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This document consists of 21 Pages. Copy No. 14 of Series.

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR
DECEMBER, 1958

Compiled By
OPERATION MANAGERS

January 21, 1959

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Work performed under Contract No. W-31-109-Eng 52 between the Atomic Energy Commission and General Electric Company

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

DECEMBER, 1958

GENERAL SUMMARY

PRODUCTION

Production of plutonium from the separations plants during December and for CY 1958 exceeded the corresponding commitments. Purex plant established a new record high for uranium processed which exceeded the previous high by 3 per cent.

The production of UO_3 met the December and CY 1958 commitments, and UO_3 shipments conformed to the established shipping schedules.

The output of unfabricated plutonium exceeded the schedule for December and the commitment for CY 1958. The production and shipment of shapes exceeded the Official Forecast, both on a monthly basis and for CY 1958.

ENGINEERING

Purex products all met specifications during December; however, uranium produced during the latter part required silica gel processing. Solvent extraction process adjustments, intended to reduce neptunium losses to HAW, briefly caused the uranium stream to exceed gamma shipping specifications two-fold.

Redox dissolution rates for E-metal averaged 1.0 ton of uranium per day per dissolver. Adopting the rate of specific gravity increase to observe completeness of the second dissolver cut and of the heel removal, permitted attainment of this rate. Due to critical mass considerations and to the high plutonium assay of the first E-metal received at Redox, no plutonium recycle was possible in December processing.

In chlorination development work during December, five and a half kilograms of plutonium oxide were chlorinated batch-wise. A small continuous chlorinator was also operated successfully for eight days.

Several batch reductions of plutonium trichloride were made, seeking to reduce the material without mixture of the ingredients. The longer batches to-date have shown poor yields (81 - 86 per cent).

The process study covering recovery of fission krypton and xenon from Purex dissolver off-gas has been completed for transmittal to the Commission.

The contractor has experienced considerable difficulty installing the five lateral pipe lines under the 113-SX waste storage tank. The fourth line was not completed beyond 100 feet as a result of damage to the augering equipment and cutting shoe on the pipe. The contractor is now preparing as-built data showing location of the lateral pipes.

Preliminary equipment designs and cell layouts for power fuels reprocessing were completed for all dissolution alternates at both Redox and U Plant. These studies together with other information, will serve as the basis for making a recommendation to management on the best course of action with this program.

GENERAL

As a result of discussions initiated by Product Cost, the local office of the AEC has agreed to allow full credit to current fiscal year operating costs for the replacement value of capitalized prototypes, regardless of the year in which costs were incurred. This new procedure represents a major improvement over the previous method which prevented distribution of credit to the specific source of funds, thereby causing an overstatement of Process Technology and Research and Development costs as well as unit cost of products. This agreement, being of major importance to all other HAPO components, was referred to Contract Accounting for preparation of an accounting information bulletin.

The HAMTC filed a notice of arbitration on the D. E. Flowers case. This is a relatively trivial matter involving a shift change for one employee.

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STAFF

Vice President and General Manager, Atomic Products Division . . . F. K. McCune
General Manager, Hanford Atomic Products Operation W. E. Johnson
General Manager, Chemical Processing Department W. K. MacCready
Manager, Production J. H. Warren
Manager, Purex Operation P. R. McMurray
Manager, Redox Operation C. T. Groswith
Manager, Finished Products Operation W. N. Mobley
Manager, Power & General Maintenance Operation T. G. LaFollette
Manager, Financial Operation K. G. Grimm
Manager, Facilities Engineering Operation H. P. Shaw
Manager, Research and Engineering Operation V. R. Cooper
Manager, Employee Relations Operation D. S. Roberts

CHEMICAL PROCESSING DEPARTMENT
NUMBER OF EMPLOYEES
DECEMBER 31, 1958

<u>OPERATION</u>	<u>EXEMPT</u>		<u>OTHER</u>		<u>TOTAL</u>	
	<u>11-30-58</u>	<u>12-31-58</u>	<u>11-30-58</u>	<u>12-31-58</u>	<u>11-30-58</u>	<u>12-31-58</u>
GENERAL MANAGER'S GROUP	10	10	1	1	11	11
PRODUCTION	7	6	3	3	10	9
PUREX	52	51	217	213	269	264
REDOX	55	55	228	225	283	280
FINISHED PRODUCTS	59	58	237	238	296	296
POWER AND GENERAL MAINTENANCE	40	39	242	250	282	289
FINANCIAL	21	20	40	40	61	60
FACILITIES ENGINEERING	69	68	23	23	92	91
RESEARCH AND ENGINEERING	62	62	25	25	87	87
EMPLOYEE RELATIONS	<u>29</u>	<u>28</u>	<u>50</u>	<u>51</u>	<u>79</u>	<u>79</u>
TOTAL	404	397	1066	1069	1470	1466

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CHEMICAL PROCESSING DEPARTMENT

PATENT SUMMARY
FOR
MONTH OF DECEMBER, 1958

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.

<u>INVENTOR</u>	<u>TITLE</u>
G. D. Davis,	Inner Band Design for
C. H. Hammack, Power &	Glove Ports
General Maintenance	

U. S. Macready
GENERAL MANAGER
CHEMICAL PROCESSING DEPARTMENT

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CHEMICAL PROCESSING DEPARTMENT
PRODUCTION OPERATION

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DECEMBER, 1958

I. RESPONSIBILITY

There were no changes in the responsibility assigned to the Production Operation during December.

II. ACHIEVEMENT

A. Production Statistics

1. Purex Operation

	<u>December</u>	<u>November</u>
Tons uranium processed	584.33	523.3
Average production rate during operation (T/D)	21.4	24.0
Total waste loss (%)		
Uranium	0.05	0.09
Plutonium	0.16	0.19
Average cooling time (days)	102	99
Minimum cooling time (days)	90	90
On-line efficiency (%)	90	73.5

2. Redox Operation

	<u>December</u>	<u>November</u>
Tons uranium processed (64.9 E 8.6 normal)	73.5	0
Average production rate during operation (T/D)	5.7	-
Total waste loss (%)		
Uranium	0.23	-
Plutonium	0.38	-
Average cooling time (days)	219	211
Minimum cooling time (days)	161	206
On-line efficiency (%)	42	45.2

3. 234-5 Operation

	<u>December</u>	<u>November</u>
Batches input to Task I	231	214
Runs completed through Task III	258	233
Batches through Product Recovery	25	64
Reduction Yield (%)	98.83	98.15
Waste disposal (units)	122.20	631.14

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4. UO₃ Operations

	<u>December</u>	<u>November</u>	<u>To Date</u>
UO ₃ loaded (tons)	608.9	453.2	
UO ₃ approved for shipment (tons)	597.7	498.96	30,927.18
UO ₃ shipped (tons)	644.63	499.89	30,601.79
UNH backlog (tons)	304 plus 56 "E"	311	

5. Power

	<u>200 East</u>	<u>200 West</u>
Raw water pumped (gpm)	9,871	4,152
Filtered water pumped (gpm)	945	934
Maximum steam generated (lbs/hr)	260,000	167,000
Average steam generated (lbs/hr)	216,629	109,864
Total steam generated (M lbs)	161,172	81,739
Coal consumed, est. (tons)	10,876	5,856

6. Waste Storage

	<u>Equivalent Tons U</u>	
	<u>December</u>	<u>November</u>
Salt waste reserve storage capacity-Redox	2,589	2,654
Salt waste reserve storage capacity-Purex	34,068	34,659
Coating waste reserve storage capacity-Redox	31,041	31,106
Coating waste reserve storage capacity-Purex	46,597	47,188

C. Finished Products and Customer Liaison

The review of the rough draft report of the Fission Products Market Survey, originally scheduled for early December, 1958, was postponed until January 13, 1959 due to inability to establish a December date mutually satisfactory to HAPO and Arthur D. Little, Inc.

E. Reports and Documents

1. Prepared and Issued

HW-58290 RD	Redox Plant Production Schedule, December, 1958 D. McDonald
HW-58291 RD	Purex Plant Production Schedule, December, 1958 D. McDonald
HW-58292 RD	UO ₃ Plant Production Schedule, December, 1958 D. McDonald
HW-58293 RD	234-5 Plant Production Schedule, December, 1958 D. McDonald

HW-58412 Essential Materials Consumption-Purex - Chemical Processing Department for November, 1958
M. A. Thress

HW-58473 Essential Material Area Report to Cost and Purchasing - Production Operation - Chemical Processing Department for November, 1958, M. A. Thress

HW-58579 Chemical Processing Department - Waste Status Summary for November 30, 1958, M. A. Thress

HW-58643 Scheduled Shutdown - UO₃ and Purex Plants, Unscheduled Shutdown - Recuplex, December 24, 1958, R. E. Tomlinson

2. Prepared for Signature and Issuance

HW-58307 Production, November, 1958, A. B. Greninger

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no plant injuries reported by Production Operation personnel during December, 1958.

B. Security

There were no security violations in the Production Operation during the month.

C. Visits

R. E. Tomlinson, Acting Manager, Production Operation attended a conference on transportation of non-production fuels, in Chicago, Illinois, on December 2 and 3, 1958.

J. L. Warner
Manager
Production Operation

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CHEMICAL PROCESSING DEPARTMENT
PUREX OPERATION

December, 1958

I. RESPONSIBILITY

There were no changes in the responsibilities of the Purex Operation during the month.

II. ACHIEVEMENT

A. Processing Experience

1. Production Statistics

a) Production - Percent of Monthly Commitment

Uranium	130 Percent
Plutonium	128 Percent

b) Production Rates

12-1-58 at 0001 to 12-2-58 at 0540	Shut down for Palm recovery.
12-2-58 at 0540 to 12-4-58 at 1130	2.64 CF
12-4-58 at 1130 to 12-30-58 at 0140	2.70 CF
12-30-58 at 0140 to 12-31-58 at 2359	Shut down for Palm run preparation

c) Operating Continuity

Uranium	90 Percent
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d) Waste Losses

Uranium	0.05 Percent
Plutonium	0.16 Percent

e) Product Re-treated in Silica Gel 399 Tons

(65 tons of this material was shipped to Redox for silica-gel treatment.)

2. Normal Processing

A partially successful palm run was completed prior to the December 2, 1958 startup. During the normal processing period the 2AW waste containing the palm lost from the previous recovery run was re-processed through the system. Retention of palm was satisfactory during the early run period but became progressively poorer as the total quantity of palm built up in the 3WB system.

The performance of the extraction batteries during the entire month was excellent. During a major portion of the run period the uranium product met specifications without silica-gel treatment and all of the plutonium product was well within specifications. Plutonium and uranium waste losses, 0.164 percent and 0.049 percent, respectively, were a record low and palm retention in the 3WB system was very encouraging. Production for the month was three percent greater than for any previous month.

The nitrite addition to the HAO stream was suspended during the entire period; however, an addition was made routinely to HAF as a means of reducing palm losses to the HAW stream.

The plutonium ion exchange facility performed very well during the period although the XAF pump operated at capacity to deliver minimum flows. Resin push times increased during the month. Samples showed no resin fines but softening of the beads due to radiation damage was indicated.

Self-concentration of wastes in tanks 241-A-101, 102, and 103 continued at a rate of 3.9, 14.5, and 1.5 gallons per minute, respectively.

3. Special Processing

A partially successful palm run was completed prior to the December 2, 1958 startup. The original run (plus three L cell package flushes) was loaded out for additional decontamination and purification in the Redox laboratory. The solvent quality was maintained at acceptable levels during the palm run by operating the organic recovery equipment at elevated rates.

4. Radiation Experience

The total monthly radioiodine emission was 12.7 curies. The maximum emission during a seven-day period was 3.6 curies for the period ending December 31.

Six and one-third Radiation Occurrences were charged to Purex during the month. Three were the result of loss of contamination control within a radiation zone which resulted in contamination spread to areas not normally subject to risk in the work being done. Three were due to failure to comply with operating or radiation work procedures.

Fourteen cases of fission product skin contamination were incurred during the month. The maximum level encountered was 60,000 c/m on an employee's left thumb and forefinger. All contamination was reduced to less than detectable.

A box of miscellaneous cell jumpers was buried at a maximum dose rate of 4 r/hr at 35 feet. The failed F-6 tube bundle, H-1 pump, and D-5 agitator were transferred to the 271-U canyon for further decontamination and repair.

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An employee monitoring during process sampling contaminated his protective clothing to a maximum of 2 rads/hr. and prior to discovering the contamination the employee spread the contamination from the sample gallery to the Analytical Laboratory. All areas affected were decontaminated and returned to normal status within 24 hours.

