurities in the plutonium product solution, however, the solution still meets product specifications. Typical data on metallic impurities with the flowsheets are tabulated below.

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<u>Metal</u>	<u>Metallic Impurities</u>	
	<u>Parts Impurity Per Million Parts Plutonium</u> <u>Present Flowsheet</u>	<u>Former Flowsheet</u>
Al	1000	50
Ca	500	N.D.
Cr	2500	1000
Fe	5000	500
Na	250	100
Ni	1000	250
Si	100	100
Ti	200	200

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3. Plutonium Process Engineering Operation

(a) Button Line

In October the sintered stainless steel calciner blowback filter elements were found completely corroded away after only two months of service. The replacement elements of the same material were again inspected this month, and after two months of service were found to be in excellent condition. The shortened life of the first set of elements may have been due to any one or combination of the following:

- (1) During the lifetime of the first filter elements, the heater elements in the filter failed and may have permitted condensation in the elements and corrosion.
- (2) The first elements were tested with lead oxide before installation and may have been activated during the cleaning following the test.
- (3) During part of this period, a relatively large amount of recycle metal oxide dissolver solutions with fluoride ion were processed.
- (4) There were periods of heavy off-gas loads when filter cakes were wetter than normal.

(b) Incinerator

A shortage of storage space for air-dried floor sludge, presently being removed from the Recuplex reception and blending (R & B) hood, prompted a burning test in the incinerator. Objectives of the test were to reduce the volume and provide a safer, more suitable material for long-term storage. The feasibility of burning air-dried R & B floor sludge in existing incineration equipment was demonstrated, and adopted as a standard operation for the remaining air-dried sludge. A 4-fold reduction in storage volume resulted. No "flare-ups" were experienced during the test, and the off-gas scrubber system operated normally. The ash from the burning was quite similar to normal incinerator ash; the few large lumps that were produced were easily broken up.

(c) Criticality Safety

The vacuum drum filters for oxalate precipitate (hoods 9A and 9B) have a void space in the center of the drum that was filled with paraffin to prevent plutonium from entering this void. When the hood 9B drum filter was disassembled in October, the paraffin was found to have melted and 2/3 of it had leaked out. To eliminate this problem, a solid polyethylene shape was fabricated to replace the paraffin in the filters in both hoods. When the filter in hood 9A was disassembled for removal of the paraffin, there was no evidence that any had leaked out. The paraffin was replaced with the polyethylene shape as planned.

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4. Separations Chemistry Laboratory

(a) Purex Process Improvement

Since the addition of oxalic acid has been shown by previous work to improve decontamination across the HA column, multi-batch counter-current studies were continued to define process variables. Laboratory work further indicates that plutonium losses are not increased by oxalic acid additions up to 0.001M in the HAF. At this concentration the Zr-Nb decontamination is increased by a factor of three. The addition of oxalic acid to the 2D scrub at 0.001 to 0.003M resulted in a reduction of the plutonium in the 2DU stream and only slight improvement in Zr-Nb decontamination.

The potential precipitation of plutonium by the addition of oxalic acid was investigated by adding oxalic acid to synthetic HAF samples in the range 1×10^{-4} to 0.12M. These samples were allowed to stand for two days at which time a precipitate which appeared to be oxalic acid formed in the 0.12M solution. Contacting the samples with organic extractant did not produce a precipitate in solutions less than 0.05M in oxalic acid. From these data it may be concluded that the optimum concentration in the HAF would be in the .001 to .005M oxalic acid range.

Sodium formaldehyde sulfoxalate (Discalite) was substituted for ferrous sulfamate in lab scale 2D column flowsheet tests. Initial results indicate reduced plutonium losses to the 2DU, little if any effect on the Zr-Nb decontamination, by a factor of three increase in ruthenium decontamination. These studies will be continued.

(b) Redox Process Improvement

Additional laboratory work has been accomplished on the "bottle process" of refluxing neptunium in an extraction column. In these tests ferrous ammonium sulfate (without sulfamic acid) was found to be an effective reductant for neptunium(VI) in a low acid system. The ferrous ammonium sulfate is also sufficiently stable at 25 C in acid deficient aluminum nitrate to permit plant use of such a scrub stream. The use of such a salted scrub stream for refluxing neptunium could lead to a better system of nitric acid control in the hexone system.

(c) Fission Product Process Improvement

Additional laboratory work on the sugar kill method of destroying nitric acid has disclosed that the rate of reaction can be increased if the acid concentration is maintained at 4M by concentration of the solution during the reaction. By this method one mole of sugar destroyed 16 moles of acid in 24 hours without the need of iron catalyst. This method is recommended for the rare earths process.

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(d) Laboratory Improvement

A comparison of analytical results between the Purex and Z-Plant laboratories was completed on ten batches of plutonium product from Purex that were sampled both at Purex and Z Plant and the samples analyzed at both laboratories. Statistical analysis of the results disclosed no difference between laboratories or between batch samples at the 95% confidence level.

