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CHEMICAL PROCESSING DEPARTMENT

MONTHLY REPORT

FOR

NOVEMBER, 1959

Compiled By
OPERATION MANAGERS

December 21, 1959

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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

HW 62864

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

NOVEMBER, 1959

GENERAL SUMMARY

PRODUCTION

Production of plutonium from the separations plants during November and on a year-to-date basis exceeded the corresponding commitments.

Production of UO_3 was slightly below that scheduled; however, year-to-date output is two per cent above that forecasted. UO_3 shipments conformed to the Commission established shipping schedule.

The output of unfabricated plutonium was slightly below schedule while production of shapes conformed to the latest Albuquerque Schedule, Revision D. Shipping schedules were met for both products.

ENGINEERING

A new "zebra" scrub section cartridge was installed in the Purex plant first cycle solvent extraction column early in November. The removed cartridge showed disintegration of almost all the polyethylene sieve plates. The decontamination performance of the solvent extraction cycles subsequent to the cartridge replacement was not as effective as could have been expected. Thus, evidence continues to mount that flowsheet adjustments and operating patterns required for neptunium recovery using existing Purex facilities have an unfavorable influence on plutonium and uranium processing. Process study of considerable magnitude and indefinite duration is indicated and is being undertaken.

Process changes were completed in the Redox plant which permitted by-passing the H-2 metal solution centrifuge used for clarifying column feed solutions. Operation to date has been satisfactory.

During November, the basic capability of an acid precycle flowsheet designed to accumulate neptunium was demonstrated in Redox extraction. Preparations were initiated for a removal flowsheet demonstration effort next month.

Tests were made in the Purex plant of a single stainless steel reboiler to perform the entire backcycle waste concentrator boilup function. Results were promising, since the one reboiler carried the entire load at 2.9 Capacity Factor.

Engineering studies were continued on the evaluation of various neptunium production alternates for Purex. Current study is directed toward neptunium purification at the Purex plant, with either the purified nitrate or the oxide powder as the final product.

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GENERAL

The Chemical Processing Department achieved its seventh top Safety Award (now the HAPO General Manager's Award) at midnight, November 23, 1959. At that time the Department had operated 654 days or nearly five million man hours since its last disabling injury on February 7, 1959.

W.K. MacReady

General Manager
Chemical Processing Department

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STAFF

Vice President and General Manager, Atomic Products Division . . . L. R. Fink
General Manager, Hanford Atomic Products Operation . . . W. E. Johnson
General Manager, Chemical Processing Department . . . W. K. MacCready
Manager, Production Operation . . . J. H. Warren
Manager, Purex Operation . . . P. R. McMurray
Manager, Special Separation Processing & Auxiliaries . . . 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 & Engineering Operation . . . V. R. Cooper
Manager, Relations Practices . . . R. B. Britton

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CHEMICAL PROCESSING DEPARTMENT
NUMBER OF EMPLOYEES
NOVEMBER 30, 1959

<u>OPERATION</u>	<u>EXEMPT</u>		<u>OTHER</u>		<u>TOTAL</u>	
	<u>10-31-59</u>	<u>11-30-59</u>	<u>10-31-59</u>	<u>11-30-59</u>	<u>10-31-59</u>	<u>11-30-59</u>
GENERAL MANAGER'S GROUP	10	10	1	1	11	11
PRODUCTION	7	7	4	4	11	11
PUREX	48	48	207	207	255	255
SPECIAL SEPARATION PROCESSING & AUXILIARIES	49	49	214	216	263	265
FINISHED PRODUCTS	55	55	221	222	276	277
POWER & GENERAL MAINTENANCE	44	44	250	247	294	291
FINANCIAL	13	13	11	11	24	24
FACILITIES ENGINEERING	68	68	21	21	89	89
RESEARCH & ENGINEERING	59	59	24	25	83	84
RELATIONS PRACTICES	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>11</u>	<u>11</u>
TOTAL	358	358	959	960	1317	1318

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CHEMICAL PROCESSING DEPARTMENT

PATENT SUMMARY
FOR

MONTH OF NOVEMBER, 1959

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

INVENTOR

TITLE

* R. W. McKee, Facilities Engineer-
W. A. Graf, ing Operation

Combination Trough Tray and
Vertical Tube Dissolver for
Enriched Power Reactor Fuels

Donald M. Miller, Machinist,
Finished Products Operation
Maintenance

Special Hydra-Lock Chuck
(A device for supporting and
holding thin section material
of irregular shape for machining.)

W. F. Walbridge

General Manager
Chemical Processing Department

*Reported in October

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CHEMICAL PROCESSING DEPARTMENT
PRODUCTION OPERATION

NOVEMBER, 1959

I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Production Statistics

1. Purex

	<u>November</u>	<u>October</u>
Tons uranium processed	441.97	305.9
Average production rate during operation (T/D)	22.2	20.0
Total waste loss (%)		
Uranium	0.09	0.10
Plutonium	0.28	0.34
Average cooling time (days)	107	102
Minimum cooling time (days)	91	92
On-line efficiency (%)	66.4	57.0

2. Redox

Tons uranium processed	78.5	66.64
Average production rate during operation (T/D)	4.8	5.6
Total waste loss (%)		
Uranium	0.11	0.14
Plutonium	0.30	0.64
Average cooling time (days)	(143 E	179 E
	(103 N	
Minimum cooling time (days)	(113 E	123 E
	(96 N	
On-line efficiency (%)	82.5	54.1

3. 234-5

Batches input to Task I	123	180
Runs completed through Task III	178	171

Waste disposal (units)	426.0	424.0
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4. UO₃

	<u>November</u>	<u>October</u>	<u>To Date</u>
UO ₃ loaded (tons)	(66.1 E 381.6 N	58.7 E 488.5 N	
UO ₃ approved for shipment (tons)	(96.2 E 451.4 N	47.7 E 503.0 N	665.4 E 35 770.4 N
UO ₃ shipped (tons)	(0 E 451.1 N	93.6 E 453.7 N	521.5 E 35 618.6 N
UNH Backlog (tons)	(47 E 176 N	32 E 118 N	

5. Power

	<u>200 East</u>	<u>200 West</u>
Raw water pumped (gpm)	7 300	4 104
Filtered water pumped (gpm)	1 000	731
Maximum steam generated (lbs/hr)	240 000	175 000
Average steam generated (lbs/hr)	171 215	118 411
Total steam generated (M lbs)	123 275	85 256
Coal consumed, est. (tons)	6 992	4 852

6. Waste Storage

	<u>Equivalent Tons U</u>	
	<u>November</u>	<u>October</u>
Salt waste reserve storage capacity-Redox	3 156	3 234
Salt waste reserve storage capacity-Purex	29 484	29 941
Coating waste reserve storage capacity-Redox	25 772	25 850
Coating waste reserve storage capacity-Purex	38 425	38 882

E. Reports and Documents

1. Prepared and Issued

HW-62654 Essential Materials Consumption-Purex, Chemical Processing Department for October, 1959, J. E. Lentz

HW-62723 Chemical Processing Department Waste Status Summary, for October, 1959, J. E. Lentz

HW-62851 Scheduled Shutdown - Purex and Redox Plants, November 24, 1959, J. H. Warren

2. Prepared for Signature and Issuance

HW-62592 Production - October, 1959, W. E. Johnson

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III. ORGANIZATION AND PERSONNEL

A. Safety

There were no plant injuries reported by Production Operation personnel during November, 1959.

B. Security

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

C. Visits

J. H. Warren attended a feed materials planning meeting in Washington, D. C. on November 19 and 20, 1959.

J. H. Warren
Manager - Production

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CHEMICAL PROCESSING DEPARTMENT
PUREX OPERATION

November, 1959

I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Processing Experience

1. Production Experience

a) Production - Percent of Monthly Commitment

Uranium	110 Percent
Plutonium	115 Percent

b) Production Rates

11-6-59 to 11-20-59	2.64 CF
11-20-59 to 11-26-59	2.88 CF
11-26-59 to 11-30-59	Shutdown for Palm run.

c) Operating Continuity

Uranium	66.4 Percent
Palm	9.3 Percent

d) Waste Losses

Uranium	0.085 Percent
Plutonium	0.28 Percent

e) Uranium re-treated through silica gel - 320 tons.

2. Normal Processing

Normal processing was started on November 6 following replacement of the HA column cartridge. The decontamination efficiency of the process was unsatisfactory during the run period with an average gamma ratio of 6.4 for the uranium product (prior to silica gel) and a G/AT of 4.3 for plutonium. Many flowsheet changes were made in an effort to improve the decontamination effectiveness with little success. A clue to the possible cause of the difficulties was provided when the 3WB pump failed. During the three and one-half hour period required for a pump change, the HA column was operated without 3WB recycle additions and the HSP gamma showed

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a rapid and significant drop in activity. A later planned test confirmed these results.

Midway in the run period flooding in the final plutonium extraction column (2A) caused a large increase in plutonium product activity.

Waste losses were 0.27 and 0.09 for plutonium and uranium, respectively. The higher-than-normal level of waste losses reflects the increased amount of flushing and rework carried out during the month.

Palm processing started on 11-28-59 and continued into December.

The silica gel facilities processed 320 tons of uranium during the period to produce specification material for shipment.

3. Special Processing

Prior to the replacement of the HA column cartridge, the HA-HS system was chemically flushed to reduce radiation levels of the failed cartridge. The HA column was overflowed to the cell floor while the cartridge was out and several gallons of a separate brown phase were observed to overflow, along with large quantities of the broken plastic plates. Both the HAP line and the HSF line were thoroughly flushed to remove fragments of plastic.

One batch of IWW waste, collected just before the October shutdown, was reworked via F3. Approximately 949 units of plutonium and 74 pounds of uranium were recovered.

The final uranium cycle was operated during the Palm run in order to reprocess high gamma product which had been accumulated in the outside storage tanks.

B. Radiation Experience

The total radio-iodine emission for the month was 16.8 curies.

Two Radiation Occurrences were experienced during the month. The more serious incident was a plutonium puncture wound. The surface contamination on employee's right thumb was readily removed. A survey made at the Whole Body Facility indicated that approximately 6,000 d/m remained in the thumb. Preliminary bio-assay results indicate no significant deposition.

Fragments of plastic, which fell to the canyon deck from the failed HA column cartridge, gave radiation readings up to 22 rads/hr. at two inches.

C. Mechanical Experience

The following work was completed:

1. Replaced the HA column scrub cartridge. The old cartridge was found to have broken loose from the spider that fastened the cartridge to the column's flanged cover.

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2. Installed a test 2½ inch Yarway impulse-type steam trap in the H4 west position, replacing the Armstrong double-bucket-type assembly. The latter has been a malfunction problem of long standing. The first installation of a Yarway trap in the K4 east position in March, 1959 has given very satisfactory performance to date.
3. Replaced the upper and lower sections of the ion exchange concentrator loop with 304 stainless steel after leaks developed in the lower loop from corrosion attack. A similar failure of both upper and lower loops occurred in March, 1959.
4. The J1 pump was replaced with a reconditioned spare pump after upper seal leakage became excessive. A similar failure occurred in this same position on October 1, 1959. It is planned to modify one of the existing pumps for this location by installing a new type discharge head designed to extend the life of the pump.

D. Analytical Performance

Several special studies were conducted for Process Technology to help evaluate the high gamma activity in the final product streams. Information obtained pointed to the 3WB stream as the offender. Palm and fission product runs were progressing satisfactorily at the end of the month.

Studies to determine the Palm value for production fuels have been completed and the results recorded in document HW-62824.

E. Improvement Experience

1. Process Tests and Revisions

In an attempt to improve overall decontamination of the plant, centrifugation of the HAF was resumed on November 11.