Plugging of the A-4 crib during the jetting of the 216-A-2 catch tank, resulted in this material backing into the 291-A turbine house through the floor drains. The floor was contaminated to 20 rads/hr at 10 inches. In addition an area of ground and blacktop outside the building was contaminated up to 8 rads/hr. To prevent a reoccurrence of this incident the floor drains were disconnected from the crib line and routed to a newly installed french drain. Plans have been made for returning the affected areas to an acceptable status.

C. Mechanical Experience

As a result of plugging of the 216-A-4 crib, which receives waste solution from the 216-A-2 waste collection tank, the U-3 and U-4 laboratory waste receiver tanks, the dissolver off-gas scrubbers and the 241-A-151 diversion box catch tank, emergency measures were taken to route these wastes to 241-A-101 underground storage tank until such time as they can be permanently routed to the 216-A-21 crib. The life expectancy of the A-21 crib under the new flow conditions is estimated to be approximately six months. Project action was initiated to provide a new crib specifically designed to handle these wastes.

The fabrication and installation of three jumpers in the 151-A diversion box was completed on 12-19-58 on an emergency basis in order to provide a temporary routing for the normally cribbed waste.

The C cell ammonia scrubber installation was completed during the early part of the month. Due to the failure of the A-4 crib, operation of all three dissolver ammonia scrubbers was suspended on 12-5-58.

Repairs and added improvements were performed on the 1 HP agitator located in the 205 chemical makeup tank in AMU. The repairs and modifications consisted of replacing the bent agitator shaft and installing a torque tube with a lower graphitar bearing, designed to provide greater stability to the shaft. Two shaft failures have occurred on this unit during the year.

During the month repairs were completed on the P-U2-1 turbine pump which failed on 11-20-58 due to excessive upper seal leakage. Repairs consisted of replacing the shaft seals and bearings. Although the upper throttle bearing and the lower bowl bearings showed considerable wear, no definite cause for the excessive bearing wear was determined.

The F-11 left hand (West) tube bundle was replaced during the shutdown at month end due to leaking tubes. This is the sixth tube bundle failure since plant startup.

D. Analytical Experience

Due to the emphasis on the palm recovery program, a series of studies has been made to improve laboratory methods on palm and thorium analyses and gamma scans. The 256 pulse height analyzer has proven to be a very versatile and useful tool in meeting and resolving many of the analytical problems. A new gamma counting method for thorium was developed.

Additional effort was applied to analyses of cribbed wastes. Purex Analytical Control has now assumed the responsibility for the semi-annual fission product analyses required on materials being sent to the cribs. This work was previously handled by HLO. Fission product analyses are currently being performed on dissolver coating waste solutions to help determine the best mode of disposal.

E. Improvement Performance

1. Process Tests and Revisions

The acidity of the IBX stream was reduced from 0.56 M to 0.3 M in an effort to change the fission product split, which might help improve uranium dF. An improvement in the general decontamination performance of the entire process masked any effect of this change. The improved dF was ascribed to the palm dichromate flowsheet having a beneficial effect on column performance by flushing or improving the plate wetting characteristics.

The 2D column flowsheet was altered to reduce the palm losses to the 2EU stream by increasing the 2DS water flow while reducing the 2DIS water and acid. Palm losses were temporarily reduced by a factor of three.

Sulfuric acid was added in the 2DS stream in an effort to complex the palm and have it go out with the 2DW instead of going overhead with the uranium stream. The test was unsuccessful.

Nitrite was added to the HAF stream instead of the HAO stream during the entire run period. Palm retention was materially improved, but it has not been determined that this was the entire cause.

A test to determine the HA-HS and IBX-IBS plutonium holdup was conducted at the time of the shutdown and stripping of the columns after the November run period. The HA-HS system contained approximately 1350 units and the IBX-IBS system 2900 units.

2. Equipment Changes

A 16 point temperature recorder was installed in the 241-A-102 tank instrument enclosure to determine temperature readings at different levels in the 241-A-101 and 241-A-102 boiling tanks.

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F. Inventions and Discoveries

No inventions or discoveries were reported by Purex personnel during December 1958.

G. Events Influencing Costs

The replacement of the F-11 tube bundle added approximately \$28,000 to the Applied Materials account.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling or near-serious accidents during the month. Six medical treatment injuries were recorded.

Surprise 200 East Area practice evacuations were conducted on each shift.

B. Security

There were no security violations in December.

C. Personnel

R. E. Dahl, Chemist, transferred to Hanford Laboratory Operation on December 1.

There were no contacts with the Services Department components of the Company.

L. W. Roddy, C. E. Lorenzen, C. P. Sutter, B. V. Snow, and N. J. Heiling completed the PEM-I course.

The following persons visited Purex during December:

Congressman J. H. VanZandt - Member of Joint Committee on
Atomic Energy
J. E. Bauser - Staff Member of Joint Committee
on Atomic Energy
B. H. Mackey - E. I. duPont Company
J. S. Parker - Vice President - General
Electric Company

Manager
Purex Operation

PR McMurray:EAF:gt

CHEMICAL PROCESSING DEPARTMENT
REDOX OPERATION

DECEMBER, 1958

I. RESPONSIBILITY

There were no changes in the scope of responsibility of the Redox Operation this month.

II. ACHIEVEMENT

A. Processing Operation

1. Production Rates and Operating Continuity

From 12-1-58 through 12-5-58 Redox processing operations were directed toward the rework of flush material, high product wastes, and the ninth and final shipment, under the present contract, of Chalk River fuel elements. To clear the building for E-Metal processing and allow proper segregation of E-Metal UNH, a flush of the uranium containing processing vessels and columns was made during the period 12-6-58 through 12-7-58. Processing of E-Metal was subsequently started on 12-8-58 and continued as scheduled for the balance of the month.

The monthly production commitment was exceeded by 8% while operating at 57% of the total scheduled hours in the month, except the dissolvers which operated at near capacity.

Sixty-five tons of high gamma UNH (four to five ratio) from the Purex Plant was reprocessed through the Redox silica gel bed during the first part of the month. All of this material was readily brought within specifications and shipped to U Plant for further processing.

During an extensive 10% nitric acid flush of the processing equipment in the 233-S Concentration Building approximately 420 grams of plutonium was recovered. This flush followed the Z Plant Skull and Crucible recycle solution which was reprocessed on a test basis during November. The material was recovered by reprocessing through the 202-S Building third plutonium cycle and the 233-S Concentration Building.

Iodine-131 emission to the 291-S stack remained under good control. Total emission for the month was 0.117 curies.

Except for two batches of UNH which required ozonation and two batches of plutonium which were returned to the second plutonium cycle to bring the gamma ratios to specifications, both product streams remained well within shipping specifications. Waste losses for the E-Metal processing averaged 0.23% and 0.38% for uranium and plutonium respectively.

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2. Equipment Experience

The C-2 dissolver coil developed a leak of sufficient magnitude that it was taken out of service during the latter part of the month. This is an original installation, however, during the early years of the Redox operation it was used as an installed spare and as such experienced only limited use. The failed unit is to be replaced during the coming month with a spare dissolver which is currently undergoing repairs at the 221-U Equipment Reclamation Facility.

The recirculation jumper on the H-5 ruthenium scrubber failed during the month due to a leak at the bottom connector head. It is presumed that the high radiation associated with the H-5 equipment deteriorated the teflon gasket in the lower head. Replacement was made on 12-7-58 without incident and the unit is now operating in a normal manner.

A new sampler was installed in the G-4 organic waste receiving tank on 12-13-58 to permit sampling of the hexone still bottoms. This installation was made in conjunction with the Palm recovery program.

B. Maintenance Operation

A leak which developed at the right hand tube bundle flange on the D-12 waste concentrator proved to be very troublesome this month. Three different gasket replacements were tried, as well as a new tube bundle, but all were unsuccessful in eliminating the leak. On 12-6-58, after all efforts to make up the tube bundle flange had failed, a dissolver pot lid was used to seal off the tube bundle opening and processing operations were continued using only the left hand tube bundle. The reasons for the tube bundle's failure to make up, by process of elimination, have been reduced to two. The first and most plausible is that some foreign object or undissolved material in the bottom of the tube chest will not let the tube bundle go into place. This would not have to be very large since the clearance between the bottom of the steam chest and the tube bundle could be as small as 1/2 inch. The second reason is that the flange in the tube chest may have become warped. Corrective action will consist of fabricating a one-inch spacer to set inside the flange bolt circle with the necessary gasketing to insure a seal with the tube bundle. The tube bundle which was removed has been sent to the 221-U Equipment Reclamation Facility where the intake steam nozzle is to be shortened by one inch to compensate for the one inch spacer set inside the flange bolt circle. It is expected that this corrective action will resolve the difficulty with the make-up of this particular piece of equipment.

The electrical connection on the impact wrench of the 60-ton canyon crane was modified this month so that it will no longer be necessary to disconnect the wrench under high radiation exposure conditions. Eighty feet of cable was attached to the wrench, thus allowing the electrical connector to be moved back to the reelite where radiation exposure time is considerably more favorable. This modification should eliminate a troublesome maintenance job which in the past has required considerable radiation exposure time.

Four canyon jumper replacements were made during the month, one being associated with the new sampler installed on the G-5 organic waste receiving tank.

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C. Waste Handling and Decontamination Operation

1. Waste Handling

Redox Coating Waste Received (S Farm)	14,023 Gallons
Redox Salt Waste Received (SX Farm)	113,032 "
Total Gallons Boil-Off Salt Waste	218,369 "
Waste Received at TX (From 221-U)	24,720 "

The 113-SX tank bottom remained static during the month. Drilling of the five horizontal laterals at an elevation of approximately ten feet below the bottom of the tank was completed by Engineers Limited of Seattle. No soil contamination was encountered. Tentative plans call for checking the laterals for correct location and then adding water to the tank to verify the presence (or absence) of a leak in the tank.

2. Equipment Decontamination and Repair

a. Regulated Steam Pit

Eleven vehicles and seven pieces of heavy equipment were decontaminated during the month. A total of 60 manhours was charged to this operation.

b. Railroad Equipment

Sixty-eight manhours were charged to decontamination and operational coverage for repairs to equipment. The work included decontamination of two locomotives, one tank car and one well car. Maintenance work included repairs to well cars No. 36, 37 and 41.

c. 221-U Canyon

Repair work on one impact wrench, two steam trap jumpers, one organic pump, and two charging yokes was completed this month for the Redox Operation.

Repair work and run-in of the Purex A-E-1 agitator was completed this month. A net savings of approximately \$6,500 over the cost of a replacement unit was realized.

Twenty thousand ninety dummy slugs used in the 100 Area reactors were decontamination, sorted, and returned to the customer.

D. Analytical Control

Considerable analytical support on an around-the-clock basis was provided for the Palm recovery run conducted by the Process Chemistry Group in the multi curie section of the 222-S Building. No unusual difficulties were experienced.

E. Radiation Monitoring Operation

The Redox Operation experienced its best month of the year in radiation work performance with just one radiation occurrence and six cases of low level skin contamination being recorded. The one radiation occurrence involved a small spot of contamination which was deposited on the coverall sleeve of a Laboratory Assistant during work at the primary sampler in the 222-S Building. However, no over-exposure resulted from this incident.

F. Improvement Experience

1. Process Tests and Revisions

Information related to this item is covered in the Research and Engineering portion of the Department report.

2. Inventions or Discoveries

There were no inventions or discoveries of a patentable nature reported in the Redox Operation during the month of December, 1958.

G. Events Influencing Costs

Spare parts reductions during December amounted to \$3,371. The total reduction for CY 1958 in the inventory of spare parts and spare equipment amounts to \$36,023 and \$137,440 respectively.

The Redox Plant was not scheduled to operate on December 25 and 26 and only a standby crew was scheduled on December 25. On December 26 all excess personnel were loaned to the Finished Products Operation to assist in a cleaning program in the Recuplex Area.

H. Plant Development and Expansion

1. Preparatory Engineering

Plant Modifications for Processing Non-Production Reactor Fuels

A preliminary project proposal has been prepared to request design and construction funds for the initial phase of work on this project. This phase of work is planned to consist of (1) providing facilities to receive and store incoming non-production reactor fuels prior to processing, and (2) design and associated management services for the total project. The proposal is currently being routed within the General Electric Company for approval signatures.