Bathophenanthroline has been evaluated as a possible substitute for 1, 10 orthophenanthroline in the wet chemical analysis of iron in plutonium and UO_3 . The new reagent forms an extractable complex which provides a more sensitive and more specific test for iron. The method will detect 2 μg of iron with a variance of around 2% and is quite tolerant to interfering ions. This is a spectrophotometric method using the 530 m μ absorption peak.

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5. Plutonium Chemistry Laboratory

(a) Direct Calcination Of Plutonium Nitrate

A total of four runs were made in the direct calciner during December and approximately five kilograms of oxide suitable for chlorination was produced. The sulfate-plutonium ratio of the oxide was varied from 0.15 to 0.3 for the different runs. The chloride prepared from the oxide was satisfactory and in each case at least 90 per cent chlorination was obtained.

Chemical analysis of the oxide produced indicated a significant titanium content as compared to runs reported previously. The calciner was disassembled to see if any sign of corrosion could be detected, but none was apparent. At one point in the calciner there was evidence of erosion due to metal-metal friction, but this did not appear to be serious.

One run of 10 hours' duration was made to check the thermal stability of the calciner. The results obtained indicate that approximately 3 - 4 hours' operation are required for the calciner to reach thermal equilibrium. Once steady-state operation has been reached, however, the temperature does not appear to fluctuate more than 5 - 10 C as long as the feed rate and screw speed are held constant.

(b) Chlorination Of Plutonium Dioxide

Batch experiments with the two-inch nickel reactor during this period showed that (1) the mechanically-stirred fluid bed can be operated as high as 500 C, and (2) the heat generation during chlorination is not large enough to require special cooling for temperature control.

Two batch chlorinations of oxide from the experimental calciner with an SO_4/Pu ratio of 0.5 resulted in conversions of 79 and 88 per cent, the best results seen so far. In both cases more than three times the stoichiometric requirement of phosgene was furnished to the reactor over approximately four hours.

The outside skin temperature of the reactor was controlled at 475 C. In each case the corresponding internal temperature rose to about 520 C in the initial phase of the reaction and then settled down toward 475 C as the reaction approached completion.

(c) Electrowinning Plutonium Metal

The objective of recent runs has been to shake down equipment for the new larger cells and begin investigation of chloride feed made from direct calcined plutonium dioxide.

The new equipment functioned with no significant difficulty. One run produced 2007 grams of plutonium metal in 5.8 hours with an 83 per cent electrical efficiency using PuCl_3 made from direct calcined oxide. The high-density magnesia cell obtained from the Los Alamos Scientific Laboratory was tested as part of these runs.

The cell performed well and showed only 25 per cent as much corrosion as the magnesium titanate cells normally used.

One of the unknowns in the present chloride process is the effect of the PuCl_3 made from direct calcined oxide. Two test runs were made in which this chloride was fed intermittently with PuCl_3 made from regular oxalate-oxide. A difference was noted in that the direct calcined oxide-chloride made the electrolyte more viscous and tended to froth more than the other. Also the product withdrawal was irregular. When the temperature was raised from 900 to 1000 C, this feed functioned normally.

(d) DBBP Extraction Of Plutonium

A static column using dibutyl butyl phosphonate will be used to remove residual plutonium from the plutonium reclamation facility waste, CAW.

Tests in a laboratory column have shown low efficiency. Nevertheless, a 10-fold reduction in waste loss is anticipated. Stripping with 0.5M Na_2CO_3 was tested in one column run and 87 per cent removal was obtained in three column volumes. Acidification of this solution with 13M HNO_3 was readily accomplished with no polymer formation.

(e) Americium Recovery

Purification of the solvent extraction product is to be accomplished by four ion exchange cycles. These are under test on a small scale.

The first column is a cation concentration column of Dowex 50W-X12. This column was readily loaded with only 0.5 per cent waste loss. It is estimated 500 column volumes could have been loaded. Elution was with 10.6 volumes of 2.3M ANN.

The second column is a Permutit SK anion column which will use loading from a strong nitrate solution for purification. The third column is a cation column which will be used for concentration and crossover to the chloride system. The fourth column is again an anion column to separate from plutonium and iron in the chloride system. Definition of process conditions is under way.