A test was conducted to evaluate the effects of the HSR nitric addition on the decontamination performance of the HA-HS system. The acid addition was reduced to 30 percent of the original flow with no apparent benefit being noted.

The 3WB flow was suspended for six hours in order to verify the effects noted when the J1 pump was replaced earlier in the month. After stopping the flow, the HSP gamma activity decreased and leveled off at 25 percent of the original value. To determine effect of "point of entry" into the column the 3WB was then added to the HAF, instead of being returned to the distributor in the HA column. The HSP monitor began to increase and leveled out at approximately its original value. From this test it was concluded that there was some substance in the 3WB system which adversely affects the decontamination performance of the HA-HS column.

2. Inventions and Discoveries

Nothing to report.

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F. Events Influencing Costs

The J1 and J2 canyon pumps, valued at \$7,000 each (total of \$14,000), were decontaminated and repaired at a total cost of \$6,800.

G. Plant Development and Expansion

The additional air conditioning unit installed in the Purex Laboratory was accepted.

H. Reports Issued (Secret)

HW-62824 - Palm Content of Production Metal, November 23, 1959,
by M. H. Campbell and W. H. Swift.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling or near-serious accidents during November. Five medical treatment injuries were reported.

B. Security

No security violations were reported.

C. Personnel Activities

J. R. Cartmell and E. A. Foskett completed the "Introduction to Finance" course.

Nine exempt personnel attended lectures on subjects related to the Redox and Purex processes.

The Purex Manager held a dinner meeting at the Desert Inn Hotel on November 19 for the Purex Operation exempt employees.

On November 19, 1959, P. R. McMurray spoke to approximately 125 members and guests of the Everett, Washington, Kiwanis Club on the "Importance of Nuclear Materials and Nuclear Power".

Manager-Purex

PR McMurray:EAF:gt

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CHEMICAL PROCESSING DEPARTMENT
SPECIAL SEPARATION PROCESSING & AUXILIARIES OPERATION
NOVEMBER, 1959

I. RESPONSIBILITY

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

II. ACHIEVEMENT

A. Redox Processing Operation

E-Metal processing was conducted as scheduled throughout the month and the monthly production commitment was exceeded by 21 percent while operating at 82.5% of the total hours available for column operation. As usual, continuous operation of the dissolvers was necessary to produce sufficient metal solution for the production commitment. The mechanical efficiency for the month was 100 percent, there being no downtime chargeable to failed or malfunctioning equipment.

With the change from potassium permanganate to a sodium dichromate oxidation in the head-end flowsheet, control of ruthenium downstream has been achieved through the use of the E-13 ozonator on UNH and the E-2 ozonator on the plutonium product stream. The use of catalyzing agents, periodic acid in E-13 and sodium bismuthate in E-2, was started this month to reduce ruthenium removal time. The results have been very encouraging as ruthenium oxidation has been accelerated to the point that both product streams can now be reduced to shipping specifications within a reasonable period of time.

The quality of both product streams was under good control throughout the month. No silica gel treatment was necessary on any of the UNH produced. All plutonium production was within shipping specifications, although some high uranium to plutonium ratio was experienced during the first part of the month, and two E-7 batches were returned to the column for rework. Acid control in the UNH stream became a little difficult the latter part of the month and two E-12 batches were sent to uranium storage for subsequent blending.

Product waste losses were very good for the month, averaging 0.11% and 0.30% for uranium and plutonium respectively. Twelve D-9 waste batches were returned to the process as "catalytic-kill" solution during the operating period.

Jumpers were installed this month which permit by-passing the E-2 metal solution centrifuge. Operation to date has been satisfactory thus indicating that this method of operation is reasonably certain of becoming standard procedure. It will also have the added benefit

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of lowering waste losses as well as removing a significant piece of equipment from the process.

Operation of the codecontamination cycle column (1A) on an acid flowsheet and the second extraction cycle column (2D) on an acid-deficient flowsheet continued this month. A significant build-up of Palm inventory in the precycle system has resulted. At month-end preparations were started in anticipation of making a Palm recovery run during the first week of December.

Iodine 131 emission to the 291-S stack totalled 13.06 curies for the month. The maximum emission for any 24 hour period was 1.2 curies.

B. Maintenance Operation

The mechanical efficiency for the month was 100%, there being no downtime chargeable to failed or malfunctioning equipment. Five canyon jumpers were installed, two replacements and three associated with a new installation.

A new hexone decanter was installed ahead of the D-5 hexone stripper on 11-28-59. The decanter routes any hexone phase to the G-3 organic still for recovery instead of the D-5 hexone stripper. Improvement in the hexone recovery from the condensate system is expected.

A new chemical addition tank was installed at E-Panel in the 202-S operating gallery during the month. The tank is to be used as a sodium bismuthate make-up and feed tank to the E-2 ozonator.

The installation of jumpers necessary to by-pass the H-2 centrifuge was completed on 11-15-59. Feed material can now be transferred directly from the H-4 metal solution oxidation tank to the H-1 feed make-up. In light of the possible retirement of the H-5 and J-2 caustic scrubbers, this move presents a much simpler head-end process for the Redox Plant.

A portable inert gas purge board was fabricated and put into service this month to eliminate downtime while the installed inert gas PRV's and rotameters are out of service for cleaning. Diaphragm operated steam valves were also installed on the inert gas driers, replacing the defective solenoid valves.

The pins in the H-7 thermohm wall connector in the 202-S Canyon were finally removed this month with a specially fabricated tool and the wall head is now available for electrical service. Several previous attempts to remove the pins had been unsuccessful.

Modifications to the Palm recovery processing equipment in the 1-F cubicle in the 222-S Building have been completed with the exception of a stainless steel concentrator tank. This unit is nearing completion in the Power and General Maintenance Shop and should be installed by mid-December.

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C. Waste Handling and Decontamination Operation

1. Waste Handling

Redox Coating Waste Received (S Farm)	10,316 gallons
Redox Salt Waste Received (SX Farm)	95,181 gallons
Total Gallons Boil-Off Salt Waste	127,110 gallons
Waste Received 118 TX (from 221-U)	19,938 gallons
Stored Waste Transferred (112-SX to 111-SX)	53,722 gallons

A periscope was installed in the 106-TY tank (suspected of leaking) on 11-20-59. However, more light is needed for a thorough inspection of the inner tank lining and the Facilities Engineering Operation is currently making up a light bar for this purpose.

Approximately 40,000 gallons of waste from Tank 007-WR was neutralized and disposed of for the Finished Products Operation.

On 11-12-59 a significant leak was detected in a diversion valve located in the valve pit near the 112-SX boiling waste tank. Condensate from waste storage tanks 101-SX through 105-SX, is collected in the 106-SX de-entrainment tank and then pumped, as directed by the Redox Process Technology Operation, to any one of the boiling waste tanks 107-SX through 115-SX. Direction of flow is controlled through valving located in the valve pit near the 112-SX tank. Since the valve pit has no catch tank, any liquid losses are diverted to the immediate ground area. From inventory losses observed over the past four months, during condensate transfers from the 106-SX tank, it is estimated that a maximum of 25,000 gallons of condensate containing 80 to 100 curies of cesium have been discharged to ground via the leaking diversion valve and the valve pit. However, dry-well readings in the 241-SX Tank Farm Area have indicated no increase in activity, continuing to remain within the normal level of less than 100 c/m.

2. Equipment Decontamination and Repair

a. Regulated Steam Pit

Two vehicles, seven pieces of heavy equipment, and nine air operated valves were decontaminated at the regulated steam pit during the month. A total of 160 man-hours was charged to this operation.

b. Railroad Equipment

One hundred and fourteen man-hours were charged to decontamination and operational coverage for repairs to equipment at Riverland. The work was primarily concerned with Well Cars No. 37, 42, 44, and 99 which are being repainted.

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c. 221-U Canyon

The Redox dissolver, 1V-A2, was run through three additional decontamination cycles. Radiation levels are now as low as economically practical and the unit is to be moved to the 221-T Canyon for repair.

Two Purex pumps (F-7 and U-1) were decontaminated, dismantled, and the component parts returned to the Purex Plant for re-assembly.

Removal and decontamination of a one cubic foot cross section from a failed Purex F-6 tube bundle was completed this month. This service was requested by the Purex and Facilities Engineering Operations in their studies relative to the Purex tube bundle failures.

Thirty reactor pigtails were decontaminated for the Irradiation Processing Department (100-DR).

d. 221-T Canyon Building

All jumpers were removed from sections 11-L and 11-R and stored in sections 20-L and 20-R. Centrifuges 10-2 and 11-2, plus the 11-3 tank, were removed and stored on the canyon deck at the 221-B Canyon Building.

Minor Construction installed Hauserman partitions from sections 17 through 19 in the operating gallery, to form a new lunch room and four offices. Light fixtures and electrical outlets have been installed and painting has started.

The only crib available for 221-T low activity waste is the 241-TY crib. To utilize this crib it was necessary to make a tie-in where the line from the 112-T tank to the TX tile field crosses the scavenged waste line from the 241-TY tank to the 241-TY crib. The job was completed this month without incident.

D. Analytical Control Operation

A new method was devised this month, in conjunction with the Soil Effluents Group, HLO, which permits checking the strontium retention and break-through point of soils on the 256 Channel Gamma Energy Analyzer. The new method employs a Sr^{85} gamma emitter spike and eliminates the long and tedious wet chemistry method for determination of Sr^{89-90} .

Flowsheet changes and adjustments in the Redox Process for checking optimum head-end treatment, Palm build-up, and ozonator performance taxed the capabilities of laboratory personnel this month. Good

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coordination of day and shift analytical personnel was required in meeting the additional analytical work needed to provide control of the process and evaluation of operating procedures.

E. Radiation Monitoring Operation

Four radiation occurrences were recorded during the month. Three involved minor contamination spreads within non-regulated zones. The fourth occurred when an operator was momentarily exposed to a radiation field of 50 r/hr during the decontamination of a failed pump. However, the operator was quickly alerted and left the area. A technical over-exposure did not result and the employee's exposure was conservatively estimated at less than 400 mrad and 100 mr.

On one occasion during the month a significant increase in fission product activity to the sand filter was detected. Investigation revealed the source of increased activity to be the failed H-4 oxidation tank and associated vent line, which have been temporarily stored in J-Cell for ruthenium decay. Localized water spraying of this area reduced the activity to normal levels. Analysis of air samples taken downstream from the sand filter showed normal fission product activity during the period.

Some increase in fission product activity from the 291-S stack was measured on deposition filters and ground area control plots this month. White particles (ammonium nitrate) measuring up to one-half inch in diameter were frequently associated with the radioactive specs. Stack flushing on a weekly basis has not been effective in reducing the problem and a sampling program has therefore been established in an effort to further define the source of the contamination.

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 operation during November, 1959.

G. Events Influencing Costs

The Redox Plant was shutdown for the Thanksgiving holidays, November 26 and 27, and only standby personnel were scheduled to work.

The annual audit of property control, management methods and procedures was completed during the month and to the satisfaction of

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the General Electric traveling auditors.

With the installation of jumpers, which will permit by-passing the H-2 metal solution centrifuge, a significant piece of equipment has been removed from the Redox head-end process. Based on previous replacement experience for this unit, a savings of approximately \$36,000 per year is expected to be realized.

H. Plant Development and Expansion

1. Design and Construction Liaison

CG-772, Multi-Purpose Dissolver - Redox

Assembly of components, such as neutron moderator, vessel, grid, coil and bottom plate has started. The schedule for completion by mid-February is still realistic.

CAC-812, Equipment Decontamination Building - 2706-W

All exceptions to Phase I of the contract were completed this month. Construction of the Phase II solvent make-up lean-to was started on November 3, 1959, and is proceeding as scheduled. The concrete floor has been poured, structural iron work erected, and the corrugated sheeting is currently being installed.