Power Fuels Business

The shipment of MTR elements from Arco, Idaho has been postponed because of a Commission request for re-irradiation to produce U-240. Latest information is that the Washington AEC intends to send these 30 elements to Oak Ridge for processing rather than to Hanford.

Due to the comparative early timing of the initial PRTR discharge and the research significance of the program, plans are being developed for processing of these elements in the Redox Plant prior to completion of the formal NPF reprocessing facilities. Two methods of handling the fuel elements are being studied. The first and preferable method would consist of cutting the elements into 12-inch pieces in the 328 Building, encapsulating and shipping to the 221-U Building in J casks. Transfer to standard charging buckets would be made in the 221-U swimming pool for storage or transfer to cask cars. The second plan consists of shipping whole elements in special casks to the Redox tunnel. Transfer to the dissolvers by crane would then be made. Objection to this method is that

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the elements must be slanted into the charging chute with a portion unsubmerged until the lower portion dissolves. Crane operations may be awkward and an accident such as jamming may become serious. A dummy aluminum element is to be fabricated for a trial run during January, 1959. Current plans for coating removal and dissolution involve using either the existing Redox dissolvers or the proposed multi-purpose dissolvers should this latter equipment be available.

2. Design and Construction Liaison

CG-772, Utilization of 224-U Acid at Redox and Purex

The Redox phase of this project was accepted without exception on 12-18-58.

CG-686, In-Line Monitoring Instruments - Redox and Purex

Testing of the prototype LAFS sample jumper proved the design to be satisfactory. Work is proceeding on final design for drafting. Final shop assembly of the Redox steam condensate gamma monitor is being held up while waiting for the recorder from the vendor. Recorder delivery is expected 1-5-59.

CG-783, Additional Fire Protection, 222-S Building

The contractor, National Automatic Sprinkler Company, has been prefabricating components and will start construction when security clearances permit. Scheduled installation is for a six-week period.

CAC-812, Equipment Decontamination Building - 2706-W

Comment drawings have been received on structural, architectural, railroad layout, and outside piping. Preliminary fair cost estimates have been completed and are being reviewed.

I. Reports Issued

No secret reports were issued by Redox Operation personnel during the month of December, 1958.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling injuries in the Redox Operation during December, 1958. One serious accident occurred on 12-2-58. Details of this injury are described in the investigation report, "Serious Accident CPD No. 58-12". Five medical treatment injuries were reported during the month.

Four practice evacuations were conducted during the month, three on 12-17-58 and one on 12-28-58 so that all four shifts could participate.

A radiation re-training program was started this month in the Redox Waste Handling and Decontamination Operation. Special consideration is being given to the basic problems of radiation and how they apply to the personnel working in this particular operation.

B. Security

There were no security violations in the Redox Operation during the month of December, 1958.

C. Personnel Activities

J. E. Rice, Supervisor, Redox Processing Operation, transferred to IPD on 12-1-58.

J. L. Jackson, Shift Analyst, Redox Processing Operation, transferred to HIO on 12-1-58.

P. J. Wiater, Supervisor, Finished Products Operation, CPD, reported to the Redox Processing Operation on 12-15-58.

Dr. Kenneth Newman, Consultant Engineer for the Turco Products Company, visited the Redox Operation on 12-1-58 to discuss methods of electrical motor decontamination and also the use of Turco 4306-B as a decontaminating agent for painted concrete surfaces.

A well-attended Christmas party was held by the Redox Operation personnel on 12-5-58 at the Officers' Club in North Richland.

L. K. Coon, Painter Journeyman, in the Redox Maintenance Operation, was elected to the Richland City Council.

Chas. F. Groswith
Manager
Redox Operation

CT Groswith:HWM:bfg

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CHEMICAL PROCESSING DEPARTMENT
FINISHED PRODUCTS OPERATION
MONTHLY REPORT

DECEMBER 1958

I RESPONSIBILITY

There were no changes during the month in the responsibilities assigned to the Finished Products Operation.

II ACHIEVEMENTS

A. Processing Operations

Production and shipping schedules for unfabricated plutonium metal were exceeded by 1% during December. The Recuplex operation fell approximately 50% short of schedule as a result of an extended shutdown caused by a serious spread of contamination shortly after mid-month.

The production of unfabricated plutonium metal reached an almost record high output during the month in spite of two days unscheduled lost time due to vacuum header troubles. Exceptionally good operation efficiency was sustained by the 9A (continuous Task I and II) unit throughout the month. There were essentially no operating troubles.

Operations in the Recuplex process were interrupted on the 17th when all operations in the building were shut down for a two-day intensive investigation of the 234-5 Building vacuum system. Following a restart of the process in Recuplex on the 20th a serious spread of contamination developed as a result of the corrosion of a steam coil and steam line to the J-7 concentrator. This contamination necessitated a shutdown of operations in the Recuplex facility for the balance of the month. A separate report has been issued covering the details of this incident. At month end cleanup is essentially complete, however certain related maintenance work remains to be done, and the solvent extraction portion of Recuplex will not start until about January 8.

The Recuplex operation during the early portion of the month processed 38 slag and crucible runs at an average waste loss of 0.2%. The solvent extraction portion of the facility operated at 1177 l/day for 59% operating efficiency and sustained waste losses of 0.45%.

On January 17, due to continued vacuum difficulties and a lack of knowledge of the exact condition of the equipment, a major investigation program was initiated to accurately determine the status of the building vacuum system. A series of 10 holes was cut in the vacuum header and a profile of the accumulated solids

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A. Processing Operations (Cont'd)

and their plutonium content was made. This investigation disclosed that, while the situation is a troublesome one, no criticality danger exists at this time. Based on the findings of this investigation, the replacement vacuum header, which is currently being installed, will be completed on the scheduled basis. Following completion of the replacement header scheduled cleanout program will be initiated to salvage the material currently held up in the existing vacuum system.

B. Fabrication Operations

Production and delivery schedules for the 65 model assemblies were met for December. The goal forecast for production for CY-1958 also was met.

Mechanical performance of the fabrication equipment during December was somewhat better than has been experienced in previous months. Repair work was mainly of a preventive nature and was done mostly on a scheduled basis.

Delays were experienced in fabrication early in December, due in part, to a lower than desirable working inventory, and to tooling difficulties. Advantage was taken of the time available to perform other repair work such as the replacement of the mist lubricator compressors. When fabrication was resumed excellent progress was shown and it was possible to keep on the production schedule without difficulty. Reject rates were lower, and this also helped the overall progress of work. The equipment was shut down for the last two days of the month, on a scheduled basis, in order to permit the overhaul of some of the critical machines which had developed wear.

Chip handling remains a major problem which will require more attention before suitable results are achieved. The new equipment with improved vapor degreasing and briquetting facilities has helped considerably but it is still not possible to recycle this material directly to Melting. The chip handling situation is under continued investigation.

C. Uranium Reduction Operation

All schedules including the CY-1958 goal forecast were exceeded in December. An all time high in weekly production was achieved during the week of December 15 when all six calciners operated 100% of the time. During the month there were 538,000 pounds of 100% nitric acid recovered, this being 83.8% of theoretical.

The operation of Uranium Reduction Plant was shut down on December 24, for major repairs and revisions. This included tie-ins for E metal handling, replacement of leaking X-19 coil, unplugging the recirculation legs of the D-2 and D-6, 100% UNH concentrators, repacking of calciner

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C. Uranium Reduction Operation (Cont'd)

drive shafts, replacement of all shear pins and guards on M Cell Calciner, and installation of test magnetic flow control rotometers on K Cell. During the month $2\frac{1}{2}$ days production time was lost due to lack of 5-ton containers. During this delay X-30 and C-2 tanks were completely flushed. A rate check made on G Cell, whose feed points had been relocated to provide better heat distribution, showed a rate exactly comparable with the standard H Cell.

D. Maintenance Operation

The equipment in the area of plutonium metal preparation operated very well during the month. Routine maintenance such as filter changes, faulty valve replacement or repair, unplugging of lines, and calibration of instruments was sufficient to maintain proper continuity of operation.

Equipment used in plutonium fabrication operated well with the exception of the vacuum furnaces in Task IV. Poor furnace vacuum and a high rate of heating element failure required an unusual amount of time to maintain production on schedule.

Maintaining satisfactory operation in the Recuplex area continues to be difficult due to numerous valve failures, leaks, and plugged lines. Failure, from corrosion, of the steam coil to the J-7 concentrator resulted in a major contamination in the entire Recuplex facility. Replacement is presently underway.

An investigation of the 26" vacuum system was made during the month. This required the installation of numerous inspection ports and the taking of samples in order to gain a better knowledge regarding the buildup of solids in this system. Other work included filter replacement, vacuum trap replacement and bypassing of the vacuum receiver in 291-Z Building.

In the Uranium Reduction Plant the maintenance activities during December continued to be favorable to both maintenance and operation, with only one forced shutdown, of M Calciner, to replace a bent feed point and to repair the weir box. The drive motor on L Calciner was replaced with a reconditioned motor. Other maintenance activities in the UO_3 Plant were of a routine nature.

E. Analytical Control

A total of 7302 determinations were performed on 978 samples received during the month.

Both the shipping schedule and the production goal for the Model 65 assemblies were satisfied in Product Inspection. This was accomplished without overtime. Rejection rates continued to improve, 10.5% on the 6506 and 8.2% on the 6507.

E. Analytical Control (Cont'd)

A Norelco 150-300 KV X-Ray Unit was installed in Room 192 and will be ready for use as soon as radiation measurements are made and shielding completed.

F. Radiation Monitoring

Nineteen Radiation Occurrences were documented and thirty cases of skin contamination were reported during the month.

The average stack emission for December was 24.7 micro curies/day. New filters were installed in the 26-inch vacuum system and currently the average is 10 micro curies/day.

G. Improvement Experience

1. Process Tests and Revisions

Information relating to this item will be covered in the Research and Engineering portion of the Department report. Other information concerning Weapon Data will be covered in a separate report to be written at a later date.

2. Inventions or Discoveries

No inventions or discoveries of a patentable nature were reported during the month.

H. Events Influencing Cost

Nothing significant to report this month.

I. Plant Development and Expansion

1. Projects: Study, Scoping or Approval Phase

The 216-WR Crib Replacement Project for the Uranium Reduction Operation is being circulated for company approval. Beneficial use of the completed crib, pending approval action, is acceptable with the schedule suggested by the Soil Science Operation.

The following project proposals have been submitted to the AEC for approval, and release of construction funds: Addition Fire Protection - CG-789; Liquid Waste Handling, UO₃ Plant - CG-725; Conversion of Recuplex to a Manufacturing Facility - CG-723; Recovery of Pu from Waste - CGC-813; and Additional Fabrication Equipment - CGC-811.

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I. Plant Development and Expansion (Cont'd)

2. Projects: Construction Phase

A total of six projects are in the construction phase for the Finished Products Operation. They are: RMC Fabrication Line - CG-745; RMC Button Line - CG-734; Miscellaneous Improvements, UO₃ - CG-767; Cribs and Test Wells, 234-5 - CAC-798; Reduction of Exposure, RMA Line - CGC-800; Vacuum System Improvements, 234-5 - CGC-826.

3. Projects: Completed

The following capital expenditure projects were physically completed during the Period: Utilization of 224-U Acid at Redox and Purex - CG-722; and Fire Resistant Filter Installation at 234-5 - CG-756.

III ORGANIZATION & PERSONNEL

A. Organization Changes

There were no organization changes during the month.

B. Safety Experience

No disabling injuries or serious accidents occurred during the month. Ten medical treatment injuries were experienced as compared to seven in November.

C. Radiation Experience

All significant information relative to radiation experience in the Finished Products Operation is carried in this report under Radiation Monitoring (Item II-F).

D. Security Experience

There were no security violations experienced during the month.

E. Personnel Activities

During the month 36 employees attended the radiation training and discussion program started in October. To date 190 employees have participated in this Finished Products Operation's effort to improve radiation knowledge and practices. Twenty employees are attending the effective writing training sessions. Two employees completed the Understanding People course. Seven employees completed the Professional Business Management-I course.

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F. Miscellaneous

W. N. Mobley and L. I. Brecke visited APED at San Jose, California, on December 8, 1958 for the purpose of discussing general atomic energy problems. On December 9, 1958 and December 10, 1958, they visited the E. O. Lawrence Radiation Laboratory at Livermore, California, to discuss the weapons fabrication program and fabrication requirements.

On December 22, 1958 and December 23, 1958, three practice evacuations were held at Z Plant. These covered the three primary shifts and the day shift. All three of the drills demonstrated satisfactory procedure.