T. S. Frank

Manager
Research and Engineering

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CHEMICAL PROCESSING DEPARTMENT
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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Operation</u>	<u>Monthly</u> <u>11-30-63</u>	<u>Salaried</u> <u>12-29-63</u>	<u>Weekly</u> <u>11-30-63</u>	<u>Salaried</u> <u>12-29-63</u>	<u>Total</u> <u>11-30-63</u>	<u>12-29-63</u>
General Manager's Group	9	8	2	2	11	10
Financial	13	16	13	21	26	37
Research & Engineering	69	69	30	29	99	98
Facilities Engineering	71	98	23	219	94	317
Power & Crafts Operation	36		231		267	
Production	6	7	4	4	10	11
Redox	62	62	223	222	285	284
Purex	71	71	262	262	333	333
Weapons Manufacturing	<u>56</u>	<u>61</u>	<u>239</u>	<u>262</u>	<u>295</u>	<u>323</u>
Total	<u>393</u>	<u>392</u>	<u>1027</u>	<u>1021</u>	<u>1420</u>	<u>1413</u>

B. PERSONNEL CHANGES

Effective December 1, 1963, all functions of the Power and Crafts Operation were transferred to other CPD components, mainly to Facilities Engineering. Key personnel in the former Power and Crafts Operation were reassigned as follows:

T. G. LaFollette, Manager-Power and Crafts, to Analyst - Salary Administration, Financial Operation.

P. E. Cunningham, Manager-Power, to Manager-Power and Services, Facilities Engineering Operation.

C. E. King, Manager-Fabrication Shops, to Manufacturing Engineer-Reclamation Startup, Plutonium Reclamation Operation, Weapons Manufacturing Operation.

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B. PERSONNEL CHANGES (Continued)

P. E. L. Nussbaum, Manager-Crafts and Landlord, to Manager-Shops, Facilities Engineering Operation.

H. F. Scott, Analyst-Forecasts and Performance and J. F. Lee, Analyst-Reports and Personnel, transferred to Engineering Administration Operation, Facilities Engineering Operation, same job title.

R. W. Bryant, Analyst-Administration, transferred to Production Operation, same job title.

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
L. M. Knights	Crotonville, New York	Attend symposium (Quality Control). (12/2 - 3/63)
	New York, New York	Discuss quality control problems. (12/4/63)
	Schenectady, New York	" " " (12/5/63)
<u>To AEC and Other AEC Contractors</u>		
G. C. Oberg	Lawrence Radiation Lab.	Discuss fabrication and
A. E. Smith	Livermore, California	production specifications. (12/2/63)
	Sandia Corporation	Discussions on ALOO
	Albuquerque, New Mexico	Standards Program. (12/3/63)
	American Car & Foundry	Standards Laboratory
	Industries	discussions.
	South Albuquerque, N. M.	(12/3/63)
	Los Alamos Scientific Lab.	Discuss fabrication and
	Los Alamos, New Mexico	product and process specifications. (12/3 - 4/63)
	The Dow Chemical Co.	74 follow-up and production
	Rocky Flats Plant	specification discussions.
	Denver, Colorado	(12/5/63)
W. J. Gartin	Albuquerque Oper. Office	Attend Scheduling meeting.
	Albuquerque, New Mexico	(12/4 - 6/63)
S. J. Beard	Oak Ridge National Lab.	Participate in study on
	Oak Ridge, Tennessee	hazards associated with management of radioactive waste and technical dis- cussions relating to fission product recovery. (12/5 - 6/63)
I. N. Taylor	The Dow Chemical Co.	Follow-up on 74 testing.
	Rocky Flats Plant	(12/9 - 10/63)
	Denver, Colorado	

C. TRIPS (Continued)

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To AEC and Other AEC Contractors (Continued)</u>		
K. G. Grimm	U. S. AEC	Technical discussions on fission product and waste management programs. (12/13/63)
W. M. Harty	Division of Production	
B. F. Judson	Germantown, Maryland	
L. R. Michels		
<u>To General Industry</u>		
H. L. Caudill	Otto York Company and Schuyler Mfg. Company New York, New York	Spare Purex F-F6 de-entrainer. (12/2 - 4/63)
<u>To Conventions and General Meetings</u>		
H. L. Caudill	New York, New York	Attend Exposition of Chemical Industries. (12/2 - 4/63)
R. E. Tomlinson	Am. Management Assoc. Los Angeles, California	Session of planning productive and profitable R&E programs. (12/11 - 13/63)

D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors</u>		
W. McLuggage	U. S. AEC Div. of Nuclear Health and Safety Germantown, Maryland	General organization for nuclear safety. Tour Purex plant and criticality control. (12/12/63)
S. Beitsher	The Dow Chemical Company Rocky Flats Plant Denver, Colorado	Tensile testing consultations. (12/16/63)
W. Burkhardt C. Huntington	National Lead Co. of Ohio Fernald Plant Cincinnati, Ohio	Discuss uranium trioxide processing, thorium oxide technology, and uranium metal impurities problem. Tour Ceramic Fuels Operation. (12/17- 18/63)

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D. VISITORS (Continued)

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and Other AEC Contractors (Continued)</u>		
D. Loewe	Lawrence Radiation Lab. Livermore, California	Inspection of plutonium fabrication and testing facilities. (12/30/63)