I. Reports Issued

No secret reports were issued by personnel of the operation during November, 1959.

III. ORGANIZATION AND PERSONNEL

A. Safety

There were no disabling or serious injuries in the operation during November, 1959. Five medical treatment injuries were reported during the month. On 11-6-59 a near serious accident occurred when an electrician by-passed a control circuit on the silo sample elevator in the 202-S Building in order to lower a sampling team from the seventh level to the sample gallery, after the elevator had failed in operation. An investigation was made and corrective action has been taken. The incident is covered in detail in CPD Serious Accident Report No. 59-5.

Practice evacuations were conducted on all shifts in the Redox Plant on 11-12 and 11-13-59. No difficulties were encountered.

B. Security

There were no security violations in the operation during the month.

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C. Personnel Activities

D. W. Morris, Relief Maintenance Foreman, returned to the operation this month after a two month special assignment with the Facilities Engineering Operation.

J. D. Duncan, Contact Engineer, was loaned to the Facilities Engineering Operation for a period of approximately one month to work in the construction inspection group. He will be primarily concerned with architecture and structural inspections.

T. W. Brockett, AEC Office, Chicago, Illinois, was conducted on a general tour of the Redox Plant on 11-4-59.

George D. Monk and Muriel B. David of the Central Intelligence Agency, Washington, D.C., visited the Redox Plant on 11-19-59 for a general tour of the facilities.

Chas. S. Grosz

Manager - Special Separation
Processing and Auxiliaries

CT Grosz:sws

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CHEMICAL PROCESSING DEPARTMENT
FINISHED PRODUCTS OPERATION
MONTHLY REPORT

NOVEMBER 1959

I RESPONSIBILITY

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

II ACHIEVEMENTS

A. Processing Operation

Production of unfabricated plutonium was 5% over forecast (HW-62389) but it was 3% below schedule (undocumented) for the month, due to feed shortages caused by processing difficulties in the primary plants. Recovery (Recuplex) produced well during the month with total output being 134% of schedule (undocumented). Feed shortages also affected Uranium Reduction Operation output where production was 90% of forecast for normal material and 102% for enriched material (HW-62389). Shipping commitments for both plutonium and uranium were met. A total of 388,669 pounds of nitric acid was shipped to Purex for the U Plant recovery facilities.

Operating difficulties at the primary plants resulted in sporadic receipts during November both on the plutonium and uranium feed streams. Much of the plutonium feed received during this period was marginal in quality, requiring extensive blending prior to processing to the base metal. During the last several days of the month several batches of plutonium nitrate were processed through recovery (Recuplex) to reduce the gamma radiation level prior to processing into buttons. Equipment operation was generally normal in Z Plant with no unusual or extensive processing difficulties being encountered.

The recovery facility operated well throughout November with little operating or equipment difficulty. The extraction column operation has improved significantly since replacement of the H-3 column pulse plates in October. The current backlog of recoverable material is under good control.

The operation of the equipment in the Uranium Reduction plant was generally satisfactory during the month. The new powder handling system in G Cell, installed by project action failed on trial, and modifications by engineering are under way. Two of the ACA motors (M & L Cells) have been replaced with induction motors, as part of the programmed replacement schedule.

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B. Fabrication Operation

Production of 65 model assemblies met the production schedule (Undocumented) and satisfied delivery requirements outlined in CXXX-1776, Revision D. Since it was necessary to make a shipment on the last working day of the month, 45% of the December requirement was sent out at that time.

The fabrication of 65 model assemblies proceeded very smoothly during the entire month of November. All types of rejects were significantly lower than in the previous month. Operations were continued on a one-shift basis and schedules were met with ease. The most significant factor responsible for the improvement was the regular use of the improved design molding crucible which started on November 2. In preparation for production of the new model, training of operators on stand-in material continued and several satisfactory parts were fabricated. Time was also available for some operators to study blueprints of the new equipment and to participate in field checking activities on construction which is underway.

C. Maintenance Operation

Operation of the equipment used in plutonium preparation was satisfactory during the month. A new method of changing the filter cloth on the vacuum drum filter was developed and put in use. A reduction of personnel exposure was effected by this change.

The recovery equipment gave very little major trouble during the month, however, routine repair of the leaking lines and valves still requires extensive manpower.

Equipment used in plutonium fabrication functioned well during the period.

Uranium reduction equipment functioned satisfactorily during the month with only one major breakdown being experienced. This involved feed points in K calciner contacting the agitator arms and the resultant damage required extensive repair.

The program of replacing the ACA motors with the induction motors on the calciner drives was started during the month. Two changes have been made without difficulty and the new motors are operating satisfactorily.

D. Control Operation

The average impurity content of plutonium buttons assayed through November 30 was 1147 ppm, including 281 ppm of carbon (October process average). Three buttons were rejected for impurity levels exceeding 5000 ppm. The average purity for 6506 and 6507 parts was 99.884% and final inspection acceptance rates were 79.5% and 80.0%, respectively.

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D. Control Operation (Cont'd)

Four 0.6 gram cobalt slugs were fabricated and welded into aluminum cyclinders. From these one was chosen after leak testing, for insertion into a pile for irradiation. This is scheduled to begin December 2, 1959, and will take approximately 18 months to obtain a 50 curie Co^{60} source as a replacement for that currently expended.

Preparations for the inspection of the new model continued. These included: X-ray studies, revisions to gauges, training on new tools, listing of testing equipment needed, and arrangements to remove radiographic testing facilities, etc., to temporary quarters as required by construction project.

Analytical work proceeded routinely with 8190 determinations being made on 1330 samples. Checks on the purity of the plutonium recovered from laboratory residues in the newly installed ion exchange unit showed that it was sufficiently pure to process directly to buttons and that it would no longer be necessary to have this material recycled by the Purex Plant.

In radiation control work a very sharp improvement over the October performance was noted. Only 7 radiation occurrences and 20 skin contamination cases were recorded for the employees in the Finished Products Operation. There were no personal clothing contamination or potential deposition cases during the month.

Control of stack emission was good in both plants. Z Plant averaged 16.2 microcuries plutonium per day, and UO_3 averaged 7.4 microcuries uranium per day.

E. 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

Donald M. Miller, a Machinist in the Maintenance Operation submitted an application for a patent on a special hydro-chuck, a device for supporting and holding thin section material of irregular shape for machining.

F. Events Influencing Cost

Nothing significant to report for November.

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G. Plant Development and Expansion

1. Projects - Study, Scoping or Approval Phase

The following is included in this phase of the Finished Products capital expenditure program.

- a. A project proposal requesting design funds for a new Plutonium Reclamation Facility has been transmitted to the Atomic Energy Commission.

2. Projects - Construction

Construction funds have been made available for the following projects. The work being conducted on the various projects is classed as detail design, procurement or installation.

CG-734, RMC Button Line
CG-734, Rev. 2, Additional Shielding RMC Button Line
CGC-811, Phase I and Phase II, Additional Fabrication Equipment
CG-789, Additional Fire Protection, 234-5
CGC-843, Disposal of UO₃ Condensates
CGC-813, Pu Recovery from Contaminated Waste
CGC-826, Phase II, Vacuum System Improvements

3. Projects - Completed

Capital expenditure project CG-723, Conversion of Recuplex to a Manufacturing Facility was accepted with exceptions late in October.

III ORGANIZATION AND PERSONNEL

A. Organization Changes

P. E. Link, Specialist-Processing, Processing Operation, was transferred to the Irradiation Processing Department on November 16. The position in the recovery operation vacated by Mr. Link was filled by Mr. C. W. Campbell, a Technical Graduate who came from the Rotational Program to the Processing Operation in May of this year.

B. Safety Experience

There were no disabling injuries or serious accidents experienced in the Finished Products Operation during the month. Six medical-treatment injuries occurred as compared to eight in October.

C. Radiation Experience

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

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D. Security Experience

No security violations occurred during the month in the Finished Products Operation.

E. Personnel Activities

The Fabrication Operation has started a series of meetings to instruct employees in the production of new model weapon parts.

One Specialist-Processing is attending the present presentation of "Principles and Methods of Supervision and Leadership."

E. T. Walsh, Analyst, Processing, Fabrication Operation, is course leader for the above plant-wide course.

Five nonexempt employees are participating in the CPD Emergency Rescue Program.

Six exempt roll employees attended Relations Practices Information Meetings during the month.

F. Miscellaneous

Mr. W. N. Mobley, Manager, Finished Products, visited the Dow Chemical Company Plant at Rocky Flats on November 3 and 4, 1959, to attend a Plutonium Production Information Meeting.

Manager - Finished Products

WN Mobley:JFT:jjh

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CHEMICAL PROCESSING DEPARTMENT
POWER AND GENERAL MAINTENANCE OPERATION

NOVEMBER 1959

I. RESPONSIBILITY

The responsibilities assigned this operation remained unchanged during November.

II. ACHIEVEMENT

A. Operating Continuity

A planned steam outage, of a two-and-a-half-hour duration, was effected November 1, affecting the Redox and UO_3 Plants. The necessity for the outage was to repack the main valve on No. 2 manifold in the 284-W Power House.

B. Inspection, Maintenance and Repair

A crash program was initiated to expedite assembly and mock-up of a vendor-fabricated spare HA column for the Purex Facility which had arrived on the plant site October 26. The work was placed on an emergency around-the-clock basis on November 2, at which time the Purex Plant was experiencing considerable difficulty in removal of the remoteable sieve plate cartridge from the in-service HA column, and there existed the possibility that the entire unit would have to be replaced. Mock-up of the new unit continued on a 24-hour basis until the cartridge of the in-service unit had been successfully replaced. The cartridge for the new spare column was revised to minimize the possibility of a recurrence of the problem encountered in removal of the cartridge from the unit currently in service.

Completed on November 5 was the first of two spare tube bundles being fabricated for the Purex concentrators. The second unit is scheduled for completion December 7.

Fabrication of a Purex Prototype F-F6 Demister is in progress, and scheduled for completion in February 1960.

Installation of the Dry Atmosphere Hood, Super Air Dryer and related equipment at the Finished Products Operation is 95 per cent complete. Remaining to be done is minor electrical work and leak testing of the hood, which is scheduled for completion in early December.

The two lower panels on the NW side of the Anion Exchange Hood at the Purex Facility were replaced because of excessive corrosion of the glove port rings. This same problem necessitated replacement of the lower SE panels in this hood last month, and failure of the SW panels for the same reason is imminent. All glove port rings currently being placed in service are made of material possessing greater acid resistant characteristics than those previously installed.

Fabrication of a Multipurpose Dissolver for the Special Separation Processing and Auxiliaries Operation is approximately 25 per cent complete. February 1, 1960, is the target date for final completion.

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Special emphasis was placed on completing fabrication of 15 cell pipe jumpers required by the production facilities.

A general overhaul and repair program was completed on the exhaust duct system of the sampling hoods in the Redox sample gallery. Flexible neoprene couplings were replaced with off-set metal fittings to obtain a greater volume of exhaust air from the hoods.

A new stainless steel structure was installed in the "H" cell at the Purex Facility to support the KCI tank. The original installation of mild steel had deteriorated from acid corrosion.

As an experiment, a set of blades were machined from 4140 steel for the crucible cutter in Task III of the RMA Line at the Finished Products Operation. The original blades were made of expensive Cast Hastelloy C, whereas the new design utilizes less expensive material, simplifies machining requirements and takes advantage of the better machineability of 4140 steel. The experimental blades, which were heat-treated to a hardness of Rockwell 35, have performed satisfactorily to date; however, they have not been in service a sufficient period of time to conclusively evaluate their merit.

Installation of the Powder Conveyor Unloading System in "G" cell of the UO₃ Plant's 224-UA Building was completed, with exception of the batch weighing equipment, which is scheduled to arrive on the plant site in late December. Approximately seven work days will be required to complete installation of this equipment. Authority for performance of this work is Project CG-767 (Miscellaneous Improvements, UO₃ Plant).