L. I. Brecke
L. I. Brecke, Acting Manager
Finished Products Operation

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CHEMICAL PROCESSING DEPARTMENT
POWER AND GENERAL MAINTENANCE OPERATION

DECEMBER 1958

I. RESPONSIBILITY

Responsibilities of the Power and General Maintenance Operation remained unchanged during the period covered by this report.

II. ACHIEVEMENT

A. Operating Continuity

Steam, water, and emergency electrical services were made available to the production facilities in sufficient quantities to sustain continuity of operation without interruption for the entire month.

B. Inspection, Maintenance, and Replacement

Fabrication of the prototypal dual-pass Silver Reactor for Purex is complete except for exterior sheathing which is 50% done.

Modification of three condensers for Project CG-719, Purex Vapor Wastes, was completed on December 26, and the units were shipped on December 30. During unloading at White Bluffs, which was done by lump sum contractor's personnel, two of the condensers were bumped together. Because of the possibility that some of the header nozzles may have been dislodged from position, the three condensers are being returned to 272-E for mock-up and check on the extent of damage to the two involved in the accident.

Fabrication of the Cesium Recovery System for HLO progressed on schedule. Of the two 42 inch waste tanks, one was completed and delivered, and the other will be completed January 15. Nozzles are being installed on the Hastelloy B Neutralizer vessel and delivery, together with the modified condenser, is scheduled also for January 15. Progress on the Hastelloy B Crystallizer is static while results are awaited on attempts of the Haynes Stellite Company to roll a satisfactory coil. Fabrication completion of a stainless steel filter vessel, which was added to our phase of the program, is scheduled for February.

Hydrostatic testing was completed on the first of two concentrators purchased from Steel Alloy Tank Company. Mock-up has also been completed, and installation of raschig rings, lagging and sheathing, is scheduled to be done by late March, at which time delivery of the second unit is anticipated.

A hood extension was fabricated and installed in the main conveyor line at 234-5 between hoods 22 and 28. During installation contaminated particles were knocked loose from the hood proper, possibly due to use of a mallet during fitting, and a power wire which dropped outside the hood when the panel was removed. The skin and clothing of two mechanics became contaminated and there was some spread beyond the control area, however the situation was readily brought under control.

In support of Redox personnel in an attempt to correct a leak at the tube bundle flange, 4 remoteable gaskets and gauge rings were made for the D-12 concentrator, and a D-12 tube bundle was mocked-up and delivered. It appears the leak was caused by a foreign body, possibly a free-nut, in the small clearance between the vessel bottom and the bayonet type tube bundle, which would not allow the flange to seat properly. A helical bundle with much greater clearance is now being fabricated to solve the problem.

Fabrication of containment hoods for the Rod Straightener for 231-Z has been completed, and modifications and alterations on the Rod Straightener machinery are 75% complete. The remainder of the work is awaiting delivery of vendor items.

Work in support of the U233 Fuel Element program continued as required. Work on the fuel plate punch and die, including several design changes, is now scheduled for completion on January 9. All preparatory work in the machining room at 272-W has been done with exception of installation of lead sheets, and this will not be done until radiation levels have been more definitely determined. The present schedule projects a dummy element loaded with natural uranium to be used for de-bugging about January 15, one U-233 element for trial purposes about February 1, and the full compliance to start through in late February at the rate of 2 every 3 days.

Mock-up and run-in were completed on 3 process pumps, 1 agitator was modified for service as a turbo mixer, and 1 pump was modified for use in the G-7 position for Purex.

A total of 24 replacement process jumpers were fabricated: 13 for Redox, 8 for Purex, and 3 for 241-SX Tank Farm.

Two burials were completed without incident, although in both instances the radiation level of the contaminated equipment was higher than normally expected. The buried equipment consisted of contaminated and defective jumpers from the Purex canyon, and the centrifuge section of Hood 42, Analytical Laboratory at 234-5.

Assistance was given Purex Operation on an emergency basis when a drain line from the 291-A and 216-A Buildings which carries "hot" waste to the crib became plugged. A temporary pump and line were installed to dispose of the waste until additional excavations could be made to permanently re-route the waste.

A study of the uninstalled equipment in the 6520 and 6529 accounts resulted in the deletion of 265 items from inventory. The reduction was accomplished by transferring equipment to the rightful custodians of other Operations, transfer to the Installed Account, excessing, and deletion of low value items no longer required.

Fabrication of pipe on Project CG-827, Revision to the 26 inch Vacuum System in 234-5, is 50% complete. Installation of the 3", 4" and 6" lines is to start following clean up of contamination in the east air lock in 234-5. The completion date of this project is scheduled for February 11, 1959.

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Work on the Vacuum Casting Furnace, 234-5 Building, has been delayed pending receipt of two air lock hoods and valves from off-site vendors. Installation of electrical wiring and controls is progressing on schedule:

Completion date for Project CA-696, coal car shake-outs for 200-W Area, has been revised to February 20. Due to labor strike at vendor's plant, shipment of the hoists was delayed and will not be received on site until January.

Revised lubrication manuals, containing precise instructions for lubrication of 200 Area Power equipment, were issued to the personnel responsible for the function. Previous existing manuals were obsolete and did not cover all power equipment currently in operation.

III. ORGANIZATION AND PERSONNEL

A. Safety and Security

No disabling injuries were incurred by the Operation.

No breach of security was experienced.

T. S. LaSalle, Manager
Power & General Maintenance Operation

CHEMICAL PROCESSING DEPARTMENT
FINANCIAL OPERATION

DECEMBER, 1958

I. RESPONSIBILITY

There were no changes in the responsibilities assigned to the Financial Operation during the month.

II. ACHIEVEMENT

A. Product Cost

Operating cost statements were distributed on December 4 and 5, representing the earliest calendar date issuance of a HAPO operating report covering a calendar month.

As a result of discussions initiated by Product Cost, the local office of the AEC has agreed to allow full credit to current fiscal year operating costs for the replacement value of capitalized prototypes, regardless of the year in which costs were incurred. This new procedure represents a major improvement over the previous method which prevented distribution of credit to the specific source of funds, thereby causing an overstatement of Process Technology and Research and Development costs as well as unit cost of products. This agreement, being of major importance to all other HAPO components, was referred to Contract Accounting for preparation of an accounting information bulletin.

CPD OPG 5.3 and Advice 5.3.9 were revised to implement an agreement between the Managers - Finance, tightening overrun restrictions on work orders issued to, or received from, CEO. The change specifies overrun limits of \$100 or 10%, whichever is the lesser. This measure generally formalizes working agreements in existence for some time, insuring careful control of project expenditures.

A methods change made in cooperation with the Procedures Specialist now enables Product Cost to distribute an extra copy of the monthly vehicle IBM tabulation to field supervision in lieu of a hand prepared report, resulting in appreciable clerical labor savings.

Arrangements for Palm product cost reporting were finalized with the Commission.

Work neared completion on the detailing by quarters, months, and fourth level operations of the FY 1959 Midyear Budget Review. Extensive revisions were necessary in order to reflect in the cost detail the blanket reductions agreed upon by the third level managers and the CPD Acting General Manager.

Detailed budget statements will be issued to operating management in January, and Midyear Budget Review figures will be shown for the first time on January operating reports.

The December 8 Financial Plan received from the Commission allocated insufficient funds to cover planned 2000 Program production expenditures.

Upon receipt of notification from the CPD General Manager of this fact, the HAPO Acting General Manager reallocated \$310,000 from the Preparation of Slug Program to the 2000 Program. The adjusted 2000 Program allowance is \$21,018,000, or approximately \$100,000 less than the Mid-year Review submission. CPD Financial has been assured that additional funds can be made available later in the year if needed.

The annual physical inventory of precious metals and special materials was taken on December 31, 1958. Audit and reconciliation of the inventory is in process.

B. Personnel Accounting

During 1958 the CPD payroll was reduced from 1,610 to 1,466 (8.9%). In conjunction with this reduction the number of personnel assigned to the Personnel Accounting Operation was reduced from 16 to 12 (25%) through the use of improved procedures and other innovations.

Special year end jobs currently being performed by Personnel Accounting are as follows:

1. Preliminary work in connection with the preparation of CY 1958 W-2 forms.
2. Preparation of a listing of all participants in the Stock Bonus Plan indicating total deductions and insuring no one exceeds the maximum permissible deduction.
3. Development of initial records for participants in the new Savings and Security Plan.

Statistics

1. Salary Payments

	<u>Overtime Payments</u>		<u>Gross Payroll</u>	
	<u>December</u>	<u>November</u>	<u>December</u>	<u>November</u>
Nonexempt*	\$15 752	\$ 8 593	\$592 825	\$550 526
Exempt	<u>2 038</u>	<u>2 436</u>	<u>337 546</u>	<u>339 849</u>
Total	<u>\$17 790</u>	<u>\$11 029</u>	<u>\$930 371</u>	<u>\$890 375</u>

* Payments to nonexempt employees cover a four-week period.

2. Pension Plan

CY 1958

Number retired	10
Number who became eligible for participation	8
Number who elected to participate	8

CY 1958

3. Insurance Claims Paid

Employee Life Insurance	8
Amount	\$116 244
Employee Weekly Benefit Claims Paid	267
Amount	\$ 23 728
Employee and Dependent Accident and Health Claims Paid	2 548
Amount	\$255 272

4. Suggestion Awards

Number of Awards	380
Amount	\$ 8 510

5. Preferential Rates

Number Added	1
Number Eliminated	4
Number currently in effect	53

6. Participation in Benefit Plans

	Qtr. Ending 12-31-58		Qtr. Ending 9-30-58
	Number	%	%
Pension	1 453	99.4	99.4
Insurance			
Personal Coverage	1 501	99.8	99.8
Dependent Coverage	1 218	-	-
Stock Bonus Plan	875	59.5	60.9
Savings Plan	197	13.4	13.5
Good Neighbor Fund	935	63.6	61.5
Savings and Security Program (sign-up status)	630	95.9	-

C. General Accounting

During December, 1958, CPD Finance prepared 100 voucher checks totaling \$255,633.18. General Books issued 39 of these checks totaling \$4,064.83. No checks for contamination of personal effects were issued.

The November General Ledger Trial Balance was delivered to Contract Accounting one day early; the reports of Travel and Living Expense were delivered on schedule.

As of November 30, 1958, expenditures and commitments of \$10,168,527 and \$951,990, respectively, had been incurred against active CPD projects with \$14,081,637 authorized funds.

During December the Plant Acquisition and Construction Midyear Budget Review for FY 1959 was completed with the projected expenditures for FY 1959 estimated to be \$4,362,000.

Additional funds were authorized on Projects CG-722, Utilization of 224-U Acid at Redox and Purex (\$8,000) and CG-734, RMC Button Line 234-5 Building (\$10,000) to provide for Transferred Capital Property associated with these projects.

Interim authorizations (amounting to \$122,000) were received on two projects during December:

<u>Project Number</u>	<u>Title</u>	<u>Funds</u>	
		<u>Authorized</u>	<u>Estimate</u>
CGC-821	Project Palm - Purex	\$79 000	\$400 000
CGC-826	Vacuum System Improvements		
	234-5	43 000	70 000

Appropriation Requests, detailed below, in the amount of \$29,260 were processed during December:

Thickness Gauge	FEO	\$ 1 600
Phosgene Gas Monitor	R&E	4 800
Weed Cutter	P&GM	1 200
Remote Pipe Saw	Redox	6 790
Dew Point Monitor (Supplement)	FPO	500
Controlled Potential Coulometer	R&E	1 570
Diversion Box Jumpers	Purex	12 800
Total		<u>\$29 260</u>

D. Auditing

Formal audit reports were issued in connection with the following audits:

1. Material and Package Passes
2. Review of Maintenance Program
3. Management of Capital Assets

An audit memo was prepared and issued to CPD Level 3 Managers relating to control of Material and Package Passes.

An analysis was made of CPD vehicle utilization for management appraisal.

Nineteen AEC Manual Chapters were received and distributed.

E. Procedures

A special meeting was held with the Procedures Specialists from IPD and FPD to discuss the progress being made on the integrated financial system and demonstrated CPD progress in the integration of Cost Accounting. The project coding structure was explained and examined for possible integration with the Property Accounting unitization function.

A special meeting with CEO's Cost group was attended in order to explore the possibility of mechanizing their procedure for billing other HAPO components. If a mechanized procedure could be developed, a substantial amount of clerical effort could be eliminated. To date, CEO does not feel it appropriate to adopt CPD's proposal for mechanization of their billing procedure.