From General Industry

W. J. Vasil	Perine Machinery Co. Seattle, Washington	Shop equipment. (12/10 - 11/63)
John Quirk	Puget Sound Bridge and Drydock Co. Seattle, Washington	Shop equipment and procedures. (12/10 - 12/63)
George Cobb Harold Lambertus	Nuclear Products Dept. Kerr-McGee Oil Industries Oklahoma City, Oklahoma	Discuss Hanford Isotopes packaging plant, waste management, and general aspects of Hanford diversification. (12/11/63)
W. W. Lowe	Warren-Pickard-Lowe (Kerr-McGee Oil Industries) Oklahoma City, Oklahoma	" " (12/11/63)
P. Berner	Star Machinery Company Seattle, Washington	Hydraulic and machinery shears. (12/11/63)
W. L. Buckovitch	Cincinnati-Shaper Company Cincinnati, Ohio	(12/11/63)

From Other Government and State Agencies

R. E. Rose	Director of the Department of Commerce and Economic Development State of Washington	Plant Tour. (12/20/63)
Judson Wonderly	Staff Member	" "

D. VISITORS (Continued)

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From Other Government and State Agencies (Continued)</u>		
Stanley Donogh	Members of Advisors Council	Plant Tour.
Frank Haskell	as of above.	(12/20/63)
R. D. Lindsay		
Lorin Markham		
Henry M. Owens		
Don Tilson		
Dr. Paul Volpe		
Wilford E. Woods		

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IV. SAFETY AND SECURITY

<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</u>	<u>YTD</u>
Dis. Injuries											6
Ser. Accidents											3
Med. Treat. Inj.		12	1	10		10	15		2	50	501
Rad. Occur.				3		4	1			8	139
Contam. Wds.											20
Pu Depositions				1			1			2	22
Fires				1*						1	10
Sec. Viol.						1				1	22

* - December 17, Fire 62-10 - Material in 232-Z Chopper Hopper ignited, probably from sparks when tramp metal entered chopper. Damage, \$3709.13 - mostly decontamination.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-65616 REV, Unclassified, "Critical Mass Control Specification - Waste Treatment", dated November 15, 1963, by R. J. Sloat
- HW-74716, Unclassified, "Critical Mass Control Specification - Transportation of Plutonium-Bearing Materials by Motor Truck", dated December 6, 1963, by R. J. Sloat.
- HW-76532, Official Use Only, "Redox Plant Sampling Schedule - Revised", dated December 10, 1963, by R. E. Isaacson.
- HW-76571 REV, Secret, "Criticality Hazards Control Specifications - Redox Plant", dated December 16, 1963, by R. E. Isaacson.
- HW-77229 REV, Unclassified, "Critical Mass Control Specification - Temporary Storage of Plutonium Solutions - 234-5 Building, Corridors 3, 5, 6, and 7", dated December 4, 1963, by R. J. Sloat.
- HW-78904, Unclassified, "The Consequences of Accidental Release of Plutonium Oxide or Metal During Shipment to Euratom", dated December 6, 1963, by C. L. Brown, E. M. Johnston, and R. L. Junkins.
- HW-78993 R1, Unclassified, "FY-1965 Plant Acquisition and Construction Budget Data Sheet, "B" Plant Modifications for Isotope Purification and Encapsulation", dated December 27, 1963, by L. L. Zahn.
- HW-79529, Unclassified, "Design Criteria Plutonium Thermal Treatment Facility - 'A' Fabrication Line - 234-5 Building", dated November 20, 1963, by D. D. Wodrich.
- HW-79636, Secret, "Maintenance and Operating Experience of Plutonium Reduction Equipment", dated December 16, 1963, by V. W. Smith.
- HW-79655, Confidential, "Annual Nuclear Safety Review - Chemical Processing Department - October 1962 through September 1963", dated November 15, 1963, by L. M. Meeker.
- HW-79665, Secret, "Preliminary Study of Multiple Fuel Processing at the Purex Plant", dated November 26, 1963, by J. B. Kendall, R. W. Lambert and S. M. Nielson.

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- HW-79672, Confidential, "Pu-Th-U Partitioning Flowsheet and Equipment Specifications", dated December 20, 1963, by L. E. Bruns.
- HW-79678, Secret, "Potential Problems in U-233 Production", dated November 19, 1963, by R. J. Kofoed.
- HW-79713, Unclassified, "Critical Mass Control Specification - Storage of Plutonium-Bearing Materials - Army Ammunition Storage Igloo T-106", dated December 4, 1963, by R. J. Sloat.
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B. PREPARED FOR SIGNATURE AND ISSUANCE

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

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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. Leinker

General Manager
Chemical Processing Department

DECLASSIFIED

END

DATE
FILMED

4/11/1993