A DOP Penetrometer (Filter Testing Device) was installed on the third floor of the 271-B Building. The unit was procured from the Army Chemical Center, Edgewood, Maryland, by the Industrial Hygiene Operation, and is designed for testing high efficiency exhaust filters, using a dioctyl-phthalate method.

Fabrication on an emergency basis of a 10'x 14'x 54' long burial box was prompted by the difficulty experienced at the Purex Facility with the HA column. When it became apparent the existing HA column would not have to be replaced at this time, the burial box was placed in storage for future use.

Assistance was rendered the Facilities Engineering Operation in their efforts to determine the extent of damage from corrosion, if any, to the department's concrete underground waste storage tanks. Two core samples were drilled from the 32" thick top of the A 0103 tank in the 241-A tank farm, to be used in tests designed to evaluate the extent to which corrosion has advanced to date.

Fifteen test wells were driven in the drainage area south of Gable Mountain for the Chemical Effluent Technology Operation of HLO. The wells will be used to obtain water samples and to observe water flows, levels, etc. They consist of 2" pipe driven to a depth of 20 feet.

Malfunctioning cables on the 10-ton hook of the Purex auxiliary crane were replaced during the month. The difficulty was attributed to twists in the cables, and all previous attempts to correct the condition had been unsuccessful.

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The Finished Products Operation was assisted in making repairs to the D-6 Process Drain Line which had separated at a weld joint. The subject line is 8" stainless steel, housed in a concrete encasement, and carries product waste from the 234-5 Building to an underground crib. Making the line accessible for repair involved excavating to a depth of seven feet and opening the tar-sealed encasement.

Humidity saturation tests were conducted on high-efficiency filters submitted by three principal filter manufacturers. The tests were conducted at the request of engineers involved in the Irradiation Processing Department's Reactor Exhaust Air Decontamination Program and AEC Engineers at Hanford and Washington, D.C.

On-site assistance to other departments included rebalancing the ventilation systems in the 105 and 115-F Buildings in further support of the IPD confinement program.

The 2" steel pipe lines used for conveying brine from the salt pits to the power houses were replaced with new plastic pipe. The replaced lines were original installations and had deteriorated from the corrosive action of the brine.

III. ORGANIZATION AND PERSONNEL

A. Safety and Security

No disabling injuries were incurred during the period covered by this report.

There were eight medical treatment cases reported, for a frequency rate of 1.80 per cent. This is the second consecutive month in which the section has experienced an appreciable reduction in its injury frequency rate.

B. Personnel

The Section Manager filled a speaking engagement at the Hyland Park Baptist Church, Hermiston, Oregon.

T. G. LaFollette

Manager-Power & General Maintenance

TGL:JFL:ap

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CHEMICAL PROCESSING DEPARTMENT
FINANCIAL OPERATION

NOVEMBER, 1959

I. RESPONSIBILITY

There was no change in the responsibilities assigned to the Financial Operation during the month.

II. ACHIEVEMENT

A. Production Cost

The Midyear Budget Review was submitted in final form to Contract and Accounting Operation.

A schedule of CPD cost tabulation requirements was prepared and presented to C&AO Cost. The schedule was supplemented by an analysis of current tabulations.

EDPM tabulations, entitled "HAPO Weekly Detail Cost Report," were distributed to former recipients of weekly Stores tabulations. An explanatory letter was prepared to accompany the initial distribution.

A revised instruction letter on acquisition document cost coding was prepared and distributed to CPD exempt and nonexempt personnel involved in the acquisition chain. The letter covered changes in the use of new general ledger codes.

Special requests for shipment of continuous de-nitrated orange oxide to National Lead Company of Ohio and of plutonium to Argonne National Laboratory were billed to AEC during the month. Costs of crating and shipping the Sheffield gauge to Union Carbide Company at Oak Ridge also were billed.

A review was made of a study made by Research and Engineering personnel on Fission Product Recovery. This study involved a further refinement of an analysis prepared in May, 1959.

An analysis was made of operating costs of certain phases of the NPF program. This study was made in collaboration with Facilities Engineering.

A study of General Maintenance costs distributed to Standby during the first three months of FY 1960 resulted in relieving Standby of \$2,697 and transferring this amount to Manufacturing Overhead.

An extensive review was made of liquidating rates for the engineering components, giving due consideration to midyear budget information. Appropriate rate adjustments were made.

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A meeting was conducted with Finished Products Processing and Fabrication management and an Industrial Engineering representative for the purpose of discussing an Industrial Engineering proposal for an improved technological base for distributing Recuplex cost.

An information meeting was held with members of P&GM General Maintenance management relative to cost practices, reporting, unit IME, and budgeting.

B. Personnel Accounting

Preparations were initiated for the forthcoming annual salary review. A revised exempt force report was received which provides up-to-date exempt salary data and the format for the annual salary review. Due to the unavailability of machine time much of the data required for the review will be completed manually.

Comparison of the initially revised exempt force report with source payroll data disclosed eighteen errors on the report including misnomers in position titles and incorrect salary levels and effective dates of salary changes.

An analysis was started of the overtime worked by CPD personnel during CY 1959. The purpose of the analysis is to provide management with overtime data for future planning and scheduling and to emphasize the impact of overtime payments on operating cost.

Articles were prepared and submitted for inclusion in department publications covering (1) the need for employees' prompt submission of their 1954 Stock Bonus Custody Receipts, (2) advise of an increase in Social Security tax effective January 1, 1960 from 2 1/2% to 3% and (3) advice to all participants in the Savings and Security Plan who originally authorized 3 1/2% contributions that in accordance with the provisions of the Plan, contributions will be increased automatically to 6% on January 1, 1960 unless new authorization cards are submitted.

C. General Accounting

The Midyear Budget Review of the Plant Acquisition and Construction Budget was completed and submitted to C&AO.

An authorization was received from the AEC increasing funds for Project CGC 873 - Fission Product Loadout Facility - Purex from \$10,000 to \$66,000 to cover the total project.

There were three Appropriation Requests approved in November with an aggregate value of \$19,430. Two of these approvals were for additional funds on previously approved Appropriation Requests (1,000 Ton Hydraulic Press, \$6,330; and Sheffield Gauging Equipment, \$3,500). In addition, an AR was approved for the acquisition and installation of two glove boxes and a central hood for use in the 222-S Building (\$9,600).

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The following construction projects have been unitized during the current fiscal year:

CA 764	Test Wells 216-BC Crib Area	\$ 83 896
CA 750	Office Annex to 234-5 Development Laboratories	56 469
CA 783	Additional Fire Protection 222-S	21 096
CA 773	Interim Waste Crib - Purex	117 648
CG 725	Liquid Waste Handling Facilities, UO ₃ Plant	28 205
CAC 798	Crib and Test Wells for 234-5 Building Wastes	94 372
		<u>\$401 686</u>

Physical Completion Notices were received during November for Project CG 723 - Conversion of Recuplex to a Manufacturing Facility and for IRC 241 - Personnel Decontamination Facilities - 200W.

D. Auditing

A test check was made of store orders originated by department personnel. It was noted that five unauthorized individuals approved store orders. Responsible managers were contacted for review and counter approval. Arrangements were made with Cost Accumulation, C&AO for a monthly test check of CPD store orders and referral to Audit of orders not properly authorized.

An analysis was started of overtime lunches used by CPD personnel during CY 1959 to determine the propriety of issue and to ascertain that lunches were disbursed only with proper authorization.

A follow-up inspection tour was made with a member of Power and General Maintenance management of material and equipment not stored in warehouses nor enclosed in storage yards. Satisfactory progress has been made in correcting conditions noted during a previous inspection in October, 1959.

E. Measurements and Procedures

Arrangements were made with Data Processing for tabulation of raw data on traffic flow information accumulated by the Industrial Engineers. Utilization of existing report formats reduced programing time. Information is to be used for the purpose of improving vehicle utilization.

Arrangements were made with R. C. McGee, Supervisor, Equipment and Programing Development - C&AO to attend the CPD Industrial Engineering staff meeting. The purpose of Mr. McGee's visit was to cover the data processing development at HAPO and the relationship of Electronic Data Processing Operation and Procedures personnel. The latter resulted in a considerable amount of clarification regarding lines of communication on new applications.

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III. ORGANIZATION AND PERSONNELA. Personnel

B. M. Dobbs, Manager-Production Cost and J. E. McDonald, Specialist-Plant Costs visited Financial Operation of APED at San Jose to discuss cost matters of mutual interest.

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

C. Reports Issued

HW-62708	CPD Cost and Production Analysis - October, 1959	K. G. Grimm
HW-62709	Special Separation Processing and Auxiliaries Operation Cost and Production Analysis-October, 1959	F. A. Fieser
HW-62710	Purex Operation Cost and Produc- tion Analysis-October, 1959	F. A. Fieser
HW-62711	Finished Products Operation Cost and Production Analysis-October, 1959	F. A. Fieser
HW-62815	CPD Production and Product Cost Standards-CY 1960	F. A. Fieser

Manager - Finance

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CHEMICAL PROCESSING DEPARTMENT
FACILITIES ENGINEERING OPERATION

November, 1959

I. RESPONSIBILITY

There was no change during the month of responsibility and accountability assigned to Facilities Engineering.

II. ACHIEVEMENTS

PUREX OPERATION

A. Research and Development

E-F6 Demister Installation

Design of the Demister is proceeding as planned and an order for a 5-foot diameter by 6-inch thick tantalum wire pad has been placed with Otto H. York Company. This order approximately represents this firm's annual production of tantalum wire. The feasibility of jetting boiling LWW solutions from E-F6 to TK-F12 is being determined.

Formaldehyde Treatment of Purex LWW

The scope design of the Formaldehyde Treatment Facility for Purex is nearing completion. Scope drawings are presently out for comment. The completion date for the formal report has been scheduled for December 11.

In-Line Pu Monitor, LBXP Stream

The jumper drawings and installation plans for the LBXP neutron monitor prototype instrumentation have been completed. Work orders have been issued for the fabrication work.

In-Line Photometer, HSP Stream

The radiation level in the sampler has been lowered to a point where maintenance work can be performed. A replacement cell is being fabricated by HLO to replace the original cell which has discolored windows. The reason for this discoloration has not yet been established.

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B. Process Technology

Waste Carton Monitor

Preliminary design sketches were completed, and a cost estimate was made for a neutron counter for waste cartons. Experimental work is continuing in the instrument laboratory to obtain more sensitivity and detector placement data for use in final design.

Remote HA Column Cartridge

The remote cartridge for the HA column which failed recently at Purex was inspected after about two years' operation in a radiation field estimated at 4×10^5 R/hour. The plastic plates were almost entirely disintegrated and exhibited a yellow coloration indicative of a total radiation exposure on the order of 2×10^9 R.

The process and design feasibility of banding the cartridges along the outer circumference to confine degraded polyethylene particles between adjacent stainless steel sieve plates is being evaluated. Banding would obviate the need for early cartridge removal for preventative maintenance; a banded cartridge could remain in service until either the decontamination performance or column throughput were reduced.

Stainless Steel H-4 Reboiler

A test was recently initiated at Purex to ascertain whether a single stainless steel reboiler could perform the entire H-4 Concentrator boilup function, to permit removal of the second stainless reboiler, for reduced maintenance cost. Initial tests appeared promising inasmuch as one reboiler carried the entire H-4 load at 2.9 capacity factor, with 9 M HNO_3 bottoms acid and with only 24 psig steam pressure.

Titanium Tube Bundle

Agreement on the design of a reboiler unit fabricated from titanium has been reached and the contract for purchase of the unit from the Griscom-Russell Company is in the final steps of preparation. Delivery of this unit is expected in October, 1960. The unit will be all titanium except the shroud and guide bars. It will incorporate the "bent-tube" design concept which will retard the accumulation of scale.