Arrangement was made with the Procedures Operation of R&UO to secure an extra copy of the auto utilization billing. This can be substituted for our present manual report and result in a savings in clerical effort.

At the request of Industrial Engineering a meeting was attended to discuss the potentials of punch card and Electronic Data Processing machines and explore the potential applications of the Maintenance and Industrial Engineering Operation.

F. Measurements

Preliminary work in connection with the issuance of the CY 1958 productivity report and CY 1959 cost and production bogeys was started.

Assistance was provided to third level management in preparation of component goals for CY 1959.

Cost and production analysis reports for Redox, Purex, and Finished Products, comparing actual costs and production with forecast, were prepared and issued to interested Level 3 Managers.

III. ORGANIZATION AND PERSONNEL

A. Safety and Security

A safety and security meeting for all Financial Operation personnel was held on December 22, 1958.

No medical treatment, disabling injuries or security violations were experienced during the month.

B. Personnel Activities

George F. Kuehn was transferred to the X-Ray Department's plant at St. Petersburg, Florida, effective December 26, 1958.

C. Reports Issued

HW-58306	CPD Operating Report - November	MM McDonald
HW-58459	Essential Materials Inventory and Consumption Report - November	GE Dyreng
HW-58493	Unit Cost Information - November	BM Dobbs

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C. Reports Issued (cont.)

HW-58556	Redox Cost and Production Analysis - November	GH Temple
HW-58557	Purex Cost and Production Analysis - November	GH Temple
HW-58558	Finished Products Cost and Production Analysis - November	GH Temple
CLVI-566	CPD Cost and Production Analysis - November	KG Grimm
TS - RD	Product Cost Report - November	BM Dobbs

Manager - Finance

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January 8, 1959

CHEMICAL PROCESSING DEPARTMENT
FACILITIES ENGINEERING OPERATION

December, 1958

I. RESPONSIBILITY

There were no significant changes in responsibilities assigned to the Facilities Engineering Operation during the month.

II. ACHIEVEMENTS

PUREX OPERATION

A. Research and Development

Rare Gas Processing

The process study covering recovery of fission krypton and xenon from Purex dissolver off-gas has been completed for transmittal to the Commission. Highlights of the study, based on processing of the entire quantity of off-gas at Purex at a 3.2 capacity factor, are summarized in the following paragraphs.

Case I, Bulk Recovery of Kr-Xe Mixture, recovery is expected to be krypton, 1,680,000 curies per year and xenon, 112,000 liters per year (stp). A product containing 99.85 percent mixed rare gas would be obtained. Capital cost would be \$2,020,000, including design and 20 percent contingency; operating cost would be \$172,000 per year, less depreciation.

Case II, Recovery of Separate Krypton and Xenon Products, recovery of the same amounts as for Case I would involve costs as follows: capital costs (cumulative), \$2,130,000; operating costs (direct), \$172,000 per year; annual depreciation on a 10-year basis, \$213,000; and operating costs including annual depreciation, \$385,000. If these operating costs including depreciation were pro-rated equally, the unit costs would be krypton, 11.5 cents per curie; and xenon, \$1.72 per liter (stp). Since the additional costs, over Case I, of the Case II partitioning steps are minor, it was suggested that Hanford rare gas facilities contain the Case II partitioning equipment.

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Separation of the Case II xenon product by thermal diffusion results in a Case III product composed primarily of isotopes Xe-134 and Xe-136. The significant cost factors are: additional capital requirements (over Case II), \$3,720,000; additional annual operating expenses, including depreciation on a 10-year basis, \$744,000; and additional thermal diffusion costs per liter of Case III product (56,000 liters per year) \$13.25.

The Case I and II low-temperature distillation processes are well proved through commercial practice in this country and abroad; the Case III thermal diffusion step would employ larger columns than have been used heretofore. A research and development program is considered necessary to optimize the design of the larger thermal diffusion columns under Case III.

LWW Pu Recovery Prototype

Further start-up tests on the LWW plutonium recovery prototype have been delayed pending reprocessing of waste volumes currently stored in TK-F8 and TK-F15. This should be accomplished by early January, 1959.

Work is still progressing toward provision of a waste resin sampling system. Currently, Hanford Laboratories are conducting simulated tests on the feasibility of recirculating resin slurries through a standard Type A sample cup.

In-Line Photometer for Uranium

The installation of the prototype light photometer at the HSP sampler has been completed except for the hot tie-in to the sample stream.

Magnetic Flowmeter for Jumper Service

A magnetic flowmeter is being mounted in the spare jumper for the 2AF stream (from TK-J5) in place of the rotameter. An instrument transducer rack is also being installed in the central control room for the receiver-pneumatic transmitter.

B. Plant Engineering

Anion Exchange Conversion

The scope design for the project to convert the Purex prototype anion exchange system to a manufacturing facility was completed with the resolution of type of equipment for the XAF-XAW system. A

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Wilfley centrifugal pump installation was specified to parallel the Magnaflo pumps installed by Purex Technology for XAF service, and a new Magnaflo pump was specified in the XAW service to parallel the installed Magnaflo pump at the location.

Paint and Oil Storage Facility

Design was completed on a paint and oil storage facility to be located in the north end of the 2714-A chemical warehouse.

Pulse Generators

New drawings and specifications were completed for the pulse generators at Purex. The failure of J-4 early this month pointed out a need to increase spares for these units. Investigation of the failed unit after decontamination revealed that it can and will be repaired. Repair procedure has been given the Purex Operation.

Exhaust Damper, 291-A

New linkages have been installed on the main modulating damper. This change, in addition to providing another "fail-safe" feature, was recommended as part of a continuing study of instrument air problems in 202-A Building. Ability to actuate this damper with low air pressure minimizes the need for increased instrument air pressure.

C. Project Activities*

CA-513-A - Purex Facility - Expansion of 200 Area Facilities

The on-site hydrostatic test of the first concentrator was satisfactory. The remaining open order covering the second spare concentrator will be completed in February, and shipment will be made in February or March 1959 on the first available ship that can lift and transport the concentrator.

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* For complete information on projects, refer to the following reports:

Semimonthly Status Report
AEC-HOO Monthly Progress Report of
Construction Jobs

CA-513-E - Purex Facility - Expansion of 200 Area Facilities

The remaining procurement to be settled covers a backcharge for repairs to the 40-ton traveling crane. A final settlement statement was submitted by Purchasing to the vendor. Functional testing and acceptance was rescheduled for January 5, 1959.

DO-54760 - 216-A-4 Crib Replacement - Purex

The Purex Plant 216-A-4 crib plugged and temporary facilities were installed to divert this waste to the tank farm. By diversion of the waste stream to Purex waste tankage and the 216-A-21 Crib, it is estimated that the crib will provide interim disposal for six to twelve months. Scoping for the replacement to 216-A-4 is expected to be completed during January 1959. Drawing SK-2-17971 was prepared and approved as the scope for this project.

REDOX OPERATION

A. Research and Development

Sampler for Absorptiometer and pH Meter

A new arrangement has been developed for the jumper for the two-jet sampler which is to be installed on the LAFS stream on Project CG-686. Tests in the 321 Building indicate that previous problems of inadequate degassing and of solution entrainment have been overcome. Tests have been made with UNH solution, and will be continued with simulated LAFS solution. The design now incorporates new arrangements of the sample and overflow lines, and has resulted in the elimination of a vent jumper which was originally called for. This information will be useful in investigating current problems of vent plugging.

B. Process Technology

Neutron Monitor for Pu Concentration

The L-16 tank monitor in the 233-S Building is now operating satisfactorily. There has been no opportunity for calibration except by taking samples, and there has been no significant change in the concentration during the past month.

Off-Gas Iodine Monitor

A program has been arranged with maintenance personnel to test the practicability of a monitor on an acid recovery column as a measure of iodine in the gas. Shop work on the equipment is in progress.

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C. Plant Engineering

Design of Inert Gas Vessel, 202-S Building

At request of Redox Operation, the failure of a high-pressure vessel for the inert gas system was investigated, and steps were taken toward design of a replacement vessel. Failure of the previous vessel was attributed primarily to formation of nitric acid in its bottom. Redox Operation has ordered a silica-gel drier unit, planned for installation in March 1959, which is expected to remove most of the corrosive products from the system. A letter was issued to CEO on December 29, requesting detailed design of the replacement vessel.

Office Lighting

Fixture layout to increase illumination to 100 foot-candles was made for two offices, and fixtures were installed.

D. Project Activities

MA-10 - 113-SX Waste Tank Leak Detection

The contractor has experienced considerable difficulty installing the five lateral pipe lines under the 113-SX tank. The fourth line was not completed beyond 100 feet as a result of damage to the augering equipment and cutting shoe on the pipe. The contractor is now preparing as-built data showing location of the lateral pipes.

Preliminary Project Proposal - Non-Production Reactor Fuels

This proposal was revised to include a preliminary estimate of \$6,300,000 for the total project. The current proposal requests \$1,450,000 of this amount for facilities to receive and store incoming non-production reactor fuels, and for design and associated management services for the total project. The proposal is awaiting final Departmental approval.

FINISHED PRODUCTS OPERATION - Z PLANT

A. Research and Development

Chemical Processing and Reduction

A drawing of a small continuous centrifuge and descriptive material were transmitted to Purchasing to obtain a feasibility, cost, and delivery estimate from the Bird Machine Company. Design and development studies were continued throughout the month on a new design concept for replacing the Hood 9 equipment. Study stage layout drawings have been made of all

major equipment components and an arrangement drawing showing the assembled components is under way.

Design has been initiated for all applicable Recuplex vessels, including the Project CG-723 Task I filtrate evaporator.

A Vanton Flexiliner pump purchased to evaluate its possible use in pumping some of the Task I solutions was delivered to the Finished Products Operation for installation in the lower part of Hood H9A. This pump will be used to recirculate the slurry from the overflow and condensate receiver tanks.

The Finished Products Operation has requested that a fourth Cambridge type filter be installed in the E4 exhaust line from the Hood 9 equipment. Recent air sampling tests indicate that at least one of the first two filters is not effective in removing product from the air stream. Although work is underway to install a fourth filter in series, consideration is being given to a longer range, more comprehensive study of the overall filtering problems throughout Z-Plant.

The ventilation system for the RMC button line was reviewed from the standpoint of its suitability for eventual chloride operation. Studies to date have not revealed a need for any changes to the RMC button line ventilation system.

Weapons

All of the detail design drawings on the batch type casting furnaces using the bell jar principle have been completed through the check print stage. Present plans are to expedite the fabrication and installation of a new hood containing three furnaces.

Design and development efforts were expedited during the month to develop suitable methods for radiological shielding of the various process hoods. A hood window mock-up has been fabricated and delivered to the 234-5 Building maintenance shop, and a glove port shield was designed.

B. Process Technology

234-5 Building Vacuum Supply

Scope drawings are in preparation for the 26-inch vacuum supply to the Development and Analytical Laboratories at the 234-5 Building. This system will be tied into the new 26-inch vacuum by-pass line now under construction. Completion of this work will remove the original 6-inch vacuum header from service for flushing and recovery of the contents. A study is also being made on the overall 26-inch vacuum system.

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FINISHED PRODUCTS OPERATION - UO₃ PLANT

A. Plant Engineering

Low Level Waste

The process design for the disposal of the UO₃ condensate to the 216-T-27 and 28 cribs was revised to include the 291-U stack drain. Scope drawing SK-2-17905 was approved for inclusion in the project proposal.

B. Project Activities

CG-767 - UO₃ Plant Miscellaneous Improvements

Final definition of scope for Project CG-767 was completed and approved within CPD. The acid circulation system included in earlier scope designs to minimize the entrainment of E-Metal into the recovered acid system was eliminated when it was determined that adequate control of nuclear safety could be maintained under anticipated operating conditions without the acid recirculation system.

GENERAL ACTIVITIES

A. Research and Development

Power Fuels Reprocessing

Preliminary equipment designs and cell layouts were completed for all dissolution alternates at both Redox and U-Plant. The cost estimates for these alternates were carefully reviewed and differences resolved to permit equitable comparison with each other. Preliminary designs covering receiving, handling and mechanical preparation facilities at Redox and U-Plant were likewise completed and estimated. These studies, together with other information, will serve as the basis for making a recommendation to management on the best course of action with this program.

Titanium Connector Nozzles

Tests have been completed on titanium for connector nozzles. The nozzles were found to be as good or better than stainless nozzles as far as strength is concerned and have superior corrosion resistance. Their use is recommended where required because of extreme corrosion conditions.

B. Plant Engineering

The workload of plant engineering work continued with its normal variety. Particular emphasis was placed on NPR piping materials and welding procedures. Also, substantial progress was made on such efforts as craft work forecast, steam costs, and maintenance measurements program.

C. Project Activities

Project cost information as of December 21, 1958:

Total Authorized Funds - Active Projects	\$14,214,000
Total Cost-To-Date	10,457,000
Commitments and Open Work Releases	1,464,000
Unencumbered Balance	2,293,000

Costs charged to above projects	
November 16, 1958 to December 21, 1958	465,000

CG-731 - Critical Mass Laboratory

Approximately 65 critical mass laboratory drawings have been reviewed. Investigations into the problem of waste disposal to cribs are being conducted by Radiological Design and Development.

III. ORGANIZATION AND PERSONNEL

A. Personnel

V. W. Wood, Senior Engineer transferred to Power and Mechanical Design Operation of CEO on December 1, 1958.

D. D. Wodrich, Rotational Trainee, Mechanical, completed his assignment in Equipment Design and Development on December 26, 1958 and moved to a new assignment in HLO.

B. Safety

Safety and Security meetings were held by all components during the month, including the FEO All-Girl Safety Meeting on December 17. Representative topics for discussion were based on safety and security precautions for the holiday season.

C. Invention Reports Filed

None

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D. Reports Issued

HW-API-1 Report on Process Design Study for a Rare Gases Recovery and Purification Facility, by Air Products, Incorporated, November 4, 1958.

HW-API-2 Supplementary Information on Process Design Study for Gas Recovery and Purification Facility, by Air Products, Incorporated, December 21, 1958.

HW-58323 HAPO Gas Purification Study - Revised Schedule, by J. H. Warren, December 2, 1958.

HW-58400 Process Study - Gas Purification Facilities at Purex, by L. R. Michels and J. M. Gerhart, December 22, 1958.

HW-58586 Transmittal of Summary Reports, by J. H. Warren, December 31, 1958.

Letter B. Manowitz, Brookhaven National Laboratories from L. R. Michels, Brookhaven Freon Process, December 1, 1958.

Letter D. W. McKee from L. D. Gustafson, Project CG-767, E-Metal Segregation in Continuous Calciners, Change in Scope, December 2, 1958.

Letter H. P. Shaw from L. L. Zahn, Jr., Project CG-767, Miscellaneous Improvements - UO₃ Plant E-Metal Segregation Facilities, Approval of Scope, December 3, 1958.

HW-58365 Design Scope - Casting Equipment, Project CGC-811, J. W. Kolb, November 20, 1958.

A Study on Replacement of the RMA Button Line, E. O. Swain, December 23, 1958.

HW-58361 Report on Titanium Process Connector Development, by D. D. Wodrich, December 4, 1958.

HW-58437 RD Assumptions for Preparation of Plant Acquisition and Construction Budget for FY 1961 - CPD, D. R. Gustavson, December 8, 1958.

HW-58619 Project Proposal (CGC-811) Revision 2, Additional Plutonium Fabrication Facilities, 234-5 Building, D. R. Gustavson, December 29, 1958.

E. TRIPS

L. J. Battey visited Stearns-Rogers Manufacturing Company, Dow Chemical Company, and the Rocky Flats Plant in Denver, Colorado, December 11 to December 16, 1958 to witness the functional test of Hood HC-15 ABC on project CG-734.

G. P. Kesel visited Northwest Copper Company of Portland, Oregon on December 30, 1958, to review acceptance of Hood 17 on Project CG-734.

M. L. Oldfather attended the annual meeting of the American Institute of Chemical Engineers held in Cincinnati, Ohio December 7 - 10, 1958.

D. E. Braden visited the Stearns-Rogers Manufacturing Company, Denver, Colorado, on December 11, 1958, for the purpose of inspecting Hood 15 equipment. He visited the Dow Chemical Company's Rocky Flats Plant on December 12, 1958 for the purpose of touring button and fabrication line facilities.

F. Visitors

Mr. R. E. Myers, Betz Laboratories, Seattle, Washington, paid his regular monthly visit on December 17, per contract agreement, for consulting services.

Dr. Frank Neumann, Seismologist, University of Washington, consulted with personnel from FEO and HLO on December 11, 1958, concerning seismic conditions of the HAP0 area and to obtain pertinent geological and engineering data.

Manager
Facilities Engineering Operation

EP Shaw:WVC:mh

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CHEMICAL PROCESSING DEPARTMENT
RESEARCH AND ENGINEERING OPERATION
DECEMBER 1958

PUREX PROCESS TECHNOLOGY

Feed Preparation

Irradiated uranium with cooling times of 90 to 112 days was dissolved with fifty percent nitric acid to form solvent extraction feed. Radioiodine control was excellent. The use of mercuric nitrate in the head end vessels for the suppression of iodine from the vessel vent system was temporarily eliminated on a test basis and the radioiodine emission rate increased from 0.3 - 0.4 to 0.8 - 0.9 curies per day.

The use of the ammonia scrubbers was temporarily discontinued during coating removal operations when the crib which receives the scrubber effluent became plugged. A bypass line to a nearby unused crib (A-21) is being installed.

The acetylene concentration in the dissolver off-gases downstream of the acid recovery facility has been established as $\angle$ 0.025 parts per million.

Solvent Extraction

The solvent extraction equipment processed normal production material for 93 percent of the month at capacity factors ranging from 2.64 to 2.88. Typical performance data for normal processing are summarized below:

<u>Cycle</u>	<u>Log Decontamination Factor, dF</u>		<u>Instantaneous Loss, Percent</u>	<u>Recycle, Percent</u>	
	<u>Plutonium</u>	<u>Uranium</u>	<u>Plutonium</u>	<u>Plutonium</u>	<u>Uranium</u>
First	4.8	4.3	0.04	-	-
Final	2.9	2.4	0.004	1.2	6.0
Ion Exchange	>0.6	-	-	6.0	-
Overall	>6.3	6.7	0.044	7.2	6.0

The startup philosophy of producing a specification solvent extraction uranium product, possibly at the expense of losing neptunium, was changed early in the month when AEC requested a neptunium shipment early in January. Although the uranium produced during the major part of the operating period was well within the $\angle$ 2.0 gamma ratio shipping specifications, subsequent changes, intended to reduce the neptunium loss to the HAW, caused the uranium produced during the latter part of the operating period to exceed gamma shipping specifications two fold. This out-of-specification uranium was converted into specification product by silica gel processing. The results of

a IBX acidity reduction from 0.56 M to 0.30 M, which was designed to force the major portion of the fission products in the IBXF into the IBP stream, were not readily discernible because of the generally improved plant performance; however, no adverse effects were noted, so the lower acidity is being maintained. Rework of adequately-hydrolyzed (45 days of re-fluxing) miscellaneous wastes was again demonstrated to have no adverse effect on normal processing when the material was properly blended with the feed. Overconcentration of the backcycle wastes produced a concentrator control problem and required excessive steam because the overall heat transfer decreased as a result of an increase in the solution boiling point. An increase in the 3WB flow rate, after the controller was repaired, plus a reduction in the 2DW uranium concentration corrected the difficulty by reducing the boiling temperature to normal in the concentrator.

Solvent extraction waste losses were normally acceptable throughout the operating period. High initial HAW plutonium losses (0.1 percent, average) persisted for approximately eight days after start-up and were attributed to excess sulfate remaining in the 3WB after the November neptunium recovery run. When the sulfamate concentration became excessive in the IBP (the IBX sulfamic acid concentration was increased from 0.06 to 0.10 M in preparation for flowsheet testing), the plutonium concentration in the 2AW temporarily increased fifty fold. The inline alpha monitor immediately detected the increase, and an adjustment in the 2AF sodium nitrite addition reduced the loss to normal. A high plutonium concentration level in the plant, due to high MND/T uranium plus plutonium recycle, increased the 2EW losses fifteen fold. A fifteen percent reduction in the 2AX flow returned the loss to normal (0.004 percent) by increasing the L/V in the 2B Column.

Neptunium Recovery

Neptunium recovery during normal processing was excellent until approximately 500 to 600 grams had been accumulated in the system at which time the HAW and 2EU losses began to increase gradually until the sum equalled the virgin feed input at about an 800 gram inventory. Flowsheet changes cautiously made in attempts to reduce the 4.5 percent HAW loss and the 0.7 percent 2EU loss (both based on neptunium introduced into the column) are shown below:

- (a) The routine 0.01 M HAF sodium nitrite addition was increased to 0.015 M, but had no effect on the HAW neptunium loss.
- (b) Two slight reductions in HA Column organic uranium saturation did not improve neptunium recovery, but did impair the uranium decontamination performance.
- (c) An increase in the HAW acid concentration (more acid added to the HAF and 3WB) from 2.3 M to 2.6 M had no detectable effect on the HA Column neptunium recovery.
- (d) A thirty percent increase in the 2DF ferrous sulfamate concentration reduced the 2EU neptunium loss by one-third.

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- (e) Additions of 0.0025 and 0.005 M sulfuric acid to the 2DS did not get an accurate evaluation because of the short duration of the test; further testing is planned.

A neptunium recovery operation using 3WB feed and oxidizing HA Column conditions is scheduled for the first part of January.

Plutonium Concentration

The gamma activity of the first plutonium batch after start-up was below detectable limits as a result of returning the XCP stream to TK-J1 (3WB Tank) via the XSW routing until the Plutonium Ion Exchange Unit reached equilibrium. Tests indicate that resin degradation (softening) instead of the presence of fines gradually increased the time required for resin pushes from 30 to 45 seconds during the operating period; consequently, the resin was replaced after 145 days of operation (205 days in the unit).

Solvent Treatment

Upon completion of the November neptunium recovery run, using 3WB as feed, no special solvent treatment was necessary to reduce the gamma activity and/or improve the quality of the first cycle solvent as was required after the neptunium run using IWW as feed. Besides benefiting from lower gamma activity in the feed, the solvent also responded to a more rapid operation of the No. 1 Solvent Treatment System which permitted about forty gallons per minute of solvent, not required as HAX, to be recycled from the IOO to the IOF Tank. The low solvent rate through the No. 2 Solvent System during the neptunium run provided increased holdup time and produced solvent of quality comparable to normal 200.

Waste Treatment and Acid Recovery

Operation of the Waste Treatment and Acid Recovery sections of the plant was normal with the IWW rate being maintained at flowsheet throughout the normal processing period. Waste volumes sent to underground storage during the month averaged 51, 383, 14 and 126 gallons per ton of uranium for neutralized IWW, solvent washes, centrifuge cleanouts, and cell drainage, respectively. The coating waste solution sent to storage was 230 gallons per ton of uranium. Over-all plutonium and uranium losses for the month were 0.16 and 0.05 percent, respectively. Coating waste losses for plutonium and uranium accounted for 26 and 38 percent of the overall losses.

The sixth concentrator tube bundle to fail in acid service since plant start-up was replaced when the west tube bundle of the No. 1 Acid Concentrator failed after twenty months of service.

Self-concentration continues in Tanks 241-A-101, 102, and 103 at approximately 3.9, 14.5, and 1.5 gallons per minute, respectively.

REDOX TECHNOLOGY OPERATIONDissolution

Approximately 72 tons of E-Metal, cooled in excess of 170 days, were dissolved during December. Difficulties in obtaining representative metal solution samples from the dissolver limited the dissolution rate, early in the month, to an average of 0.23 ton of uranium per day per dissolver. Adoption of the rate of specific gravity increase during the second cut as the primary check on the completeness of the heel removal permitted attainment of an average dissolution rate of 1.0 ton of uranium per day per dissolver.

Control of the heel size continued to be satisfactory with the second cut removing only 2 to 9 percent of the metal charged. Occasional third cuts, made to verify the completeness of the heel removal, dissolved an average of 0.2 percent of the uranium charged to the dissolver.

Solvent Extraction

A faulty LAW rotameter permitted an abnormally high rate of recycle of LAW to the 1A Column, over a two-day period, approximately doubling the aluminum nitrate concentration of the LAFS and raising the salt strength in the 1A Column extraction section as high as 2.15 M in aluminum nitrate. The excessive salt concentration caused a four-fold increase in the activity of the partition cycle product streams but the final product streams did not exceed the specifications for fission product activity.