C. Plant Engineering

Crane Rail Repair

The Purex crane rails were examined to determine causes of failed side plates at rail joints. Cracked side plates were temporarily repaired with

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metal-arc type 310 stainless electrodes; however, it is believed that the rails also will require butt-welding. Four sample weld joints were prepared for mechanical testing.

High-level Cave Design

Detail design drawings for the Purex laboratory lead cave were completed and issued for comment. It is also expected that detailed cost estimating will be completed by month-end. An Appropriation Request is tentatively planned.

D. Project Activities*

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

Removal and relocation work was started during the month by CPFF forces.

CGC-873 Fission Products Loadout Facility

With the receipt of the directive during the month authorizing the total project funds, fabrication and construction work was started. Fabrication was completed of the jumper which provides the load-out lines between the canyon and exterior of the Purex building.

CAC-881 Emergency Water Supply - 241-A

This project proposal was transmitted to the AEC November 24, 1959. The estimated total project cost is \$175,000.

REDOX OPERATION

A. Research and Development

pH Monitor, LAFS Stream

Testing of a pH monitor on the LAFS sample stream was resumed during the month. A redesigned sample cell was provided by HLO, and operation has been satisfactory for approximately three weeks.

B. Process Technology

Off-Gas Iodine Monitor

A prototype installation was placed in operation to monitor I¹³¹ in the absorber tower. A scintillation detector is used, and both a commercial vacuum tube model and a HAPO transistORIZED model single channel energy analyzer are being operated in parallel for evaluation purposes.

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DECLASSIFIED**C. Plant Engineering****Gauge Ring and Gaskets**

Redesign of remote gauge ring and gaskets for dissolver tower and tube bundles was completed. The new design incorporates a lifting bail as an integral part of the gauge ring and gasket.

H-4 Oxidizer Vessel

An interim design for a stainless steel vessel to use advantageously the available stainless steel, has been completed for Redox. This will be vessel No. 8 and will have a flat bottom and no agitator port.

D. Project Activities***CGC-772 Redox Multi-Purpose Dissolver**

Process specifications for an air-in-bleed diaphragm-operated-valve were transmitted to Project Engineering. These specifications take cognizance of alternate in-bleed requirements under normal, E-Metal, and NFR service. Fabrication of the dissolver is underway in the 200-W Shops and is estimated to be 26 per cent complete. Fabrication of related jumpers was started during the month.

FINISHED PRODUCTS OPERATION**A. Research and Development****RMA Replacement**

Two problems, fabrication and relative potential of the screw-type halogenator, remain unresolved. Studies are being made to evaluate relative merits of the screw-type and fluid-bed type of halogenators.

Several conceptual sketches for PR can assemblies utilizing a transfer can principle for attachment to loading and unloading heads have been worked out, and one promising approach drawn up for further study and evaluation. This approach utilizes a breech lock principle for locking the can lid to the can and the lid to the unloading head enclosure. A single shaft is used to actuate the engagement and disengagement of the can assembly to the head enclosure.

Weapons

Test methods for measuring leak rates have been developed so that reproducible results can be obtained. The large amount of data obtained

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during these tests is now being analyzed and compiled. Engineering studies on possible methods for breaking cast or machined shells were also started during the month. Recycling of thin wall shells to the new casting equipment provided on Project CGC-811 will not be possible unless the shells are first broken into relatively small fragments. Mechanical methods for breaking these shells are needed because of the hand exposure problem that would be encountered in a manual operation.

Final Inspection Neutron Counter

All drawings were completed and approved for the neutron counter for the final inspection facility. Purchase specification information was also prepared for use by Project Engineering.

B. Process Technology

A new design for the calciner vacuum drum filter chute, incorporating adjustment features, has been completed. Fabrication of both a carbon steel mock-up and the final chute is essentially complete. It is planned to try the carbon steel mock-up chute in Hood H-9A early in December.

Tests performed last month on a device for testing the suitability of metal-to-metal seats on a transfer can gave unsatisfactory results. The contamination was found between the can lid and glove box door. Further work on this type of seating arrangement for the transfer can discussed under RMA replacement will be delayed until the design of the lock mechanism has been modified.

C. Plant Engineering

Task III Cutter Blades

Three sets of crucible cutter blades have been shop-fabricated and tested in service to determine a suitable or better substitute for the cast Hastelloy "C" blades. Spare Parts stock was depleted and 14 weeks delivery was quoted on the cast blades. The first two sets, of welded 304 and milled 440 stainless, were lacking in strength. The third set, of milled 4140 steel and slightly different design, has now been in service a week with no apparent damage.

Inspection Hoods

Operator limitations and specifications were developed for an inspection hood in 234-5 to minimize operator fatigue and insure operator access to components.

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D. Project Activities*

CG-734 RMC Button Line - 234-5 Building

Detail design is in progress on the shielding wall for the HC-6 tank and for shielding the ends of the HC-1 conveyor. Completion of design for the glove port covers is the only other design work remaining to be done on the shielding portion of the project. Welding of the shielding glass frames to the hoods is 70 per cent complete. The purchase requisition for lead glass was issued November 30. Drawings were prepared and issued for comment on a new type of slag and crucible grinder. According to present plans, the new grinder will be purchased as a prototype and tested; if results are satisfactory, methods will then be explored of getting it installed into the hood.

GENERAL ACTIVITIES

A. Research and Development

Pre-Amplifier Development

A new physical arrangement is being developed for a transistor pre-amplifier used in process tank well probes for neutron counting. Resistance to corrosion and acid fumes is of principal consideration, as that is a major problem in the Recuplex installation.

NPR Supporting Work

Work is under way to define the nuclear safety aspects of the proposed NPR Cask. The criticality tests will be performed using approximately five tons of tubular one per cent enriched uranium and are scheduled for completion during April 1960.

Palmolive Studies

Engineering studies were continued on the evaluation of various Palm processing alternates for the continuous recovery of virgin Palm from the 3WB system at Purex. A promising alternate involves the installation of new NA and NB columns and an NC Concentrator in the J-2 position, now occupied by the 1BSU-HAO Organic Mix Tank.

Seismology

The final report on seismological investigations at Hanford Works (GEH-24659), Consultant Agreement CA-204, was received from Dr. Frank Neumann, Seismologist, University of Washington. This report satisfactorily completes the scope of work defined in CA-204. With reservation and qualifications, Dr. Neumann suggests an earthquake intensity of MM-6 as a sound

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working value for engineering purposes.

Welding Report

Document HW-62096 "Welding of Nickel-Base and Cobalt-Base Alloys" was completed and issued for general on-site use November 17, 1959. This welding study was made primarily in support of the NPF Program.

B. Process Technology

Waste Disposal

Cutting of concrete core samples from the dome of tank 241-A-103 was successful after a method of securing the core drill was devised. Visual examination of the ceiling side of the core revealed no deterioration of the concrete. The cores were taken to 300 Area where a compression test, modulus of elasticity test, and moisture content will be made.

Fission Product Recovery

Fission Product studies have been directed towards converting B-Plant for Fission Product Recovery - Waste Calcination, with emphasis on early occupancy of B-Plant at minimum capital cost. One alternate would utilize the B-Plant dissolvers for interim storage of fission product concentrates delivered from the Purex plant.

C. Plant Engineering

None applicable.

D. Project Activities*

Project cost information as of November 22, 1959:

Total authorized funds - 18 Active Projects	\$ 10,212,000
Total Cost-to-Date	3,764,000
Commitments and Open Work Releases	1,109,000
Unencumbered balance	5,339,000
Costs charged to above projects 10-18-59 to 11-22-59	221,164

IRC-241 was dropped from active status during this period:

Authorized funds	\$ 2,570
Total Cost	2,451

CGC-830 NPF Reprocessing

The design criteria for the mechanical processing system is nearing completion, with the first comment issue scheduled for early December. Two process flow diagrams were issued for comment on November 12. Two of the five engineering flow diagrams on the solution storage system are essentially complete, and a third is 50 per cent complete. The study of the canyon ventilation system has been completed and the design criteria are now being prepared.

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III. ORGANIZATION AND PERSONNEL

A. Personnel

George Kligfield, Chief Mechanical Engineer for Vitro, returned to New York, leaving one engineer to continue NPF design.

B. Safety and Security

The regular safety-security-health meetings were conducted for all FEO employees, with particular emphasis being placed on seasonal and climatic hazards. There was no security violation.

C. Reports Issued

HW-60573 Project CAC-881, Emergency Water Supply, 241-A Tank Farm, dated November 9, 1959, by L. W. Finch.

Plant Equipment & Analysis Report, Emergency Water Supply - 241-A Tank Farm, dated November 9, 1959, by L. W. Finch.

HW-61777 Project CAC-880, Plutonium Reclamation Facility - Z-Plant, dated November 10, 1959, by L. W. Finch.

Plant Equipment & Analysis Report, Plutonium Reclamation Facility - Z-Plant, dated November 10, 1959, by L. W. Finch.

HW-61887 Rev. 2 Performance Criteria of a Titanium Reboiler for H-4 Purex Concentrator, November 16, 1959. Prepared by J. F. Kane.

HW-61950 Project CGC-830, Rev. 2 Plant Modifications for Reprocessing Non-Production Reactor Fuels, dated November 17, 1959, by W. G. Browne.

Plant Equipment & Analysis Report, Plant Modifications for Reprocessing Non-Production Reactor Fuels, dated November 17, 1959, by W. G. Browne.

HW-62096 Welding of Nickel-Base and Cobalt-Base Alloys, November 17, 1959. Prepared by G. A. Conner.

HW-62353 Project CAC-843, Rev. 1, Disposal Facilities for UO_3 Process Condensate, dated November 24, 1959, by W. G. Browne.

HW-62457 Palmolive Capabilities, W. K. MacCready, November 6, 1959.

HW-62742 Distribution of Recuplex Manufacturing Cost, November 8, 1959. Prepared by C. M. Thomas.

HW-62764 Bases for Preparation of Plant Improvement Programs, Chemical Processing Department, dated November 17, 1959, by W. K. MacCready.

Undocumented report, Transparent Glove Box Panels, R. A. Ciccarelli, November 13, 1959.

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D. Invention Reports

None

E. Trips and Visitors

Trips

E. L. Reed went to Schenectady, New York to attend the meeting of Managers of Manufacturing Engineering which was held November 4-5, 1959. He also visited Manufacturing Services, Methods & Time Standards and Engineering Services, Drafting, to discuss maintenance management and drafting problems. During this same week, he met with Manufacturing Services, Operation and Quality Control in New York City to discuss integration of Manufacturing Engineering with production components.

J. B. Fecht visited London, England and Brussels, Belgium to participate in United Kingdom-U.S. AEC Exchange Program Chemical Separations Plant and consult Eurochemic group, Belgium on fuel handling and storage from November 12 through November 30, 1959.

Visitors

Mr. P. S. Otten, Griscom-Russell Company, Massillon, Ohio, visited on November 11, 1959, for discussions on design and fabrication of titanium reboiler unit.

Mr. Ed Dahlhausen, Electric Storage Battery Company, Sacramento, California, was at HAPO November 5-18, 1959, to replace separators in batteries.

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CHEMICAL PROCESSING DEPARTMENT
RESEARCH AND ENGINEERING OPERATION
NOVEMBER, 1959

PUREX PROCESS TECHNOLOGY -

Head End

In an attempt to improve overall decontamination performance of the plant, centrifugation of the HAF was commenced on November 11. Because only one head end centrifuge is currently operable, holdup time during centrifugation is only five minutes compared to a normal ten minutes.