Spectrographic analyses of plutonium, recovered during November from 300 gallons of slag and crucible recycle solution, confirmed preliminary indications of incomplete removal of metallic ions, particularly zinc, lead and copper, during processing through the third plutonium cycle. Further metallic ion contamination was encountered during processing of the second flush which followed the slag and crucible recycle solution. The combined heel clean-out and first acid flush, still stored in the L-16 recycle tank, is to be analyzed to determine the metallic ion content and the distribution ratios likely to be encountered during solvent extraction processing of this material.

The initial batches of E-Metal were quite high in plutonium content (750 - 790 grams per ton of uranium). Thus because of limitations imposed by the need for critical mass control, no recycled plutonium of any kind could be added to the feed solution for processing through the first two solvent extraction cycles. The plutonium content of the E-Metal, as received, dropped steadily throughout the month, however, and it will be possible during January to resume the practice of blending recycled plutonium on a limited, carefully controlled basis.

Product Concentration

A third 40 percent nitric acid flush of the L-2 stripping tower and the L-3 product concentrator removed only 200 grams of plutonium, less than 1 percent of the amount previously recovered, indicating that the clean-out of the product concentration system was essentially complete. Extensive flushing of the product concentration system is scheduled for January to determine whether product

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deposition occurred during the December operating period. A special 3BP analytical program was started to determine the need for addition of extra nitric acid to the product stream fed to the L-2 stripping tower to prevent future plutonium deposition.

Waste Storage

The installation of the five lateral pipes of the 113-SX tank leak detection system at an elevation approximately ten feet below the bottom of the tank was completed without encountering soil contamination. No further signs were seen of changes in the contour or elevation of the bottom liner plate in the tank; therefore it is tentatively planned to add more water to this tank to a) help prove the presence (or absence) of a leak, b) help in the final removal of remaining sludge, and c) improve chances for a successful periscopic or photographic inspection of the steel liner. This step will not be taken, however, until it has been decided whether or not laterals will be put out under other nearby tanks from the caisson sunk for the 113-SX leak detection project.

The 111-SX tank was emptied to a depth of about 3.5 feet by means of the facilities provided under Project CG-717, and will be re-used for current waste starting the first week in January.

An outline of the new, expanded set of process specifications for waste storage was prepared during the month and should be incorporated in the formal specifications (HW-50360) in the coming month.

FINISHED PRODUCTS TECHNOLOGY OPERATIONURANIUM CONVERSION OPERATIONProcess Performance

All uranium trioxide shipped met product specifications.

Eight hundred eighty three (883) pounds of nitric acid per ton of uranium processed (83.7% of theoretical) were recovered at an average concentration of 47%.

The average operating rate of the calciners was 7.7 tons uranium per unit for each day on the line. The overall calciner operating efficiency was 98.4%.

Pressurization of the 60 - 100% UNH concentrators at relatively low rates (approximately 22.5 tons uranium per day) was found to be caused by a high pressure drop across a concentric pipe reducer (6 inch to 4 inch) in a horizontal section of vapor line, and the section of line containing condensate retained by the reducer. The reducer was removed and the 4 and 6 inch pipe was replaced with 8 inch pipe. Preliminary data indicate that rates of 45 tons uranium per day or greater are possible without pressurization.

Shear pin failure occurred on the M calciner agitator assembly after 3748 hours of operation. The replacement pins were 5/8 inch diameter with no relieved section. The sheared pins had a half-inch diameter relieved section. There was no severe agitator damage.

Four feed points were found to be cracked and will be replaced. Two other feed points, which had previously cracked and been repaired by welding of the cracks, failed completely after 223 hours and 676 hours of operation. No agitator damage was evident.

Four broken thermowells were replaced with stronger units.

METAL FINISHING OPERATIONRecuplex

Thirty-eight (38) runs, consisting of crucibles, fragments, powders, and clean-outs were processed through the Slag and Crucible Hood. Slurry losses to crib averaged 0.02% of the recovered plutonium. Decantation of the slag and crucible solution after settling for one hour has eliminated all filtration problems. The solids content of the decanted solution compares favorably with the solids content of filtered solution. Solvent extraction processing of this feed has been normal. Filtration of the solution containing the settled solids (100 liter heel from ten runs) has been satisfactory using gelatin as a coagulation agent.

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The SE Hood processed 1180 liters per day at an operating efficiency of 59% for an average instantaneous rate of 2000 liters per day. Waste losses to crib averaged 0.0070 g/L (0.54% of the feed plutonium).

Task III

The ZrO_2 (Rokide) lining in the experimental Task III replacement pressure vessel failed after six cycles. Repeated heating and cooling caused the bond to fail, and the lower half of the lining peeled off in large pieces. One successful reduction has been made in the pressure vessel since the "Rokide" lining failed, using an unsanded close fitting (approximately 1/64 inch annulus) crucible with a divider. No difficulty was encountered in removing the reduced charge. Further testing is planned.

PROCESS CHEMISTRY OPERATIONRedox Process Studies: Process Variables Affecting Critical Mass Control

Work has continued on the partial precipitation, with caustic, of the uranium in dissolver solution, and on the resultant distribution of plutonium between the precipitate and the supernatant solution. As reported last month, the sodium polyuranate precipitate from untreated dissolver solution has a greater Pu/U ratio than the original solution. The observed plutonium enrichment in the precipitate was presumed to result from the existence of the plutonium in dissolver solution as Pu(IV). Recent work has shown that with the plutonium in the hexavalent state, the precipitate has a lower Pu/U ratio than the original solution. Since this is the more desirable condition, it has been proposed that the plutonium in dissolver solution be oxidized before any caustic is added for acid adjustment. It has been found that the oxidation of more than 90 per cent of the plutonium may be accomplished by boiling with 0.005 M $\text{Cr}_2\text{O}_7^{=}$.

NEPTUNIUM PROCESSINGPurex Flowsheet Studies

Laboratory work in support of the neptunium recovery program in Purex has 1) corroborated the plant observation that using a dichromate-oxidation flowsheet for neptunium recovery results in removal of fission product activity from the process vessel surfaces and consequently a loss in D.F.; 2) shown that the dichromate in the HAW produced during neptunium recovery with an oxidation flowsheet can be reduced with NaNO_2 , at a ratio of 3.8 moles NaNO_2 per mole of $\text{Na}_2\text{Cr}_2\text{O}_7$; and 3) indicated that the use of first cycle solvent in the second plutonium cycle will not adversely affect the second cycle D.F.

Neptunium Purification

One hundred fourteen grams of neptunium-237 was successfully purified in the I-F cubicle ion exchange equipment. The process gave arithmetic decontamination factors of 77 for UX_1 , 1600 for plutonium, and greater than 1000 for fission product gamma activity. The product contained 0.07 weight per cent plutonium, 1.7 weight per cent iron, and a gamma activity of 4.04×10^4 microcuries per liter, of which more than 99 per cent was due to Np-239. The following flowsheet was used:

Loading: 6 M HNO_3 , 0.15 M $\text{Fe}(\text{NH}_2\text{SO}_3)_2$, 0.1 M semi-carbazide. Rate 3.3 mg Np/min/cm², 12.6 l/hr.

Wash I: 6 M HNO_3 , 0.1 M $\text{Fe}(\text{NH}_2\text{SO}_3)_2$, 0.1 M semi-carbazide. 30.5 column volumes, 16 l/hr.

Wash II: 8 M HNO_3 , 0.05 M semi-carbazide, 0.01 M HF. 23.2 column volumes, 16 l/hr.

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Wash III: 7 M HNO_3 , 0.05 M semi-carbazide; 3.3 column volumes, 20 l/hr.

Elute: 0.35 M HNO_3 , ca. 2 column volumes, 6 l/hr.

The product was concentrated, by evaporation, to give a solution containing ca. 260 g/l Np, 3.7 M HNO_3 , and 4.7 g/l Fe.

ANALYTICAL ASSISTANCE

Determination of Plutonium in Non-Production Fuels

Analytical development efforts to provide a suitable control laboratory method for the chemical assay of plutonium in dissolver solutions resulting from the dissolution of spent power reactor fuels were continued.

Recent work with the anion exchange-controlled coulometric titration method indicates that this method will be satisfactory for the various types of dissolver solutions involved. Application of the method to synthetic Hanford-type dissolver solutions gives unbiased results (average recovery from 32 runs of 99.997%) with a standard deviation of $\sim 1\%$ for an individual result. Future tests will include the analysis of synthetic Darex and Niflex solutions.

Earlier difficulties, which had been encountered in titrating the plutonium product from the anion separation (Dowex 1 x 4, 100-200 mesh resin) step, have been resolved. In previous work using titanium chloride in dilute hydrochloric acid as an elutriant, coulometric titrations were definitely impossible due to high residual currents. This phenomenon is believed to be due to electrode reactions involving organic material eluted off the resin. The difficulty has been resolved by eluting the plutonium from the resin with dilute nitric acid (0.5 M) and hydroxylamine (0.02 M). The product of this elution contains a minimum of organic material and is titratable.

Analysis of Chromium(VI) in Purex HAW (Neptunium Recovery)

Because of the possible interference by iron (III) and chromium(III), the analytical method used for the analysis of chromium(VI) in Purex HAW (the first cycle waste resulting from the oxidizing flow sheet used in the neptunium recovery process) was evaluated. The method, diphenyl carbazide colorimetric was found to be applicable to the determination of chromium(VI) in the presence of 200 times as much iron(III) and 500 times as much chromium(III) in a synthetic HAW.

234-5 DEVELOPMENT OPERATIONContinuous Chlorination

The small continuous chlorinator has recently operated successfully for eight days, at rates ranging from a few grams per hour to a rate of $3\frac{1}{4}$ grams per hour of plutonium trichloride, with no indication that this is a maximum.

Present work involves a systematic approach to optimizing rates and reducing operating difficulties (mostly plugging of lines). At increased rates, there is some tendency for trichloride powder to plug the tube.

Chlorination takes place in a 1" diameter, 40" long Pyrex tube, inclined at an angle $2^{\circ} 18'$. The tube is heated to 510°C by two tube-type furnaces placed end to end, heating a length of 26". Phosgene, the chlorinating agent, is fed into the lower end of the tube. Powder is fed automatically by a gear-type valve operated intermittently by an electric motor and timer. A small vibrator motor is mounted on the elevated end of the tube. Intermittent vibration moves the powder through the tube to a glass container at the end of the tube. By employing a ball-type valve at the end of the tube, the container can be replaced without halting the operation.

Off-gases are removed by means of an air aspirator pulling a slight vacuum on the tube (0.2" - 0.5" H_2O). Gases are drawn through a series of filters and then through a trap and two caustic scrubbers (capacity 2.5 liters each). Present operation requires scrubbers be changed twice a shift, causing a brief interruption of operation.

Little or no chlorination was experienced when the reaction tube was operated at low pressure, vacuum of 10 - 20 inches of water. A faulty vacuum gauge which led to this observation was replaced. Other equipment changes have included replacement of a plugged ceramic finger filter, replacement of leaking powder receiver with one which admitted no air to dilute the phosgene, and replacement of an erratic vibrator.

Particle Size Of Powders

Particle size determinations on two samples of plutonium trichloride were found to be four and six microns for batch and continuous chlorination respectively. Samples of the plutonium dioxide from which these originated were each less than 0.2 micron. These are average particle size values determined on a Fisher Sub-Sieve Sizer by T. D. Chikalla of HLO.

Preparation Of Plutonium Trichloride

Oxide was received from Operations and 5.52 kg was chlorinated with phosgene in the batch chlorinators. Chlorination proceeded smoothly with no plugging of off-gas lines except in the case of one carton which contained (by visual estimate) approximately 10 - 15 percent fluoride.

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Off-Gas Studies

The following data are the results of analysis of gases resulting from passing phosgene through a quartz tube furnace.

<u>FURNACE TEMPERATURE</u>	<u>% COCl₂</u>	<u>% CO</u>	<u>% HCl</u>	<u>% Cl₂</u>
276	94.9	2.5	2.5	---
310	95.7	---	4.3	---
344	100.0	---	---	---
426	89.7	6.2	4.1	---
499	92.5	7.5	---	---
525	65.1	10.5	11.0	13.4
534	46.5	30.3	9.7	13.5
548	34.5	23.5	10.0	31.0
587	13.1	40.7	11.2	35.0

The small HCl figures as noted in runs up to 500 C are not considered significant. The larger amounts of HCl in the higher temperature analyses have not been satisfactorily explained, although it is thought produced primarily by hydrolysis of phosgene and/or chlorine due to moisture in the gas sample after displacing brine in the gas burette.