Additional analytical results from samples taken during the October fission product recovery test indicate the path of Sr 90 to be as follows:

- (a) Only twenty-five per cent of the Sr 90 in the IWW remained with the centrifuged solids and was dissolved in the leach liquor.
- (b) Fifty per cent of the Sr 90 in the leach liquor was precipitated by the sulfate strike.
- (c) Sixty-two per cent of the Sr 90 in the dissolved sulfate precipitate remained in the supernatant with the Rare Earths during the peroxy-acetate precipitation.

Solvent Extraction

Sixty-six per cent of the month was spent in normal irradiated uranium processing; the remainder of the time was spent in replacing the HA Column scrub section cartridge, equipment flushing and a neptunium recovery run. Typical performance data for the normal operating period are summarized below:

	<u>Log Decontamination</u> <u>Factor, dF</u>		<u>Instantaneous</u> <u>Loss, Percent</u>	<u>Recycle,</u> <u>Percent</u>	
	<u>Plutonium</u>	<u>Uranium</u>	<u>Plutonium</u>	<u>Plutonium</u>	<u>Uranium</u>
First	3.9	3.5	0.04	-	-
Final	3.5	2.8	-	4.3	7.0
Ion Exchange	0.5	-	-	0.6	-
Overall	7.9	6.3	0.04	4.9	7.0

At the start of the month, the Purex Plant was down because of restricted flow through the HA Column. Inspection of the HA Column removable scrub section cartridge showed disintegration of almost all the linear polyethylene sieve

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plates (the column had been installed 23 months). Fragments of the plastic plates removed from the column were discolored (yellowish), porous and structurally weak. By comparing the color of the fragments with the color of irradiated control samples, the radiation exposure was estimated to be $\approx 2 \times 10^9$ roentgens. A substantial amount of a yet unidentified "crud" was flushed from the lower portion of the HA Column while the scrub section was removed. In addition, pieces of polyethylene plugging the overflow line were removed by backflushing. Remote installation of a new "zebra" scrub section cartridge, identical to the original cartridge except for an improved method of assembly, was accomplished without incident.

After startup, overall decontamination performance of the solvent extraction cycles generally declined as operation continued despite the new HA Column scrub section cartridge and efforts to improve decontamination by flowsheet and operational changes. Although a temporary upset occurred during a rate increase, and variations in the HA Column organic uranium saturation tended to produce gamma bursts in the intercycle streams, the basic cause of the poor plant performance was directly traceable to poor decontamination in the HA Column. The results of tests made in an attempt to identify the cause of poor HA Column decontamination are tabulated below:

- (a) Stepwise reduction over a three day period of the HSR nitric acid addition to thirty per cent of flowsheet produced no significant change in the HA Column decontamination performance.
- (b) A six hour interruption of the 3WB flow produced a four-fold reduction in the HSP gamma activity as measured by the inline monitor. The reduction occurred 1-1/2 hours after the 3WB was shut off and continued for the duration of the test.
- (c) Introduction of HAF containing 3WB in the proper flowsheet proportion (3WB flow equals zero) returned the HSP gamma activity to the value experienced prior to elimination of the 3WB stream.

In all above tests, the HAW nitric acid concentration was maintained at 2.4 M by acid addition to the HAF. Based on the information obtained from the above tests, extensive flushing of the Backcycle Waste system was planned during the next shutdown period.

All uranium product batches produced during the month ranged from 1.5 to 8-fold above the <2.0 gamma ratio specification with an average value about four-fold high. However, the majority of this material was converted to specification product by silica gel processing. Batches containing the highest gamma ratios (up to 16) were produced just prior to shutdown because the uranium saturation in the 2D Column was decreased in order to reduce the amount of uranium in the Backcycle Waste system (in preparation for a neptunium recovery run). These batches were segregated for rework through the Final Uranium Cycle. Normal efforts to improve uranium decontamination by minor flowsheet and operational adjustments produced only insignificant changes in decontamination performance.

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Fifty per cent of the plutonium batches exceeded the current G/AT specifications of 3.5×10^{-11} despite ion exchange processing. A severe aqueous entrainment of unknown origin occurred in the top of the 2A Column and upset the Final Plutonium Cycle. After this and other upsets caused by rate, process or HA Column uranium saturation changes, the gamma activity of the final plutonium product increased and became borderline or exceeded the G/AT specifications.

The HAW plutonium waste loss was erratic throughout the run period because of close organic saturation control in the HA Column. Periods of process changes plus recycle of off-standard plutonium to the HAF appeared to have contributed to the increased waste loss which averaged about three-fold above the normal 0.03 per cent.

Other items of interest to solvent extraction included:

- (a) The severe aqueous entrainment in the 2AP did not respond to either adjustments or complete stoppage of the 2A Column pulse generator, but dissipated when the 2AS and 2AX flows were reduced 30 and 13 per cent, respectively.
- (b) Variations in the HSS-HNO₃ flow control system produced an HSS acid concentration in the 1.4 to 1.8 M range (flowsheet 2.0 M).

Neptunium Recovery

Despite erratic organic uranium saturation control in the HA Column which produced a tendency for higher temporary HAW neptunium losses, the overall loss remained essentially normal (25 per cent of the neptunium in virgin HAF). Some tendency for increased HAW neptunium loss was detected during the period when the HSR nitric acid addition was reduced significantly. Neptunium loss to the 2DU increased four-fold (to about fifteen per cent of the neptunium in virgin HAF) when the 2D Column organic uranium saturation was reduced in preparation for shutdown.

At month end, a neptunium recovery run was in progress to recover the estimated 1200 grams of neptunium accumulated in the Backcycle Waste system.

Plutonium Concentration

Mechanical operation of the Plutonium Ion Exchange Unit was satisfactory; however, despite high gamma activity in the XAF, decontamination performance was only normal (3 - 5 DF). Adjustments made to maximize decontamination included:

- (a) The XAS flow was increased to approximately 200 per cent.
- (b) The length of the resin pushes was reduced from about eleven to eight inches.
- (c) The volume of solution discharged via the XSW after each push was increased 20 per cent.

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Of all the above changes, the latter appeared to produce the most beneficial effect on decontamination.

A study of metallic impurities in the Plutonium Ion Exchange produce produced the following conclusions:

- (a) Essentially all the metallic impurities in the XCP result from feed contamination.
- (b) The XCP total metallic impurities may be limited to 500 - 1000 ppmp plutonium if the proper slipwater (XSW) flow can be maintained.

The stainless steel recirculation loop of the Final Plutonium Concentrator was replaced when the loop failed after eight months of service. Because the titanium loop on order was not ready for delivery from the vendor, the replacement was fabricated from 304-L stainless steel.

Solvent Treatment

The gamma activity of the No. 1 System solvent was reduced from 1400 uc/gal to about 800 uc/gal after startup and maintained at this value until just prior to shutdown. Although one per cent caustic was used during the run period in the turbomixer instead of 2.5 per cent sodium carbonate, conclusive data are not available to indicate whether or not the low solvent gamma activity was a result of this change. However, the use of caustic did increase the aqueous entrainment in the solvent leaving the turbomixer by several fold. An increase in the solvent activity up to 2500 uc/gal just prior to shutdown appeared to correlate with a sharp increase in the ICW Zr-Nb activity.

Waste Treatment and Acid Recovery

Except for minor dip tube plugging in the No. 1 Waste Concentrator, operation of the Waste Treatment and Acid Recovery equipment was satisfactory during the month. Waste transferred to the underground storage tanks averaged 54, 507 and 115 gallons per ton of uranium for neutralized IWW, solvent washes and cell drainage, respectively. Overall plutonium and uranium waste losses were 0.28 and 0.10, respectively. Plutonium and uranium coating waste losses accounted for 8 and 15 per cent, respectively, of the overall losses.

Self-concentration continues in the underground storage tanks 241-A-101, 102, 103 and 104 at boil-off rates of 1.8, 9.3, 1.3 and 11.2 gallons per minute, respectively. An insufficient boil-off rate in TK-101 necessitated diversion of cell drainage wastes into TK-102 which also currently receives the solvent washes.

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REDOX TECHNOLOGY OPERATION - 11

Feed Preparation

All solvent extraction feed during the month was oxidized with sodium dichromate. The length of time of acidic feed boil-up in the oxidation vessel was tested with times of 120, 60, 30, and 10 minutes, with no resultant changes in product losses during solvent extraction. At the end of the month the sodium dichromate oxidation procedure consisted of:

- 1) adjustment of the dissolver solution to 0.1 M $\text{Na}_2\text{Cr}_2\text{O}_7$ and 0.4 M HNO_3 ,
- 2) a 10-minute boil-up.

During the last two weeks of operation the centrifuge used for feed clarification was by-passed with no noticeable effect upon column operation or product losses. By-passing the centrifuge eliminates a serious equipment expense item and its related maintenance problems, and allows a reduction in the feed preparation time cycle of approximately 20 percent. The centrifuge is thus available for potential future use in the reprocessing of various types of new fuels.

Solvent Extraction

The extraction battery was operated the entire month with the precycle on an acid flowsheet to test the proposed internal recycle scheme for neptunium recovery. The neptunium collected in the last week of October was included in the total of approximately 200 grams accumulated from the 90 tons of enriched uranium processed through the end of November. During the accumulation period no neptunium was detected in the HAW salt waste stream. (The lower detection limit is approximately 5 percent of the virgin feed neptunium.) Based on the best available analytical and process performance data combined with the best estimate of the initial concentration of neptunium in the uranium received from the reactors, accumulation of the neptunium over this period of five consecutive weeks, appears to have been quantitative - within the limits of analytical reliability. Toward the end of the month, indications at one point in the cycle were that the accumulation had ceased, and that equilibrium had been reached between loss and recovery. However, a severe loss of acid control in the second extraction cycle was sustained, confusing the picture and making it impossible to determine whether or not a plateau had actually been reached. The second extraction cycle (1A Column) went acidic for several hours and approximately 6 to 8 grams of neptunium were therefore routed into the plutonium stream; none appeared in the uranium stream. Neptunium getting into the plutonium stream is expected to accompany plutonium through the third and fourth plutonium cycles since they are operated under oxidizing conditions on acid flowsheets. The neptunium would then consequently be "lost".

At the end of the month preparations were being made to test the proposed flowsheet for removal of the accumulated neptunium from the system during the first week in December.

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A salt waste batch containing some neptunium along with plutonium and uranium was processed early in the month on an acid salt waste rework flowsheet (HSF 0.1 M HNO_3 , HSX 0.2 M HNO_3 , and HSA 0.2 M HNO_3). The neptunium recovery was excellent, demonstrating that all three products can be easily recovered from the salt waste stream.

During the last week of October the LAFS stream was changed from -0.40 to -0.60 M HNO_3 and the fission product decontamination across the partition cycle was improved by a factor of two. This was done to help reduce the loss (arithmetic factor of 100) in fission product decontamination suffered from the adoption of the acid precycle flowsheet. The same acid concentration change was made in the 2DF stream with the same effect. However, the LAFS was later changed to -0.50 M HNO_3 when it became apparent that the extraction battery was overloaded with sodium nitrate as shown by samples of concentrated HAW and LAW which contained appreciable quantities of solid sodium nitrate. The point was actually reached on one occasion where the precycle was undersalted because the aluminum nitrate concentration was inadequate due to the increased sodium nitrate. Several changes in acid concentrations were therefore made during the month to decrease the sodium nitrate concentration.

It is planned to test dibasic aluminum nitrate (Diban) in the place of sodium hydroxide for obtaining the desired acid-deficiency in the second extraction cycle and the third uranium cycle as soon as the chemical can be obtained. The use of dibasic aluminum nitrate will produce aluminum nitrate in the system instead of sodium nitrate and will also eliminate the possibility of precipitating uranium or plutonium hydroxides in the process vessels. This will thus make it possible to operate a plutonium cycle on an acid-deficient flowsheet to gain additional fission product decontamination. It is estimated that the chemical will be available for test no earlier than February, 1960.

Since so much decrease in fission product decontamination (arithmetic factor of 100) was experienced as a result of the acid precycle flowsheet used for neptunium internal recycle recovery, some stream flow ratios were changed to help offset the decrease. The HA Column aqueous-to-organic ratio was changed from 0.51 to 0.556 by decreasing the HAX flow ratio. The LBS flow ratio was increased from 77 to 200 compared to an EAF of 100 at 2.0 M uranium.

The prototype plutonium ozonator was operated continuously during the month using varying amounts of the supplementary oxidant ("catalyst") sodium bismuthate, to obtain adequate fission product decontamination. While two individual samplings of 3BP exceeded fission product specifications, all final concentrated plutonium product met specifications. The sodium bismuthate was added as a 2.0 weight percent slurry in water at an average rate of one pound per equivalent ton of uranium processed. An evaluation of the effect of the varying amounts of catalyst added has not yet been made, but the minimum requirement will be established in forthcoming tests.

Periodic acid (HIO_4) was used in the uranium ozonator as an auxiliary oxidant for nearly all of the concentrated uranium product. The gamma ratio for 2EU product stream averaged 57 during the month with a maximum of 354. Through the use of

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approximately 30 parts of periodic acid per million parts of uranium, the average activity of the product stream was reduced to a gamma ratio of 1.85 giving an arithmetic decontamination factor of 30. A maximum decontamination factor of 275 was obtained on a product batch which had an initial gamma ratio of 158. Routine use of periodic acid has increased the essential material costs by only \$1 per ton of uranium.

Essential Materials

The prototype condensate hexone decanter was installed at the end of the month. The D-5 Condensate Stripper, which is supposed to steam distill hexone for return to the solvent system and thus prevent it from going to underground crib disposal in the condensate, is unable to handle occasional large amounts of hexone reaching the concentrators through column flooding and entrainment. This is believed to be the cause of most of the large hexone losses. The prototype decanter will handle the heavy loads imposed by column flooding and maloperation upstream from the stripper and will prevent the solvent slugging and overloading of the stripper. It is anticipated that hexone losses will be considerably reduced.

Waste Storage

The Redox neutralized salt waste stream was diverted from the 111-SX underground storage tank to the 115-SX underground storage tank at the beginning of the month according to the plan stated in the August report. In order to reduce the volume of dilute, non-boiling, neutralized salt waste presently in Redox underground storage, and thereby increase the ultimate capacity of the present tank system, it was planned to divert Redox waste from the currently receiving tank (whose contents are boiling) before the hydrostatic head limit was reached. The heat in this tank is being used to concentrate the dilute non-boiling waste pumped in from the 112-SX tank. A volume of 330,000 gallons of dilute waste in the 112-SX tank is expected to be received and concentrated by a factor of two over the course of the subsequent twelve months.

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FINISHED PRODUCTS TECHNOLOGY -

URANIUM CONVERSION OPERATION

Process Performance

All UO_3 shipped met product specifications. One container failed to meet the particle size specifications and required remilling.

One thousand, one hundred and seventy five (1,175) pounds of nitric acid per ton of uranium processed were recovered at an average concentration of 47%. This high recovery, 111% of theoretical, may be due to an increase in free acid in the feed. Eleven carloads of acid, averaging 44%, were shipped to Purex.

The average operating rate of the calciners was 7.3 tons uranium per unit for each day on the line. The overall calciner operating efficiency was 94.7%.

Process Improvement

Early in the month the G calciner agitator hub and arm assembly shear pin holes were reamed out to $3/4$ inch diameter. The new shear pins installed were $3/4$ inch with a $5/8$ inch shear diameter.

K calciner was damaged on November 12, 1959. Two thermowells and feed points were badly damaged and several shear pins had failed. It appeared that a blade bolt had failed and initiated the damage. The ACA agitator drive motor was replaced with the new fixed speed induction motor.

METAL FINISHING OPERATION

Recuplex

Seventy-two (72) runs, consisting of crucibles, fragments, powders, and clean-outs, were processed through the S & C Hood. Slurry losses to crib averaged 0.07% of the recovered plutonium.

The SE Hood processed 2220 liters per day at 94% operating efficiency for an average instantaneous rate of 2360 liters per day. Waste losses to the crib averaged 0.005 g/l (0.26% of the feed plutonium).

Hydroxylamine nitrate, vice hydroxylamine sulphate, was used in the stripping column (CCX) to determine the effect on product purity, and observe extraction column performance. The impurities in the product were reduced two-fold, nominally, from 10,000 to 5,000 ppm/Pu. Additional operating data are required in order to observe trends toward anticipated improvement in extraction column waste losses.

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Task I - II

One hundred eighty-two (182) runs were processed with an average filtrate recycle of 4.6%. The above normal recycle was largely due to overflows from the drum filter caused by plugged cloths.

Operation of the drum filter with the cloth installed with only four of the twelve hold down strips was satisfactory after the unused slots were filled with blank strips. This procedure simplified this installation of the cloth whenever replacement is required.

The cake wash water flow was increased in an attempt to improve the area of cake that is washed. A redesign of the water distributor may be necessary.

Compressed wire mesh primary filters were used in the hydrofluorinator off-gas system during the month instead of porous carbon. One filter, of Hastalloy C construction, was removed from service after 28 calendar days, and leached in dilute nitric acid for the second time. Five brushings were required during this period. Inspection after leaching did not reveal corrosion damage and the filter is considered satisfactory for reuse.

A Haynes 25 filter was installed as a replacement for the Hastalloy C element.

Task III

Reduction yields averaged 98.5% and the density of acceptable buttons averaged 19.31. Total impurities for acceptable buttons averaged 1,180 ppm.

Fifteen buttons were rejected. Ten were density rejects; four contained excessive iron and chromium and one delta button failed to meet minimum 70-58 specification.

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PROCESS CHEMISTRY

PUREX PROCESS ASSISTANCE

During the month, laboratory work in support of the Purex Process was centered mainly on 1) determining the cause of the large decrease recently experienced in decontamination across the HA column and 2) studying the properties of Purex first-cycle waste (LWW) after denitration with formaldehyde.

In looking for a chemical cause for the loss in HA column decontamination performance, the following observations were made:

1. The buoyant, orange-colored material flushed from the HA column after the disintegration of the polythene plates of the scrub-section cartridge was tentatively identified as finely divided polythene. The material was found to be more dense than Purex organic streams but less dense than Purex aqueous streams.
2. Preliminary examinations of 3WB (backcycle waste) solution indicate the presence of traces of similar material. Although the 3WB solution was clear on visual examination, high speed centrifugation with an air-driven ultracentrifuge appeared to concentrate some foreign material on the surface of the solution. This was evidenced by fission product distribution ratios for this surface material which were about three times greater than for the uncentrifuged solution or for 3WB solution subjected to normal centrifugation.

The volume of solids resulting, before and after neutralization, under various conditions of denitration and/or concentration was investigated.

The data summarized below show that denitration and/or concentration of the LWW before neutralization does not greatly reduce the total volume of solids which may be effectively transferred to underground storage. Denitration from 4.0 to 0.1 M nitrate reduces the sodium concentration of the neutralized waste by about 40 per cent.

The synthetic LWW contained about 5.5% by volume settled solids when acidic and about 70% by volume (95% of the volume of original LWW) settled solids when neutralized from 4 M H^+ to pH 10.5 with 50% sodium hydroxide. Denitration of acid LWW (~ 4.0 M H^+) with formaldehyde at 90 C maintaining constant volume throughout the denitration, to final nitrate molarities of 2.0, 1.5, 1.0, 0.5, and 0.1 yielded (acidic) slurries with about the same ($\sim 15\%$) settled volume of solids. Denitration with formaldehyde reduced the caustic requirement for subsequent neutralization to the extent that denitration from 4.0 to 0.1 M NO_3^- gave sodium molarities for the corresponding neutralized wastes of 5.3 and about 3.2, respectively. Concurrently, the total volume of solids in the neutralized waste was reduced by about 5-15%.

A two-fold concentration of the acidic wastes reduced the total volume of solids in the corresponding neutralized wastes by about 20%. Concentration of the acidic waste by more than a factor of 1.5, during denitration to less than 0.5 M nitrate, produced acid slurries with greater than 25% solids and

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undesirable transfer properties. Neutralized slurries of this material, produced by neutralization with 50% caustic, required dilution with water before transfer could be effected.

REDOX PROCESS ASSISTANCE

With the testing of an acid first-cycle in Redox, the acidity of the second cycle feed (1AF) has been decreased to -0.5 M HNO_3 . As a precautionary measure against plutonium deposition, the 1AA (scrub) acidity was increased from $+0.2 \text{ M}$ to $+0.3 \text{ M}$. Laboratory deposition tests on 1AF solution indicate that deposition would not occur under these conditions.

NEPTUNIUM PROCESS STUDIES

One hundred twenty (120) grams of neptunium was recovered by ion exchange techniques from waste solutions generated in the neptunium purification facility during October. Seventy-five (75) grams of this material was converted to NpO_2 by calcination and sintered at 1100°C for two hours. The remainder of the material was converted to the oxide in the usual way by heating to 550 to 600°C . The average particle size of the high-temperature oxide was approximately twice that of the normal oxide. As the sintered oxide offered no advantages over normal oxide in subsequent metallurgical operations, normal oxide only will be produced for the time being.

ANALYTICAL ASSISTANCE

Investigation of Metal Inclusions by the Micro-Spark Technique

A qualitative micro spark spectrographic technique was investigated for use in the 234-5 Development Laboratory program to determine the nature of inclusions occasionally found in finished plutonium metal. Tests were carried out using metallic uranium as a stand-in for plutonium. Small holes were made in the surface of the metal and metallic impurities were incorporated into the holes to act as synthetic inclusions. Spectrographic analysis of the inclusion areas by the micro-spark technique gave a satisfactory (low uranium) background and good qualitative detection of the metallic impurities. These studies will be extended to plutonium when spectrographic equipment for glove box operation is obtained.

Purex Plutonium-to-Uranium Ratio Measurement

A controlled potential coulometer was recently installed in the Purex Laboratory for the purpose of verifying and/or improving the present Purex Pu/U ratio measurement made on dissolver solution (E-5). To date, the instrument has been used principally for the uranium assay in determining the ratio in dilute E-5 solutions in which the uranium concentration is about 1 g/l . For this application, the instrument performance has been very favorable.

Because of the large pipetting variance and the correspondingly large plutonium bias corrections presently associated with the E-5 Gilmont pipetter, a ratio

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measurement on the E-5 Gilmont dilution is currently under consideration. To evaluate this approach, the Pu/U ratios of monthly composite samples of E-5 dilutions were measured using the coulometric method for uranium and the radioassay method for plutonium. Ratios obtained on the monthly composite samples compare quite well with monthly accountability ratios based on uranium assays by the density method and plutonium values by radioassay of Gilmont dilutions. As yet, sufficient data have not been accumulated to make firm comparisons. However, initial ratio values on the monthly composite samples appeared to be more consistent (lower between-month variance) than present accountability ratios.

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234-5 DEVELOPMENT

Reprocessing Of Off-Standard Chloride Powders

Two methods were demonstrated for the recovery of any off-standard powders produced in the chlorination of plutonium dioxide. Such powders might arise from process failure or from hood sweepings and cleanouts.

The first of these may be generally applied. This is the oxidation of the powder by air, followed by dissolution of the plutonium dioxide in nitric and hydrofluoric acids for recovery.

The oxidation reaction was studied at two temperatures--400 C and 500 C. To reduce the chloride content to 0.2 percent, 1,000 minutes is estimated required at 400 C and 350 minutes at 500 C. These reactions were carried out using six-gram samples of plutonium trichloride.