Solid products have not formed in visible amounts in the temperature range 400 - 650 C.

Analysis of off-gases from the chlorination of cerium oxide is to begin immediately. Completed data will be used to optimize the chlorinating gas composition.

Plutonium Trichloride Reduction (Batch)

Work continued aimed at reducing plutonium trichloride without a mixing step. The calcium and iodine were placed on top of the plutonium(III) chloride. A good reduction was obtained on a 200-gram scale, but when repeated on a 700-gram scale, the reduction was unsuccessful. In order to increase the interface between the plutonium(III) chloride and the calcium, a 1400-gram size crucible was used for a 700-gram reduction. Placing the calcium and iodine on top, in this case, gave an 86 percent yield. This low yield was thought to be due to the isolation of some of the plutonium(III) chloride in the "formed" bottom of the crucible. The same reduction was repeated with a flat-bottom crucible. The yield in this case was 81 percent. The poor yield in this case may have resulted because the reduction vessel was not placed in the proper part of the induction coil.

Recovery Of Plutonium From Chloride Slag And Crucible

Two slag and crucible dissolutions have been made of nickel-coated crucible residues.

No difficulties were encountered using the standard flow sheet, in which 80 percent of the plutonium was found in the solution resulting from the chloride removal step, and 20 percent in the solution resulting from the nitric acid - hydrofluoric acid treatment of the residue. These results were approximately the same as for slag and crucible material containing no nickel.

Using the "precipitation" flow sheet in which plutonium is precipitated as the hydroxide, the nickel does cause difficulties. The ammonia complexes with nickel, requiring a much greater quantity of ammonium hydroxide, making the addition of dilute (0.2 M) ammonium hydroxide impractical. Adjustment of the pH is also made difficult, and an increase in the volume of precipitate is obtained which increases filtering time. Waste losses to the filtrate were unduly high (ca 3.8 percent). Cold experiments with synthetic feeds are under way to learn the ammonium hydroxide concentration allowable and clarify conditions for complete precipitation of the plutonium without coprecipitation of large quantities of magnesium, calcium, or nickel hydroxides.

Radiation Study

The radiation study of solutions of plutonium nitrate in storage bottles has continued with two series of tests this month. To date, the radiation dose rate at the surface of polythene bottles increases rapidly with the concentration of plutonium from 1 to approximately 45 g/l. Above 45 g/l, the dose rate does not increase much up to 500 g/l; however, a variance of from 270 to 410 mr/hr was found up and down the sides of an eight-liter polythene bottle due to differences in thickness of the polythene. One layer of lead tape around the bottle decreases the dose rate by a factor of ca 10. At two inches from the bottle, the dose rate decreases to from $1/3$ to $1/2$ of the surface dosage.

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ORGANIZATION AND PERSONNEL

Personnel

No Change.

Trips

E. R. Irish contacted Richard M. Kohler to deliver a speech at the Puget Sound Science Teachers Association, Tacoma, Washington on November 22, 1958.

V. R. Cooper and A. E. Smith visited R. B. Richards, General Electric Company, Atomic Power Equipment Department, San Jose, California on December 8, 1958 for technical discussions. Contact was also made with D. T. Scalise, University of California Radiation Laboratory, Livermore, California on December 9 and 10, 1958 to hold Hanford fabrication capacity discussions.

Visitors

L. E. Brownell, University of Michigan, Ann Arbor, Michigan and C. T. Clayton, Curtiss-Wright Corp., Quehanna, Pennsylvania visited R. G. Geier and B. F. Judson on December 22, 1958 to hold fission product discussions. They also visited E. R. Irish to tour Purex and discuss process and fission product recovery.

Inventions

None

Manager
Research and Engineering Operation

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EMPLOYEE RELATIONS OPERATION
MONTHLY REPORT - DECEMBER 1958

I. RESPONSIBILITY

There were no changes in responsibility during the month of December.

II. ACHIEVEMENT

FIRE PROTECTION OPERATION

There was only one fire response during the month. Some employees unknowingly burned a pile of weeds on top of an abandoned tile field which was lined with and covered over with railroad ties. These railroad ties began to burn after the employees had left at the end of the shift.

During the month, 325 fire extinguishers were inspected, three installed, three delivered to new location, 12 seals broken and not reported, 36 serviced, and 225 weighed. Twenty gas masks were inspected, and three serviced. Eighteen hand lines were inspected. Sprinkler systems in 272-W, 272-E, 277-U, and 277-S were inspected and daily checks were made on the No. 4-B dry system in 2101-E. The moisture was drained from 272-E dry system during the month.

Forty-two alarm boxes were tested during the month. Classes were held each Friday during the month in Civil Defense Rescue Work.

Various services were performed for other operations. The pipe line from the power house to the ash disposal basin was completely plugged. This was flushed out, using high pressure, thus saving the digging up of the pipe for cleaning.

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EMPLOYEE COMPENSATION OPERATION

Statistics and subsequent analyses of appraisals and proposed salary actions for the current Salary Review have been completed. At month-end, revisions to the original figures were being received and revised statistics were being developed.

Reconciliation review of our exempt positions with the other HAPD Departments continued. Our engineering and maintenance type positions were approximately 75 percent completed.

An analysis of proposed organization changes in one third level operation was completed and recommendations made to the manager.

Six nonexempt jobs were reviewed during the month. Two of these were clerical for which new classifications were established, two secretarial for merit reviews, and two semi-technical. Warranted promotional action was accomplished for the secretarial and classifications determined for the semi-technical.

The policies with regard to the application of rehiring rules in relation to R.O.F.'d personnel not permanently removed from the payroll were investigated. The conclusion reached was that in such cases essentially the same rules applicable to reactives should be applied.

SUGGESTION PLAN

	<u>November</u>	<u>December</u>
Suggestions Received	37	42
Acknowledgments to Suggestions	36	43
Suggestions Pending Acknowledgement	1	0
Suggestions Referred to Operations for Investigation	36	43
Suggestions Pending Referral to Operations	1	0
Suggestions Completed and Closed	32	70
Adopted Suggestions Approved by Board	13	49
Adopted Suggestions Pending Approval by Board	11	15
Total Net Tangible Savings	\$8,594.78	\$19,715.36
Cash Awards Paid During Month	905.00	2,550.00

As of the end of December, \$8,510 have been paid in awards with a total of \$69,379 in net tangible savings. The average award of the 360 adopted suggestions is \$23.64 (below criteria of \$27.27) and the ratio of awards to savings is 12.3% (below criteria of 16.1%).

	<u>November</u>	<u>December</u>
Total number of suggestions outstanding to Operations at end of the month	102	94

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Average Age of Open Suggestions

Months

Participation in Benefit Plans

November

December

Insurance Plan	99.8	99.8
Pension Plan	99.4	99.5
Stock Bonus Plan	59.5	58.8
Good Neighbor Fund	63.6	64.0
Savings and Security Program	95.9	96.9

There was one employee death during December. C. O. Post, a maintenance man in Purex Operation, passed away December 28. His wife was contacted on December 29, and all matters are proceeding in a satisfactory manner.

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HEALTH AND SAFETY OPERATION

<u>Chemical Processing Department</u>	<u>December</u>	<u>November</u>	<u>Year to Date</u>
Disabling Injuries	0	0	0
Serious Accidents	1	2	12
Medical Treatment Injuries	51	28*	521
Overexposure Incidents	0	0	6
Potential Overexposure Incidents	0	0	5
Radiation Occurrences	26-1/3**	29	324-1/3
Fires	1	0	19
Security Violations	0	2	11

*Three injuries were reclassified as non-industrial.

**Responsibility for one radiation occurrence was split three ways.

Comments on Statistics

Serious Accident CPD #58-12 occurred when a pickup truck, being driven outside the normal traveled area, struck an anode riser. A passenger in the pickup was treated at First Aid. Damage to the pickup was estimated at \$165.00.

Programs

Leaflets were distributed to CPD personnel in cooperation with the national Back The Attack on Traffic Accidents campaign.

A First Aid Training program was developed and approved by management.

Plans were completed and conference leaders selected to conduct a CPD Supervisors Safety Development program.

In conjunction with the Industrial Medical Operation plans were made to provide safety glass (non-prescription) fitting and adjusting service through Area First Aid Stations.

Advice and Counsel

Redox - Procedures for testing heat detector devices and flushing of fire fog systems; pallet storage.

Purex - Storage of paints in 202-A Building storage gallery; tests for per cent oxygen in Trap Pits 2 and 5.

P & GM - Property transfer of fixed personnel monitoring equipment located in CPD badgehouses from P & GM to Redox and Purex Radiation Monitoring Operations.

200-East Area fire alarm system between the permanent alarm circuit to Purex and 275-EA Warehouse; compliance with Electrical Standard No. D3-10 regarding ground conductors.

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Facilities

Engineering - Comment prints for Purex paint and oil storage facility; comment print for proposed heat detector system for 241-A compressor building.

Finished

Products - Design of incinerator for plutonium recovery; addition of hydraulic oil storage CO₂ system to CPD fire alarm system; safety meeting material.

Employee

Relations - Fire Protection Operation - Disaster Trailer and equipment needs; safety meeting material; rescue training program.

Inspection, Investigation and Audit

Test and inspection of 276-S fog system and heat actuator devices.

Tests of heat detector devices in Redox 804 Enclosure and Silo Sample Gallery.

Serious Accident CPD 58-12

The Financial Operation audit was issued.

Reports Issued

Accident Prevention Council Minutes

Serious Accident 58-12

Monthly Health, Safety and Security Performance

Monthly As We See It

UNION RELATIONS OPERATION

There was a sharp increase in number of grievances filed during the month of December. Much of this activity can be attributed to problems arising out of the Christmas holidays.

The HAMTC served notice of arbitration on the D. E. Flowers Case. This involved an employee who was called for jury duty for about a sixty day period and the Company considered it necessary to transfer him from shift work to straight days in order to make him more readily available for jury service.

Another meeting was held with Radiation Monitors in an effort to resolve the long standing Wonacott (Monitor Jurisdiction) Case. The only benefit arising from this meeting was furnishing further evidence that the Company stands willing to bargain in good faith on this issue and try to arrive at a practical and logical solution. There is still a real possibility that this case will never proceed to arbitration and that it may just "die on the vine".

During the month a one-day strike occurred which involved Electricians of a subcontractor on Minor Construction work. Some of the men involved were engaged on critical work at the 234-5 Building. This office was considering the feasibility of placing G.E. Electricians on this work if the strike were to continue; however, a quick end to the strike eliminated the need for our further action.

A meeting was held with the various plant managers, CPD to discuss recommendations for change in the Chemical Workers ratio understanding. Suggestions for change are being studied for either immediate application or to use as bargaining material in 1960 negotiations.

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UNION RELATIONS OPERATION

	<u>December</u>	<u>November</u>
Bargaining Unit Employees in CPD	815	813
Bargaining Unit Employees Utilizing Check-off	539	534
Percentage of Total Bargaining Unit Employees Utilizing Check-off	66.1	65.7

Following is the grievance statistics summary for the month of December, 1958.

	<u>Unit</u>	<u>Nonunit</u>
Grievances received year to date	152	4
Grievances pending at Step II on 11-30-58	14	0
Grievances received during the month	14	2
Satisfactorily answered at Step I	3	0
Settled at Step I through expiration of 90 day time limit	8	0
Processed at Step II	1	2
Pending at Step II on 12-31-58	15	1
Pending at arbitration		
Active	4	0
Inactive	8	0

COMMUNICATION

Arrangements were made for three tours of CPD facilities during the month. These included one for B. H. Mackey of duPont; C. C. Walker and J. S. Parker; and, Congressman James E. Van Zandt (member of the Joint Committee) and Commander E. J. Bauser.

Two pages in an early December issue of the GE NEWS were devoted to a picture feature on Power & General Maintenance's landlord services. Eleven P&GM components, and twenty-nine of their people, were given recognition in this feature.

In an effort to fully inform Department personnel of the revisions in the Social Security law, sufficient copies of a government pamphlet, "The Social Security Amendments of 1958 -- What They Mean to You," were purchased for distribution to employees at the time the first increase in the Social Security deduction was made. Information on the increase was also publicized in the Management News Bulletin and the GE NEWS.

Several preliminary planning sessions were held with members of Industrial Engineering and with the Manager - Union Relations to discuss the part Communication will play in the development of the maintenance performance program.

The card files for the various Employee Relations mailing lists and for CPD periodical distribution were revised and brought up to date during the month.

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