The second method may be applied to hydrated or wet plutonium trichloride. It applies to powders of low metallic impurities which can be recycled later directly into a mainline process. This method involves merely drying the powder in a phosgene atmosphere at 80 C, then at 180 C, then rechlorinating at 450 C to assure complete conversion to plutonium trichloride.

Both methods are recommended for application as needed.

Batch Reduction Of Plutonium Trichloride

A test was made of the effect of plutonium(III) oxychloride on a PuCl_3 reduction. The PuCl_3 powder contained a large fraction of PuOCl . The iodine booster ratio was 0.35, and calcium was used in 25 percent excess. The 30 grams of plutonium in the test reduction yielded only 3 grams of metal. This confirms that PuOCl in PuCl_3 has an adverse effect on reduction yield.

A small-scale (30-gram) reusable ceramic-type crucible was made with barium chloride impregnation rather than calcium chloride. There is less evidence of chemical attack on the crucible during reduction. It was hoped that the higher melting salt would provide more protection of the MgO from contact with plutonium.

Plutonium Casting And Metal Quality Studies

The use of a salt plug for bottom pour casting crucibles is being investigated. The melting point of the salt plug would be chosen so that the molten plutonium could be held in the pouring crucible long enough to "boil off" impurities.

It is hoped that the major part of the plug would be absorbed by the crucible and that the remaining part would float on the top surface of the casting.

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To date, lithium fluoride has been used with calcium fluoride to obtain salts with various melting points (850 - 900 C). Sodium chloride and potassium chloride have also been used. The plugs are pre-cast and then inserted in the crucible before loading the plutonium. The hole in the crucible is drilled 5/32" and tapered slightly. The plug is cast in an identical hole and is about 1/16" thick.

The two buttons that have been analyzed showed no evidence of contamination of the plutonium by the salt. Further work is planned to determine the path of the plug once it melts.

Further attempts at increasing the density of low-density metal from PuCl_3 reductions were unsuccessful. Adequate temperature and vacuum were reached to provide means of "boiling off" those impurities that are normally volatilized (i.e., calcium, sodium, trapped gases, etc.). The reason for this low density is still unknown.

Steam Oxidation Of Plutonium Skulls

A skull oxidation was made using a 300-gram skull and 160 - 230 C steam. The oxide was dissolved in 13 M HNO_3 - 0.2 M HF. Eighty-six percent dissolved after only 15 minutes of refluxing; and 98.7 percent dissolved after one hour of refluxing. Total time cycle was four hours for the combined treatments. Further tests will apply this process to bulk metal dissolution.

Critical Mass Fuel Preparation

The plutonium oxide-polyethylene pressed cylinders (1" O.D. x 0.5" thick), and plutonium oxide-methyl methacrylate cylinders (1" O.D. x 0.8" thick) have been subjected to gas evolution tests for 98 days. The released gas from the polyethylene cylinders was 93 percent hydrogen. Gas released from the methyl methacrylate cylinders contained 33 percent hydrogen, 20 percent nitrogen (?), 12 percent methane, 16 percent carbon monoxide, and 17 percent carbon dioxide (weight percent basis). Correcting the off-gas release for the gas composition shows the H/Pu ratio to have decreased from 14.96 to 14.28 and 14.79 for the polyethylene and methyl methacrylate impregnated cylinders, respectively. Visual inspections have not revealed any dimensional changes in the cylinders. Radiograph examinations have not disclosed any void area formations during the test period.

Mixed Crystal Fuel

Five batches of ammonium diuranate-plutonium hydroxide precipitate were prepared for the Plutonium Metallurgy Operation. The mixed compound was precipitated from a uranyl nitrate-plutonium nitrate solution by contacting with ammonium hydroxide. The precipitates were filtered and dried at 130 C. The 150-gram batches were prepared with selected plutonium concentrations ranging from 4 to 90 weight percent. The hydrogen reduction to UO_2 - PuO_2 mixed crystal will be performed by the customer.

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ORGANIZATION AND PERSONNEL

Personnel

No change.

Trips

E. R. Irish visited D. Rauth, J. B. Jones, J. Morse and G. Samos of the Martin Company, Nuclear Division, Baltimore, Maryland on November 5, 1959 for technical discussions on fission product recovery.

E. R. Irish visited P. Seyler at the University of Colorado, Boulder, Colorado on November 7, 1959 to attend Engineering Development Foundation meeting.

M. N. Raile attend the Metallurgical Show sponsored by the American Society for Metals, Chicago, Illinois November 3 through November 5, 1959.

M. N. Raile visited the Engineering Staff of the Stokes Vacuum Company, Philadelphia, Pennsylvania on November 6 and 7, 1959 to discuss production fabrication equipment.

M. N. Raile visited C. Sawyer of Jomas, Inc., Philadelphia, Pennsylvania on November 6, 1959 to discuss glove manufacture.

M. N. Raile attended the Permanent Mold and Die Casting Course sponsored by the American Foundryman's Society, Chicago, Illinois November 9 through November 11, 1959.

K. M. Harmon attended the Measurement Evaluation Seminar at the Argonne National Laboratory, Lemont, Illinois November 16 through November 19, 1959.

R. G. Geier visited M. T. Savanagh, C. Buck, P. Batterly, B. F. Warner and Thomas Puohy of the United Kingdom Atomic Energy Authority, Product Group Headquarters - Risley, Warrington, England to discuss design philosophy, unit's operation and maintenance experience, Windscale Separations Plant, and transportation of irradiated fuels.

R. G. Geier visited E. D. Detilleux, O. Jenne and E. P. Nickelson of the Eurochemic Center of Belgium Nuclear Studies, Mol, Belgium to discuss storage, handling and mechanical processing of irradiated power reactor fuels.

Visitors

L. Stanford of the Oak Ridge National Laboratory, Oak Ridge, Tennessee visited M. K. Harmon on November 19, 1959 to discuss ruthenium contamination problems and decontamination technology.

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ORGANIZATION AND PERSONNEL

Visitors (Continued)

R. O. Hill of the Air Reduction Co., Murray Hill, New Jersey and J. B. Jones of The Martin Company, Baltimore, Maryland visited E. R. Irish, S. J. Beard, B. F. Judson and C. R. Cooley on October 22 and 23, 1959 to discuss fission product recovery.

A. R. Fritsch of the Atomic Energy Commission, Division of International Affairs, Washington, D.C. visited E. R. Irish on November 10, 1959 to discuss separations plant and process requirements from an intelligence viewpoint.

E. L. Anderson of the Atomic Energy Commission, Division of Reactor Development, Washington, D.C. visited E. R. Irish on October 22, 1959 to discuss plutonium processing.

F. Maslan of the Brookhaven National Laboratory, Dept. of Nuclear Engineering, Upton, New York visited E. R. Irish on October 22, 1959 to discuss separations processes.

A. R. Irvine of the Oak Ridge National Laboratory, Union Carbide Nuclear Company, Oak Ridge, Tennessee visited E. R. Irish on October 22 and 23, 1959 to discuss separations processes and tour of facilities.

A. S. Jennings of E. I. du Pont de Nemours & Co., Wilmington, Delaware and H. L. Hull of the Savannah River Plant, Aiken, South Carolina visited E. R. Irish and S. J. Beard on October 22, 1959 to discuss Palmolive program and separations processes.

Inventions

None

E. R. Irish

Acting Manager
Research and Engineering

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**RELATIONS PRACTICES OPERATION
MONTHLY REPORT-DECEMBER, 1959**

I. RESPONSIBILITY

There were no changes in responsibility during the month.

II. ACHIEVEMENT

A. Communication

Most of the initial arrangements for PBM-I classes to be held starting in January have been completed. All that remains to be done are preparation and mailing of letters of invitation to each participant, distribution of study guide material, and reading material, and an advance meeting with the three course leaders. Session O is now scheduled for January 11.

Chemical Processing Department's contribution to the HAPO Achievement Report - 1946-1959 was written and submitted to Relations Operation for final approvals and inclusion in the overall report.

B. Salary Administration

An analysis of the national salary survey results for engineering and scientific graduates made by three surveying agencies was completed and comparative curves and data drawn for use in further analyzing salary position of Company and Department technical graduates. Communication with appropriate managers is planned.

The Department annual appraisal program has begun. Schedules and guidance information were prepared and issued to managers. Completion of this program is scheduled for January 15, 1960.

A study of maintenance foreman position is underway and is approximately fifty per cent complete. The study is part of a HAPO-wide program to review relationships of these positions.

C. Wage and Benefits

New job descriptions have now been received for all but four of the 74 non-unit jobs to be affected by the proposed Nonexempt Non-unit Compensation Plan. Preliminary evaluations have been completed on all of the descriptions submitted. Chemical Processing Department can easily meet the tentative February 1, 1960, deadline presently established for conversion to the new plan.

Arrangements have been completed for holding the annual pre-retirement contact meetings on a small group basis instead of an individual basis. Sixty-six employees in the 60-65 age group will be contacted during the month of December.

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Suggestion Plan participation has almost doubled since the start of the low-pressure promotional campaign "It's All In Your Head" as compared to activity of the past four months.

Two employees, one exempt and one nonexempt, were retired during the month.

D. Personnel Placement

During the month a transfer was arranged to the Vallecitos Atomic Laboratory of one Welder and one Radiation Monitoring Journeyman.

A ten year forecast of exempt Manufacturing personnel covering the period 1959-1969 was submitted to Manufacturing Services in New York based on information indicated by each section in the Chemical Processing Department. It appears that the Department will add about ten to eleven exempt personnel each year with an equal number transferring out to other functions.

E. Health, Safety, and Radiation

The Chemical Processing Department achieved its seventh top Safety Award (now the HAPO General Manager's Award) at midnight, November 23, 1959. At that time the Department operated 654 days or nearly 5 million man hours, since its last disabling injury on February 7, 1958.

A Department November Safety Program, "Remember Safety", was concluded on November 25. Seventy-five employees were personally contacted by Program Council members and asked to quote a posted safety slogan. Merchandise awards will be procured for eighteen winners.

Audits of the Department safety meetings and practice evacuations were conducted and recommendations made for improvement. Advice and services were extended to other HAPO department representatives to strengthen their participation in 200 Area evacuations.

A Rescue Training Program for Chemical Processing Department people was arranged with the 200 Area Fire Protection Operation of Construction Engineering and Utilities Operation. Training starts December 4, 1959.

The Specialist, Health, Safety and Radiation, presented three Safety Skull Sessions to two Section Managers and seventeen Subsection managers and specialists. Purpose of the meetings was to determine what needs to be done to improve safety performance in 1960 and to review Relations Practices health, safety and radiation services.

Operation of the Redox Silo Sample Gallery Elevator with the door safety interlock temporarily out of service presented an unsafe practice and condition; no injuries or property damage occurred.

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Fire damage of \$142 was sustained during overhead welding in Purex when sparks fell on clothing and supplies in the Canyon.

One plutonium wound occurred in Purex when a sharp object punctured an operator's glove, injuring the thumb, during work in N Cell Hood through glove ports. Skin contamination of 30,000 d/m was promptly removed.

<u>Chemical Processing Department</u>	<u>November</u>	<u>October</u>	<u>Year to Date</u>
Disabling Injuries	0	0	0
Serious Accidents	2	0	6
Medical Treatment Injuries	24	28	393
Technical Overexposure Incidents	0	0	1
Radiation Occurrences	15	22	194
Contaminated Wounds	1	2	11
Fires	1	1	9
Security Violations	0	4	21

III. ORGANIZATION AND PERSONNEL

The Specialist, Personnel Placement represented HAPD in a recruiting trip at Washington University in St. Louis, St. Louis University, and Texas A&M College.

There were no medical treatment injuries in Relations Practices during November, and there were no security violations.

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

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